IRANIAN JOURNAL OF NUCLEAR MEDICINE

Iranian Journal of Nuclear Medicine is a peer-reviewed biannually journal of the Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, covering basic and clinical nuclear medicine sciences and relevant application. The journal has been published in Persian (Farsi) from 1993 to 1994, in English and Persian with English abstract from 1994 to 2008 and only in English language form the early of 2008 two times a year. The journal has an international editorial board and accepts manuscripts from scholars working in different countries.

Chairman & Chief Editor: Saghari, Mohsen; MD

Associate Editor and Executive Manager: Beiki, Davood; PhD

Scientific Affairs: Eftekhari, Mohammad; MD and Fard-Esfahani, Armaghan; MD

Editorial Board

Alavi, Abbas; MD (USA)
Ay, Mohammad Reza; PhD (Iran)
Beheshti, Mohsen; MD (Austria)
Beiki, Davood; PhD (Iran)
Cohen, Philip; MD (Canada)
Dabiri-Oskooei, Shahram; MD (Iran)
Eftekhari, Mohammad; MD (Iran)
Fard-Esfahani, Armaghan; MD (Iran)
Grammaticos, Philip C.; MD (Greece)
Mirzaei, Siroos; MD (Austria)
Najafi, Reza; PhD (Iran)
Rahmim, Arman; PhD (USA)
Rajabi, Hossein; PhD (Iran)
Saghari, Mohsen; MD (Iran)
Sarkar, Saeed; PhD (Iran)
Zakavi, Seyed Rasoul; MD (Iran)

Editorial Office
Iranian Journal of Nuclear Medicine,
Research Institute for Nuclear Medicine,
Shariati Hospital, North Kargar Ave. 1411713135, Tehran, Iran

Tel: ++98 21 88633333, 4
Fax: ++98 21 88026905
E-mail: irjnm@tums.ac.ir
Website: http://irjnm.tums.ac.ir

Indexed in/Abstracted by
EMBASE, Scopus, ISC, DOAJ, Index Copernicus, EBSCO, IMEMR, SID, IranMedex, Magiran

Vol 20 , Supplement 1
2012

INSTRUCTION TO AUTHORS

Aims and Scope

Iranian Journal of Nuclear Medicine is a peer-reviewed biannually journal of the Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, covering basic and clinical nuclear medicine sciences and relevant application. The journal has been published in Persian (Farsi) from 1993 to 1994, in English and Persian with English abstract from 1994 to 2008 and only in English language form the early of 2008 two times a year. The "Iran J Nucl Med" is indexed and abstracted in the world-known bibliographical databases including EMBASE, Scopus, Index Copernicus, EBSCO, ISC, IMEMR, SID, IranMedex and Magiran. The journal has an international editorial board and accepts manuscripts from scholars working in different countries.

Manuscript submission

There are no charges for publication in this journal and all manuscripts should be submitted via journal URL: http://irjnm.tums.ac.ir

Conditions and Ethics

Manuscripts are considered with the understanding that they are submitted solely to the "Iran J Nucl Med" and have not been published elsewhere previously either in print or electronic format, and are not under consideration by another publication or electronic medium. Submission of an article for publication implies the transfer of the ***copyright*** from the authors to the "Iran J Nucl Med" upon acceptance. The final decision of acceptance rests with the Editor. Authors are responsible for all statements made in their papers. All accepted papers become the permanent property of the "Iran J Nucl Med" and you may not modify copy, distribute, transmit, display, or publish elsewhere without written permission from the "Iran J Nucl Med". Authors should refrain from contacting the mass media about papers that are being peer reviewed or in press; the Editor reserves the right to withdraw an article from publication if it is given media coverage at any stage of the review/publication process.

Ethical considerations will be taken into account in the assessment of papers that have experimental investigations of human or animal subjects. Authors should state in the Methods section of the manuscript that informed consent was obtained from all human adult participants and from the parents or legal guardians of minors and an appropriate institutional review board approved the project. Those investigators without such review boards should ensure that the principles outlined in the Declaration of Helsinki have been followed.

Manuscript categories

Original articles

These include controlled trials, interventional studies, studies of screening and diagnostic tests, outcome studies, cost-effectiveness analyses, and large-scale epidemiological studies. Each manuscript should clearly state an objective; the design and methodology; the essential features of any interventions; the main outcome measures; the main results of the study; a discussion placing the results in the context of published literature; and the conclusions which can be drawn based on the study. The text should not exceed 4000 words, the number of tables, figures, or both should not be more than six, and references not more than 40.

Review articles

These are, in general, invited papers, but unsolicited reviews, if of good quality, may be considered. Reviews are systematic critical assessments of literature and data sources pertaining to clinical topics, emphasizing factors such as cause, diagnosis, prognosis, therapy, or prevention. The text should not exceed 6000 words, the number of tables, figures, or both should not be more than ten, and references not more than 120. All articles and data sources reviewed should include information about the specific type of study or analysis, population, intervention, exposure, and test or outcomes. All articles and data sources should be selected systematically for inclusion in the review and critically evaluated, and the selection process should also be described in the paper.

Case reports

Case reports will be accepted only if they deal with a clinical problem that is of sufficient interest. The text should not exceed 2500 words; the number of tables, figures, or both should not be more than four; references should not be more than 25.

Editorials/Commentaries

Commentaries on current topics or on papers published elsewhere in the issue. Length should not exceed 2000 words; tables or figures are allowed only exceptionally; references should not be more than 40.

Letters to the Editor

Letters discussing a recent article in the "Iran J Nucl Med" are welcome and should be sent to the Editorial Office by e-mail <irjnm@sina.tums.ac.ir> within 6 weeks of the article's publication. Letters that do not refer to an "Iran J Nucl Med" article may also be considered. The text should not exceed 1000 words, have no more than two figure or table, and 10 references.

Criteria for manuscripts

Manuscripts submitted to the "Iran J Nucl Med" should meet the following criteria: the content is original; the writing is clear; the study methods are appropriate; the data are valid; the conclusions are reasonable and supported by the data; the information is important; and the topic has general medical interest. Manuscripts will be accepted only if both their contents and style meet the standards required by the "Iran J Nucl Med".

Manuscript preparation

Authors should refer to a current issue of the "Iran J Nucl Med" and to the Uniform Requirements for Manuscripts Submitted to Biomedical Journals for guidance on style. Use Arabic numerals for numbers above nine, for designators (e.g. case 5, day 2, etc) and for units of measure; numbers should be spelled out if below 10, at the beginning of sentences, and for fractions below one. Manuscripts should be word-processed double-spaced.

The manuscript (complete with tables and figures) should be submitted via journal URL: http://irjnm.tums.ac.ir

The manuscript should be accompanied by the following statements, signed by all the authors: "No work resembling the enclosed article has been published or is being submitted for publication elsewhere. We certify that we have each made a substantial contribution so as to qualify for authorship and that we have approved the contents. We have disclosed all financial support for our work and other potential ***conflicts of interests***."

Use System International (SI) measurements only, except when "Dual report" is indicated in the SI unit conversion table. Use generic names of drugs, unless the specific trade name of a drug used is directly relevant to the discussion. When generic names are not available, brand names which take an initial capital can be used. In Original articles, the maker of the study drug must be given. Do not use ***abbreviations and symbols*** in the title or abstract and limit their use in the text. Standard abbreviations may be used and should be defined on first mention in the text unless they are the standard units of measurement. In general, terms should not be abbreviated unless they are used repeatedly and the abbreviation is helpful to the reader.

Peer review and publication processes: All manuscripts are considered to be confidential. They are peer reviewed by at least 2 anonymous reviewers selected by the Editorial Board. The corresponding author is notified as soon as possible of the editor decision to accept, reject, or require modifications. If the manuscript is completely acceptable according to the criteria set forth in these instructions, it is scheduled for the next available issue. A computer print out is sent to the corresponding author for ***proof reading*** before publication in order to avoid any mistakes. Corrections should be marked clearly and sent immediately to the journal office. The corresponding author will be supplied with 2 free issues. Once published, all copies of the manuscript, correspondence and artwork will be held for 6 months before disposal.

Arrangement

Title page-This page should contain (1) the title, (2) names and surnames of authors, with their degrees [maximum two] and affiliations; if an author's affiliation has changed since the work was done, list the new affiliation as well, (3) the full address, phone and fax numbers, and e-mail address of the corresponding author, and (4) a short running head of no more than 40 characters.
Abstract-The abstract should not exceed 250 words for structured (Original articles, Review articles) unstructured abstracts (Case reports). The abstract should be concise, summarizing the purpose, basic procedures, main findings (giving specific data and their statistical significance, if possible), and principal conclusions of the investigation. Abstract headings should be as follows: Objective, Design, Setting, Patients (or Participants), Interventions (if any), Main outcome measures, Results, and Conclusions (for Original articles); Objective, Data sources, Study selection, Data extraction, Data synthesis, and Conclusions (for Review articles); or Objective, Participants, Evidence, Consensus Process, and Conclusions (for Consensus statements).
Key words-At the end of the abstract, authors should provide no more than five key words to assist with cross-indexing of the paper. Key words should be taken from Medical Subject Headings (MeSH) list of *Index Medicus* (http://www.nlm.nih.gov/mesh/MBrowser.html).
Introduction-The rationale for the study should be summarized and pertinent background material outlined. The Introduction should not include findings or conclusions.
Methods-These should be described in sufficient detail to leave the reader in no doubt as to how the results are derived.
Results-These should be presented in logical sequence in the text, tables, and illustrations; repetitive presentation of the same data in different forms should be avoided. This section should not include material appropriate to the Discussion. Results must be statistically analyzed where appropriate, and the statistical guidelines of the International Committee of Medical Journal Editors should be followed.
Discussion-Data given in the Results section should not be repeated here. This section should consider the results in relation to any hypothesis/es advanced in the Introduction. This may include an evaluation of methodology and of the relationship of new information to the existing body of knowledge in that field. Conclusions should be incorporated into the final paragraph and should be commensurate with-and completely supported by-data in the text.
Acknowledgement-All contributors who do not meet the criteria for authorship should be covered in the acknowledgement section. It should include persons who provided technical help, writing assistance and departmental head who only provided general support. Financial and material support should be acknowledged.
References-Number references in the order they appear in the text; do not alphabetize. References should follow the Vancouver style and should appear in the text, tables, and legends as Arabic numerals in parenthesis. Journal titles should be abbreviated in accordance with *Index Medicus*. Authors are responsible for the accuracy of references and must verify them against the original documents.

The following are sample references:

Standard journal article
List all authors when there are six or fewer; when there are seven or more, list the first six, then "et al" :
Mackness MI, Mackness B, Durrington PN, Fogelman AM, Berliner J, Lusis AJ, Navab M, Shih D, Fonarow GC. Paraoxonase and coronary heart disease. Curr Opin Lipidol. 1998 Aug;9(4):319-24.

As an option, the month and issue number may be omitted.
Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002;347:284-7.

Article, no author given:
Cancer in South Africa. S Afr Med J. 1994 Dec;84(12):15.

Chapter in a book:
Phillips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, editors. Hypertension: pathophysiology, diagnosis, and management. 2nd ed. New York: Raven Press; 1995. p. 465-78.

Book, personal author(s):
Ringsven MK, Bond D. Gerontology and leadership skills for nurses. 2nd ed. Albany (NY): Delmar Publishers; 1996.

Book, editor(s) as author:
Norman IJ, Redfern SJ, editors. Mental health care for elderly people. New York: Churchill Livingstone; 1996.

Book, Organization as author and publisher:
Institute of Medicine (US). Looking at the future of the Medicaid program. Washington: The Institute; 1992.

Article in electronic form:
Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis [serial online] 1995 Jan-Mar [cited 1996 Jun 5];1(1):[24 screens]. Available from: URL:
http://www.cdc.gov/ncidod/EID/eid.htm

Conference proceedings:
Kimura J, Shibasaki H, editors. Recent advances in clinical neurophysiology. Proceedings of the 10th International Congress of EMG and Clinical Neurophysiology; 1995 Oct 15-19; Kyoto, Japan. Amsterdam: Elsevier; 1996.

Conference paper :
Bengtsson S, Solheim BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, editors. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 1992 Sep 6-10; Geneva, Switzerland.

Tables and figures

Tables

Do not submit tables as photographs. Number tables consecutively in the order of their first citation in the text and supply a brief title for each. Give each column a short or abbreviated heading. Place explanatory matter in footnotes, not in the heading.
All non-standard abbreviations used in each table should be defined in the footnotes, in alphabetical order. Statistical measures of variations such as standard deviation, standard error of the mean, or confidence interval should be identified in headings. Vertical rules and horizontal rules should be omitted. Ensure that each table is cited in the text.

Figures

Illustrations include photographs, photomicrographs, charts, and diagrams, and these should be camera-ready. Professional medical illustrators should be consulted when figures are prepared; freehand or typewritten lettering is unacceptable. Letters, numbers, and symbols should be clear and of sufficient size to retain legibility when reduced. The diagram should not lose clarity on reduction; it is generally simplest to aim for a 50% linear reduction. Titles and detailed explanations should be confined to legends and not included in illustrations. Number illustrations consecutively in the order of their first citation in the text. Photographs of persons must be retouched to make the subject unidentifiable, and be accompanied by written permission from the subject to use the photograph.

The Final Checklist

The authors must ensure that before submitting the manuscript for publication, they have taken care of the following:

1- Title page should contain title, short running title, name and surname of author/co-authors, their qualifications, designation and institutions they are affiliated with and mailing address for future correspondence, e-mail address, phone and fax number.
2- Abstract in structured format up to 250 words.
3- References mentioned as stated in the Instruction to Authors section.
4- Do not submit tables as photographs. Make sure for heading of the table, their number.
5- Photographs/illustrations along with their captions. Titles and detailed explanations should be confined to legends and not included in illustrations.
6- Disclosure regarding source of funding and conflict of interest if any besides approval of the study from respective Ethics Committee/Institution Review Board.
7- Covering Letter
8- Copyright Transfer Form

Sample Cover Letter

Dear Editor
On behalf of my co-authors, I would like to submit our manuscript entitled "----------" for consideration of publication by your Journal. This manuscript has not been published in this or any similar form (in print or electronically, including on a web site), nor accepted for publication elsewhere, nor is under consideration by another publication. All authors offer the copyright to the "Iran J Nucl Med" and each author has contributed significantly to the submitted manuscript. Also it should be mentioned that, there is no conflict of interest in connection with the submitted article.

"Corresponding Author's Signature"

Copyright Transfer Form

The Iranian Journal of Nuclear Medicine is pleased to publish your manuscript #_____, entitled:

"----------

----------"

Upon acceptance by *The Iranian Journal of Nuclear Medicine*, all copyright ownership for the article named above is transferred to The *Iranian Journal of Nuclear Medicine*. We, the undersigned coauthors of this article, have contributed to (1) data design, analysis, or interpretation; (2) writing or critiquing drafts of the manuscript; and (3) approval of the final manuscript before publication. We share in the responsibility for the release of any part or all of the material contained within the article noted above. We also affirm that the manuscript has been seen and approved by all authors. The undersigned stipulate that the material submitted to *The Iranian Journal of Nuclear Medicine* is new, original and has not been submitted to another publication, be it print or electronic, for concurrent consideration; likewise, this manuscript has not been published elsewhere either in part or in its entirety.
We also attest that any human and/or animal studies undertaken as part of the research from which this manuscript was derived are in compliance with regulations of our institution(s) and with generally accepted guidelines governing such work.
We further attest that we have herein disclosed any and all financial or other relationships that could be construed as a conflict of interest and that all sources of financial support for this study have been disclosed and are indicated in the acknowledgments.

Corresponding Author's Signature Date

Author's Signature Date

Author's Signature Date

Author's Signature Date

Author's Signature Date

Author's Signature Date

Author's Signature Date

Author's Signature Date

Author's Signature Date

Abstracts

10th Asia-Oceania Nuclear Medicine and Biology Congress,

May 16-20, 2012

Tehran, Iran

Organized and Hosted by

Research Institute for Nuclear Medicine,

Tehran University of Medical Sciences

In Cooperation with

Iranian Society of Nuclear Medicine
&
Nuclear Medicine Research Center,
Mashhad University of Medical Sciences

Sponsors

PLATINIUM SPONSOR

DELSHID

Scientific Committee

(In alphabetical order of last name)

Farzad Abbaspour, Iran
Hojjat Ahmadzadehfar, Germany
Shahram Akhlaghpour, Iran
Mehrossadat Alavi, Iran
Abdul Rahim Al Suhaili, UAE
Mehrangiz Amiri, Iran
Mahasti Amoui, Iran
Mojtaba Ansari, Iran
Majid Asadi, Iran
Mohammad Reza Ay, Iran
Morteza Bahri, UAE
Marika Bajc, Sweden
Mohsen Beheshti, Austria
Davood Beiki, Iran
Salvatore Berlangieri, Australia
Bijan Bijan, USA
Hee Seung Bom, S. Korea
Emilio Bombardieri, Italy
Stefano Boschi, Italy
Thomas Brucke, Austria
Paolo Castellucci, Italy
Vahid Reza Dabbagh Kakhki, Iran
Shahram Dabiri, Iran
Mohamadreza Deevband, Iran
Abbas Eftekhari, USA
Mohammad Eftekhari, Iran
Abdel Hamid Elgazzar, USA
Alireza Emami Ardekani, Iran
Mostafa Erfani, Iran
Babak Fallahi, Iran
Jamshid Farahati, Germany
Armaghan Fard-Esfahani, Iran
Saeed Farzanehfar, Iran
Hassan Firoozabadi, Iran
Feridoon Fotouhi, Iran
Pardais Ghafarian, Iran
Peiman Haddad, Iran
Amir Ali Hamidieh, Iran
Shahab Hoda, Iran
Simon Horenblas, Netherland
Seyed Jalal Hosseinimehr, Iran
Raihan Hussain, Bangladesh
Masood Iravani, Iran
Sina Izadyar, Iran
Seyed Amirhosein Jafari-Sepehr, Iran
Amir Reza Jalilian, Iran
Kalevi Kairemo, Finland
Dariush Kamal-hedayat, Iran
Felix Keng Yung Jih, Singapore
Ali Khalaj, Iran
Zhamak Khorgami, Iran
Hamidreza Khosravi, Iran
Peter Knoll, Austria
Werner Langsteger, Austria
Bagher Larijani, Iran
Georgios Lounto, Greece
Seyed Rabie Mahdavi, Iran
Hadi Malek, Iran
Arun Malhotra, India
Darab Mehraban, Iran
Mehdi Momennezhad, Iran
S. Mohamad Javad Mortazavi, Iran
Hossien Mozdarani, Iran
Seied Asadollah Mousavi, Iran
Isa Neshandar-Asli, Iran
Jerry Obaldo, Philippines
Ajit KumarPadhy, Singapore
Farzaneh Pooyafard, Iran
Arman Rahmim, USA
Hossein Rajabi, Iran
Borzou Rashidi, Iran
Pasha Razifar, Sweden
Ramin Sadeghi, Iran
Keyvan Sadri, Iran
Mohsen Saghari, Iran
Teofilo San Luis, Philippines
Haluk B. Sayman, Turkey
Nahid Sedighi, Iran
Shahram Seifollahi, Iran
Ali Shabestani-Monfared, Iran
Soraya Shahhosseini, Iran
Alireza Shirazi, Iran
Fereydon Sirati, Iran
Mehdi Sohrabi, Iran
Mansour Movahed, Iran
Kerim Sönmezoğlu, Turkey
Ahmadreza Soroosh, Iran
Abbas Takavar, Iran
Giorgio Treglia, Italy
Omar Ugur, Turkey
Arsalan Vakili, Iran
Sobhan Vinjamuri, UK
Nahid Yaghoubi, Iran
Keiichiro Yoshinaga, Japan
Habib Zaidi, Switzerland
Alireza Zakani, Iran
Seyed Rasoul Zakavi, Iran
Amin Zonoozi, Canada

Oral Presentations*

***The abstracts published in this supplement have been edited by the Scientific Committee of 10th AOFNMB congress and were not subject to the standard reviewing process of the "Iranian Journal of Nuclear Medicine".**

OP 001

Friday, May 18, 2012

11:30-12:30, Hall 5

Effect of radiotracer injection volume on the success of sentinel node biopsy of early stage breast cancer patients

Zohreh Adinehpour[1*], Ramin Sadeghi[1], Mohammad Naser Forghani[2], Ali Jangjoo[3], Mostafa Mehrabibahar[3], Asieh Sadat Fattahi Masoum[4], Alireza Tavassoli[4]

[1]Nuclear Medicine Research Center, Imam Reza Hospital, Mashhad University of Medical Sciences
[2]Cancer Research Center, Omid Hospital, Mashhad University of Medical Sciences
[3]Surgical Oncology Research Center, Imam Reza Hospital, Mashhad University of Medical Sciences
[4]Minimally Invasive and Endoscopic Surgery Research Center, Ghaem Hospital, Mashhad University of Medical Sciences

Introduction: Radiotracer volume to be injected for sentinel node mapping is a controversial issue in breast cancer patients. In the current study, we evaluated the effect of radiotracer injection volume on the accuracy of sentinel node mapping in early stage breast cancer patients.
Methods: 383 patients with early stage breast caner (cN0) were included in the study. Patients received intradermal injection of the ^{99m}Tc-Antimony sulfide colloid for sentinel node mapping. The volume of injection was 0.1 mL for 102 patients, 0.2 mL for 221 patients, 0.5 mL for 30 patients, and 1 mL for 30 patients. Sentinel nodes were detected during surgery using gamma probe and blue dyes (methylene blue or patent blue V in 335 patients).
Results: Overall detection rate was 93.9%. Detection rates were 95.1%, 95%, 90%, and 86.7% for 0.1, 0.2, 0.5, and 1 mL volumes respectively, which shows a minimal trend to lower detection in the higher volumes. The time of sentinel node visualization also showed a minimal increasing trend by increasing the volume of injected radiotracer.
Conclusion: Volume of radiotracer injection can affect the detection rate of sentinel node mapping in breast cancer patients. Increasing the volume results in minimal reduction of detection rate and increase in time of sentinel node visualization. Considering the pain of injection with high volumes of the radiotracer, lower volumes (0.1 or 0.2 mL) are more desirable.

OP 002

Sunday, May 20, 2012

8:00-9:30, Main Hall

Radionuclide Therapy

Hojjat Ahmadzadehfar

Department of Nuclear Medicine, University Hospital Bonn, Germany

Therapy in nuclear medicine practice has a long distinguished history. Nuclear medicine therapy is required to be highly specific and targeted, since it always involves administration of unsealed sources of radioactivity. Most therapy agents utilize ß-particle emissions for their ability to penetrate tissues. This deposition of energy in tissue by ß emitters results in cellular damage. Among the ß emitters there are several choices with respect to energy of the ß emission. Lower energy ß particles can travel a few ell diameters, or at most in the sub-millimeter range. Higher energy ß particles such as those emitted by Y-90 have excellent tissue penetration with a range beyond the source of several millimeters. The physical half-life of the therapeutic radionuclide is an important consideration and underlying principle for therapy planning. Rarely, except in thyroid treatment, is the simple salt form of the radionuclide used, it is most likely attached to a drug or particle that controls its biodistribution. The ideal therapeutic radiopharmaceutical is one that remains attached to the parent drug or its metabolites, and is excreted rapidly through a known simple route. Following radionuclide therapies will be discussed in this session. 1- Peptide receptor radionuclide therapy (PRRT) is a powerful therapeutic tool for treatment of inoperable metastatic neuroendocrine tumours. PRRT produces a high tumour response rate with outstanding treatment tolerance and low toxicity, results in a significant survival benefit, and improves quality of life. 2- Selective internal radiation therapy is a promising catheter-based liver-directed modality for patients with primary and metastatic liver cancer, providing several advantages over traditional

treatment methods because of its low toxicity profile. 3- Internal radiotherapy using bone-seeking agents is effective in delivering high doses of radiation to widespread metastatic bone lesions and can limited dose to healthy tissue. 4- ^{131}I-MIBG therapy as a radiotherapeutic metabolic agent in neuroectodermal tumours.

OP 003

Thursday, May 17, 2012
9:30-11:00, Hall 4

HiRESPECT™ an in-house high resolution SPECT imaging system

Mohammad Reza Ay[1, 2, 3]

[1]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[2]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran

Small animal imaging is increasingly recognized as an important facet of drug development and cancer research. It is well known that the pharmaceutical industries and research centers profit from SPECT system as they accelerate drug and biomarker development by yielding more reliable in vivo results and cost effective study design.
More recently in Research Center for Science and Technology in Medicine We have designed and constructed a high resolution small animal SPECT system (HiReSPECT™) with dual head configuration based on pixelated and high resolution detectors. Each detector comprises a pixilated CsI(Na) crystal array with detector pitch of 1.2 mm, two 52 mm square position-sensitive photomultiplier tubes (Hamamatsu H8500) and a ultra high resolution parallel-hole collimator. HiReSPECT uses high performance and reliable dual head configuration that can be upgrade to four heads configuration with the possibility of head rotation for imaging of bigger animals such as rat and rabbits. The raw projections data are registered in 40 × 80 matrix, determined by the number of the crystal elements. In this study, phantom experiments were performed to characterize the planar and tomographic performance of the scanner. Beside phantom experiments, whole-body animal scan was conducted to evaluate the quality of in vivo images of small animals. The planar resolution measured with 1.1 mm capillary rods filled with Tc99 placed at the surface of the collimator was 1.6±0.1 mm FWHM. An in-house phantom including 1.6 mm to 2.6 mm hot rods (similar to Micro Deluxe) was built for evaluation of tomographic resolution. A dedicated iterative image reconstruction with the capability of resolution recovery was developed for 3D image reconstruction. In the reconstructed image of the phantom with applied resolution recovery, the 1.8 mm hot rods were distinguishable, that defines the SPECT resolution of the system 1.8±0.1 mm at minimum radius of rotation. The whole-body mice studies were done by injection of ^{99m}Tc-MDP for skeletal scan and ^{99m}Tc-DMSA for renal scintigraphy. The results of phantom experiments and also mice whole-body scans proved that the performance characteristics of the HiReSPECT are suitable for high resolution imaging of preclinical studies and small animal laboratories.

OP 004

Friday, May 18, 2012
8:00-9:30, Main Hall

PET – CT in the detection of bone metastases in prostate cancer patients

Mohsen Beheshti

PET CT Center, St Vincent's Hospital, Linz, Austria

Assessing bone metastases is often beyond the scope of plain-film radiography, and nuclear imaging in the form of bone scintigraphy has proved the mainstay of detection of bony disease for over 40 years. Bone scanning with 99mTechnetium – labeled diphosphonates relies on the detection of pathological osteoblastic response elicited from malignant cells. This technique offers the advantage of whole bony examination, low cost, availability and high sensitivity; however, suffers from relative low specificity.

Positron emission tomography (PET), a tomographic modality with higher spatial resolution than that of single-photon emission computed tomography (SPECT) can be particularly helpful in detecting small lesions.
Moreover, PET imaging using various specific radiotracers has the advantage of detecting malignant disease in both bone and soft tissues and is highly sensitive mainly in detecting early bone marrow metastases as well as for diagnosing lytic bony metastases and can be also reliably used to monitor therapy response.
Many PET tracers have been tested for use in the evaluation of prostate cancer patients based on increased glycolysis (F-18 FDG), cell membrane proliferation by radiolabeled phospholipids (C-11 and F-18 Choline), fatty acid synthesis (C-11 Acetate), amino acid transport and protein synthesis (C-11 Methionine), androgen receptor expression (F-18 FDHT) and osteoblastic activity (F-18 Fluoride). However, there are presently no accurate imaging modalities to directly, reproducibly, and effectively delineate bone metastases in prostate cancer.

OP 005

Thursday, May 17, 2012

12:30-13:30, Hall 5

Radiation exposure optimization in nuclear medicine procedures

Mohamadreza Deevband

Atomic Energy Organization of Iran

Considering Extensive use of Nuclear medicine procedures in diagnosis and treatment, Radiation dose optimization is extremely important. So, the procedures must guarantee the image quality/treatment objectives as well as lowering radiation exposure to patients, staff and public at large. This aim is possible by achieving the following considerations:

Proper design of Nuclear medicine departments
Performing routine quality assurance programs
Proper use of instruments and devices
Considering radiation protection guide lines
…

This abstract deal to the most important issues of dose optimization according to the recent recommendations of IAEA for radiation protection in nuclear medicine.

OP 006

Wednesday, May 16, 2012

8:00-16:30, Hall 3

Who is the competent nuclear physician?

Vahid Reza Dabbagh Kakhki

Nuclear Medicine Research Center, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, IRAN; E-mail: Dabbaghvr@mums.ac.ir

First and foremost, the nuclear medicine physician is a physician. Medical knowledge, patient contact, interpersonal skills and communication, professionalism, ethical behavior, are vital parts of what nuclear medicine physicians have and do. It has to mention that medical practice will change dramatically over the coming decades.
Medicine specialists are expert in all aspects of diagnostic and therapeutic nuclear medicine services: including different radiopharmaceutical distributions obtained with planar, SPECT and PET techniques and fusion & co-registered anatomic (CT, MRI) and functional (PET or SPECT) imaging. They responsibility for procedural protocols, imaging interpretation and perform all radiopharmaceutical therapies. They have to prepared to participate by extending the scope of nuclear medicine practice beyond that available at the time of training.
In core competency area, the nuclear medicine requires special knowledge in the: physical science, mathematics and statistics, computer science , instrumentation, radiation biology & protection and patient safety, radiotracer production, biochemistry, and clinical physiology, In vivo diagnostic use of radiotracers, cross-sectional anatomy, molecular imaging, description and interpretation of final images, and radionuclide therapies.

OP 007

Saturday, May 19, 2012

11:30-12:30, Hall 4

Principles and techniques of radiation synovectomy

Jamshid Farahati

Clinic for Radiology and Nuclear Medicine, Elisabeth Hospital, Dorsten
Institute of Radiology, Nuclear Medicine & Radiotherapy, Bottrop, Germany

Despite recent therapeutic advances, rheumatoid arthritis remains incurable. Radiosynovectomy is a safe, minimally invasive, cost-effective alternative local treatment of inflammatory arthritis when conventional treatments such as oral antiinflammatory drugs or intra-articular steroids fail. The most common indications for radiation synovectomy are rheumatoid arthritis, psoriatic arthritis, hemophiliac arthropathy, and pigmented villonodular synovitis. All major and minor joints including the interphalangeal joints can be treated with synovectomy. Desirable radionuclides are those with beta-particle emissions capable of treating synovitis. Many radiocolloids have been used for radiation synovectomy, including yttrium-90-citrate, rhenium-186-citrate, Erbium-169-citrate, chromic- phosphate-32, dysprosium-165 and holmium-166. Pain relief can be achieved in 60 to 80 per cent of cases. No serious side effects have been found as much as ten years after treatment. Interest has recently grown in its use as an outpatient treatment, and it is now practised in more than 120 countries. In order to avoid an uncritical application, a multisdisciplinary approach involving rheumatologists, orthopedists, and nuclear medicine physicians is essential in selecting cases for treatment.

OP 008

Wednesday, May 16, 2012

11:50-12:30, Hall 3

What are needed to harmonize our act? Are we ready? Asian Board of Nuclear Medicine

Abdelhamid Elgazzar, MD, FCAP

Department of Nuclear Medicine, University of Kuwait

Nuclear Medicine is a unique specialty which is not yet appreciated as an important component of modern medicine and carries the potential of significant development of medical care in general. Decision makers, medical strategists, some practicing physicians as well as some nuclear medicine professionals are not fully aware of such fact. Consequently proper training of future specialists in this field is a challenge to prepare generations for the future struggle to continue develop this filed and meet the challenges imposed by both rapid changes in the field, policies and awareness.
The nuclear medicine physician is required to have a broad knowledge and experience in medicine. In addition, the practice of nuclear medicine necessitates special knowledge in the many areas covered in the training program such as pathophysiology, Pathology and laboratory medicine. Molecular biology, immunology and genetics, Cross-sectional anatomy, therapeutic applications and related management methods and research and communications.
The current era requires different training compared to earlier years since there is a need to train real expertise and is definitely not film readers which can not and should not be the case in this filed of medicine. The training program, accordingly need to be for longer time and add more components. The program which we believe is for 5 years inclusive of clinical rotations in the relevant clinical disciplines and 6 months of radiology training. The addition of research component during training or combined n academic degree as in our experience has added strength to the graduates and helped in acquiring skills to follow literature updates and better analysis of data. The training methods should be also modified to depend on supervised self teaching, teaching assignments and the use of open ended question technique in conducting the discussions during reading and teaching sessions.
The Asian Board of Nuclear Medicine needs a panning task force to put the strategic plan and objectives and curriculum. The culture diversity must be considered in every step as well as the strengths of different centers and identifying the leaders in clinical training in the field within the continent to harmonize the standards. Training the trainers to meet these challenges by conducting workshops and discussions with experts in postgraduate clinical training experts is crucial to

achieve successful outcome. Alan for periodic assessment of the program and the graduates is crucial for continuous improvement.

OP 009

Saturday, May 19, 2012

9:30-10:30, Hall 4

Radioiodine therapy of thyroid cancer: benefits vs. potential risks?

Armaghan Fard-Esfahani*, Davood Beiki, Babak Fallahi, Alireza Emami Ardekani, Mohammad Eftekhari, Mohsen Saghari

Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Radioiodine (I-131) is the main adjuvant therapy for thyroid cancer which is performed after total thyroidectomy. There are many important advantages to this treatment that renders this method of high value; however there are few complications that the physician should consider in patient management.
The main advantages of radioiodine therapy for thyroid cancer includes ablation of the thyroid remnant which will help in surveilance for recurrent disease by using whole body radioiodine scan and thyroglobulin; elimination of known persistent diseases; destroying the possible micrometastases. Using this treatment will result in lower rate of recurrence; also the chance of developing metastases will significantly decrease which in turn will reduce disease specific mortality rate. Disadvantages of radioiodine therapy are essentially related to complications of using high doses of I-131 including early and late side effects. The more serious ones are the possibility of developing lung fibrosis and secondary malignancies which warrants more consideration regarding the frequency and amount of administered dose.

OP 010

Friday, May 18, 2012

8:00-9:30, Main Hall

Positron emission tomography in breast cancer

Armaghan Fard-Esfahani*, Davood Beiki, Babak Fallahi, Alireza Emami Ardekani, Mohammad Eftekhari, Mohsen Saghari

Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Nuclear Medicine diagnostic procedures including bone scan, breast scintigraphy with MIBI/Tl and sentinel node mapping have had a considerable role in management of breast cancer. Positron Emission Tomography (PET), the most recent modality in nuclear medicine, is opening its way as a valuable and efficacious method in management of these patients especially when fused with Computed Tomography (CT) imaging. Although PET has limited role in primary cancer detection due to small size and low grade status of these lesions, it can be used in evaluating mammographically difficult-to-examine breasts (i.e., radiodense breasts, postsurgical breasts), detecting an occult primary breast cancer in a patient with known axillary metastatic disease and assessing the local extent of breast cancer (i.e., detecting multicentric or multi focal disease). Demonstration of small invasive breast carcinomas with FDG dedicated positron emission mammography is improved. PET is useful in both locoregional staging and systemic staging. In locoregional staging although PET is not proved to be of high value in routine axillary staging, it is highly specific for staging of axillary nodal disease in patients at high risk. Also it is helpful in revealing involvement of internal mammary nodes. PET or PET/CT does not have a considerable role in systemic staging of stage I, II or T3N1M0 of breast cancer, because of high false negative rate in lesions that are below 1 cm and/or low grade; the low sensitivity for detection of axillary nodal metastases; the low pretest probability of these patients and high rate of false-positive scans. However it is recommended as an option for patients with either recurrent or stage IV disease, and in this setting it has been shown to be both sensitive and specific. It can identify occult sites of malignant involvement and thus affecting therapeutic options. In assessing bone metastases FDG PET is complementary to bone scintigraphy, which remains the standard imaging procedure for surveying the skeleton for metastatic involvement. 18F-Fluoride is another PET agent which is highly sensitive for detection of skeletal abnormalities and when it is used with CT, specificity is improved. Monitoring response to therapy is another important application of this valuable

method. It also allows differentiation of responders to chemotherapy versus nonresponders, by measuring changes in tumor FDG SUVs before and after 2 months of therapy. Estrogen receptor PET imaging using 16-[18F]-fluoro-17-estradiol (FES) has been successfully used to image ER+ breast cancers and to accurately determine the ER status of these tumors, which could be valuable in decision making and management of these patients.

OP 011

Saturday, May 19, 2012

11:30-12:30, Hall 4

PET/CT in radiation therapy planning

Peiman Haddad, MD

Professor of Radiation Oncology, Cancer Institute, Tehran University of Medical Sciences, Tehran, Iran

Advances in the field of radiation oncology in the last decade have resulted in an increasing number of opportunities to optimize therapy. Increased accuracy to deliver the dose to tumors while sparing normal tissues demands more precise delineation of the tumors. When delivering a boost to more aggressive parts of tumors, intratumoral heterogeneity needs to be assessed accurately. Adaptive radiotherapy demands evaluation of response during the course of radiotherapy, in terms of both volumetric and functional changes. Positron emission tomography (PET) and, more recently, integrated positron emission tomography/X ray computed tomography (PET/CT) have appeared as significant diagnostic imaging systems in clinical medicine. Accurate recognition of cancers in patients by means of PET scanning has illustrated a need to determine a mode of therapy to achieve better prognoses. The clinical management of cancer patients has improved dramatically with the introduction of clinical PET. For treatment of cancer patients, on the other hand, radiation therapy plays an important role as a curative therapy. It is crucial that cancers are encompassed by high dose irradiation. Irradiation should precisely target the entire tumor and aim to minimize the size of microscopic extensions of the cancer, as well as minimize radiation damage to normal tissues. PET is useful for determining therapy ports. It can be used both to limit ports to spare normal tissue and to include additional involved regions. Several studies have shown that PET has an impact on radiotherapy planning in an important proportion of patients. Treatment plans that include all the ^{18}F-FDG-avid lesions or the ^{18}F-FDG-avid portions of a complex mass will result in more effective local control with less unnecessary tissue being treated. Recent coordinated research projects have shown that this is an important subject which should be addressed through clinical trials in order to best meet the needs of developing countries.

OP 012

Saturday, May 19, 2012

9:30-10:30, Hall 4

Clinical significance of FDG-avid lymph nodes after total thyroidectomy in patients receiving initial I-131 ablation for differentiated thyroid cancer

Hee-Seung Bom*, Hyun Hong, Byung Hyun Byun, Jung-Joon Min and Ho-Chun Song

Department of Nuclear Medicine, Chonnam National University Medical School, Hwasun, Republic of Korea

Introduction: FDG-avid lymph node (LN) metastasis has been reported to be resistant to I-131 therapy in differentiated thyroid cancer (DTC) patients. We compared the rate of successful I-131 ablation according to the presence of visually FDG-avid regional LN metastasis.
Methods: From Jan 2008 to Jun 2010, 194 patients who met all of the following criteria were enrolled: 1) Total thyroidectomy followed by initial I-131 ablation (5.55 to 6.66 GBq) for DTC, 2) regional LN metastasis was identified on postsurgical specimen, 3) no evidence of distant metastasis and no history of other primary malignancy at the time of I-131 ablation, 4) anti-thyroglobulin antibody ≤60 IU/ml. All patients underwent FDG-PET/CT one week before I-131 ablation and divided into three sub-groups by visual assessment of regional LN except the central neck region; no regional LN metastasis (PET-), FDG-avid regional LN with indeterminate malignant potential (PET±) and FDG-avid regional LN suggesting metastasis (PET+). We measured the SUVmax of FDG-avid LNs in each patient, and compared the SUVmax of PET± and

PET+ group. The presence or absence of focal increased uptake suggesting regional LN metastasis except the central neck region on post-treatment whole body scan was denoted as TxWBS- and TxWBS+, respectively. The rate of negative serum thyroglobulin (Tg) 3 to 6 months after I-131 ablation were compared in each PET and TxWBS group.
Results: The number of patients with PET-, PET± and PET+ was 147 (75.8 %), 34 (17.5 %) and 13 (6.7 %), respectively. The SUVmax was significantly higher in PET+ group (median: 3.8, range: 2.8-7.1) than PET± group (median: 2.7, range: 1.6-4.4) (P <0.05). None of 34 patients with PET± and 5 of 13 patients (38.5 %) with PET+ were TxWBS+. The rate of negative Tg after I-131 ablation was significantly lower in PET+ group than in PET- or PET± group (23.1% vs 84.3 % and 73.5 %, respectively) (p<0.001, chi-square test). There was no statistically significant difference in the rate of negative Tg between PET- and PET± group (p=0.214). In PET+ group, 2 of 8 patients with WBS- (25.0 %) and 1 of 5 patients with WBS+ (20.0 %) showed negative Tg after I-131 ablation.
Conclusions: Visually-assessed FDG-avid regional lymph node metastasis is associated with the lower chance of successful I-131 ablation for DTC patients, and may influence the management strategy.

OP 013

Saturday, May 19, 2012

8:30-9:30, Main Hall

Magnificent bone imaging with $Na^{18}F$ PET/CT

Shahab Hoda, M.D.

Iranian Society of Nuclear Medicine, Tehran, Iran

Re-emergence of $Na^{18}F$ PET in the era of high technology and novel hybrid imaging systems has brought excitement and confidence for the imaging of a wide spectrum of bone pathologies, particularly the metastatic bone lesions.
The basis for the molecular imaging of the $Na^{18}F$ PET relies on it high affinity for the bone matrix and the exchange of F-18 with the hydroxyl ions in the hydroxyapatite crystal of bone tissue, creating a powerful biomarker and indicator of bone metabolic activity.
Comparing with the conventional Tc99m-MDP planar and SPECT bone scans, $Na^{18}F$ PET/CT has remarkable advantages. It shows rapid and significant uptake in bone with early blood clearance. Due to unequivocal higher sensitivity, specificity and accuracy rates it enables us to find out smaller metastatic and pathologic foci, most notably providing more confidence in differentiation between malignant and benign lesions. $Na^{18}F$ PET/CT provides comprehensive skeletal assessment within a short time period which is about 30 minutes. Regarding radiation, it has comparable doses to Tc99m MDP studies.
Higher cost of $Na^{18}F$ PET/CT would be indeed compensated by higher diagnostic performance and ultimate better management, potentially leading to reduced overall costs.
There is global growing desire for the applications of the $Na^{18}F$ PET/CT imaging and according to strong evidence derived from recent thorough multicenter studies, this technique will turned out to be performed as a routine clinical imaging procedure and become a potential valuable substitute to the traditional bone scanning in the near future.

OP 014

Thursday, May 17, 2012

14:30-15:30, Hall 3

Anti-cancer strategies using attenuated *Salmonella typhimurium* with cytotoxic ClyA proteins under the control of inducible P_{Tet} and P_{BAD} promoters and enhancement of the P_{BAD} promoter activity by disruption of *ara* operon

Hyun Hong*, Hee-Seung Bom, Hyun El Choy, and Jung-Joon Min

[1]Department of Nuclear Medicine and Microbiology, Chonnam National University Medical School, Gwangju, Republic of Korea

Bacteria are well known to specifically target tumors, actively penetrate tissue, and can controllably induce cytotoxicity as we have reported using genetically engineered *Salmonella typhimurium* defective in ppGpp synthesis (mSL).

Since the bacteria might be toxic to normal organs, mainly liver and spleen, when protein drugs are expressed under the constitutive promoter, the tumor-specific expression of cytotoxic proteins (e.g. cytolysin A) can be achieved using inducible promoters such as P_{TET} and P_{BAD}.
In the current study, we employed the bacterial Tet system in which dual genes can be induced bi-directionally by external administration of tetracycline or doxycycline. We constructed a dual gene expression system with cytolysin A (ClyA) as a therapeutic gene and renilla luciferase variant 8 (Rluc8) as an imaging reporter gene in Tet system (pTet-CL/RL8).
When SLΔppGpp-pTet-CL/RL8 was intravenously injected in CT26 or Hep3B tumor bearing mouse and CT26 lung metastasis mouse models, we observed the significant inhibition of tumor growth in the animals with doxycycline induction, compared to non-induced and negative control groups.
Bacteria were successfully engineered to express both diagnostic and therapeutic molecules simultaneously and specifically in the tumor.
As another gene expression inducing system, we can use P_{BAD} promoter which is induced by L-arabinose molecule. However, it is difficult to expect the controllability of gene expression because L-arabinose is the molecule that is metabolized into the D-xylulose-5-P by enzymes encoded in *ara* operon. Thus, the purpose of the study is to disrupt *ara* operon to increase the efficiency of L-arabinose and to assess the gene expression driven by P_{BAD} after disruption.
We performed linear DNA transformation by using λ red recombinase which exchanges *ara* operon with linear DNA including antibiotics resistance gene that are homologous to the regions adjacent to the *ara* operon. The generated *ara* operon-disrupted strains (mSLΔara) were transformed with the plasmid encoding renilla luciferase variant 8 (Rluc8) under the P_{BAD} (mSLΔara-pBR8). mSLΔara-pBR8 or its mother strain (mSL-pBR8) were intravenously injected in the mice bearing CT26 cancer.
The luciferase assay and western blot analysis revealed 5-fold stronger expression of Rluc8 in mSLΔara than in mSL-pBR8 after induction by L-arabinose. After injection in the tumor bearing mice, mSLΔara-pBR8 and mSL-pBR8 revealed comparable numbers in tumor at each time point. In vivo bioluminescence imaging also showed stronger imaging signal (~ 5-fold) in tumor after injection of mSLΔara-pBR8 than after injection of mSL-pBR8.
We could enhance the promoter activity in *Salmonellae* with disrupting the operon involved in the metabolic pathway of its inducer, L-arabinose. Our results can be employed to enhance the production of therapeutic molecules in tumor via bacteria.

OP 015

Friday, May 18, 2012

9:30-11:00, Hall 4

^{125} I-labeled quercetin as a novel DNA-targeted radiotracer

Seyed Jalal Hosseinimehr[1, 2*], Vladimir Tolmachev[2], Bo Stenerlöw [2]

[1]Department of Radiopharmacy, Faculty of Pharmacy, Mazandaran University of Medical Sciences, Sari, Iran
[2]Division of Biomedical Radiation Sciences, Rudbeck Laboratory, Uppsala University, Uppsala, Sweden

Quercetin is a major flavonoid, found in most plants, it can intercalate with DNA. The purpose of this study was to investigate radiolabeled of qurecetin with ^{125}I, DNA binding and cellular process. In this work quercetin was labeled with Auger emitting nuclide ^{125}I using Chloramine-T. DNA binding of ^{125}I-quercetin (^{125}I-Q) was investigated using cell free in vitro assay with naked human genomic DNA in agarose plugs. Cellular uptake and nuclei accumulation was evaluated in human prostate cancer cell lines (DU 145). The internalization of ^{125}I-Q was evaluated with fluorescence microscopy. Cellular damage was monitored by using apoptosis assay.
Quercetin was successfully labeled with ^{125}I, and it was taken rapidly with cells and accumulated in the cellular nuclei. ^{125}I-Q-DNA binding was tightly with long retention time and it induced potentially DNA damage. These findings provide for using of ^{125}I labeled quercetin as a carrier of Auger electron emitting radionuclide to the cell nuclei for targeted radiotherapy.

OP 016

Thursday, May 17, 2012

16:00-17:30, Hall 4

Molecular imaging of HER2-positive cancer in nuclear medicine

Seyed Jalal Hosseinimehr

Department of Radiopharmacy, Faculty of Pharmacy, Mazandaran University of Medical Sciences, Sari, Iran

The Human Epidermal Growth Factor Receptors (HER) are trans-membrane receptor tyrosine kinases that are involved in intracellular signally pathways that regulate cell growth and differentiation. HER2, is a member of HER family that has particular importance in breast cancer, overexpression or gene amplification of HER2 is closely associated with aggressive tumor progression and poor prognosis. Several cancers associated with overexpression of this gene. However, there is a need for non-invasive imaging agents to assess disease markers and monitor response to therapy. There are used several radionuclide labeled targeted molecule on HER2 receptor for imaging of cancers in animal model and patients. However, trastuzumab is a monoclonal antibody for HER2 receptor which it was labled with different radionuclides and it widely investigated for imaging, it has several limitations such as low clearance through blood. One of interested peptide for this purpose is Affibody molecule. Affibody molecules with small size (7 kDa) have rapid tumor localization with fast clearance from nonspecific tissues. Now there are several research teams to work for optimization of this molecule.

OP 017

Friday, May 18, 2012

9:30-11:00, Sa'di Hall

PET/CT in the routine clinical diagnosis of prostate cancer- a special emphasis on external beam radiation therapy dose planning

Kalevi Kairemo*, Martti Ala-Opas, Kaarina Partanen, Timo Joensuu

Departments of Molecular Radiotherapy & Nuclear Medicine and Medical Physics, International Comprehensive Cancer Center Docrates, Helsinki, Finland

Positron emission tomography/ computed tomography (PET/CT) with choline, labelled with ^{11}C or ^{18}F, is an important diagnostic tool of oncologic disease with low glucose metabolism. Altered choline metabolism has been demonstrated as a characteristic of prostate cancer (PCa), and radiolabeled choline and choline analogs have been investigated as PET/CT imaging agents for prostate cancer; [^{18}F]fluoromethyl-dimethyl-2-hydroxyethyl-ammonium (^{18}F-FCH) shows particular promise as a PCa imaging agent because of its favorable physical and pharmacokinetic properties. Choline is an important component of phopholipids in the cell membranes, and in malignant tumors with high proliferation rate and increased metabolism of cell membrane components tumors demonstrate increased uptake of choline. Therefore, fluorocholine (FCH) is routinely employed in the diagnosis/ radiation therapy (RT) dose planning of PCa at our institution.

So far we have applied this FCH method in 154 PCa patients. First of all we evaluated FCH the location of recurrence after primary treatments, radical prostatectomy or radiation therapy. Is the recururrence in the area close to the operation and is the recurrence after radiation therapy in the prostate or/and lymph nodes in pelvic or other areas of the body? Salvage RapicArc RT or HDR brachytherapy are potential treatment options for local relapse with need for castration. We also evaluated FCH in castrate-resistant disease before chemotherapy or local RT. Additionally, we have found sources for false-positive/ false-negative findings, e.g. when we compared our findings of FCH imaging with those of MRI and MRS. Biopsy information is available as well in selected patient groups. Other tracers besides FCH for PCa imaging will be reviewed. Molecular imaging is helpful in defining biological target volume (BTV) for external beam radiation therapy. Information from a variety of functional imaging techniques could be used to define sub-targets, such as regions of proliferation, hypoxia and androgen receptor expression. These may be used in the future for advanced targeting in dose planning. In our experience FCH imaging together with MRI is the basis of BTV in soft tissues. NaF-PET serves already as a substitute in the skeleton.

On the basis of the overview, we suggest potential scenarios where this functional metabolic imaging might be considered for clinical routine for guiding PCa management.

OP 018

Thursday, May 17, 2012

14:30-16:00, Hall 5

The 3-D voxel-based dosimetry and dose planning in clinical routine for Lu-177-labelled somatostatin receptor analogues in peptide receptor radionuclide therapy based on 4-D SPECT/CT acquisition

Kalevi Kairemo*, Timo Kiljunen, Joakim Pyyry, Tuomo Alanko, Aki Kangasmäki

Departments of Molecular Radiotherapy & Nuclear Medicine and Medical Physics, International Comprehensive Cancer Center Docrates, Helsinki, Finland

Peptide receptor radionuclide therapy (PRRT) is already a part of current Scandinavian guidelines in treating neuroendocrine tumors. Lu-177 and Y-90 labelled somatostatin analogs, to which DOTATOC, DOTANOC and DOTATATE belong, are most commonly used and have turned out to be effective.
For clinical routine, we have developed a system for dose calculation and for predicting therapy doses based on serial pre- and posttherapeutic scannings.
In pretherapy scans, approximately 200 MBq Lu-177-DOTA-Octreotate was injected for serial imaging at 1, 24 and 72 and/or 168 hrs using amino acid kidney protection (25 g L/l, 25 g R/l). Similar conditions were applied for post therapeutic scanning after receiving 6.6-7.8 GBq of the Lu-177-labelled compound. Both OLINDA and own software was used for actual dose calculation. Tumor to background –ratios based on SPECT/CT in liver varied from 4:1 to 15:1.The tumor doses varied from 2.4 to 110 Gy and normal organ doses in kidneys 2.4 -6.0 Gy, normal liver 2-20 Gy, spleen 1.5-16.4 Gy per cycle using posttherapeutic scans. The highest tumor dose was typically obtained in the first cycle.
Our own software is a voxel based system, alignment for voxel half-life calculation was made by nuclear medicine fusions.
The OLINDA software and our programme gave similar normal organ doses, whereas tumor doses could be calculated in a more detailed manner using the 3-D programme.
In dose planning pretherapeutic scanning can predict critical organ doses, in some organs with a slight overestimation, e.g. kidney and spleen. Tumor dose was similar in both pretherapeutic and posttherapeutic scans using our special software. Because of a precise voxel based approach, bone marrow dose could also be predicted and verified, usually 0.4-0.6 Gy per cycle.
Thus dose planning in advance, like as part of external beam therapy, requires new tools. No practical tool for PRRT does exist, this might be one. Basic problem is the possible change in radiopharmacokinetics when the activity comes 40-fold and the specific activity remains the same. In a multicenter study, this extrapolation factor may be calculated in an appropriate manner. Preliminarily, we also have studied the doses in combinatorial therapies, this gives a possibility to plan therapy trials based on actual tumor dose.

OP 019

Saturday, May 19, 2012

9:30-11:00, Hall 3

Differentiation between Parkinsonian syndromes and essential tremor, using ^{123}I- Ioflupane SPECT

Amir Kashefi

Department of Radiology, Division of Nuclear Medicine, University of California, USA

Introduction: Accurate diagnosis of patients with suspected parkinsonian syndromes (PS) is critical to predict the disease course and select appropriate therapies. Misdiagnosis can lead to unnecessary disability if effective treatment options are not instituted, and inappropriate therapies may unnecessarily expose patients to the risk of potential side effects. An important diagnostic distinction is that between Parkinson's disease (PD) and essential tremor (ET), but this can sometimes be difficult on clinical grounds alone. Recent studies have highlighted the high misdiagnosis rate of PD. [^{123}I]FP-CIT (Ioflupane I-123, DaTscan) is a radiopharmaceutical used for single-photon emission-computed tomography (SPECT) brain imaging. [^{123}I]FP-CIT is a radiopharmaceutical that binds reversibly to striatal presynaptic dopamine transporters. [123I]FP-CIT SPECT has recently been approved by the Food and Drug Administration (FDA) for use in the United States.

Methods: The safety and efficacy of [^{123}I]FP-CIT SPECT imaging were evaluated in two principal multicenter clinical trials, that are reviewed in this talk.
Results: High positive percent agreement (abnormal baseline scan and clinical diagnosis of PS) of 79-97% and high negative percent agreement (normal baseline scan and a clinical diagnosis of non-PS) of 74-97% were reported.
Conclusion: [^{123}I]FP-CIT SPECT brain imaging is used to assist in the evaluation of adult patients with suspected PS and may help differentiate ET from PS as an adjunct to other diagnostic evaluations.

OP 020

Saturday, May 19, 2012

14:30-15:30, Hall 4

Strengthening of medical exposure control in nuclear medicine

Hamidreza Khosravi

Atomic Energy Organization of Iran

Nuclear medicine is one of the best uses of unsealed sources in diagnosis, therapy and biomedical research. Beside of diagnosis, treatment and research objectives since nuclear medicine involves exposure of the patient (volunteer), radiation protection of the patient should be applied.
There are more than 125 nuclear medicine centers in the country and radiation protection for patients especially for children are need to be considered as well as biomedical research due to fast developing in radiopharmaceutical products in the country.
The estimated risks of the irradiation should be explained to those individuals involved who knowingly incur doses while voluntarily helping (other than in their occupation) in the care, support or comfort of patients undergoing medical diagnosis or treatment.
When selecting subjects for a research project the age, number of patients (volunteers), multiple studies and women need to more consideration.In addition, when employees who work with radiation are considered as possible volunteers for research, the researcher must ensure that, as volunteers, they are aware of the additional risk arising from their exposure to radiation at work.
The ICRP and WHO recommend the use of categories of risk arranged according to the radiation dose and estimated level of risk to be received by the subject, for research projects involving use of ionizing radiation. The risk may then be evaluated with regard to the expected benefit.

OP 021

Thursday, May 17, 2012

14:30-15:30, Hall 3

The synthesis and evaluation of [^{18}F]-labeled novel mitochondrial voltage sensors as myocardial perfusion agents for PET

Dong-Yeon Kim[1,2*], Hee-Seung Bom[1], Kook-Hyun Yu[2], Jung-Joon Min[1]

[1]Department of Nuclear Medicine, Chonnam National University Medical School, Hwasun, Korea
[2]Department of Chemistry, Dongguk University-seoul, Seoul, Korea

Introduction: Despite substantial advances in the diagnosis and treatment of cardiovascular diseases, there are a few radiopharmaceuticals for diagnosis of ischemic heart diseases (IHD) using PET. Thus, four kinds of ^{18}F-labeled tetraphenylphosphonium cation derivatives (^{18}F-TPPs) were synthesized with different carbon chain lengths and functional groups that accumulated in cardiomyocytes depending on mitochondrial membrane potential. Here, we evaluated the performance of each ^{18}F-TPPs as novel myocardial perfusion agents.
Methods: ^{18}F-(5-Fluoropentyl)triphenylphosphonium cation (^{18}F-FPTP), ^{18}F-(6-fluorohexyl)triphenylphosphonium cation (^{18}F-FHTP), ^{18}F-(2-(2-fluoroethoxy)ethyl)triphenylphosphonium cation (^{18}F-FETP), ^{18}F-(2-(2-fluoroethoxy)ethyl)tris(4-methoxyphenyl)phosphonium cation (^{18}F-FETMP) were synthesized via two-step nucleophilic substitution reactions. The uptake of ^{18}F-TPPs was examined after modulation of mitochondrial membrane potential with CCCP (carbonyl cyanide m-chlorophenylhydrazone) in a cultured embryonic cardiomyoblast cell line (H9c2). To confirm the kinetics of ^{18}F-TPPs in vivo, biodistribution was assessed in BALB/c mice at 10, 30, 60, and 120 min after i.v. injection of 7.4 MBq of each radiotracer. A dedicated PET/CT scanner was used for in vivo imaging of

radiotracers kinetics. Especially, microPET study of ^{18}F-FPTP was assessed by using Sprague-Dawley rats with or without left coronary artery (LCA) ligation.
Results: ^{18}F-TPPs were synthesized with a radiochemical yield of 15–30% and radiochemical purity of > 98%. Specific activity was > 6.0 TBq/μmol. Cell uptake of ^{18}F-TPPs were higher in H9c2 than in negative control. The heart-to-blood ratio of ^{18}F-FPTP, ^{18}F-FHTP, ^{18}F-FETP, ^{18}F-FETMP was approximately 50, 30, 55 and 34 at 10 min respectively, indicating rapid clearance of each compound from the blood. The heart-to-lung, heart-to-liver ratios of ^{18}F-FPTP, ^{18}F-FHTP, ^{18}F-FETP, ^{18}F-FETMP were > 4, > 3, > 4, > 2 and > 3, > 4, > 11, > 2 respectively at 10 min after radiotracer injection. Dynamic microPET imaging for 60 min after injection of ^{18}F-TPPs showed an initial spike of radioactivity, followed by retention in the myocardium and very rapid clearance from the background. ^{18}F-FPTP microPET images in LCA-occluded rats demonstrated sharply defined perfusion defects in the corresponding area of the myocardium.
Conclusions: ^{18}F-TPPs showed stable uptake in the myocardium and rapid clearance from other organs, and enabled an excellent image quality. ^{18}F-TPPs might have a potential to be utilized as a novel myocardial agent for PET and be useful for clinical cardiac PET/CT applications.

OP 022

Friday, May 18, 2012

8:00-9:30, Main Hall

F-18 Choline PET- CT in the primary staging of prostate cancer patients

Werner Langsteger, MD, FACE

PET CT Center, St Vincent's Hospital, Linz, Austria

Positron emission tomography (PET), usually combined with computed tomography (PET/CT) allows the non - invasive interrogation of metabolic processes in tissue using radiolabelled probes. For instance ^{18}F-Fluorodeoxyglucose (18F-FDG) PET has been shown to provide valuable clinical information and influence management in many cancers; however, 18F-FDG PET has been found to have relatively poor performance in prostate cancer. Altered choline metabolism has been noted as a characteristic of prostate cancer and radiolabelled choline and choline analogs have been investigated as a PET/CT imaging agents with improved performance noted compared to conventional 18F-FDG PET/CT. Of these agents, 18F-Fluorocholine (FCH) shows particular promise as a prostate cancer imaging agent given its favorable physical and pharmacokinetic properties. Based on our experience FCH PET-CT could be useful as a "one stop diagnostic procedure" especially for the evaluation of high risk prostate cancer patients to exclude distant metastases, preoperatively. It changed the therapeutic management of 20% of high risk patients, which emphasizes again on the proper clinical indication for referring the prostate cancer patients to metabolic imaging prior to surgery. In this review, we also summarize the published clinical data to date with FCH PET/CT in the primary staging of prostate cancer.

OP 023

Saturday, May 19, 2012

14:30-15:30, Hall 4

Low dose radiation induced cancer

Seyed Rabi Mahdavi

Tehran University of Medical Sciences, Tehran, Iran

State of art national and international ionizing radiation risk estimates, radiation-protection standards low dose radiobiological studies are commonly based on the Linear No-threshold (LNT) Hypothesis. This hypothesis reveals that the risk is directly proportional to dose without any threshold. Studies have shown that human associated risk can be measured in three different methods. The most important low dose radiation risk is believed to be different types of cancer diseases. However, the everlasting question is the meaning of low dose and how much is the low dose in different situation of clinical radiation use. To study about the risk induced to cancer the minimum dose, energy and tracks of radiation attempting DNA damage should be considered through normal cells. While the LNT model has been reported to be applicable for low doses with threshold dose of 100 mGy, in this report we tried to reveal the risk associated in different clinical radiation condition from nuclear medicine to radiology examinations as well as radiotherapy.

OP 024

Friday, May 18, 2012

8:00-9:30, Main Hall

Clinical value of imaging modalities in the pretreatment diagnosis of prostate cancer

Darab Mehraban

Urology Ward, Dr. Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran

Prostate Cancer is the second most frequently diagnosed solid tumor in Iranian males. In 2008, the age adjusted incidence and the mortality rates in Iran were 11.6 and 7.9. Because of the advent of PSA, nowadays, the majority of the prostate cancers are diagnosed at an earlier stage. This puts a great demand on imaging tools to differentiate malignant from benign conditions and tumors that are limited to confines of the prostate or have extended beyond the gland.

The most commonly used imaging study for viewing the prostate is transrectal ultrasound (TRUS). Unfortunately, due to their isoechogenecitiy, 40% of tumors are not visible with TRUS. In a study funded by NIH recruiting 386 patients that were candidates for radical prostatectomy as judged by the investigators, TRUS was no more accurate at predicting organ-confined disease than was DRE. These findings were supported by another study at M. D. Anderson Cancer Center, where the outcome for 558 men who underwent both DRE and TRUS and received external beam radiation was evaluated relative to the prognostic information from DRE, TRUS, or both revealed that there was no meaningful superiority of TRUS over DRE. Three-dimensional transrectal ultrasonography (3D-TRUS) was used in 180 subjects by Mitterberger and colleagues to determine its value in staging clinically localized prostate cancer. The authors concluded that If 3D-TRUS indicates locally advanced disease, the probability of capsular perforation or seminal vesicle invasion is very high. An overview of ultrasound and its different techniques for imaging of the prostate was published in 2010 by these authors and contrast-enhanced colour Doppler imaging, contrast-specific ultrasound techniques and elastography are discussed in detail. Unfortunately, all TRUS techniques remain largely operator-dependent and are not able to differentiate between T2 and T3 tumors with sufficient accuracy to be recommended for routine use in staging.

Magnetic resonance imaging (MRI) can detect prostate cancer but is not recommended as an initial screening tool. However, in patients who have repeated high PSA but with negative TRUSGB, this modality is finding its way in to help clinicians. Also, it may help in local staging to determine the best treatment applicable especially in high or moderate risk groups. Both CT and MRI are now of a high technical standard. However, neither CT nor MRI is sufficiently reliable to make their use mandatory in the assessment of local tumor invasion. Endorectal MRI (e-MRI) may allow for more accurate local staging by complementing the existing clinical variables by improvements in spatial characterization of the prostatic zonal anatomy and molecular changes. Image quality and localization improves significantly with e-MRI compared with external coil MRI. When compared with DRE and TRUSGB findings, e-MRI contributes significant incremental value for local PCa staging particularly in the pre-operative identification of extraprostatic extension (EPE) and seminal vesicle invasion (SVI) when interpreted by dedicated genitourinary radiologists. While proton magnetic resonance spectroscopic imaging (MRSI) can provide metabolic information, diffusion-weighted MRI (DW-MRI) allows in vivo measurement of diffusion coefficients of biological tissues, and dynamic contrast-enhanced MRI (DCE-MRI) enables noninvasive visualization of tissue vascularity. These are the subject of intense research and have instigated a very promising technological progress that will be discussed in brief.

OP 025

Wednesday, May 16, 2012

8:00-16:30, Hall 3

Status of nuclear medicine training in Asia

Jerry M. Obaldo

Nuclear Medicine and the Radioisotope Laboratory, University of the Philippines – Philippine General Hospital

One of the goals of the Asian Board of Nuclear Medicine is to review existing training programs across the region. In order to achieve this goal, and provide baseline situational analysis for subsequent strategic efforts, a survey of nuclear medicine training programs was conducted

starting late in 2011. Representatives from 18 states (17 Asian states, and Australia) completed the survey forms.
All respondents reported that nuclear medicine was an independent specialty in their states, although in 3 states, there is no specialty organization accrediting physicians. Fifteen states have active training programs. Of these, the proportion of nuclear medicine institutions offering training range from 2.4% to 71.4%. Training duration range from 2 to 5 years, with the majority being 3 years. A straight residency program (no prior training requirement) is available in 10 states, although a separate government medical service might be required prior to entering residency.
PET and hybrid imaging technology is available in almost all responding states. However, there was no relation between the availability of PET and duration of nuclear medicine training.
Seven states do not require Radiology training, but this is still incorporated in the nuclear medicine programs of 2 of those states. The rest require between 1 and 8 months of Radiology training. Seven states likewise do not require a clinical medicine rotation during training. Those who do, had a clinical rotation ranging from 1 month to 1 year.
Regarding the requirement of a formal radiation safety course as part of the residency program, no separate course is required in 3 states. Basic radiation safety is learned as part of on-the-job training. In the other states, the basic radiation safety course range from 5 days to 4 weeks.
Analysis of the relationship of the number of nuclear medicine facilities with population and economic data showed good correlation, particularly when correction was made with some parameters.
In conclusion, the duration and manner of nuclear medicine training differ among Asian states. The levels of nuclear medicine activity and practice in Asia show some inequality, but these levels are highly correlated with certain economic and demographic indicators.

OP 026

Thursday, May 17, 2012

14:30-15:30, Hall 3

Bacteria-mediated cancer imaging

Seung-Hwan Park[1,2*], Deok-Mi Kim[1,2], Ho-Chun Song[3], Hee-Seung Bom[1], Jung-Joon Min[1,2]

[1]Department of Nuclear Medicine, Chonnam National University Medical School, Hwasun, Republic of Korea
[2]Laboratory of In Vivo Molecular Imaging, Chonnam National University Medical School, Gwangju, Republic of Korea
[3]Department of Nuclear Medicine, Chonnam National University Medical School, Gwangju, Republic of Korea

It was reported that a number of bacteria could target and proliferate in tumor. The bacteria have been applied for specific delivery of protein drugs and imageable probe to tumor. We have taken advantage of this phenomenon to target luciferase-expressing *Escherichia coli* or *Salmonella typhimurium* to tumor and metastasis in mouse models to image them noninvasively using an in vivo optical imaging system (IVIS). To apply this system in treatment, we engineered the *E. coli* K12 or attenuated *S. typhimurium* defective in ppGpp synthesis to emit the bacterial luciferase (pLux). After intravenous injection of pLux-expressing *E. coli* (10^8 CFU) or attenuated *S. typhimurium*, the bioluminescence signals from bacteria were detected exclusively in tumor tissue after 24 hours. Moreover, the balance-lethal host-vector system using the gene encoding aspartate β-semialdehyde dehydrogenase (asd) enabled stable maintenance of pLux in tumor-targeting *E. coli* or attenuated *S. typhimurium*. Interestingly, *E. coli* and attenuated *S. typhimurium* were capable of targeting both primary tumors and metastases, enabling them to be imaged noninvasively in both nude and immunocompetent mice. On the basis of above imaging technique, we firstly reported that light-emitting bacteria are capable of targeting the myocardial infarction. In addition, using bacterial surface engineering system, we engineered the outer membrane protein of bacteria for enhancement of targeting in tumor. Our results suggest the potential clinical use of this technology for tumor targeting and myocardial infarction.

OP 027

Sunday, May 20, 2012

9:30-11:00, Hall 4

Emerging shape and texture analysis for medical imaging

Arman Rahmim

Division of Nuclear Medicine / PET, Department of Radiology and Radiological Science, Johns Hopkins University School of Medicine, USA

In this talk, we will outline new directions in quantitative imaging, where one seeks to move beyond standard approaches to analysis of regions-of-interest (ROIs): as an example, it is worth noting that positron emission tomography (PET) images are commonly analyzed using (i) the mean or max standard uptake value (SUV) when analyzing tumors, or (ii) mean binding potential in parametric brain imaging. However, mean or max operations are the simplest and most straightforward approaches to ROI analysis, and potentially valuable ROI textural information is commonly discarded. Potential applications include (i) quantification of tumor heterogeneity, using various texture analysis approaches, as a predictive indicator for treatment response, and (ii) shape and texture analysis for the analysis of MRI-based ROIs and/or PET distributions within these ROIs. Overall, shape and texture analysis can serve as potentially powerful tools to quantitatively discriminate between different subjects and to serve as prognostic indicators.

OP 028

Sunday, May 20, 2012

9:30-11:00, Hall 4

Overview of kinetic modeling - part I and part II

Arman Rahmim

Division of Nuclear Medicine / PET, Department of Radiology and Radiological Science, Johns Hopkins University School of Medicine, USA

Nuclear medicine imaging enables not only visualization of the distribution of radiotracers, but also provides tremendous opportunities for quantification of biochemical and physiological processes. The ability to perform dynamic imaging coupled with the kinetic modeling methodology enables generation of kinetic parameters of interest at the region-of-interest (ROI) and/or individual-voxel level (the latter referred to as parametric imaging). In these two talks, we will provide an overview of various approaches to kinetic modeling, particularly in the context of compartment modeling, as applied to radiotracers with irreversible vs. reversible binding/trapping.

OP 029

Thursday, May 17, 2012

11:30-12:30, Sa'di Hall

Validation of calculation of the clearance rate constant (k_{mono}) of C-11 acetate using parametric image for myocardial oxidative metabolism by PET

Raihan Hussain[1*], Takashi Kudo[2], Tetsuya Tsujikawa[2], Yasushi Kiyono[2], Hidehiko Okazawa[2]

[1]Institute of Nuclear Medicine & Ultrasound, BSM Medical University Campus, BAEC, Dhaka, Bangladesh
[2]Biomedical Imaging Research Center, University of Fukui, Fukui, Japan

Introduction: ^{11}C-acetate is avidly extracted by myocardial tissue and is rapidly converted into ^{11}C-acetyl Co-A. The oxidation of ^{11}C-acetate and its subsequent clearance provides an index of myocardial oxidative metabolism. The kinetics of ^{11}C-acetate, is used to measure clearance rate constant (k-mono). The k-mono is usually measured on placing ROIs on the dynamic count based image and is represented only in numbers. In clinical setting, images instead of numbers should be more useful, especially in viability assessment. The purpose of this study was to generate a parametric k-mono image representative of myocardial oxidative metabolism.
Methods: Fifteen subjects (seven volunteers, eight patients) were studied. Dynamic PET was acquired after intravenous injection of 700 MBq of ^{11}C-acetate. The clearance rate constant of ^{11}C-acetate (k-mono) was calculated pixel by pixel using logarithmic conversion of original dynamic counts to generate the parametric k-mono image. The k-mono values from this image and those

calculated from the dynamic image by monoexponential fitting of the time-activity curves of each ROI were compared.
Results: Two different methods showed an excellent correlation, regression equations were $y=0.99x+0.0034$ ($r^2=0.86$, $P<0.001$) and $y=1.16x-0.0077$ ($r^2=0.87$, $P<0.001$) in normal volunteer and patient groups, respectively, and $y=1.07x-0.0019$ ($r^2=0.87$, $P<0.001$) when combined. The k-mono values measured with parametric images were 0.061±0.014, and with dynamic images were 0.063±0.014. The $r^2 = 0.95$, $P<0.001$, and the slope of the regression equation was very close to the line of identity (slope=1.008). The generated parametric k-mono images showed uniform uptake of ^{11}C-acetate over the myocardium in normal individuals whereas it showed lack of uptake in the areas of infarction, where there is absence of oxidative metabolism.
Conclusion: The study shows that, in this technique, parametric images of k-mono can be created reliably and easily. The parametric k-mono image would result in better understanding of regional myocardial oxidative metabolism visually and clinically and could provide an easy visual clue for viability assessment.

OP 030

Friday, May 18, 2012

16:00-17:30, Hall 4

Motion Free PET/CT

Pasha Razifar

Institute for Information Technology, Centre for Image Analysis, Uppsala University

Integrated Positron Emission Tomography/Computed Tomography (PET/CT) imaging has opened many doors/opportunities towards new applications of PET. E.g. whole-body PET/CT using [18F]fluorodeoxyglucose tracer (FDG-PET/CT) has become one of the predominant imaging modalities with major indications in oncology for detection, staging and restaging and monitoring the response to treatment/therapy. This modality combines the strengths of two modalities; functional information obtained by PET, which depicts the information about distribution of metabolic or biochemical activity and anatomical and structural information obtained by CT scanning. However, in CT imaging, organs' motion/movement, respiratory motion and heart-beat produce inaccurate information about the size, shape and volume of the anatomical regions of interest therefore, breath-holding protocol is used when performing CT scan. Conversely, due to long acquisition time in PET,breath-holding is not an option when performing whole-body FDG-PET/CT. Furthermore, the temporal mismatch between the short CT and the long PET scans might generate a spatial misalignment between CT and PET data. This misalignment causes artefacts in the reconstructed PET images, when CT is used for attenuation correction and will afflict visualization and quantization for organs and lesions that are in motion. As a result, radioactivity of a concentrated source like a lesion appears smeared over the volume of displacement, causing a loss of image contrast and weakening the lesion detectability. These cause an underestimation of the tracer uptake/radioactivity concentration (Standardized Uptake Value, SUV) and an overestimation of the lesion volume. Many studies have been dedicated to exploring the effects of breathing and developing methods to control and compensate for the degradation effects related to motion. One of the most promising technological progresses of integrated PET/CT systems is related to the development of respiratory gated 4D-PET/CT acquisition techniques called Motion Free PET/CT. Motion Free PET/CT is performed when synchronizing PET and CT acquisition to the patient's respiratory cycle, which represents an innovative methodology for accurate imaging of tumors and diagnosis.

OP 031

Saturday, May 19, 2012

16:00-17:30, Hall 4

Ugly yet informative vs. fine-looking but frozen information - Which one should be the future of PET imaging?

Pasha Razifar

Institute for Information Technology, Centre for Image Analysis, Uppsala University

Positron emission tomography (PET) is a non-invasive imaging modality and an excellent exploratory tool, based on "tracing" molecules labelled with a positron emitting radionuclide, called "tracer". One of the main strengths of PET is its ability to depict and illustrate metabolic, physiological and biological interaction of the administered tracer with target(s) of interest in either a sector or whole body of a living creature, as image volumes.
A decade ago this functional information provided by PET was coupled with excellent anatomical information provided by Computed Tomography (CT), introducing a new and powerful duo-modality intended to improve the diagnosis value and to fulfil the drawbacks of using two separate imaging modalities, especially in the field of Oncology.
Furthermore, one of the revolutions and at the same time one of the "curses" on PET when introducing this excellent duo-modality was, and still is, the frequent use of Fluorodeoxyglucose, when performing whole body static PET/CT (FDG-PET). Due to short scanning time and good image quality this approach has become a golden standard tool for tumour imaging. However, when performing static imaging the fourth dimension, time, is frozen and the acquired data illustrates only the mean tracer distribution of the administered tracer during the scanning time. This deflates the key strength of the PET, the exploratory dimension, which is based on "tracing a molecule".
On the other hand a dynamic PET imaging generates sequential image volumes, which have poorer image quality, compared with images obtained when performing static imaging. However, these sequential image volumes can be regarded as multivariate image volumes from which physiological, biochemical and functional information can be "traced" and derived by analyzing the distribution and kinetics of the administrated radiolabelled molecules. This implies that each of the image volumes displays/contains part of a kinetic information representing physiological behaviour of the administered tracer during different time points (the 4-th dimension). Due to presence of the four dimension, dynamic image volumes could be quantified and analysed using several approaches/methods such as graphical modelling, parametric images, pixel-wise modelling, and multivariate image analysis.
The important questions still remains: What are scientists looking for when they are utilizing an excellent imaging tool such as PET? Ugly yet informative or fine-looking but frozen information? Is FDG-PET the future of PET imaging?

OP 032

Thursday, May 17, 2012

9:30-11:00, Hall 4

Is in vivo animal PET/CT imaging, golden standard for drug/tracer development?

Pasha Razifar

Institute for Information Technology, Centre for Image Analysis, Uppsala University

Preclinical imaging (both in vitro and in vivo) is used to study, visualize and observe changes, either at the organ, tissue, cell, or molecular level. In vitro methods such as frozen section autoradiography, whole-body autoradiography, binding study and ex vivo methods such as cell culture, etc. are the cheapest and the fastest methods used for these purpose. However, in vivo imaging such as animal- Magnetic Resonance Imaging (MRI), Computed Tomography (CT) and ultrasound produce anatomical and structural information, while optical imaging, animal- Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET) produce functional and physiological information. Moreover, integrated animal scanners such as animal- PET/CT, SPECT/CT, MRI/CT, PET/MRI and PET/SPECT/CT are available as well.
These in vivo imaging modalities are use to to study the living animals for research, translational medicine and drug development. Additionally, in in vivo imaging the same animal can be used repeatedly, longitudinally when performing treatment follow up studies. This is particularly valuable in cancer research because it results in an increase in the statistical quality of the data since the same subjects can be used as their own control. This reduces the number of animals required for a given study.
However, the biggest concern is when scientists/experts/doctors with different scientific background neglect the limitation of the new in vivo animal imaging especially in field of preclinical PET/CT, which is shown to be one of the most frequently used preclinical imaging modalities for drug and tracer development. When validating either new tracer/drug or existing tracer/drug for new applications, it is very essential to combine and start the validation procedure

with fastest and easiest methods to observe the kinetic behaviour of the molecule of interest. Then correlate/compare the results obtained when performing different preclinical PET modalities such as various in vitro and ex vivo methods before moving toward in vivo animal PET/CT imaging.

OP 033

Wednesday, May 16, 2012

8:00-16:30, Hall 3

Nuclear medicine training program's objective: competency
What must we teach trainees? And how long must their training be?
The span of training a physician should have

Teofilo O.L. San Luis, Jr.

Dean, Asian School of Nuclear Medicine

In the Asian Region, there is great in homogeneity in Nuclear Medicine in terms of infrastructure, processes and human resource development. There are developed countries with their full range of instrumentation and procedures that can be even superior to those found in the Western world, while in some countries there are no Nuclear Medicine (NM) facilities at all. On the average, however, in most Asian countries, NM now offers modest diagnostic and therapeutic services as components of routine health care.
If NM services are found wanting, more so would be expected when it comes to education & training. Undergraduate medical curricula have so much instructional materials coming from many basic and clinical disciplines competing for the students' attention with scant mention of NM. Rotations in the higher years often favor the traditional clinical departments more than the ancillary services to which NM usually belongs. And even if a trainee shows good prospects for Nuclear Medicine, formal training programs are not always offered since most NM facilities are still purely service-oriented. If ever, training opportunities are available only in tertiary hospitals or university-based facilities.
Typical NM training programs consist of exposure to various clinical diagnostic investigations and therapeutic interventions applicable in the setting. In NM facilities offering hybrid imaging (SPECT/CT & PET/CT) trainees are exposed to cross-sectional anatomy and tandem readings with radiologists and working knowledge of cyclotron-produced radiopharmaceuticals esp FDG. There are modules on basic nuclear physics & chemistry, instrumentation, radiopharmaceuticals, computer applications as well as regulatory requirements and radiation protection. The format, level and duration of training will depend on the capabilities of the NM facilities and rotations in different institutions, number and availability of qualified and competent training officers and mentors, teaching materials, and training strategies and processes.
These issues and related matters on education & training will be covered in the presentation and in the plenary discussion.

OP 034

Thursday, May 17, 2012

8:00-9:30, Main Hall

The clinical uses of cardiac PET imaging

Haluk B. Sayman

Istanbul University, Cerrahpasa School of Medicine, Turkey

Nuclear cardiology techniques measuring myocardial perfusion play an important role in detecting coronary artery disease and predicting its prognosis. Among these, Positron Emission Tomography (PET) has been accepted as the most accurate technique for the measurement of regional myocardial blood flow.
Measurement of regional myocardial perfusion permits measurement of coronary flow reserve and the evaluation of physiologic significance of coronary lesions and patency of collateral or retrograde flows.
Assessment of myocardial blood flow with serial PET is a useful method for: Treatment planning; evaluating the response to treatment; determining the progression of diseases.
PET can measure tissue perfusion in milliliters per minute per gram of myocardium in vivo. For this purpose: (i) A radiotracer with retention or clearance kinetics related to MBF during normal

and pathologic states, (ii) accurate measurement of the arterial blood and myocardial activity of the radiotracer with adequate temporal resolution to define the tracer kinetics, (iii) established methods of modeling the tracer kinetics to permit calculation of regional myocardial blood flow (RBF) measurements are required. PET radiopharmaceuticals for RBF are Rubidium-82, Nitrogen-13-ammonia, Potassium-38, Oxygen-15-water, Carbon-11-acetate, Copper-62-Pyruvaldehyde bis (N4-methylthyosemicarbazone) (PTSM) and Fluor-18-fluorobenzyl triphenyl phosphonium.
This lecture will discuss:
-RBF Radiopharmaceuticals
-Indications
-Patient preparation
-Vasodilator Pharmacological Stress
-Dobutamine Stress
-Exercise Stress
-Rubidium-82 Imaging Protocol
-N-13-Ammonia Imaging Protocol
-Semiquantitative Image Interpretation
-Common artefacts
-Measurement of Coronary Flow Reserve
-Registration of PET and CT angiography
-The Clinical Applications
-PET perfusion imaging in non-atherosclerotic heart disease
-Myocardial Viability
-Image Interpretation
-Exercise F-18 FDG PET
-C-11 Choline
-Oxidative Metabolism and PET
-Future Applications of Cardiac PET

In conclusion, the role of PET myocardial perfusion imaging is now well established for diagnosis of CAD. It is a valuable tool for: Evaluating prognosis in CAD, quantification of coronary flow reserve and evaluating the benefits of revascularization and its cost-effectiveness. Moreover there are many emerging benefits to use metabolic imaging in investigation of cardiovascular pathologies.

OP 035

Saturday, May 19, 2012

14:30-15:30, Hall 4

Radioprotectors

Alireza Shirazi

Tehran University of Medical Sciences, Tehran, Iran

Due to damaging effects of ionizing radiation, radiobiologists have long been interested in identifying novel, nontoxic, effective, and convenient compounds to protect humans against radiation induced normal tissue injuries.
Ionizing radiation interacts with biological systems to produce reactive oxygen species (ROS) and reactive nitrogen species (RNS), which attack various cellular components. Radioprotectors act as prophylactic agents to shield healthy cells and tissues from the harmful effects of radiation. Researches for synthetic radioprotectors in the past have led to little success primarily due to the various toxicity-related problems. Results of experimental researches show that antioxidant nutrients, like vitamin E as well as herbal products and melatonin, are protective against damaging effects of radiation with less toxicity and side effects.
Therefore, we propose that in the future, antioxidant radio-protective agents may improve the therapeutic index in radiation oncology.

OP 036

Thursday, May 17, 2012

14:30-16:00, Hall 5

PET/CT imaging of thyroid cancer

Giorgio Treglia, MD

Institute of Nuclear Medicine, Catholic University, Rome, Italy

During the last two decades PET and PET/CT, mostly with F-18 Fluorodeoxyglucose (FDG) have been increasingly used in patients with thyroid cancers. The role of FDG PET/CT in differentiated thyroid cancer is well established, particularly in patients presenting with elevated thyroglobulin levels and negative radioactive iodine whole-body scan. FDG-PET/CT is also useful in the post-thyroidectomy staging of high-risk patients with less differentiated (and thus less iodine-avid and clinically more aggressive) subtypes, such as tall cell variant and Hürthle cell carcinoma, but in particular poorly differentiated and anaplastic carcinoma. Furthermore, incidental findings of focal FDG uptake in the thyroid occur with a frequency of 1-4% and a risk of thyroid cancer of > 30%. Medullary thyroid cancer recurrences are often difficult to detect using conventional imaging and traditional scintigraphic methods, whereas FDG and F-18 DOPA PET and PET/CT show promise for localizing the source of elevated calcitonin levels in these patients. Novel PET radioisotopes like Iodine-124 may serve a role in obtaining lesional dosimetry for better and more rationale planning of treatment with Iodine-131.

OP 037

Saturday, May 19, 2012

16:00-17:30, Hall 4

Advances in multimodality molecular imaging: from PET-CT to PET-MR

PD Habib Zaidi, Ph.D

Division of Nuclear Medicine and Molecular Imaging, Geneva University Hospital, Switzerland
Department of Nuclear Medicine and Molecular Imaging, Groningen University, The Netherlands

Early diagnosis and therapy increasingly operate at the cellular, molecular or even at the genetic level. As diagnostic techniques transition from the systems to the molecular level, the role of multimodality molecular imaging becomes increasingly important. Positron emission tomography (PET) and magnetic resonance imaging (MRI) are powerful techniques for *in vivo* molecular imaging. The inability of PET to provide anatomical information is a major limitation of standalone PET systems. Combining PET and CT proved to be clinically relevant and successfully reduced this limitation by providing the anatomical information required for localization of metabolic abnormalities. However, this technology still lacks the excellent soft-tissue contrast provided by MRI. Standalone MRI systems reveal structure and function, but cannot provide insight into the physiology and/or the pathology at the molecular level. The combination of PET and MRI, enabling truly simultaneous acquisition, bridges the gap between molecular and systems diagnosis. MRI and PET offer richly complementary functionality and sensitivity; fusion into a combined system offering simultaneous acquisition will capitalize the strengths of each, providing a hybrid technology that is greatly superior to the sum of its parts. A combined PET/MRI system provides both the anatomical and structural description of MRI simultaneously with the quantitative capabilities of PET. In addition, such a system would allow exploiting the power of MR spectroscopy (MRS) to measure the regional biochemical content and to assess the metabolic status or the presence of neoplasia and other diseases in specific tissue areas. This talk briefly summarizes state–of-the art developments and latest advances in dedicated hybrid PET/MRI instrumentation. Future prospects and potential clinical applications of this technology will also be discussed.

OP 038

Friday, May 18, 2012

16:00-17:30, Hall 4

Innovations in PET-CT guided radiation therapy treatment planning

PD Habib Zaidi, Ph.D

Division of Nuclear Medicine and Molecular Imaging, Geneva University Hospital, Switzerland
Department of Nuclear Medicine and Molecular Imaging, Groningen University, The Netherlands

The role PET during the past decade has evolved rapidly from that of a pure research tool to a methodology of enormous clinical potential. Historically, anatomical CT and MRI images were used to delineate the gross tumour volumes (GTVs) for radiotherapy treatment planning. The capabilities offered by modern radiation therapy units and the widespread availability of combined PET/CT scanners stimulated the development of biological PET imaging-guided radiation therapy treatment planning with the aim to produce highly conformal radiation dose distribution to the tumour. The progress in radiation therapy technology has been enormous during the last two decades offering now the possibility to plan highly conformal radiation dose distributions through the use of sophisticated beam targeting techniques such as intensity-modulated radiation therapy (IMRT) using tomotherapy, volumetric modulated arc therapy and many other promising technologies for sculpted 3D dose distribution.
The foundation of molecular imaging-guided radiation therapy (MIGRT) lies in the use of advanced imaging technology for improved definition of tumour target volumes, thus relating the absorbed dose information to image-based patient representations. This talk discusses technological advancements in the field concentrating on the conceptual role of molecular PET/CT imaging in radiation therapy treatment planning and related image processing issues with special emphasis on segmentation of medical images for the purpose of defining target volumes. One of the most difficult issues facing PET-based radiation therapy treatment planning is the accurate delineation of target regions from typical noisy functional images. The major problems encountered are image segmentation and imperfect system response function. Image segmentation is defined as the process of classifying the voxels of an image into a set of distinct classes. The difficulty in PET image segmentation is compounded by the low spatial resolution and high noise characteristics of PET images. Current approaches used and future opportunities together with the challenges facing the adoption of PET-guided delineation of target volumes will also be addressed.

OP 039

Friday, May 18, 2012

11:30-13:30, Hall 4

New frontiers in quantitative imaging: PET metrics

PD Habib Zaidi, Ph.D

Division of Nuclear Medicine and Molecular Imaging, Geneva University Hospital, Switzerland
Department of Nuclear Medicine and Molecular Imaging, Groningen University, The Netherlands

PET offers the possibility of truly quantitative (physiological) measurements of tracer concentration *in vivo*. However, there are several issues limiting both visual qualitative interpretation and quantitative analysis capabilities of reconstructed PET images that must be considered in order to fully realize this potential. The major challenges to quantitative PET can be categorized in 5 classes: (i) factors related to imaging system performance and data acquisition protocols (instrumentation and measurement factors), (ii) those related to the physics of photon interaction with biologic tissues (physical factors), (iii) image reconstruction (reconstruction factors), (iv) factors related to patient motion and other physiological issues (physiological factors), and (v) Methodological factors: issues related to difficulties in developing accurate tracer kinetic models, especially at the voxel level.
This talk reflects the tremendous increase in interest in quantitative molecular imaging using PET as both clinical and research imaging modality in the past decade. It offers an overview of the entire range of quantitative PET imaging from basic principles to various steps required for obtaining quantitatively accurate data from dedicated standalone PET and combined PET/CT and PET/MR systems including data collection methods and algorithms used to correct for physical degrading factors as well as image processing and analysis techniques and their clinical and research applications. Considerable advances have been made and much worthwhile research focused on the development of quantitative imaging protocols incorporating accurate data correction techniques and sophisticated image reconstruction algorithms. The fundamental concepts of quantitative image analysis techniques as they are applied in diagnostic and therapeutic nuclear medicine will be explored. The monitoring of therapeutic efficacy in several malignancies and incorporation of quantitative FDG-PET data and various PET metrics such as PET Response Criteria in Solid Tumors (PERCIST) will also be addressed. Future prospects, research trends and challenges are identified and directions for future research are discussed.

OP 040

Thursday, May 17, 2012

11:30-12:30, Sa'di Hall

Radiation-induced myocardial perfusion abnormalities in breast cancer patients following external beam radiation therapy

Hanie Zamani[1*], Babak Fallahi[1], Mohammad Eftekhari[1], Robabeh Anbiaei[2], Davood Beiki[1], Ahmad Ameri[2], Alireza Emami Ardekani[1], Armaghan Fard-Esfahani[1], Alireza Momen Roknabadi[2]

[1]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Introduction: Radiation therapy for breast cancer can induce myocardial capillary injuries and may cause increased cardiovascular morbidity and mortality. This investigation assesses myocardial perfusion abnormalities in breast cancer patients who underwent 3-dimentional treatment planning radiation therapy.
Methods: Thirty one left sided breast cancer patients (exposed group) and 32 right sided breast cancer patients (control group) were participated in this study. The Framingham risk score for 10 years coronary artery disease in all patients were below 5% and all of them were asymptomatic. All patients received Antracyclin based chemotherapy and radiation therapy (50 Gy in 25 fractions). Six month after radiation therapy they were evaluated by myocardial perfusion imaging (MPI) using SPECT for assessment of myocardial perfusion abnormalities. In the exposed group some portions of heart was involved in the radiation therapy field but in the control group, the heart was completely out of the radiation field. MPI-SPECT was performed as a rest-stress protocol using ^{99m}Tc-MIBI to assess perfusion and functional abnormalities .Statistical analysis were done using Mann-Whitney and Chi-2 tests.
Results: Totally 31patients were enrolled in case group and 32 in control group. There were no significant differences ($p>0.05$) between the mean ages of two groups, coronary artery disease risk factors and left ventricle ejection/fraction (65.47±7.24). Among the indices of myocardial perfusion abnormality, ischemia of the apex was more frequently seen in the exposed group ($p=0.032$). But there were no significant differences in myocardial function indexes between study groups.
Conclusion: Three dimentional treatment planning radiation therapy can frequently cause myocardial perfusion abnormalities especially in the apical region which are more common in the left sided breast cancer patients. Since these abnormalities may affect patients' survival, early diagnosis and treatment can change outcome. MPI is a promising method to find these abnormalities.

OP 041

Thursday, May 17, 2012

9:30-10:30, Hall 3

Expansion of pulmonary diagnostics in nuclear medicine: Ventilation and perfusion lung scintigraphy using Gallium-68 aerosol and Gallium-68 labeled macroaggregated albumin (MAA)

Stephan Maus*, Stephan Ament, Christoph, Mathias Schreckenberger

Clinic and Polyclinic of Nuclear Medicine, University Medical Centre Mainz, Germany

Introduction: Imaging of lung ventilation and perfusion using single photon emission tomography is a well-established diagnostic tool for suspected pulmonary embolism (PE). Against the background of the worldwide shortage of Mo-99, Ga-68 labeled aerosol and Ga-68 labeled macroaggregated albumin (MAA) are potential tracers for PET lung ventilation/perfusion imaging and in the diagnosis of clinically suspected PE. After preclinical studies and in the abscence of alternatives the clinical applicability of Ga-68 labeled tracer for PET lung ventilation/ perfusion imaging was investigated in form of an exploratory study of 5 patients with clinical suspicion of PE.
Methods: Five patients with suspicion on pulmonary embolism underwent PET/CT (Philips TF) after inhalation of Ga-68 labeled aerosol and application of 42-116 MBq Ga-68 labeled MAA (injected activity was calculated compared to the activity inhaled). PET scans were acquired with an acquisition time of 5 min per bed position. The acquisition protocol included a low-dose CT for

attenuation correction (AC). Dosimetry calculations and continuative phantom measurements for validation of the quantification were performed.
Results: PET lung ventilation/perfusion imaging using Ga-68 labeled aerosol and Ga-68 labeled MAA is clinically feasible. In one case a clinically suspected PE could be detected and verified. Radiation exposure (0.7 mSV / 6 MBq Ga-68 labeled aerosol, coinc rate 71000) was comparable to the SPECT technique with Tc-99m labeled aerosol (0.6 mSV / 40 MBq, ICRP 80) for lung ventilation imaging and 50% higher (3.7 mSV / 42 MBq Ga-68 labeled MAA, coinc rate 415000) as Tc-99m labeled MAA for lung perfusion imaging (2.2 mSV / 200 MBq, IRCP 80). Extrapulmonal activity but no free Ga-68 activity could be detected. In phantom measurements using a torso phantom with Ga-68 free water we found 15% measurable (but „not existing“) activity of the total applied activity dose from the closed hollow cylinder with lung mass density equivalent material (inside of the torso phantom). This effects could be caused by the high kinetic energy of Ga-68 positrons.
Conclusion: Ga-68 aerosol and Ga-68 labeled MAA are principally adequate surrogate markers for clinical use and could be an interesting alternative with high accuracy to lung ventilation/perfusion imaging with Tc-99m labeled radiotracers in times of Mo-99 shortages. Further studies on broad reach of positrons due to high kinetic energy of Ga-68 are needed to investigate the possible effects on PET lung ventilation/perfusion imaging.

OP 042

Saturday, May 19, 2012

11:30-12:30, Hall 3

Controversies in imaging of children with urinary tract infection

Boris Ajdinovic*, Ljiljana Jaukovic, Zoran Krstic, Marija Dopudja

Military Medical Academy, Institute of Nuclear Medicine, 11000 Belgrade, Crnotravska 17, Serbia

Introduction: The relationship among urinary tract infection (UTI), vesicoureteral reflux (VUR) and permanent renal damage in children is not fully understood. The aim of this study was to evaluate the incidence of renal scarring in children with history of UTI and to determine the change in probability of permanent renal damage due to the presence of VUR documented on MCU.
Methods: We analyzed 400 kidneys in 201 children (127 girls and 74 boys, aged 7 months to 7 years, median 2.5) with culture verified UTI, referred for technetium labeled dimercatpo-succinic renal scintigraphy (DMSA) 4-6 months after acute UTI. Micturating cystoureterography (MCU) was also performed mostly one month prior to DMSA. Statistical analysis was performed using Chi square test or Fisher's exact test. Likelihood ratio (LR) positive and negative, diagnostic odds ratio (DOR) and post test probability of (no) disease were calculated for VUR on MCU versus scarring on DMSA.
Results: VUR was found in 158 of the 400 studied kidneys (39,5%) and evaluated as grade I, II, III, IV and V in 3, 70, 43, 25 and 17 refluxing renal units respectively. Of the 201 patients 55 (27.4 %) had permanent renal damage according to DMSA. Scarring was shown in 29.7% (47/158) of kidneys with UTI and VUR and in 5.8% (14/242) kidneys with UTI without VUR ($p < 0.0001$). In kidneys with VUR grades I, II, III, IV, and V the incidence of renal scarring findings was 0% (0/3), 8,6% (6/70) 46,5% (20/43), 48,0% (12/25) and 52,9% (9/17), respectively. Rate of scarring significantly increased with VUR of grade III, IV and V. There was no significant difference in the incidence of scarring in kidneys with UTI without VUR and kidneys with low grade (I and II) VUR ($p=0.306$). LR positive was 2.353 (95% CI; 1.889, 2.865), LR negative was 0.341, (95% CI: 0.209, 0.523) and DOR was 6.895 (95% CI; 3.533, 14.093). Presence of VUR on MCU increased the chance of renal damage on DMSA by about 15%, whereas the negative MCU increased the chance of no renal involvement by 9%.
Conclusion: Micturating cystouretrography should not be used as a first line test to rule out the permanent renal damage due to UTI. The priority of imaging strategy should be focused on early identification of renal lesion to prevent further deterioration. DMSA renal scintigraphy is a more sensitive test exposing the child to reduced radiation dose compared with MCU.

OP 043

Saturday, May 19, 2012

12:30-13:30, Hall 5

Comparison between fragmented QRS versus Q wave in diagnosis of myocardial scar

Narjess-Khatoon Ayati*, Vahid Reza Dabbagh Kakhki, Mohammad Tayyebi, Seyed Rasoul Zakavi

Nuclear Medicine Research Center, Mashhad University Of Medical Science, Mashhad, Iran

Introduction: Myocardial infarction (MI) diagnosis has a pivotal role in patient management and prognosis. Consequently, finding efficient and accurate methods for MI detection is very important. Q wave is not present in all patients with MI and its prevalence is declining. Recently, fQRS complex has been introduced as a marker of prior MI. In this study, we compared the value of fQRS complex and Q wave for myocardial scar diagnosis.
Method: 500 consecutive known or suspected cases for Coronary Artery Disease (CAD), who were referred for myocardial perfusion scan (MPI), were studied. MPI was performed in two steps (rest and pharmacologic stress) with gated SPECT technique. ECGs were also evaluated for presence of fQRS and Q wave. Ventricular perfusion and function indices in patients with or without fQRS and Q wave have been compared.
Results:207 males and 269 females (mean age±SD= 57.06 ±12) were evaluated. 30.7% of patients had fQRS, 3.8% had Q wave and 14.3% had both in ECG. Myocardial scar was reported in 22.3% of patients according to MPIs. Sensitivity, specificity, positive and negative predictive value of fQRS for myocardial scar was 78%, 65%, 39% and 91% respectively and 61%, 94%, 76% and 89% for Q wave.
Conclusion: According to this study, although fQRS is not as specific as Q wave for myocardial scar detection, but it has better sensitivity and negative predictive value. fQRS is a valuable marker of prior MI. fQRS associated with Q wave had incremental value in detection of myocardial scar.

OP 044

Friday, May 18, 2012

9:30-11:00, Hall 4

Nano-liposomal Patent Blue labeled with ^{99m}Tc-HMPAO, as a novel probe for sentinel lymph node mapping

Kayvan Sadri[1*], Najmeh Heidari[2], Mahmoud Reza Jaafari[2], Ramin Sadeghi[1], Seyed Rasoul Zakavi[1], Fariba Johari[3]

[1]Nuclear Medicine Research Center, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[2]Nanotechnology Research Center, School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran
[3]Nuclear Science and Technology Research Institute, Tehran, Iran

Introduction: Radio-colloid particles travel slower than soluble tracers in lymphatic system, and had higher uptake in the lymph nodes. Nano-Liposomes are colloidal particles composed of spontaneously forming lipid spheres. The main goal of this study was to prepare a novel lymph node delivery system with nano-liposomes encapsulated patent blue. These preformed nano-liposomes are then labeled with ^{99m}Tc, permitting scintigraphic imaging of the colored sentinel node at the same time.
Methods: Patent blue and glutathione (GSH) were encapsulated into liposomes via the solvent evaporation method. After reducing the size of liposome to the nano-scale size using extrusion, they were labeled with prepared ^{99m}Tc-HMPAO and purified by passing through Sephadex G-25. 40 µl of 99mTc labeled liposome containing patent blue dye were administered subcutaneously to the hind limbs of mice to map the lymphatic drainage patterns.
Results: Encapsulation efficiency of patent blue dye was determined to be 1.26% ± 0.1. Labeling efficiencies for liposomes encapsulating 200 mM GSH were 70% ± 4.6. Tissue counts of the nodes as percentage injected dose per gram (%ID/g) are in progress to be done.

Conclusion: Nano-liposomes encapsulating patent blue dye can be successfully labeled with ^{99m}Tc-HMPAO, providing a convenient option for the simultaneously visualization and radio-localization of the sentinel lymph node.

OP 045

Friday, May 18, 2012

9:30-11:00, Sa'di Hall

^{11}C-choline PET/CT for the early restaging of patients with biochemical relapse after radical prostatectomy and PSA values lower than 1.0 ng/mL

Paolo Castellucci[1*], Francesco Ceci[1], Chiara Fuccio[2], Marcelo Mamede[3], Rossella Ferrara[4], Annarita Ianniello[4], Riccardo Schiavina[5], Giuseppe Martorana[5], Filippo Lodi[1], Stefano Fanti[1]

[1]Policlinico S.Orsola Malpighi Bologna Italy
[2]Nuclear Medicine Unit Istituto Maugeri Pavia, Italy.
[3]Nuclear Medicine Universidade Federal Minas Gearais, Brazil,
[4]Nuclear Medicine Unit II Università di Napoli, Italy
[5]Urology Unit Policlinico S.Orsola-Malpighi, University of Bologna, Italy.

Introduction: To assess the use of whole body ^{11}C-Choline PET/CT in the re-staging of prostate cancer (PC) patients previously treated by radical prostatectomy (RP), that showed an increase of PSA with values lower than 1.0 ng/mL.
Methods: 81 consecutive PC patients (mean age=68 years; range=54-82) previously treated by RP who showed an increase in PSA lower than 1.0 ng/mL (mean value= 0.60 ng/mL; median value= 0.50 ng/mL; range 0.2-1.0 ng/mL) were included in our retrospective study. Positive findings were validated by: TRUS guided biopsy in case of local recurrence; follow up (at least 6 months) either with TRUS, CT, BS, MR; a repeated ^{11}C-Choline PET/CT. In all patients PSA doubling time (PSADT) was calculated.
Results: Overall, ^{11}C-Choline PET/CT showed positive findings in 23/81 (28.3%) patients: local relapse in 6/81 (7%) and distant metastasis in 17/81 (21%) patients. Bone lesions were detected in 9 patients (seven single and two multiple); lymph node lesions in eight patients (seven single and one multiple). TRUS guided biopsy confirmed all six patients with local relapse and showed undetected local relapse in 3 additional patients (PET/CT sensitivity= 66%). The mean PSA value in PET/CT positive and negative patients were respectively 0.64±0.2 ng/mL and 0.51±0.2 ng/mL (p 0.2). Twenty-one out of 81 patient (26%) were receiving Hormonal Treatment (HT) at the time of PET/CT scan. In such sub population of patients the detection rate of PET/CT resulted to be significantly higher (10/21; 47%) than in the remaining patients that were not receiving treatment (13/60; 21%). Finally, on a multivariate analysis, PSAdt resulted to be the a statistically significant predictor factor for a PET/CT positive result:
Conclusion: ^{11}C-Choline PET/CT detected relapse in 28% of the patients with PSA levels lower than 1 ng/mL. Despite such low sensitivity ^{11}C-Choline PET/CT could be recommended as the first re-staging diagnostic procedure, especially in patients showing fast PSA kinetic and in which the HT seems to be ineffective. However, TRUS should always be performed due to the low sensitivity of PET/CT in the detection of local relapse.

OP 046

Saturday, May 19, 2012

16:00-17:30, Hall 4

2D interpolation of virtual sinogram in an irregular grid for metal artifact reduction of PET/CT images

Mehrsima Abdoli[1*], Johan de Jong[1], Jan Pruim[1], Rudi Dierckx [1], Habib Zaidi[1, 2]

[1]Department of Nuclear Medicine and Molecular Imaging, Groningen University, Groningen, The Netherlands
[2]Division of Nuclear Medicine, Geneva University Hospital, CH-1211 Geneva, Switzerland

Introduction : Metallic implants are known to generate bright and dark streaking artifacts in CT images, which can propagate to the corresponding CT-based attenuation corrected PET data. This will result in over- and/or under-estimation of the activity uptake in regions adjacent to metallic implants and thus, cause inaccurate quantification of the tracer uptake and potential erroneous clinical interpretation of the attenuation corrected PET data. The aim of the present study is to develop an improved algorithm for metal artifact reduction (MAR) in PET/CT imaging.

Methods: The MAR procedure starts by generating the virtual sinogram by forward projection of the original CT images. To preserve the smoothness of the sinogram, a 2D cubic interpolation technique was applied to substitute the values of the affected projection bins. Since we omit the projection bins affected by metallic artifact from the regular grid of the sinogram, the interpolation scheme has to be performed on an irregular grid. Therefore, an irregular grid was generated using Delaunay triangulation technique. The Clough-Tocher interpolation, which is compatible with the triangulated grid, was used in the proposed approach. The corrected sinogram is finally reconstructed using a filtered backward projection routine to generate the corrected CT images. A cylindrical phantom filled with uniform activity concentration incorporating metallic inserts and 30 clinical PET-CT studies containing hip prostheses were used to assess the performance of the proposed approach. The resulting images were compared to those obtained using the built-in MAR algorithm on a Siemens mCT64 PET/CT scaner.
Results: Phantom and clinical studies showed that the proposed algorithm performed considerably better than Siemens's method in the regions corresponding to dark streaking artifacts (underestimated regions), whereas it performed equally well compared to Siemens's method in the other regions. In the underestimated regions, the proposed method increased the uptake value up to 45%, whereas the Siemens's method kept almost the same uptake as the uncorrected PET images. In the overestimated regions both methods decreased the uptake by ~45%. The phantom experiment also revealed that the proposed approach is in better agreement with the actual activity concentration compared to both the uncorrected and corrected images using Siemens's method.
Conclusion: It can be concluded that the proposed method allows more accurate attenuation correction of PET data thus preventing misinterpretation of activity uptake in regions adjacent to metallic objects.

OP 047

Friday, May 18, 2012

11:30-12:30, Hall 5

Concordance between peri-areolar blue dye and peri-incisional radiotracer injections for sentinel node mapping of the patients with history of primary breast cancer excisonal biopsy

Ramin Sadeghi[1*], Elena Saremi[2], Shahriar Azizi[2], Ali Jangjoo[2]

[1]Nuclear Medicine Research Center. Mashhad University of Medical Sciences, Mashhad, Iran
[2]Surgical Oncology Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: Sentinel lymph node biopsy is the standard procedure for axillary staging in early breast cancer patients. Many aspects of this important procedure are still controversial and need to be addressed in details. One of these controversial issues is the history of previous excisional biopsy of the breast lesions and its implication in the injection site of the radiotracer. In this study, we evaluated the concordance between peri-incisional injection of the tracer and peri-areolar injection of the blue dye regarding sentinel node detection.
Methods: 80 breast cancer patients with the history of previous excisional biopsy of the breast lesion were included in the study. The patients received 2 injections of 99m-Tc-antimony sulfide colloid in both ends of the incision line. During surgery 2 mL patent blue V was also injected in the peri-areolar region of the indexed quadrant. The sentinel nodes were harvested using a hand-held gamma probe and the concordance between blue and hot nodes were recorded**.**
Results: In 79 patients at least one sentinel node could be harvested during surgery. Totally 94 sentinel node were harvested. Nodes blued while not hot were not detected. In three patients sentinel nodes were detected by gamma probe but not blue dye (95% detection rate for blue dye on the patient basis). The tumor location in all of these patients was in the upper lateral quadrant and the incision line was extended into the axillary tail of the breast in all of them.
Conclusion: Concordance rate between peri-areolar and peri-incisional injections is high in sentinel node mapping of the breast cancer patients with the history of excisoinal biopsy. This shows that single peri-areolar injection in the index quadrant would suffice for sentinel node mapping of this group of patients. Care should be taken in patients with large excisional biopsy in the extreme proximity to axilla.

OP 048

Friday, May 18, 2012

11:30-12:30, Hall 5

Sentinel node biopsy in endometrial cancer: systematic review and meta-analysis of the literature

Ramin Sadeghi[1,2*], Mohammad Reza Ghodsi Rad[1], Maliheh Hasanzadeh Mofrad[3], Hassan Gholami[2], Zohreh Yousefi[3]

[1]Nuclear Medicine Research Center. Mashhad University of Medical Sciences, Mashhad, Iran
[2]Meta-analysis Sub-Committee, Evidence Based Medicine Committee, Mashhad University of Medical Sciences, Mashhad, Iran
[3]Womens Health Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: Sentinel lymph node biopsy is a fairly new approach for staging of gynecological malignancies. In the current study, we comprehensively reviewed the available reports on sentinel node biopsy of endometrial cancer.
Methods: We searched Medline, SCOPUS, ISI web of knowledge, Science Direct, Springer, OVID SP, and Google scholar with the following search terms: "(endometrium OR endometrial OR uterine OR uterus) AND sentinel". The outcomes of interest were detection rate and sensitivity.
Results: Overall 30 studies had enough information for false negative rate evaluation and 46 studies (including the sub-groups of the above-mentioned studies) for detection rate evaluation. Pooled detection rate was 75.7% [95% CI: 71-79.8%] and pooled sensitivity was 89% [95% CI: 82-93%]. Cervical injection as well as using both blue dye and radiotracer results in higher detection rate and sensitivity.
Conclusion: Sentinel node mapping is feasible in endometrial cancer. Larger studies are still needed to evaluate the false negative rate and the factors influencing the sensitivity before considering this method safe.

OP 049

Saturday, May 19, 2012

12:30-13:30, Hall 4

Production, quality control and biodistribution studies of ^{175}Yb-TTHMP

Laleh Safarzadeh[1*], Mohammad Ghannadi Maragheh[2], Simindokht Shirvani Arani[2], Ali Bahrami Samani[2]

[1]Department of Radiation Application, Shahid Beheshti University, Tehran, Iran.
[2]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), AEOI, Tehran, Iran.

Introduction: Bone is the third most common site of metastatic disease. Bone pain is the major source of morbidity associated bone metastasis. Bone-seeking radiopharmaceuticals labeled with beta emitters to relieve intense bone pain resulting from metastases.
Methods: ^{175}Yb is one of the potential lanthanide having excellent radionuclidic properties.^{175}Yb decay by emission of β^- particles by 480 keV maximum energy with a convenient half-life of 4.18 days. ^{175}Yb also emits photons of 113 keV (1.9%), 282 keV (3.1%) and 396 keV (6.5%) which are suitable for studying the biolocalization. Production, quality control and biodistribution studies of ^{175}Yb-TTHMP were targeted in this work.
Results: Yb-175 chloride with activity 31.82 mCi/mg was obtained bythermal neutron flux of a natural Yb_2O_3 sample in the Tehran Research Reactor (TRR). Radiolabeling was completed in 1 hour by the addition of Triethylene Tetramine Hexa Methylene Phosphonic acid (TTHMP) at room temperature. Radiochemical purity of >92% was obtained using ITLC. The results of biodistribution studies from normal rat's tests are excellent. It was taken up in the bone in 2 h after injection (ID/g%= 1.6) and even reminded after 8 d (ID/g%= 3.89).
Conclusion: It was observed from animal tests and quality control data of ^{175}Yb-TTHMP that is shows good features to be used as bone pain palliation again. The produced ^{175}Yb-TTHMP properties such as relatively long half-life, appropriate beta and gamma energy, low cost and easy production suggest good potential for efficient use of this radiopharmaceutical for bone pain palliation of skeletal metastases.

OP 050

Friday, May 18, 2012

11:30-12:30, Hall 5

Comparison of animal studies between interstitial magnetic resonance lymphography and radiocolloid SPECT/CT lymphoscintigraphy in the head and neck region

Shigeru Kosuda

National Defense Medical College, Japan

Introduction: To comparatively assess two techniques, radiocolloid SPECT/CT lymphoscintigraphy and interstitial MR lymphography using SPIO and gadoxetate disodium, in animal models.
Methods: We used twenty one 8-week-old male nude mice of strain BALB/c Slc-nu/nu, weighing 23 g to 27 g. The 4.7-tesla MRI equipment was used to detect the SNs. T2*WI of gradient-echo sequences was acquired sequentially up to 24 h after administering SPIO, ferucarbotran. T1WI was acquired sequentially up to 80 min after administering gadoxetate disodium. ^{99m}Tc-phytate SPECT/CT lymphoscintigraphy was taken at 30 min. after the injection to detect the SNs using animal-dedicated whole-body SPECT/CT hybrid scanner. The injection was submucosally performed in the right tongue margin of each mouse. Reading performances concerning SN visualization and its quality on interstitial MR lymphogram and SPECT/CT lymphoscintigram were performed by 3 radiologists.
Results: The SN intensities were 0.43 for the right, 0.61 for the left at 30 min after ferucarbotran injection, with gradual decrease in intensity, and 1.43 for the right, 1.33 for the left at 10 min after gadoxetate disodium injection with a fast decrease in intensity. The base value of 1.0 was at pre-examination. The mean numbers of lymph nodes visualized were 4.00 nodes for on SPECT/CT lymphoscintigram and 2.0 for interstitial MR lymphogram. There was statistically significant difference in the mean scores between SPECT/CT lymphoscintigraphy and interstitial MR lymphography (two-factor mixed design with repeated measures on one factor: $p < 0.0002$).
Conclusions: In our comparative study using mice, the results of radiocolloid SPECT/CT lymphoscintigraphy were superior to those of interstitial MR lymphography, while both SPIO and gadoxetate disodium have a potential of being employed for sentinel node navigation surgery by interstitial MR lymphography in the head and neck region.

OP 051

Thursday, May 17, 2012

9:30-11:00, Hall 4

Development of image reconstruction code with collimator-detector response function compensation for a preclinical SPECT

Navid Zeraatkar[1, 2*], Mohammad Hossein Farahani[1, 2], Hossein Arabi[1, 2, 3], Saeid Sarkar[1, 4], Salar Sajedi[1, 2], Arman Rahmim[5, 6], Mohammad Reza Ay[1, 2, 4, 7]

[1]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Parto Negar Persia Co, Tehran, Iran
[3]Department of Medical Physics, CancerCare, University of Manitoba, Canada
[4]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[5]Department of Radiology, Johns Hopkins University, Baltimore, MD, USA
[6]Department of Electrical and Computer Engineering, Johns Hopkins University, Baltimore, MD, USA
[7]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

The small animal High Resolution SPECT (HiReSPECT) is a dedicated dual head gamma camera that recently designed and developed in our Laboratory for imaging of murine models. Each detector composed of an array of 1.2x1.2 mm^2 (pitch) pixelated CsI(Na) crystals. Two H8500 position-sensitive photomultiplier tubes (Hamamatsu, Japan) are coupled to each head's crystal. In

this work, we report on the resolution-recovery-embedded image reconstruction code of the system and the practical results achieved using different phantoms and mice scans.
For being utilized in the image reconstruction process, Collimator-Detector Response Functions (CDRFs) were measured by pixel-driven method using Monte Carlo simulation for some finite distances from the head within the field of view (FoV). CDRFs then fitted by independent 2-dimensional (2D) Gaussian functions. Thereafter, linear interpolation applied on *sigma* of the Gaussians to obtain the CDRF for the other distances from the head.
Rotation-based Maximum-Likelihood Expectation Maximization (MLEM) method was used for reconstruction. A novel rotation algorithm developed to rotate the image matrix according to the desired angle by means of some pre-generated rotation maps. In addition, a tune ratio was defined in the code to alter the amount of update that is supposed to applied on the image causing better image quality resulted from the reconstruction.
The experiments showed the improvement of resolution in our resolution-recovery-embedded image reconstruction. While the radial and tangential resolution of the system in terms of Full-Width at Half-Maximum (FWHM) without resolution recovery is over 2 mm in almost all positions within the FoV and reaches around 2.5 mm at the worst case, it does not exceed 1.8 mm even at the worst case. The noise performance of the system is also acceptable showing the standard deviation value of 5.6%.

OP 052

Thursday, May 17, 2012

11:30-12:30, Hall 3

Whole body FDG-PET in elderly twin pairs; the differences and the similarities

Shinichiro Watanabe[1*], Hiroki Kato[1], Eku Shimosegawa[1], Jun Hatazawa[1], The Twin Research Group [2]

[1]Department of Nuclear Medicine and Tracer Kinetics, Osaka University Graduate School of Medicine, Osaka, Japan
[2]Twin Research Center, Osaka University Graduate School of Medicine, Osaka, Japan

Introduction: Monozygotic twins have identical genes in common. Differences between monozygotic twin pairs might reflect the differences in their life-style and environmental factors. Studies for monozygotic twin pairs discordant for a disease might enable to estimate relative contribution of genetic and environmental factors of the disease.
Many studies using brain FDG-PET for Alzheimer disease or other neuronal disorders have been reported, but whole-body FDG-PET study targeted for monozygotic or dizygotic twin pairs is none. The aim of this study is to evaluate the differences and the similarities of whole-body glucose metabolism of twin pairs.
Methods: Cerebral and whole-body glucose metabolism was studied in nine twin pairs (monozygotic or dizygotic) using FDG-PET. (Zygotic assessment is under investigating.
To evaluate the extent of FDG uptake, the ROI analysis was performed for major organs such as brain, tonsil, thyroid, aortic wall, myocardium, liver, gastric wall, which could be identified by PET images alone. With regard to cerebral glucose metabolism, voxel based statistical analysis was also performed to obtain objective results.
Results: Myocardial uptake varied both inter- and intra-pairs.
SUVmean of Tonsil and liver, and SUVmax of aortic wall were similar in both inter- and intra-pairs. Gastric uptake and thyroid uptake was different in inter-pairs, but similar in intra-pairs. Statistical analysis of brain showed similarities in intra-pairs in distribution of significant lower or higher metabolic lesions.
Conclusion: There were similarities in cerebral, thyroid, and gastric uptake, but it is uncertain whether genetic factors contributed to these results. Further studies are needed.

OP 053

Friday, May 18, 2012

9:30-10:30, Hall 3

Dynamic thyroid phantom production to simulate Technetium 99m pertechnetate biodistribution in thyroid for miscellaneous nuclear medicine studies

Arreta Rei[*], Djarwani Soejoko

University of Indonesia

A dynamic phantom has been made in house to simulate biodistribution of Tc-99m pertechnentate in thyroid. Commonly in Nuclear Medicine, study of radiopharmaceutical biodistribution, internal dosimetry, and image optimization is measured directly in human. This method is not comfortable for the patients because it has to do scanning repeatedly and takes longer time than the clinical procedure. The aim of this research is to build a dynamic phantom which represents the flow of Tc-99m pertechnetate in normal human thyroid to solve that problem. Thyroid scintigraph patients were periodically scanned with AP and PA planar imaging on the surface of neck, thorax abdomen, and pelvis for several interval times up to 90 minutes after Tc-99m pertechnetate injection to obtain elimination rate and internal dose. From 21 patients (7 males and 14 females), obtained elimination rate of thyroid is 6.20 x 10^{-3} /minute, and calculation thyroid absorbed dose with MIRD equation gave 3.38 x 10^{-1} mGy/mCi. The phantom was made in house with dimension 10 cm x 15 cm x 12 cm, where inside this block there are two cylinders as thyroid model with total volume of 13.4 mL. This phantom is equipped with inlet and outlet ducts. Each outlet duct has got faucet to control liquid debit for being suitable to human elimination phase in metabolism. Phantom testing showed elimination rate and absorbed dose value 6.16 x 10^{-3}/minute and 3.38 x 10^{-1} mGy/mCi respectively. Compare to the value from in vivo measurement, dynamic thyroid phantom showed good results in performing elimination rate constant and internal dose measurement. This phantom could be used for education practice and further study.

OP 054

Friday, May 18, 2012

9:30-11:00, Sa'di Hall

Comparing of SPECT/CT and planar scans in ^{123}I-MIBG semi-quantitative scoring system (curie and SIOPEN) on patients with neuroblastoma

Igor Cerny, Jiri Prasek

Nuclear Clinic of University Hospital Brno, Masaryk University Brno, Czech Republic

Introduction: We apply Semi-quantitative evaluation scoring system Curie and SIOPEN for patients with Neuroblastoma. Both methods vary by number of body segments and by classifying soft tissue into evaluation.The extension of the bone and soft tissue infiltration and level of metabolic activity in individual segments are rated. This rating has significant importance during the assessment of the medical treatment effectiveness and next medical treatment plan. Still most centers use score from Planars Scans. SPECT has not significant impact for score (British Journal of Cancer 2010). Goal: The goal of the study is comparison of value gained by evaluation of the Planar Scan and SPECT/CT scan. Next goal is comparison of Curie and SIOPEN methods.
Methods: We have evaluated total 100 pre- and post-therapy MIBG diagnostic scans in the group of 35 patients (age range 0-8 years). Each scan was evaluated first by Planar scan, the point rating range disablement and level of activity. The evaluation was repeated by SPECT/CT scan. Each scan was evaluated by both Curie and SIOPEN methods.
Results: By Curie method the average of Extensity Scores during Planar scans was 4,5 points, during SPECT/CT 6,2 points (P value less then 0.0001). The average of Intensity Scores during Planar scans was 5,3 points, during SPECT/CT 7,3 points (P value less then 0.0001). The greatest difference between SPECT/CT and Planar picture values with one patient was 13 point for Extensity Score (SPECT/CT 20 points vs. 7 points on Planar scan). By SIOPEN method the average of points during Planar screening was 6,5 points, during SPECT/CT 8,0 points (P value equals 0.0017).
Conclusion: the Semi-quantitative evaluation in accordance with the Planar scan is significantly lower precise comparing with SPECT/CT method. For the exact set of the disablement point range values and the level of activity the evaluation by SPECT/CT scan is necessary. In other case the patient would receive better validation comparing the reality, which might have impact on next medical treatment. The modern facility shall apply the SPECT/CT picture method only. The suggested method is Curie as compared the SIOPEN method. SIOPEN method does not cover the soft tissue and it cannot be applied for the patients who do not have infiltered Bones. The total numbers of such patients were 33% in this project. The alternative is SIOPEN method complemented by evaluation of soft tissue.

OP 055

Friday, May 18, 2012

11:30-13:30, Hall 4

Implementation of data acquisition board with digital signal processing capability for nuclear imaging and spectrometry devices

Salar Sajedi[1,2*], Mohammad Hossein Farahani[1, 2], Hossein Arabi[1, 2], Navid Zeraatkar[1, 2], Mohammad Reza Ay[1, 2, 3,4]

[1]Parto Negar Persia Co., Tehran, Iran.
[2]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[4]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Signal processing for scintillation detectors has largely developed by digital systems' improvement. In this study we have introduced and compared new techniques in digital signal processing for nuclear spectrometry and imaging applications and illustrated trade-offs between them. Also, we have shown the implementation requirements for high rate spectroscopy that needs real-time processing.
Methods: There are many methods for offline processing algorithms, but in many cases, real-time processing is mandatory. The largely used methods in digital processing consist of digital filters for Gaussian and trapezoidal pulse shaping for peak detection algorithm, integration detection algorithm, and, Moving Window Deconvolution (MWD) and more recently shape dependent algorithms. For data acquisition boards that need real time pulse processing, the hardware needs to have processing capacity for desired algorithm. With simulation of these algorithms, in this work, the hardware requirements for different algorithms have been assessed; a platform has been established with analog amplifier and filter, 40MSPS ADC, an FPGA processor, SDRAM for memory and miscellaneous parts. This configuration results to a more general flexibility for data acquisition algorithms which is fabricated as a card for use in variety of devices. A main board with FPGA based processing is collecting all PMTs data and sends with USB2.0 protocol to computer.
Results: This work has practically tested with a conventional NaI(Tl) detector and PMTs. The hardware configuration detects input pulses and sends data to the main board. Main board collects pulses and sends photon's position and energy data to PC for spectrometry and image reconstruction algorithms. With this platform, we compared the processing and detection algorithms for NaI detector. The Gated Integration (GI) and Peak Detection had good results in low count rates. By increasing count rates to 50kcps and more MWD and Pulse Clipping algorithms outperformed the conventional and simple algorithms. In spectrometry application where count rate may be more than 1Mcps, the best energy resolution obtained by utilizing Pulse Clipping algorithm, which changes from %13 to 25%. Meanwhile, number of registered counts decreased from 98% to 45% in both algorithms.
Conclusion: The new hardware fills application specific requirements of the gamma camera, SPECT and PET scanners with routine operational count rates, while simulations and real data results show that, by utilizing new digital algorithms can be used as high rate real-time signal acquisition module.

OP 056

Friday, May 18, 2012

11:30-13:30, Hall 4

Automatic detection of cardiac motion in nuclear medicine imaging using partial correlation comparison

Iraj Mohammadi[1*], Hossein Rajabi[2], Majid Pouladian[1], Mehdi Sadeghi[1], Alireza Shirazi[1]

[1]Islamic Azad University, Science and Research Branch, Tehran, Iran
[2]Department of Medical Physics, School of Medical Sciences, Tarbiat Modarres University, Tehran, Iran

Nuclear medicine myocardial perfusion imaging is widely used for evaluation of patient with known or suspected coronary artery disease. The imaging time is typically in the range of 5-30 minutes. Here abrupt and gradual motion of the heart occurs due to voluntary patient movement and/or involuntary motion. These motions affect as many as 10% to 20% of all cardiac SPECT studies and cause misalignment of the projection data, which degrades the reconstructed image and may introduce artifacts. These motion artifacts may significantly affect the diagnostic accuracy of the perfusion images. In this study, via retrieval data from SPECT system, the cine mode from planar raw images and condensed images such as sinogram and linogram was created to observe of cardiac motion occurrence and partial cross correlation between two successive frames was introduced, implemented and evaluated in order to estimate and compensate for the cardiac motion depends on degree of motion (abrupt/gradual) at integer pixel and sub-pixel accuracy, time at which occurs and repetition of motion. Using our method the improvement percentage is obtained 90% and 75% for abrupt and gradual motion respectively, along the axial direction. Also the motion relative error is obtained 24% along the transaxial direction at the corresponding reconstructed images. Our findings showed that the type of motion (abrupt and gradual) affects the derivation of quantity of motion and the time when motion starts in the specific frame and its duration (intensity of motion).

OP 057

Sunday, May 20, 2012

9:30-10:30, Hall 5

Biological and dosimetry studies of four radiolabeled of rituximab for human based on distribution data in rats

Amir Reza Jalilian, Edalat Radfar*, Ali Bahrami Samani, Hassan Yousefnia

Nuclear Science and Technology Research Institute (NSTRI), AEOI, Tehran, Iran

Introduction: Rituximab binds with human B-lymphocate-restricted differentiation antigen: CD20. In the present article, preparation and biodistribution of ^{177}Lu, ^{111}In, ^{153}Sm and ^{90}Y labeled rituximabs have been studied and followed by calculation of preliminary dosimetry for human based on distribution data in rats by acceptable approximations.
Methods: Radiolabeled compound was prepared according to the methods previously given in the literature and their QCs and stability testing was run completely. ^{177}Lu-DOTA-rituximab, ^{111}In-DOTA-rituximab, ^{90}Y-DOTA-rituximab and ^{153}Sm-DOTA-rituximab were administered to normal rats separately (15 rats). The animals were killed at the exact time and the specific activities of different organs were measured by using an HPGe detector (for ^{177}Lu, ^{111}In and ^{153}Sm) and a beta scintillator detector (for ^{90}Y). The following equation was used to extrapolate biodistribution data of radiolabeled from rats to humans:
$\%ID/g_{\text{human organ}} = \%ID/g_{\text{animal organ}} * k$
$k = \text{Body mass}_{\text{animal}} / \text{Body mass}_{\text{human}}$
Absorbed dose rate of each organ was calculated in determined time by MIRD method with linear approximation in measurement of activities.
Results: Absorption and biodistribution of radiolabeled in organs of rats were determined by measuring %ID/g at different times. The uptakes were observed in limited organs such as liver, spleen and lungs and less in kidneys, bone and blood.
Conclusion: The dose rate estimation is based on more than 1.5 times of effective half-life of each radiolabeled compound. The results showed that the high absorbed dose is in liver, lungs and spleen; and absorbed dose of other organs is low as acceptable level values. Therefore according to the kind of decay and energy (only beta$^-$, > 2MeV), it is observed that Y-90 impose the highest amount of absorbed dose to the body. Due to the highest abundance of gamma photon decay, In-111 has the most fragments of organs that received dose. Lu-177 has the least fragmented of organs that received dose.

OP 058

Friday, May 18, 2012

9:30-11:00, Hall 4

Design of a radiopharmaceutical potential agent for liver imaging

Saleh Salehi Zahabi[1, 2*], Hossein Rajabi[1, 2], Samira Rasaneh[3]

[1]Tarbiat Modares University, Tehran, Iran
[2]Dept. of Medical Physics, Faculty of Medical Sciences, TarbiatModares University, Tehran, Iran
[3]Nuclear Science and Technology Research Institute, Tehran, Iran

Introduction: Nanoparticles have great potential to be used as diagnostic and therapeutic agent in nuclear medicine. Due to excellent biocompatibility and biodegradability Chitosan have been used extensively for pharmaceutical application. In this study we investigated the possibility of using ^{99m}Tc labeled chitosan nanoparticles for liver imaging.
Methods: Chitosan nanoparticles were synthesized based on the ionic gelation method. Particles size were determined by dynamic light scattering (DLS) technique. Chitosan nanoparticles were labeled with ^{99m}Tc. The labeling efficiency and stability of radiolabeled nanoparticles were checked by ITLC. Biodistribution study in the normal mice was performed at 15 and 30 minutes after administration of 200 µCi ^{99m}Tc-chitosan complex.
Results: After purification and filtration, the size of nanoparticles was 300-900 nm. The labeling efficiency was 99±18%. The stability in saline buffer at 6 h post preparation was 98±2%. Biodistribution studies demonstrated good in vivo stability and efficient accumulation of ^{99m}Tc-chitosan complex in the mice liver.
Conclusion: The results showed that the ^{99m}Tc-chitosan nanoparticles may be considered as a promising radiopharmaceutical of liver imaging for further investigation.

OP 059

Saturday, May 19, 2012

12:30-13:30, Hall 4

Preparation and quality control and biodistribution studies of [^{90}Y]-DOTA-Cetuximab for radioimmunotherapy

Ariandokht Vakili

Islamic Azad University, Science And Research Branch, Medical Radiation Engineering, Tehran, Iran

Yttrium-90 is a useful radionuclide for radioimmunotherapy (RIT) and the anti-epidermal growth factor receptor (anti-EGFR) antibody Cetuximab is clinically approved for the treatment of EGFR-expressing metastatic colorectal cancer and advanced head and neck cancer. Thus in this work radiolabeling of monoclonal anti-EGFR with ^{90}Y for radioimmunotherapy (RIT) is targetted. Cetuximab was successively labeled with [^{90}Y] chloride (74MBq) 2mCi after conjugation with macrocyclics bifunctional chelating agent, 1,4,7,10-tetraazacyclododecane-N,N,N,N-tetraacetic acid mono-(N-hydroxysuccinimidyl) ester (DOTA-NHS), purified and concentrated by centrifugation using an Amicon Ultera-15 filter (Millipore, MWCo, 30000). Y-90 chloride was obtained by ^{90}Sr/^{90}Y generator. Radiolabeling was completed in 24 hours by the addition of DOTA-NHS-Cetuximab conjugate at 37°C. The stability of radiolabeled was studied in human serum. Biodistribution studies in normal rats were carried out to determine the radioimmunoconjugate distribution up to 96h. Radiochemical purity of 92% (using ITLC) was obtained for final radioimmunoconjugate (Specific activity = 0.55 GBq/mg). The final isotonic ^{90}Y-Cetuximab complex was checked by gel electrophoresis for protein integrity retention. Stability of radiolabeled protein in presence of human serum was tested at 37°C for up to 24h. Biodistribution studies demonstrated the highest ID/g% in the blood (2.62±0.005 at 24 hr) and the liver (2.19±0.001). This study demonstrated that ^{90}Y-DOTA-Cetuximab is a potential compound for the treatment of EGFR-expressing cancers.

OP 060

Thursday, May 17, 2012

11:30-12:30, Hall 3

Evaluation of prostate specific antigen (PSA) in 200 patients over 40, for early diagnosis of prostate cancer

M. Moharamzadeh

Biochemistry Dept., Baku State University, Baku, Azerbaijan Republic

Introduction: PSA is a glycoprotein with the molecular weight of 34 kDa. It is composed of 90% of single 238 amino acids polypeptide chain and 10% of carbohydrate. PSA exists in blood serum in 3 main forms - a protein bound, complexed to α2-macroglobulin, α1- antichemotripsin and a free unbound form. The two later forms are immunologically detectable. The biological half life of PSA is 2.2 - 3.2 days .The main importance of PSA levels determination lies in continuous observation of patients during the treatment and the remission of the disease.
Methods: The determination of PSA is based on the immuno-radiometric method (IRMA) in which two monoclonal antibodies against two different epitopes of PSA molecule are used. The samples or standards are incubated in monoclonal antibody-coated tubes with the second I-125 labelled antibody. Collected blood in tubes containing no additive. Separate serum from cells by centrifugation and keep in 2-8 ºc to be performed within 24 hours, while for longer storage keep it frozen at -20 ºC. The PSA-IRMA kits from Immunotech (Beckman company) & Berthold gamma-counter were used for measuring of the PSA.
Results : Among 200 men over 40, about 70 person who had PSA more than 4.0 ng/ml (also 3 patients who had PSA lower than 4 ng/ml but complained of clinical problems) were referred to the Urologist . All of them had Ultra Sound (TRUS) examination and among them 46 men underwent to the Biopsy. Finally 42 Benign Prostate Hyperplasia and 4 malignancy were detected of this study. These 4 patients, have gone under chemo & radiotherapy .
Conclusion: The studied male population develop prostate cancer quite commonly if their serum PSA level are greater than 4.o ng/ml. However This study needs to be confirmed in a larger scale and different population in the region.

OP 061

Thursday, May 17, 2012

16:00-17:30, Hall 4

Biodegradable chitosan-PEI-Folate copolymer labeled with Sm-153 for diagnosis and targeted therapy purposes

Esmail Mollarazi, Amir Reza Jalilian, Fatemeh Atyabi, Ali Bahrami Samani

Department of Nuclear Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran

The aim of this study was to synthesize water-soluble chitosan derivative with suitable biocompatibility and amine functionalities conjugated folate (CHI-DTPA-g-PEI-FA) for targeting applications followed by radiolabeling with Sm-153 for internal radiation therapy. Periodate oxidation was employed to produce chitosan with flanking aldehyde groups, onto which oligoamines were conjugated. The polymer structure was confirmed by FT-IR and ^{1}H- NMR spectra. ^{153}Sm-CHI-DTPA-g-PEI-FA was successfully prepared with 15 mg/ml of polymer in aqueous solution at pH 5.5-6 using acidic $^{153}SmCl_3$ (radiochemical purity >95% ITLC). The complex was stable at room temperature in final formulation at least for 6-8 h (>90% radiochemical purity, ITLC). ^{153}Sm-chitosan and free $^{153}SmCl_3$ were also administered for biodistribution comparison. In vivo biodistribution studies in wild-type rats indicated the complex is majorly excreted through the kidneys with a rapid wash-out compared to other radiolabeled species. The present folic acid functionalized chitosan derivative is a candidate material for folate receptor therapy.

OP 062

Friday, May 18, 2012

11:30-12:30, Hall 5

Patient dosimetry in sentinel lymph node lymphoscintigraphy: ICRP-103 approach

Martin Law*, Vivian Ma, Raymond Leung, Kwong-Kuen Wong, Kwong-Kam Wong, Tse-Chung Chan, Mei-Yin Poon, Steve Li, Wai-Yin Ho

Nuclear Medicine Unit, Queen Mary Hospital, Hong Kong

The sentinel lymph node lymphoscintigraphy has become a standard procedure in nuclear medicine imaging. There has been a tendency to use SPECT/CT system to replace the conventional Co-57 flood source to more accurately locate lymph node. Therefore patient

dosimetry needs to be revised because of the recent introduction of ICRP-103 approach in which the tissue weighting factor for breast is 0.12 compared to being 0.05 in ICRP-60.
Measurements on organ absorbed dose, using a female adult humanoid phantom and TLD, have been performed. Patient effective doses are presented for the use of Tc99m as internal irradiation and SPECT/CT as transmission irradiation with the use of tissue weighting factors from ICRP-103 recommendations.
Results show that patient effective dose is dominated by the CT irradiation and the patient total effective dose is just less than 3 mSv for different imaging protocols and different surgical procedures. This patient effective dose is comparable to annual background radiation level.
Nuclear medicine physicians should be aware of the increase in the patient effective dose in using SPECT/CT instead of conventional Co-57 flood source as transmission source.

OP 063

Friday, May 18, 2012

11:30-13:30, Hall 4

Segmentation of cardiac SPECT images by active contour without edge model

Nazgol Monshizadeh[1*], Mohammad Hosntalab[1], Farshid Babapour-Mofrad[1], Mahasti Amoui[2]

[1]Faculty of Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran.
[2]Nuclear Medicine Department, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Introduction: Myocardial perfusion scintigraphy (MPS) provides a reliable assessment of coronary artery disease. Nuclear medicine imaging techniques such as Single Photon Emission Computed Tomography (SPECT) can contribute significantly to estimate cardiac volumes and left ventricular ejection fraction. Extracting the LV borders in SPECT images is a crucial and challenging task that is required in MPS procedure.
Methods: We propose a hybrid technique for LV segmentation in cardiac SPECT images based on active contour model. Major steps of the proposed techniques are as follows: (1) initialization (2) segmentation. We introduce a morphology-based operation to automatically estimate the initial boundaries. In this regard, the images are initially binarised with an Otsu's thresholding. Then, by a skeleton-process we extract the longest line that is equidistant to the LV borders. In the segmentation steps, We employ the initial boundaries to estimate the final contour a novel active contour without edge model based on Mumford–Shah function.
Results: The proposed algorithm was evaluated in the presence of 10 cases. All images were obtained with e.cam single-head SPECT system manufactured by SIEMENS that equipped with a low-energy high resolution collimator. Segmented images were compared with manually outlined contours. Experimental results reveal the effectiveness of the proposed method.
Conclusion: The results show that the active contour without edge model outperforms the active contour with edge stopping model for automated segmentation of SPECT coronary artery images.

OP 064

Saturday, May 19, 2012

16:00-17:30, Hall 4

A proximal splitting algorithm for TV-regularized PET image reconstruction

Abolfazl Mehranian[1*], Arman Rahmim[2], Mohammad Ay[1, 3,4]

[1]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Radiology, School of Medicine, Johns Hopkins University, Baltimore, USA
[3]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[4]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Model-based iterative image reconstruction algorithms play a pivotal role in quantitative positron emission tomography (PET). For PET measurements that are pre-corrected for accidental coincidences or acquired in sufficiently high count rates, the statistical variability can be appropriately modeled by a Gaussian distribution. This distribution approximates the underlying Poisson distribution and thereby results in the well-known penalized weighted least-squares (PWLS) reconstruction algorithm. In this study, we proposed a proximal splitting-based

algorithm for the PWLS image reconstruction of PET data to address two challenges encountered by the previously proposed algorithms such as separable- paraboloidal-surrogates accelerated with ordered-subsets (SPS-OS) and preconditioned conjugate gradient. First, the weighting matrix of the PWLS objective usually makes its Hessian shift-variant and its gradient large-Lipschitz. Consequently, surrogate functions end up with high curvatures and gradient-based algorithms with small step-sizes, leading to slow convergence. In addition, preconditioners, used to speed up the convergence, would poorly act on the resulting shift-variant and ill-conditioned Hessian matrix. The second challenge arises when using non-smooth penalty functions such as anisotropic total variation (TV), which is not continuously differentiable and thus not amenable to optimization with gradient-based algorithms.
Methods: To deal with these challenges in TV-PWLS objective functions, we derived a proximal preconditioned gradient (PPG) algorithm using proximal forward-backward splitting, which decouples the penalty function and thus improves the objective's condition number. Chambolle's dual formulation was also utilized for the non-differentiable TV regularization. To reduce the stair-casing effect of the TV, we also studied the continuously differentiable Huber penalty.
Results: We simulated PET imaging in a scanner with parallel strip-integral geometry for five noise realizations with 5E+06 counts and 10% random coincidence rate. In TV regularization, we evaluated the normalized root-mean-square error (NRMS) and convergence performance of the proposed algorithm. We also compared it for Huber regularization with the SPS-OS algorithm in terms of NMRS and also elapsed computation (CPU) time after a global convergence declared by a tolerance of 1E–03. The results showed that our algorithm outperforms its counterpart in NRMS (12.61% vs. 13.77%) and CPU time (14.78 vs. 67.35 sec).
Conclusion: We proposed a proximal splitting-based algorithm for TV and Huber regularization in the PWLS image reconstruction of PET and demonstrated that our algorithm outperforms the state-of-the-art SPS-OS algorithm in terms of both image quality and algorithmic complexity.

OP 065

Friday, May 18, 2012

11:30-13:30, Hall 4

A fast dedicated software for creation of SPECT projections in non-uniform objects based on Klein-Nishina equation

Faraz Kalantari[1*], Hossein Rajabi[1], Mohsen Saghari[2], Alireza Emami-Ardekani[2]

[1]Department of Medical Physics, Tarbiat Modares University, Tehran, Iran
[2]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Monte Carlo (MC) is the most common method for simulating virtual SPECT projections. The main drawback of MC is its poor efficiency and long computation time. In a real MC simulator that simulates a SPECT imaging, only one event from one million tracing can be detected. In this research, we introduced a model based method considers the effect of non-uniform attenuation, scattering and imaging system response for fast creation of noise free SPECT projections.
Methods: SIMIND MC simulator was used just to trace photons from their emission point (P_0) to their last interaction point inside the object (P_S). For primary photons P_0 and P_S have the same coordinates. This MC tracing takes less than 10 seconds for 10,000,000 tracing. The rest of process was completely analytical. We know that more than 95% of scattered photons that are registered in a 15% energy window width are first order scatters. Therefore the scattering points were considered as secondary emission points. Projecting these scattering map, results in creation of scatter projections. However the weight associated by each scatter point is different and non-isotropic. Having the point of emission and point of interaction, and also the position of gamma camera, the scattering angle was analytically determined. The associated weight that represents the scattering probability at that angle was determined by Klein-Nishina equation. Finally this scattering map inside the object was blurred to model system response and attenuated radon transform was applied to create SPECT projection in different angles. NCAT cardiac phantom with ^{99m}TC-MIBI distribution was used as our non-uniform object. Our results were compared with projections acquired by SIMIND MC Simulator.
Results: Compared with other scatter estimating methods consist of dual energy window, triple energy window and simple convolution based methods, a perfect fit between modeled and MC simulated projections of phantoms was observed (R^2>0.98).

Conclusion: It has been shown that there is no fully analytical method for scatter modelling. We used the least amount of MC simulation and combined MC results with analytical calculations to model scatter projections. Creation of 64 SPECT projections (contains both primary and scatter photons) in less than five minutes may make this method as a proper alternative for MC simulation. This algorithm can be applied during iterative reconstruction based attenuation and scatter correction methods as a forward projector.

OP 066

Friday, May 18, 2012

11:30-13:30, Hall 4

Novel high speed 3D iterative reconstruction algorithm for parallel projection based SPECT imaging

Bela Kari[1*], Akos Szalvecz [2], Gabor Hesz [2], Tamas Bukki [3], Oszkar Partos [4], Tamas Gyorke [4], Balazs Benyo [2]

[1]Semmelweis University, Faculty of Medicine, Department of Diagnostic Radiology And Oncotherapy/ epartment of Nuclear Medicine, Budapest, Hungary
[2]Budapest University of Technology and Economics Department of Control Engineering and Information Technology, Hungary
[3]Mediso Ltd., Budapest, Hungary
[4]Semmelweis University, Faculty of Medicine, Department of Nuclear Medicine, Budapest, Hungary

Introduction: Parallel projection based Single Photon Emission Computed Tomography (SPECT) is the most widely used method in nuclear imaging. Many phenomenon's, like photon absorption, scatter, as well as the distance dependent spatial resolution (DDSR) produce distortions in SPECT imaging. Further imaging imperfection can be expected, if the imaged activity distribution is not in the center of the field of view and 180º acquisition technique is applied. Our research activity focused to create high speed image reconstruction algorithm with inherent compensation of the above mentioned image distortion effects.

Methods: The applied image reconstruction algorithm is based on expected maximization iterative algorithm (Ordered Subset Expected Maximization, i.e. OSEM). The imaging model of parallel projection as well as the non-homogeneous photon absorption effect has been included in the forward projection step. The non-uniform photon attenuation map is determined by co-registered and resampled CT imaging. Dedicated calibration procedure has been worked out for the point spread function of DDSR. High performance computing method has been developed due to the intensive computation demand algorithm. The implementation has been carried out by novel nVidia based GPU's being much faster than the conventional multi-core CPU's (Central Process Unit). AnyScan™ SC (SPECT/CT), CardioDESK dual head cardiac SPECT and XRing/4R four head brain SPECT systems (Mediso Ltd.) were considered for both simulation studies and real measurements (physical phantom and patient studies). Financial background of the research work was supported by TECH_08_A2-TeraTomo (NKTH) and TÁMOP-4.2.1/B-09/1/KMR-2010-0002 grants.

Results and Conclusion: The novel 3D GPU based reconstruction algorithm resulted significant improvement in the image contrast and spatial resolution. The reconstructed images showed clear-cut better spatial activity distribution. Considering the speed of the implemented reconstruction method is suitable for daily clinical application too (running time is less than 10min. with nVidia 480GTX GPU in case of 128x128x128 volume sampling rate). Nevertheless, during the verification procedures of algorithm has been discovered equivocal hypo-perfusion segment around the apical region of the heart. The effect was observed systematically on mathematical, physical phantoms and patient studies too. The phenomenon may originate from the partial volume effect (PVE), which is under consideration already. The processed brain SPECT studies showed surprisingly good and artifact free result for both modalities with significant improvement of the image contrast and signal/noise ratio by ~2mm voxel size sampling.

OP 067

Saturday, May 19, 2012

12:30-13:30, Hall 4

Study of cyclotron production of the radiohalogen Chlorine-34m as a positron emission tomography probe

Mahdi Sadeghi[1], Mahdi Bakhtiari[2], Mohamadreza Khosravi Bakht[3*], Marzieh Anjomrouz[4], Claudio Tenreiro[5]

[1]Agricultural, Medical and Industrial Research School, Nuclear Science and Technology Research Institute. P.O. Box: 31485/498, Karaj, Iran
[2]Department of Physics, Persian Gulf University, Bushehr, Iran
[3]Young Researchers Club, Science and Research Branch, Islamic Azad University, PO BOX: 1454696111, Tehran, Iran
[4]Department of Medical Radiation Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran
[5]Department of Energy Science, SungKyunKwan University, 300, Cheoncheon-dong, 440-746, Suwon, South Korea

Introduction: In diagnostic nuclear medicine, the accelerator produced isomers are highly profitable. The radiohalogen chlorine-34m ($T_{1/2}$=32.8 min, β^+=57%, IT=43%) owing to the incorporation into a variety of chemical compounds is a potent positron emitter for medical applications. Among the several positron-emitting chlorine radionuclides, ^{34m}Cl is the only one radionuclide that is promising as a positron emission tomography (PET) tracer with a moderate half-life. This study evaluates the cyclotron production of ^{34m}Cl via a variety nuclear process.
Methods: ^{34m}Cl excitation function by the ^{36}Ar(d,α), ^{nat}Cl(p,x),^{35}Cl(α,x), ^{32}S(α,d) and ^{34}S(p,n) reactions were calculated by the last versions of TALYS as a modular nuclear reaction code for advanced calculations of nuclear reactions using various theoretical models. Then the theoretical calculations compared with the experimental measurements. Consequently, according to the SRIM code (The Stopping and Range of Ions in Matter), the required thickness of the target and the stopping power of projectiles in the targets were calculated. Lastly, the production yield of ^{34m}Cl by the five processes was calculated by means of the Simpson numerical integral.
Results: According to the cross section data and the range of ions in matter, the suitable energy range and the production yields for above reactions were specified as 8 to 3 MeV (242.8 MBq/μAh), 45 to 25 MeV (305 MBq/μAh), 50 to 20 MeV (12000 MBq/μAh), 50 to 35 MeV (596.7 MBq/μAh) and 20 to 8 MeV (1049 MBq/μAh). During the ^{36}Ar(d,α)-reaction the isotopic stable impurities ^{35,36}Cl were produced and in the ^{nat}Cl(p,x) and ^{35}Cl(α,x) reactions the stable isotopic impurities ^{35,36,37}Cl were produced. In addition, during the ^{32}S(α,d)-process the stable isotopic impurity ^{35}Cl was observed. Interestingly, in the case of ^{34}S(p,x)-reaction no isotopic impurity was reported. It must be noted that existence of the stable isotopic impurities decreases the specific activity and could not be separated by chemical methods. Therefore, the ^{34}S(p,x)-reaction can be an appropriate for medical applications.
Conclusion: The radiohalogen chlorine-34m because of its suitable characteristics could be a compelling positron emitter for nuclear medicine. This abstract provides evaluation of the cyclotron production of the radiohalogen ^{34m}Cl as a medical radioisotope by five nuclear reactions. In brief, the ^{34}S(p,n)^{34m}Cl reaction was considered as the best reaction due to possibility of no-carrier added production of ^{34m}Cl at low energy cyclotron.

OP 068

Saturday, May 19, 2012

12:30-13:30, Hall 4

Optimized preparation of [^{64}Cu]-DOTA-trastuzumab for PET applications

Behrooz Alirezapour[1, 2*], Amir Reza Jalilian[2], Mohammad Javad Rasaee[1], Saeed Rajabifar[2], Kamal Yavari[2], Mehraban Pouladi[2], Mohammad Yarmohammadi[2], Sedighe Moradkhani[2], Mohammadreza Aboudzade[2], Gholamreza Aslani[2]

[1]Clinical Biochemistry Department Faculty Of Medical Sciences Tarbiat Modares University Of Iran, Tehran, Iran
[2]Nuclear Science and Technology Research Institute (NSTRI), Tehran, Iran

Introduction: Radiolabeled monoclonal antibodies have shown great promise for cancer diagnosis and therapy. Trastuzumab (trade name Herceptin) is a humanized IgG1 monoclonal antibody directed against the extracellular domain of the Human Epidermal Growth Factor Receptor 2(HER2). HER 2 receptor is over expressed in 20-30% of the early-stage breast cancers

and these patients may be candidates for Herceptin treatment. ^{64}Cu (β+ = 17%, β− = 39%, EC = 43%) is an important emerging biomedical radionuclide that is suitable for labeling a wide range of radiopharmaceuticals for PET imaging. Its intermediate half-life (12.7 h) permits PET evaluation of slow biochemical pathways, such as protein and peptide interactions with cellular targets, and distribution to satellite imaging and therapy centres.In the present study, we have Radiolabeled trastuzumab with copper-64(suitable for PET imaging) and performed the biodistribution study in normal mice.

Methods: Herceptin was conjugated with DOTA_NHS-ester(Macrocyclics), purified by molecular filtration, the average number of DOTA conjugated per mAb was calculated and total concentration was determined by spectrophotometrically. DOTA-Trastuzumab was labeled with ^{64}Cu then Radiochemical purity, immunoreactivity on SKBr3 cell line, integrity of protein after radiolabeling and stability of ^{64}Cu-DOTA-Trastuzumab were determined. The biodistribution studies was performed in normal mice(^{64}Cu-DOTA-Trastuzumab i.v., 30 ± 5.5 µCi, 2h, 6h, 12h,18h).in the other hand biodistribution studies and coincidence image acquisition was performed in mice bearing Breast Cancer Tumor(^{64}Cu-DOTA-Trastuzumab i.v., 30 ± 5.5 µCi,6h, 12h,24h)

Results: The radioimmunoconjugate was prepared with a radiochemical purity of 84% (RTLC). The average chelate to antibody ratio(c/a) for the conjugate used in this study was 5.8:1. The final compound was stable in presence of PBS at 37ºC and room temperature.The sample were showed to have similar patterns of migration in the gel electrophoresis.The accumulation of the radiolabeled antibody in lungs, liver, spleen and other tissues demonstrates a similar pattern to the other radiolabeled anti-HER2 immunoconjugates also the radioimmunocongugate was accumulated in Breast Cancer Tumor about 16-18h after injection where has shown in image and biodistribution study.

Conclusion: ^{64}Cu-DOTA-Trastuzumab is a potential compound for molecular imaging of PET to purpose of diagnosis and treatment follow up of HER2.

OP 069

Friday, May 18, 2012

9:30-11:00, Sa'di Hall

Role of contrast enhanced CT versus plan low dose CT in breast carcinoma

Shamim Shamim*, Roja Tumma, Ajay Vyas

New Delhi, India

Introduction: Evaluate the diagnostic value of contrast-enhanced CT (CECT) versus non-enhanced low-dose CT (NECT) in the staging breast carcinoma with FDG PET-CT.

Methods: In this study we analyzed 103 patients of breast carcinoma referred to our department for staging and restaging. Whole body low dose NECT, then whole body PET followed by contrast CT was done. Images analysis was done on syngo true D software (Siemens). Criteria for evaluation were; number of lesions, extent of lesions, contrast enhancement & SUVmax of >2.5). Image analysis of PET was done by two PET consultants separately, followed by combined analysis of PET/NECT and PET/CECT. Finding were verified histologically/or follow-up of 9 months.

Results: Compare to PET-NECT, PET-CECT obtained 19 additional lesions; subpectoral lymph nodes (N=2), supraclavicular lymph nodes (N=3), Internal mammary lymph nodes (N=3), brain (N=6) and liver (N=5). Three bones lesion was missed with contrast PET-CECT. PET/CECT changed staging only in 1 patient of carcinoma breast

Conclusion: In our study, we found that PET/CECT has not much added value in staging or restaging of breast carcinoma compare to PET/NECT. It is justified to perform non-contrast CT with PET in these patients.

OP 070

Friday, May 18, 2012

9:30-10:30, Hall 3

Hyperglycemia management in patients for ^{18}F-FDG-PET study - a modified approach and our initial experience

Manjit Sarma*, Borde C R, Gerald Praveen, Padma S, Shanmuga Sundaram P

Department of Nuclear Medicine and PET/CT, Amrita Institute of Medical Sciences, Cochin Kerala 682041 India

Introduction: A modified protocol of insulin administration for blood glucose control in hyperglycemic patients for ^{18}F FDG PET study was initiated and studied to address issues like hypoglycemia and suboptimal scan quality.
Aim and objectives: We aimed to study (a) feasibilty of insulin dosage reduction, (b) ascertaining optimal time for starting blood glucose estimation and (c) to calculate a quantifiable parameter to assess scan quality in hyperglycemic patients post insulin intervention.
Methods: 223 pts were studied between Oct – Dec ,2011. Group A consisted of conventionally prepared random 100 control patients (non diabetic, age 29-86 yr, M:F=74:26) with blood glucose < 150 mg/dl (range 86-148 mg%). Rest 123 patients (27-85 yr, M:F = 83:40, diabetic mean duration 5 yr) with > 150 mg/dl (range 150- 289 mg %) were administered IV 0.75 U (for IDDM) and 0.5 U (NIDDM on oral drugs and newly detected untreated patients) of plain human insulin for every 10 mg % blood sugar increase. Blood glucose was checked at 30th min and every 15 min thereafter. Patients with good glycemic control were grouped as B (93 pts, blood glucose < 150 mg%) and uncontrolled / suboptimally controlled patients were grouped as C (30 patients, >150 mg%). ^{18}F FDG PET CT scans (head to mid thigh, 8 bed positions) were acquired. SUVmax of brain, myocardium, gluteal muscles and SUVmax ratio of brain to gluteal muscle were calculated in all patients.
Results: Symptomatic hypoglycemia was not encountered in any patient. The rising /stabilizing trend of blood glucose occurred between 75-105 min. Cardiac SUVmax values in all groups were highly variable. The mean brain:gluteal muscle SUVmax ratio in groups A, B, C patients were 9.2, 8.6 and 4.3.Independent Sample t test shows that there is no significant difference among the mean ratio of both group A and B. Sample t-test shows that a brain:gluteal muscle SUVmax value of 7 can be used as cut off for assesing scan quality.
Conclusion: Insulin dosage can be titrated to lower range than recommended in NIDDM and untreated newly detected diabetics with FDG uptake patterns comparable to euglycemic patients. The rising/stabilization of blood glucose following insulin administration occurs between 75-105 min. Sole cardiac SUVmax values are highly unreliable in assessing scan quality. FDG PET scans in hyperglycemic patients with brain: gluteal muscle SUVmax ratio less than 7.0 should be evaluated with caution.

OP 071

Saturday, May 19, 2012

11:30-12:30, Hall 3

^{18}F-FDG PET-CT in assessing disease activity and extent in patients with chronic refractory sarcoidosis

Stefan Voo[1*], Remy Mostard[2], Petal Wijnen[1], Marjolein Drent[1], Marinus van Kroonenburgh[1]

[1]Maastricht University Medical Center, Maastricht, the Netherlands
[2]Atrium Medical Center, Heerlen, the Netherlands

Introduction: Sarcoidosis is a multisystemic disease affecting predominantly hilar/mediastinal lymph nodes and lung parenchyma. Assessing the presence and localisation of active sarcoidosis sites is mandatory in clinical practice for an appropriate clinical management. The aim of this study was to assess the usefulness of ^{18}F-FDG PET-CT in detecting active inflammatory sites and their distribution in patients with chronic refractory sarcoidosis.
Methods: Between June 2006 and January 2011, 161 chronic sarcoidosis patients with suspected sarcoidosis activity underwent a PET-CT scan. Serologic markers of inflammation, such as the level of soluble IL-2 receptor (sIL-2R), angiotensine converting enzyme (ACE), and neopterine, were measured at the time of scanning.
Results: Out of the 161 patients, 120 (74.5%) had PET-positive findings associated with sarcoidosis. In 112 (93.3%) of these 120 patients, intrathoracic localisations were present, including 95 (79.2%) patients with PET-positive hilar/mediastinal lymph nodes and 76 (63.3%) with positive lung parenchyma lesions. Sixty % showed unexpected sites of occult extrathoracic sarcoidosis: 36.6% abdominal and peripheral lymph nodes, 31.6% bone (marrow), 21.6% spleen, 18.3% parotis and nasopharynx, 11.6% muscles, 8.3% liver, 3% myelum, and 3.0% skin. Most of

the PET-positive patients (79.2%) had increased levels of sIL-2R, ACE and/or neopterine. However, 20.8% (25/120) had PET-positive findings but no evident increase of inflammatory markers.
Conclusion: PET-CT is useful in detecting active sites of inflammation in patients with chronic sarcoidosis. Moreover, PET-CT is able to depict occult extrathoracic localisations of sarcoidosis, far more frequently than expected from previous literature. Our results stress the importance of functional PET-imaging as a sensitive tool in diagnosing active sarcoidosis, especially in patients with inconclusive serologic results.

OP 072

Thursday, May 17, 2012

11:30-12:30, Hall 3

Comparison of ^{99m}Tc-DMSA and ^{99m} Tc-EC for differential renal function (DRF) calculation

Mohammad ali Qodsi Rad*, Ramin Sadeghi

Nuclear Medicine Research Center, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: For renal scintigraphy, different radiopharmaceuticals like 99mTc-DMSA and 99mTc-EC can be used. Although these methods are accurate, some differences can be observed among them. These radiopharmaceuticals have different levels of reproducibility and repeatability. This study aimed to evaluate the level of inter and intra observer variability in 99mTc-DMSA scintigraphy. We also compared the renal function, measured with 99mTc-EC, with the one measured using 99mTc-DMSA scintigraphy to determine if 99mTc-EC can be used instead of 99mTc-DMSA in this regard.
Methods: The sample volume consisted of 81 patients underwent both 99mTc-DMSA and 99mTc-EC in Imam Reza Health Center in 2008. These scans were interpreted by two observers. One of the observers interpreted the scans after one month for the second time. The data were analyzed with SPSS.
Results: There was a close correlation between these two methods with respect to DRF ($P = 0.51$). Estimating intra observer variability showed close correlation between DMSA ($r = 0.997$) and EC ($r = 0.996$). The evaluation of inter observer variability also revealed high correlation between DMSA ($r = 0.995$) and EC ($r = 0.996$).
Conclusion: Since the comparison between these two methods in measuring renal function showed the same results, ^{99m}Tc-EC can be used as a substitute for 99mTc-DMSA. In addition, Tc-99m EC scintigraphy can be a reliable single-modality study to evaluate perfusion, and drainage of the urinary system and indirect evidence of vesicoureteric reflux with the added advantage of low radiation exposure to the patient. Also good reproducibility and repeatability were reported according to this study.

OP 073

Sunday, May 20, 2012

9:30-11:00, Hall 4

Determination of different collimators responses for commonly used isotopes in nuclear medicine: a Monte Carlo study

Mohammadreza Ramezani[1*], Hossein Rajabi[2], Faraz Kalantari[2], Mohsen Saghari[3], Seid Kazem Razavi Ratki[3], Alireza Emami Ardekani[3]

[1]Department of Medical Radiation Engineering, Azad Islamic University, Tehran, Iran
[2]Department of Medical Physics, Tarbiat Modares University, Tehran, Iran
[3]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: An ideal parallel-hole collimator should be very thick with very thick septa and small holes diameter to allow only transmission of incident photons that are parallel to its holes. However to increase sensitivity, usually thinner collimators with considerable holes diameter are used. Thickness of septal material should be sufficient to stop more than 95% of incident photons. Therefore, some photons pass the septa without interaction or experience scattering before they reach the detector. In this study we determined different contribution of collimator responses

consist of geometrical response, septal penetration (SP) and scatter (SC) for low, medium and high energy collimators.
Methods: SIMIND Monte Carlo code was used. A point source of activity with common energies in imaging (Tl-201: 77keV and 167keV, Ga-67: 98keV, 188keV and 296keV, Tc-99m: 140keV, I-131:364keV and PET isotopes: 511keV) was simulated. Three collimators of Symbia-Siemens Company, consist of low energy high resolution (LEHR), medium energy all-purpose (MEAP) and high energy (HE) were simulated.
Results: For LEHR collimator, SP was increased from 7% in 140 keV to 30% in 167keV and more than 75% in energies higher than 296keV. SC also was increased from 4% in 98keV to more than 15% in energies higher than 167keV and reached to its maximum (26%) in 296keV. For MEAP collimator, SP was suddenly increased from 6% in 186keV to 28% for 296keV and more than 50% for higher energies. SC was also increased from 4% in energies below 186keV to 15% in 296keV and about 30% for higher energies. For HE collimator, SP was about 20% for 364keV photons. SC was 15% for 364keV photons and only 65% of photons were geometrically collimated.
Conclusion: Even by using nominal suitable collimators, there are considerable SC and SP that influence the quantitative accuracy of planar and SPECT images.

OP 074

Sunday, May 20, 2012

9:30-10:30, Hall 5

Metastatic bone pain palliation using ^{177}Lu- EDTMP

Mehrossadat Alavi[1*], Shahpour Omidvari[1], Alireza Mehdizadeh[1], Farshid Gheisari[1]

Nuclear Medicine Ward, Nemazee Hospital, Shiraz University of Medical Sciences, Shiraz, Iran

Introduction: ^{177}Lu is presently considered as an excellent radionuclide for developing bone pain palliation agents owing to its suitable nuclear decay characteristics. The present study is a randomized clinical trial, using ^{177}LU- EDTMP for metastatic bone pain palliation.
Methods: ^{177}Lu-EDTMP was prepared by AEOI with standard protocol .Thirty patients with confirmed bone metastasis by recent bone scan were referred to nuclear medicine ward. Renal function test, and baseline CBC were evaluated as exclusion criteria. Validated Persian version of Brief Pain Inventory short form (BPI-sf) was used to evaluate the efficiency of intervention. 0.8 mCi/kg of body weight of ^{177}Lu- EDTMP in form of sterile IV Injection was administered. Blood and urine sample were collected for dosimetric studies. Bone scan in first, third and seventh day after injection were done. Questionnaire were also been filled by same expert physician every two weeks while CBC and RFT were also been checked.
Results: Twenty five out of thirty patients had shown significant pain relief after two weeks of radiopharmaceutical injection, response were found to be related to male gender, younger age, lower body weight ($p<0.05$). There were neither any significant complication according to drug injection nor any late effect complication, however 36% of patients needed Growth Stimulating Factor (GSF) injection due to blood count drop. In 72% flare phenomenon was seen which was accompanied with better pain relief. The best period of pain relief seems to be between 4-12 weeks. Alkaline phosphatase (Alk ph) revealed statistically significant decrease in patients with better drug response.
Conclusion: Using Ca mimic radioactive material for bone pain palliation has a long history however feasibility of production and administration is a key factors for successful palliation. ^{177}Lu -EDTMP as a bone seeking agent shows to have adequate bone absorption not only for treatment but also for imaging due to gamma irradiation. The moderate systemic circulation time help to decrease unwanted dose and finally good results in long term bone pain relief for patients with bone metastasis. This study also shows that we could use flare phenomenon as early and decrease in Alkph as late indicator of response. ^{177}Lu-EDTMP shows good performance in metastatic bone pain palliation.

OP 075

Sunday, May 20, 2012

9:30-10:30, Hall 5

The treatment efficacy of Samarium-153 Lexidronam for metastatic bone pain palliation

Narjess Ayati*, Seyed Rasoul Zakavi, Kamran Aryana, Ali Bahrami Samani, Fatemeh Homaei, Amir Reza Jalilian

Mashhad University of Medical Science

Introduction: Involvement of the skeleton can cause excruciating pain in two-third of end stage patients with history of malignancy. Due to several limitations of other therapies, such as analgesics, bisphosphonates, chemotherapy, hormonal therapy and external beam radiotherapy, bone-seeking radiopharmaceuticals have an important role in palliation of pain from bone metastases. Although these kinds of therapies have many advantages including the ability to treat multiple sites of tumoral involvement simultaneously, lack of significant confliction with other treatments and ease of administration and the potential to be used repetitively. In Iran using of these kinds of treatment is not widely practiced. In this study we evaluated the clinical usefulness of Sm-153 lexidronate for pain management of bone metastases.
Methods: 28 patients (14 male and 14 female) aged 38-77 years with the history of painful bone metastases caused by different cancers, not responding to conventional treatments were included in the study. All patients had recent whole body bone scan indicating multiple bone metastases. 1 mCi/Kg Sm-153 lexidronate was injected intravenously to the patients. Whole body scintigraphy was done 3 to 18 hours post injection. Pain relief and quality of life have been evaluated by *analog pain scale* and Karnofsky index every week respectively. Also all patients were evaluated for hematological toxicity every two weeks. Active follow up was performed.
Results: 46% of patients showed presence of flare phenomenon during the first four days after Sm injection with mean duration of 1.7 days. The pain relief began between 2 and 16 days post injection and the duration of pain palliation was in the range of 4 to 32 weeks (mean±SD=15.22±7.8). 64% of patients showed complete relief of pain and 21.4% achieved partial response to therapy. (Over all response to therapy was 85.7%). The lowest amount of peripheral blood cells was detected in the second week for WBCs and RBCs and in the 4th week for platelets. No one experienced hematological toxicity induced problem.
Conclusion: Sm-153 lexidronate is an effective treatment for painful bone metastases. The complication rate is low and the quality of life of the patients after treatment is significantly improved.

OP 076

Thursday, May 17, 2012

9:30-10:30, Sa'di Hall

First thyroglobulin is one of the most important prognostic factors in patients with differentiated thyroid carcinoma

Seyed Rasoul Zakavi[1*], Abolfazl Ayati [2], Zohre Mousavi [3], Ramin Sadeghi [1]

[1]Nuclear Medicine Research Center, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[2]Mashhad University of Medical Sciences, Mashhad, Iran
[3]Endocrine Research Center, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: Risk categorization of the patients with well differentiated thyroid cancer (DTC)is the most important step in management of the patients. Evaluation of the diagnostic value of the first thyroglobulin (fTg) level, performed after thyroidectomy, before radio-iodine treatment, as an early prognostic marker could be potentially helpful. We evaluated the prognostic effect of ftg in prediction of complete remission or persistent disease in patient with DTC referred to Nuclear medicine department of Ghaem hospital.
Methods: 228 patients (178 women, 50 men, 38.6±15.1 years) with DTC were studied. 30 patients (13.2%) excluded from the study due to elevated anti-tg antibody. In all patients, TSH and Tg were measured in one laboratory before initiation of radio-iodine therapy in off T4 state. All patients underwent radio-iodine therapy followed by suppressive therapy with L-T4. TSH suppression was confirmed in all patients 2 months after radio-iodine therapy and patients were followed up actively at least for 12 months. One year after initial evaluation all patients underwent whole body iodine scan and measurement of Tg and anti-Tg antibody under endogenous TSH stimulation. Complete remission was defined as negative whole body iodine scan with off T4-Tg

Results: Age of the patients ranged from 12 to 83 years. 180 patients (90.9%) had papillary thyroid carcinoma,13 patients had follicular and 5 patients had Hurthle cell carcinoma. 13.1% of patients had distant metastases and 62.2% had lymphnode metastases at presentation. According to TNM staging, 63.5%, 9.6%, 7.6% and 19.3% of the patients were in stage I ,II, III and IV respectively. The mean TSH level was 75.9± 57.0 years and mean Tg level was 217.6±906 ng/ml. At the end of the follow up, 58.1% of the patients had complete remission. The mean fTg level was 28.5±65.8 versus 479.6±1359.2 ng/ml in patients with complete remission and persistent disease respectively (P=0.003). The mean age, TSH level, anti-tg level and mean largest diameter of the tumor were not significantly different between the two groups. However male to female ratio was higher in patients with persistent disease compared to patients with complete remission (P=0.02). Cox regression analysis showed that fTg, male sex and higher TNM stage are the most important predictors of survival in these patients.
Conclusion: First thyroglobulin concentration, is higher in patients with persistent disease than in patients with complete remission and can be used as one of the most important prognostic factors in patients with DTC.

OP 077

Thursday, May 17, 2012

9:30-10:30, Hall 3

Automated interpretation of myocardial perfusion images with Multilayer Perceptron network: a decision support system free from quantification and need for normal database

Mehrshad Abbasi[1*], Saeed Farzanefar[1], Alireza Emami[2], Mohammad Eftekhari[1, 2]

[1]Department of Nuclear Medicine, Vali-asr Hospital, Tehran University of Medical Sciences, Tehran, Iran
[2]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Bull's eye pattern recognition with artificial neural networks has the potential to assist the interpretation of myocardial perfusion images (MPIs), while absolute quantification of myocardial perfusion and the population specific normal data bases for comparisons are challenging.
Methods: The study included 208 patients referred to the nuclear medicine department of a university teaching hospital for technetium-99m sestamibi 2-day stress-rest ECG-gated myocardial perfusion scintigraphy. The average relative count of 20 segments of the bull's eye images of stress MPIs, once with and then without those of rest MPIs, and also variables representing gender, constellation of coronary artery disease risk factors, scintigraphic cardiac ejection fraction and the interpreter of the scan was fed to several ANN models. Final interpretation of one of five academic nuclear medicine clinicians was the desired output. Data of 150 subjects were used for training, 21 subjects for cross validation and 37 subjects for final operation testing. Several Multilayer Perceptron (MLP), linear regression, probabilistic neural network (PNN), Classification support vector machine, Generalized Feed-Forward and Radial Basis Function were examined with different hidden layer and processing elements and functions. The same ANN was examined without inclusion of data of 20 segments of rest MPIs for possibility of tress only automated interpretation.
Results: A MPL with two hidden layer trained with both stress and rest data demonstrated the best performance to classify the normal and abnormal MPIs. The overall accuracy was 91.9%, sensitivity 92.8% and specificity 91.3%. The accuracy of the same MPL trained without rest data reduced to 67.6% (sensitivity, 60%; specificity, 76.6%).
Conclusion: The automated interpretation of MPIs with a 2-hidden-layered MLP trained with stress and rest images is an accurate support system for the interpreters. The method based on stress only images has high false negative results.

OP 078

Saturday, May 19, 2012

9:30-11:00, Hall 3

Amnestic mild cognitive impairment (aMCI) and brain hemispheres hypoperfusion using SPECT

Fereshteh Sedaghat[1, 2, 3*], Amin Rakhshani[4], Thomas Tegos[3], Stavros Baloyannis[3]

[1]Memory Clinic of Sedaghat Mashhad-Iran
[2]Nuclear Medicine Research Center of Mashhad University of Medical sciences-Iran
[3]1th Department of Neurology Aristotle University of Thessaloniki- Greece
[4]Depatrment of Computer Science, University of Crete, Greece

Introduction: The study was designed to demonstrate functional status of brain in cases with aMCI.
Methods: Twenty persons with a chief complaint of forgetfulness were tested by "Sedaghat et al. cognitive test" (a semi-computerized simply-applied test) and Montral cognitive test. Eleven cases showed abnormal memory score below the 5th percentile. They were followed-up for 8 months. Only 6 of them showed a decline in their memory status in this period. These 6 cases underwent brain perfusion scan using HMPAO single photon emission computed tomography (SPECT).
Results: Brain SPECT showed blood hypoperfusion in left hemisphere comparing to right. Precuneus showed hypoperfusion in all these 6 cases.
Conclusion: Left brain hemisphere and precuneus may be the first regions affected in very early stage of memory deficit. We suggest focusing on the necessity of a standard simply-applied cognitive test as a routine screening test for all adults.

OP 079

Saturday, May 19, 2012

9:30-11:00, Hall 3

Evaluation of DaT scan in neurodegenerative dementias

Fereshteh Sedaghat[1, 2, 3], Alexandra Papazisi[4], Eleni Dedousi[4], Marianthi Arnaoutoglou[3], Stavros Baloyannis[3]

[1]Memory clinic of Sedaghat Mashhad-Iran
[2]Nuclear Medicine Research Center of Mashhad University of Medical Sciences-Iran
[3]1th Department of Neurology Aristotle University of Thessaloniki- Greece
[4]Laboratory of Nuclear Medicine Aristotle University of Thessaloniki- Greece

The occurrence of parkinsonism in Alzheimer's disease (AD) is quite common particularly in the later stages.It has also been hypothesized that the presence of extrapyramidal signs might characterize a clinical subtype with a faster progression.
Ioflupane, N-ω -fluoropropyl-2β-carbomethoxy–3β –(4-iodophenyl) nortropane, also called FP-CIT, binds to the presynaptic dopamine transporters (DaT), labeling with radioactive ^{123}I gives the opportunity of imaging DaT, using SPECT and in this way may be used as a confirmatory biomarker in differential diagnosis of AD.
Nine patients with AD (age 70±4), 8 patients with FTD (age 71±5), 3 patients with DLB (age69±4) who presented extrapyramidal symptoms particularly rigidity and bradykinesia, and 9 normal controls (age69±4) underwent DaT scan.
The uptake of the radiotracer in caudate nucleus (CN), putamen (PUT) and striatum (ST) of the patients with AD didn't show significant decrease comparing normal group, though in the patients with DLB was significantly reduced comparing AD or normal group. Radiotracer uptake in DLB was significantly reduced in right and left CN versus FTD. In FTD the uptake of the radiotracer was significantly reduced in right and left caudate nucleus, putamen and striatum comparing normal group and in putamen comparing AD group.
Patients with FTD present dopaminergic deficit versus AD, so evaluation of dopaminergic medication in these patients is suggested. A positive DaT scan as a diagnostic biomarker, may differentiate DLB from other dementias.

OP 080

Saturday, May 19, 2012

11:30-12:30, Hall 3

The role of 99m Tc -UBI 29-41 scintigraphy to monitor antibiotic therapy in patients with orthopedic infection: a preliminary study

Babak Nazari[2], Zahra Azizmohammadi[2*], Morteza Rajaei [3], Mohsen Karami [3], Hamid Javadi[4], Majid Assadi[1], Isa Neshandar Asli [2]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Department of Nuclear Medicine, Taleghani Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran
[3]Department of Orthopedic Surgery, Taleghani Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran
[4]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences (GUOMS), Gorgan, Iran

Introduction: Ubiquicidin (UBI) 29-41 is a cationic synthetic antimicrobial peptide fragment that binds preferentially with anionic microbial cell membranes at the site of infection. The current study evaluated the potential ability of 99m Tc-UBI 29-41 to assess response to antibiotic therapy in orthopedic infection.
Methods: A total of 12 patients, 10 male and 2 female (mean age 41.6y; range 23-75y), with suspected orthopedic infection (bone, soft tissue, or prosthesis) and positive 99m Tc-UBI scan for infection were included in the study. One day after the 99m Tc-UBI scan, a bone scan was performed as well. After this evaluation, 8 of the 9 treated cases responded to the treatment. Then, 1 non-responder patient and 2 non-treated patients out of 3 cases underwent antibiotic therapy and were evaluated again 10-14 days later. After that, one of the 2 patients not treated the first time responded to therapy, and 2 patients did not. Also one case refused therapy in both first and second times .Thus, 11 treated cases were analyzed in this study and divided in two groups: a) 9 treated responder and b) 2 treated non-responder. In all patients, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were measured; and also wound cultures were carried out.
Results: Quantitative analysis of ESR, CRP, and bone scan before and after the 10-14 day interval showed no significant change in either group, but a quantitative 99m Tc-UBI scan at 30, 60, and 120 minutes after tracer injection indicated significant reduction in radiotracer uptake after the 10-14 day interval compared to the 99m Tc-UBI scan before this interval in the responder group, but no significant change in the non-responder group.
Conclusion: The 99m Tc-UBI scan can demonstrate response to antibiotics therapy in patients with orthopedic infections.

OP 081

Friday, May 18, 2012

9:30-10:30, Hall 3

Effect of a restricted diet including sea foods, on technetium-99m thyroid scintigraphy: A neglected issue in nuclear medicine practice

Hamid Javadi[2], Isa Neshandar Asli[4], Mehdi Mogharrabi[3], Sara Jalallat[2], Iraj Nabipour[5], Majid Assadi[1*]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences, Gorgan, Iran
[3]Department of Nuclear Medicine, 5th Azar Hospital, Golestan University of Medical Sciences, Gorgan, Iran
[4]Department of Nuclear Medicine, Taleghani Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5]The Persian Gulf Marine-Medicine Biotechnology Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

Introduction: Although the patients are advised to avoid sea food and iodine-containing medications prior to iodine-131 (131I) scanning, the efficacy of this diet as for technetium-99m pertechnetate (99mTc-P) thyroid scintigraphy is not well addressed in the literature. We evaluated a self-managed, outpatient, restricted iodine diet (RID) designed to reduce total body iodine in preparation for such a scan.
Methods: We have studied 39 patients who refered to our Department for multinodular goiter, 30 females and 9 males, aged: 14-54 years and their 99mTc-P thyroid scintigraphy showed poor visualization of thyroid gland. These patients were called for a repeated scan after going on a RID for at least two weeks. The two scans were compared visually, and by semiquantitative analysis.

Semiquantitative analysis was applied in 8 regions of interest (ROI) by using Wilcoxon signed rank test.
Results: Thirty-six subjects had better quality scintigraphy images in the post RID thyroid scan, as was visually assessed by two nuclear medicine physicians. Semiquantitatetivly, there was a significant difference in the mean counts of ROI of the right and the left thyroid lobes in favor of the post RID scans ($P<0.05$).
Conclusion: This study suggests that in patients with multinodular goiter, living in regions with high consumption of sea foods a two-weeks diet for the reduction of iodine body content in most of the cases induces a slightly better diagnostic thyroid 99mTc-P scan.

OP 082

Thursday, May 17, 2012

11:30-12:30, Hall 3

Theranostics

Majid Assadi

The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

The term of «theranostics» is used to represent the parallel diagnostics and therapeutics processes for patient. Theranostics approach can trailer the conventional treatments and increase the drug efficiency. Moreover, this kind of approach can help clinicians to identify the patient which are disposed to lethal side effects. Nanoparticles hold within specific and different chemical, physical, and structural properties from bulk materials that have been made from. These fundamental capability, can make nanomaterial as an ideal materials to design new structures that can be used for targeted drug delivery and diagnostic methods, or in other words for theranostics purposes, in nuclear medicine. They are suitable materials because they would enable to target specific site, transport information from the targeted cells, deliver definite amount of drug, and be tolerated by host. This means nanostructures could manage imaging and therapy both by one device parallelly. Nanoparticles can be conjugated with specific tumor ligands to direct towards tumor components. Multiple diagnostic and therapeutic agents can be labeled with one nanoparticle for cancer imaging and delivering anticancer drugs in a same time.
Interdisciplinary cooperation inbreeds promising advancements of tumor angiogenesis imaging and "other angiogenesis-related diseases" such as cardiovascular disease and stroke.
In the future nanoparticles will be constituent part of molecular imaging (nuclear imaging) which can make possible therapeutic and diagnostic aims simultaneously.
Here, we summarized the various types of theranostic agents and discussed about the advantages and challenges of each type.

OP 083

Saturday, May 19, 2012

12:30-13:30, Hall 4

Development of ^{153}Sm-TPTTC complex as a therapeutic agent for Targeted radiotherapy

Amir Hakimi[1*], Simindokht Shirvani Arani[2], Amir Reza Jalilin[3]

[1]Department of Nuclear Engineering and Physics, Amirkabir University of Technology, Tehran, Iran
[2]Department of Medical Radiation engineering, Science and Research Branch, Islamic Aad University, Tehran, Iran
[3]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), Tehran, Iran

Radiotherapy using open radioactive sources has become an important and promising mode of treatment of cancer patients, particularly in conjunction with other modalities like surgery and chemotherapy. For this purpose therapeutic radiopharmaceuticals are designed to deliver high doses of radiation to selected target organs or tissues with an aim of minimizing unwanted radiation to surrounding healthy tissue.
In this work, ^{153}Sm-[Tris(1,10-phenanthroline) Samarium(III)]trithiocyanate (^{153}Sm-TPTTC) was developed for possible therapeutic properties. The cold compound, i.e. ^{nat}Sm-TPTTC was prepared

and characterized by IR, UV, mass and ^{1}H NMR spectroscopy. ^{153}Sm-TPTTC was prepared in two steps using ^{153}Sm-$SmCl_3$, obtained by neutron activation of an enriched ^{152}Sm sample. Stability tests, toxicity tests, biodistribution studies of the complex in wild-type mice and cell proliferation assay and drug cytotxicity assayswere also determined. The radiolabeled complex was prepared in high radiochemical purity (>99% precipitation method) and specific activity of 278 GBq/mmol and demonstrated significant stability at 4, 25 and 37°C (in presence of human serum). The produced ^{153}Sm- TPTTC properties suggest an efficiently new liver accumulating therapeutic agent in order to overcome possible liver malignancies with the lowest toxicity.

OP 084

Saturday, May 19, 2012

9:30-10:30, Hall 4

Prognostic value of baseline serum thyroglobulin versus baseline antithyroglobulin antibody (TgAb) level in patients with differentiated thyroid cancer

Isa Neshandar Asli[2], Babak Shafiei[2], Ali Shafieepour-Siahkoli [2], Zahra Azizmohammadi[2*], Hamid Javadi[3], Majid Assadi[1]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Department of Nuclear Medicine, Taleghani Hospital, Shahid Beheshti University of Medical Science, Tehran, Iran
[3]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences (GUOMS), Gorgan, Iran

Introduction: The prognostic values of serum thyroglobulin (Tg) and antithyroglobulin antibody (TgAb) levels, measured immediately before 131I remnant ablation in patients with differentiated thyroid cancer (DTC), has been advocated by some researchers; however, it has had controversial outcomes. This study was carried out to examine this dilemma and to check the clinical significance of base-line serum Tg and TgAb levels and postablation 131 iodine whole body scan(WBS) findings in DTC patients.
Methods: In this retrospective study, the records of 500 patients with differentiated thyroid cancer, who had undergone treatment between 2003 and 2010, were assessed. Of these, 149 patients with results of base-line serum thyroglobulin concentration and whole body scan using radioactive iodine were included. Age, sex, tumour histology, base-line thyroglobulin (Tg), anti-thyroglobulin (TgAb) and TSH concentration, radioactive iodine dose in each hospitalization, numbers of hospitalization, and results of whole body scan were recorded. The relationship among base-line Tg, anti Tg, TSH, and whole body scan with hospitalization number and total radioactive iodine dose were assessed.
Results: A total of 149 patients, including 123 (83%) females and 26 (17%) males, with a mean age of 40 ± 15.00 years, took part in the study. The mean (SD) base-line Tg, anti-Tg, and TSH were 91.7 ± 169.2 ng/mL (0.1–1000 ng/mL), 250 ± 893 U/mL (0–9000 U/m L), and 64.8 ± 61.5 µU/mL (30–689 U/mLµ), respectively. A total of 52 (34.9%) cases had TgAb levels greater than 100 U/mL. The mean base-line Tg in patients who were admitted three or more times was significantly greater than that of patients with one hospitalization (p=0.026). In addition, the mean Tg in patients who received 7.4GBq radioactive iodine or less was significantly lower than the others (p=0.003). The mean anti-Tg and TSH were not different between these groups. In the results of the whole body scans, patients with metastasis had higher incidences of hospitalization (p=0.010) and received higher radioactive iodine levels.
Conclusion: This study showed that, in differential thyroid cancer, lower base-line serum Tg levels and absence of metastasis in radioiodine scan after ablation treatment are correlated with fewer hospitalizations and lower doses of radioactive iodine. Base-line anti-Tg and TSH demonstrated no remarkable correction. Therefore, it seems that base-line Tg could help us in determining which patients need aggressive treatment.

OP 085

Sunday, May 20, 2012

9:30-10:30, Sa'di Hall

Association between coronary artery disease and bone mineral density

Majid Assadi[1*], Marzieh Afroozandeh[1], Mohammadreza Pourbehi[2], Iraj Nabipour[3], Hamid Javadi[4], Dariush Iranpour[2], Sara Bidel-Khoshbakht[1]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr,Iran
[2]Department of Cardiology, Fatemeh Al-Zahra Hospital, Faculty of Medicine, Bushehr University of Medical Sciences, Bushehr, Iran
[3]The Persian Gulf Tropical Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[4]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences (GUOMS), Gorgan, Iran

Introduction: Based on data, an association between low bone mineral density (BMD) and atherosclerosis may exist. This study aimed to investigate the association between BMD and coronary artery disease (CAD).
Methods: In total, 74 patients (36 females, 38 males) were included in the study and evaluated for the presence of cardiovascular risk factor and CAD. Bone mineral density was measured in all patients. Low BMD was defined as T score≤2.5.
Result: There were not statistically significant differences in BMD values between two CAD and non-CAD groups. In addition, in low BMD group the presence of CAD was not significantly different as compared with normal BMD group. Logistic regression revealed that only BMI was positively and independently associated with low BMD in patients (P=0.031). The other variables including CAD, risk factor of atherosclerosis did not show such correlation.
Conclusion: Neither cardiovascular risk factors, nor coronary artery disease itself has been found to be associated with low BMD. However, BMI is found to be an independent predictor of decreased BMD in our study population.

OP 086

Friday, May 18, 2012

14:30-15:30, Hall 4

Low dose biological dosimetry : application in occupational exposure

Hossein Mozdarani

Department of Medical Genetics, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran

A number of biological markers were developed to evaluate the known or suspected exposures to ionizing radiation. Biological dosimetry based on the analysis of solid stained dicentric chromosomes has been used for over 40 years and represent an attractive biomarker. Other assays utilizing cytogenetic techniques include micronucleus (MN) assay and premature chromosome condensation (PCC). These assays primarily use peripheral blood lymphocytes as cellular surrogates for the target tissues and can be used to detect many forms of DNA damages. While all of these assays can detect the genetic consequences of the exposure to ionising radiation, they are relatively nonspecific (except for dicentrics) and nonstable for a long period after the exposure. Moreover, most of the efforts are devoted to identifying a suitable biomarker and method for the assessments ofexposure to acute doses of ionising radiation where only limited number of individuals were exposed to acute doses of ionising radiation during the last 50 years due to radiological or nuclear accidents. On the other hand, a large population working in industrial nuclear facilities or working with medical devices generating ionizing radiation or residing in high natural radiation background areas are chronically exposed to long-term low-dose ionising radiation. A particularly important parameter for the monitoring of the individuals exposed to low doses of ionising radiation and dose reconstruction is the stability of the assay with time post-exposure. Translocations, also manifestations of DNA damage at chromosomal level appear to exhibit persistence for many years and even decades. Therefore, for the biomonitoring of the cumulative exposures, stable structural aberrations such as translocations, which are also found in tumours, are the most important biomarkers. The quantification of translocations is a unique and essential approach to understanding the adverse effects of exposure and of the health-related consequences of that exposure. The use of fluorescence in situ hybridization (FISH) chromosome

painting methods to detect the structural and numerical chromosomal aberrations (CAs) may provide an increased efficiency and specificity for identifying the stable CAs.

OP 087

Thursday, May 17, 2012

11:30-12:30, Sa'di Hall

Nuclear medicine applications in acute coronary syndrome and ischemic memory

Morteza Bahri Iraii
Iranian Hospital Dubai

The application of nuclear cardiology for evaluating prognosis in asymptomatic patients with cardiovascular risk factors is potentially high and more related to ischemia and LV function assessment than to anatomical plaque measurement. Nuclear cardiology may be an excellent tool for determining short-term risk, while CAD imaging (Coronary Angiography) methods are more useful in the evaluation of long-term risk and subsequently helpful for more aggressive decisions.
Current myocardial perfusion studies with SPECT and PET detect atherosclerosis that is significant enough to limit myocardial blood flow (typically.50% stenosis). Although flow-limiting CAD causes angina pectoris, they are not typically prone to rupture (the most common mechanism of acute MI). Moreover, the less mature CADs, which are vulnerable to rupture, frequently are not sufficiently narrowed to limit myocardial blood flow. Thus, the current MPI tool has limited sensitivity for screening patients who are at risk for Acute Coronary Syndrome (ACS**)**.
Therefore, identification of subclinical coronary artery atherosclerosis to enhance primary prevention of CAD, acute MI, and sudden cardiac death requires a paradigm shift in the design of next-generation imaging techniques. New methods to detect endothelial dysfunction and early preclinical atherosclerotic plaques vulnerable to rupture are likely to play critical roles in the realization of this new goal for cardiac stress testing.
Following an acute ischemia, fatty acid metabolism can remain abnormal long after perfusion has retuned to normal again; this phenomenon is known as 'IschemicMemory'. During the ischemic memory phase, most of the cell energy is obtained through glucose metabolism. Hence, labeled fatty acid scintigraphy could help to stratify risk. In fact, 123I-beta-methyl iodopentadecanoic acid (BMIPP) scintigraphy is a line of research into ischemic memory phenomenon. Analyzing myocardial metabolic adaptation to ischemia is probably the first-line response of the myocardium to ischemia.
In addition,^{18}F-FDG uptake is increased in inflamed vascular tissue and can also be a marker of atherosclerosis. Furthermore, ^{125}I-labelling of low-density lipoproteins (LDL) has been used to obtain images of atherosclerosis in the carotid arteries. Another possibility for identifying the unstable plaque is the use of ^{99m}Tc-annexine V, which localizes the apoptotic cells.
Finally, the future applications of SPECT/PET in clinical cardiology practice must include studies that characterize, visualize and quantify cell myocardial survival as well as gene-based therapy monitoring.

OP 088

Thursday, May 17, 2012

16:00-17:30, Hall 4

Investigation of radioprotection effect of IMOD as an immunomodulator on mice bone marrow using micronuclei assay

Amin Shakeri[1], Hossein Mozdarani*[2]

[1]Department of Radiation Technology, Faculty o Paramedicine, Shahid Beheshti University of Medical Science, Tehran, Iran
[2]Department of Medical Genetics, Faculty of Medical Science,Tarbiat Modares University,Tehran, Iran

Introduction: There are a large group of drugs that have radioprotective properties and can decrease the effect of ionizing radiation. Immunomodulators are one of them that because of their ability to improve the level of body immune are recently used as a radioprotector agent. however , no suitable drugs has been introduced for routine clinical use. IMOD is an Iranian new herbal immunomodulator that is used to decrease side effect of HIV virus. In this study we investigated the radioprotective effect of IMOD on mouse bone marrow by micronuclei assay.

Methods: In this study female NMRI were grouped in several group. 3 days before of the 2 Gy gamma radiation, various doses of IMOD was injected into the mice (IV) and then the bone marrow was ejected and the PCE and NCE and the Mn were counted.
Results: the results showed that gamma irradiation can cause a high frequency of micronucleiformation and decrease cell proliferation ratio. Injection of various doses of IMOD before of irradiation can considerably reduce the frequency of micronuclei in erythrocyte of bone marrow and increase the ratio of PCE/PCE+NCE.
Conclusion: The DRF of the IMOD was about 2.4. This high DRF indicate that IMOD has high radioprotective ability seems to be due to immunimodulatory properties of this drug. These results show that IMOD can be used as a effective native radioprotector.

OP 089

Friday, May 18, 2012

9:30-11:00, Sa'di Hall

Detection of extranodal involvement in non-Hodgkin's lymphoma on baseline staging ^{18}F-FDG PET/CT

M. K. Nawaz[1, 2*], H. Ahmed [2], H. Bashir [2], S. Riaz [2], Z. S. Farouqui [2], Najam Uddin [2], K. A. Mufti[2]

[1]General Secretary, Pakistan Society of Nuclear Medicne, Pakistan
[2]Shaukat Khanum Memorial Cancer Hospital and Research Center, Lahore, Pakistan

Introduction: Extranodal involvement in non-Hodgkin lymphoma is very common. We present the frequency of extranodal involvement in NHL in adult and pediatric population detected on baseline staging PET/CT.
Methods: We reviewed histopathological classification and PET-CT reports of consecutive 394 diagnosed cases of non-Hodgkin's lymphoma who presented to our hospital for the PET-CT scan from September 2009 to September 2010. Out of total reviewed cases, 78 scans were performed for baseline staging.
Results: Out of 78 baseline staging scans, 40 were found to have extranodal involvement. The 40 patients consisted of 4 patients of pediatric group with mean age of 12 and the rest are adults with age ranging from 18 to 61 years. Gastrointestinal tract involvement (espophagus, stomatch and bowel) was seen in 10 patients; musculoskeletal in 10 patients; spleen in 9 and head and neck (tonsils, nasopharynx and buccal mucosa) in 9 patients. There was 1 patient with testicular disease and 1 with breast involvement.
Conclusion: In our observation, 51% of the baseline staging PET scans were found to have extranodal involvement with the gastrointestinal tract and musculoskeletal being the most common sites followed by spleen and head & neck region.

OP 090

Friday, May 18, 2012

14:30-15:30, Hall 4

Medical diagnostic exposure to ionizing radiation is it a double edged sword?

Ali Shabestani Monfared[*], Mehrangiz Amiri

Department of Medical Physics, Babol University of Medical Sciences, Babol, Iran

Despite extensive research over the last decades, there remain considerable uncertainties to the risks of low doses of ionizing radiation as encountered in diagnostic radiology and nuclear medicine. A lot of models have developed by different scientists to define dose-effect relationship. Many radiation advisory bodies and regulatory agencies assume that any exposure to radiation carries some degree of risk. This assumption has been contested by many radiation scientists that believe no harmful effect of routine medical diagnostic exposure has ever been observed. This paper wants to provide a closer look on the impact of medical diagnostic radiation on human health.

OP 091

Saturday, May 19, 2012

16:00-17:30, Hall 4

The accuracy of dual energy mapping approach in CTAC in presence of low concentration of contrast agent

Hossein Ghadiri[1, 2], Mohammad Bagher Shiran[1], Habib Zaidi[3, 4], Hamid Soltanian Zadeh[5, 6], Mohammad Reza Ay[1, 2, 7]

[1]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[2]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3]Division of Nuclear Medicine, Geneva University Hospital, Geneva, Switzerland
[4]Geneva Neuroscience Center, Geneva University, Geneva, Switzerland
[5]CIPCE, School of Electrical and Computer Engineering, University of Tehran, Tehran, Iran
[6]Department of Radiology, Henry Ford Health System, Detroit, Michigan, USA
[7]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Ability of Dual-energy (DE) methods to segment Contrast Agent (CA) from bone would be promising in attenuation correction of PET data in PET/CT imaging. However, similarity of bone tissues and specific concentrations of CA may cause difficulty in denotation of these materials. This study evaluates performance of DE methods in PET/CT imaging.
Methods: Human shaped phantom including soft tissues, bones and a variety of Visipaque320 CA concentrations were used as examining objects. Software including XCAT phantom and a series of MATLAB (MathWorks, Inc.) programs were used to create a series of CT images. CA and bone concentrations from 1.0% to 100% and body thickness (T) from 5 to 50 cm were considered and CT images in 80 kVp and 140 kVp were reconstructed. Different DE algorithms such as: 140 to 80 kVp HUs difference (D) and HU difference ratio (DR), the slope of regression line of 140 vs. 80 kVp HU plot (S1) and (80kVp – 140 kVp) vs. 80 kVp HU plot (S2) were analyzed to evaluate the ability of DE methods in segmentation of CA and bone.
Results: Over the full range of CA and bone concentrations and for T=25 cm, the D varies from 7.0 to 955.0 and 45.0 to 4563.0 for CA and bone, respectively; the DR is 0.673 and constant for CA, when for bone it varies from 0.141 to 0.423; the S1 are 0.70 and 0.60 and S2 are 0.43 and 0.67 for CA and bone, respectively. All these values also investigated for T=5 cm to 50 cm.
Discussion: Analysis of CT images with DE methods in presence of different concentration of CA and bone as well as varying body thickness shows an overlapping in the D values of CA and bone. The DR shows better differentiation compared to D but not for low body thickness. There is again an overlapping in S1 in high body thickness and in S2 in low body thickness.
Conclusion: Our analysis shows that there are thresholds in concentration of CA and body thickness in which the dual energy algorithms may not be able to segment CA from bone tissues. As a result, some voxels including specific concentration of CA may be mistakenly classified as bone tissue when using DE algorithms in PET/CT energy mapping.

OP 092

Saturday, May 19, 2012

16:00-17:30, Hall 4

Ugly yet informative vs. fine-looking but frozen information - Which one should be the future of PET imaging?

Pasha Razifar

Institute for information technology, Centre for Image Analysis, Uppsala University, Sweden

Positron emission tomography (PET) is a non-invasive imaging modality and an excellent exploratory tool, based on “tracing” molecules labelled with a positron emitting radionuclide, called “tracer”. One of the main strengths of PET is its ability to depict and illustrate metabolic, physiological and biological interaction of the administered tracer with target(s) of interest in either a sector or whole body of a living creature, as image volumes. A decade ago this functional information provided by PET was coupled with excellent anatomical information provided by Computed Tomography (CT), introducing a new and powerful duo-modality intended to improve the diagnosis value and to fulfil the drawbacks of using two separate imaging modalities,

especially in the field of Oncology. Furthermore, one of the revolutions and at the same time one of the "curses" on PET when introducing this excellent duo-modality was, and still is, the frequent use of Fluorodeoxyglucose, when performing whole body static PET/CT (FDG-PET). Due to short scanning time and good image quality this approach has become a golden standard tool for tumour imaging. However, when performing static imaging the fourth dimension, time, is frozen and the acquired data illustrates only the mean tracer distribution of the administered tracer during the scanning time. This deflates the key strength of the PET, the exploratory dimension, which is based on "tracing a molecule".
On the other hand a dynamic PET imaging generates sequential image volumes, which have poorer image quality, compared with images obtained when performing static imaging. However, these sequential image volumes can be regarded as multivariate image volumes from which physiological, biochemical and functional information can be "traced" and derived by analyzing the distribution and kinetics of the administrated radiolabelled molecules. This implies that each of the image volumes displays/contains part of a kinetic information representing physiological behaviour of the administered tracer during different time points (the 4-th dimension).
Due to presence of the four dimension, dynamic image volumes could be quantified and analysed using several approaches/methods such as graphical modelling, parametric images, pixel-wise modelling, and multivariate image analysis.
The important question still remains: What are scientists looking for when they are utilizing an excellent imaging tool such as PET? Ugly yet informative or fine-looking but frozen information? Is FDG-PET the future of PET imaging?

OP 093

Saturday, May 19, 2012

11:30-12:30, Hall 3

Efficacy of ^{99m}Tc-ciprofloxacin scan in diagnosis of orthopedic infection: a preliminary result

Samaneh Hosseinzadeh[1*], Mahasti Amoui [1], Elahe Pirayesh [1], Ali Akbar Esmaeilijah [2], Salman Azarsina [2], Ghasem Raziei [1], Isa Neshandar Asli[3], Mojtaba Ansari[4]

[1]Nuclear Medicine Department, Shohada-Tajrish Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran
[2]Orthopedic Department, Akhtar Hospital, Shaheed Beheshti University, Tehran, Iran
[3]Nuclear Medicine Department, Taleghani Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran
[4]Nuclear Medicine Department, Imam Hossein Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran

Introduction: Infection is a major cause of mortality and morbidity in the world. ^{99m}Tc-labeled Ciprofloxacin has been developed for detecting infectious foci as it localizes in high concentration in living bacteria. Thus it could potentially act as a specific marker for infection. The purpose of this study was to investigate the diagnostic efficacy of ^{99m}Tc-Ciprofloxacin for detection of orthopedic infection in patients with violated bone.
Methods: Patients with suspected orthopedic infectitions were included in the study. The patients underwent static ^{99m}Tc-Ciprofloxacin imaging at 1, 4 and 24 h after injection of 740 MBq radiotracer. The lesion-to-background activity ratio (LBR) was calculated by semiquantitative analysis. Then, scan result was compared to intraoperative microbiological or histological finding as a gold standard for subsequent statistic calculation. ROC curve analysis was used to determine the best cut-off point for LBR for diagnosis of infection.
Results: 23 patients (15 male, 8 female), mean age 45 years (20-72) were enrolled in the study. One case was excluded due to interfering hepatic activity with T-11 lesion. Calculated cut-off point of LBR was 1.5 to distinguish infection. Therefore, the mean LBR of the ^{99m}Tc-Ciprofloxacin was 1.89±0.35, 1.79±0.27 and 1.97±0.42 at 1, 4 and 24 hrs images, respectively in positive scans which was significantly higher than corresponding mean ratio of 1.20±0.29, 1.12±0.26 and 1.22±0.33 in negative scans.
Scan was positive in 17 cases. Sensitivity and diagnostic accuracy of ^{99m}Tc-Ciprofloxacin were 93% and 82%, respectively. There was only one case with false-negative result who was receiving intensive and prolonged Ciprofloxacin. Three cases were falsely positive, two were confirmed only by microbiologic exam, and a sampling error could be considered as a result in the other case

according to focal accumulation of radiotracer in the scan. Added cases in this ongoing study could reveal more precise results in value of ^{99m}Tc-Ciprofloxacin in orthopedic infection.
Conclusion: This preliminary result show that LBR with cut-off point of 1.5 could detect active bacterial infection in ^{99m}Tc-Ciprofloxacin scan. The high sensitivity of ^{99m}Tc-Ciprofloxacin as well as its easy availability and relatively short investigation time make it good alternative for detection of orthopedic infection.

OP 094

Thursday, May 17, 2012

9:30-10:30, Hall 3

Technetium-99m sestamibi imaging in lung masses: Comparison with histopathologic results

Shahram Oskoie[1*], Babak Mahmoudian[2]

[1]Nuclear Medicine Ward, Imam Reza Hospital, Tabriz University of Medical Sciences, Tabriz, Iran
[2]Tabriz Gamma Scan Nuclear Medicine Center, Tabriz, Iran

Introduction: Bronchial carcinoma is the leading cause of death from cancer in most countries. The aim of this prospective study was to assess the ability of ^{99m}Technetium Sestamibi (^{99m}Tc-MIBI) scan in differentiation benign from malignant pulmonary masses.
Methods: Thirty patients (25 male and 5 Female) with mean age of 56 years old (Range: 26-76 y) and lung mass, which were radiologically suspicious for malignancy were included to study. Planar scan was performed for all patients, 10 and 120 minutes after intravenous injection of ^{99m}Tc–MIBI. Also SPECT was done after completion of first static image series. Images were evaluated qualitatively and quantitatively for abnormal accumulation of radiotracer corresponding to the location of lung masses. Increased ^{99m}Tc-MIBI uptake was considered as positive scan result. Lung mass biopsywas performed in all patients.
Results: According to pathological results 20 patients (67%) had malignant lung lesions and 10 patients (33%) had benign lesion. Ninety percent of malignant masses were primary lung cancer (PLC), whereas other 10% were metastatic lesions. Increased uptake of ^{99m}Tc–MIBI was seen in 19 patients out of 30 ones, which 16 cases of them were malignant. ^{99m}Tc–MIBI scan had sensitivity, specificity, positive and negative predictive values of 80%, 70%, 84% and 64% in detection of lung malignancies, respectively. Quantitatively, malignant lesions revealed high mass/lung count ratio comparing to benign lesions (1.21±0.12 vs. 1.09±0.07, $p< 0.01$). Small cell tumors had higher ^{99m}Tc–MIBI uptake than squamous cell tumors.
Conclusion: ^{99m}Tc-MIBI scanning can be helpful in prediction of malignancy in suspicious pulmonary masses due to its high specificity and positive predictive value.

OP 095

Thursday, May 17, 2012

11:30-13:30, Hall 4

Monte carlo simulation of bremsstrahlung radiation from P-32 and spectrum in the HPGe-ntype detector

Hadi Taleshi Ahangari[1*], Hossein Rajabi[1], Mohammad Eftekhari[2], Mohammad Ali Askari[1], Abolghasem Haeri[1]

[1]Tarbiat Modares university, Tehran, Iran
[2]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: High purity germanium detectors, HPGe , are used in a wide variety of applications in medicine and nuclear physics. The determination of the activity for each radionuclide requires a prior knowledge of the full-energy peak efficiency at each photon energy for a given measuring geometry. Treatment in nuclear medicine base on beta emitter radioisotopes. Therapeutic radionuclides energy is outside the range of gamma camera imaging system sensitivity. Beta emitters interact with tissue and make bremsstrahlung radiation. In absence of gamma ray emission, bremsstrahlung radiation could be used for imaging. GATE based on Geant4 is a general and very useful software for monte carlo simulation. This software package is already validated for several nuclear medicine studies. Monte Carlo N-Particle Transport Code (MCNP) also is a

software package for simulating nuclear processes. However, P-32 bremsstrahlung spectrum has not validated with GATE and MCNP yet.
Methods: The n-type HPGe detector considered for the Monte Carlo calculations. The characteristics of the detector can be described by average of seven main parameters: diameter and height of the crystal, diameter and height of the internal core, thickness of the beryllium window, distance from the crystal top to the Be window, and the thickness of the dead layer of Ge. In the MCNP code, the F8 tally (energy distribution of pulses in detector) is used to simulate bremsstrahlung spectra of water in Marinelli geometry in HPGe detector. In the GATE code, the root output is used to read bremsstrahlung spectra of water in Marinelli geometry.
Results and Conclusion: The simulation energy spectrums in Gate and MCNP have a significant correlation with experiment energy spectrum achieve experimentally. Comparing bremsstrahlung spectrum of water in experiment and simulation using Man-Withney test shows great agreement (more than 99%).

OP 096

Friday, May 18, 2012

11:30-13:30, Hall 4

Towards parametric whole-body imaging in clinical PET

Arman Rahmim*, Nikolaos Karakatsanis, Martin Lodge, Yun Zhou, Abdel Tahari[1], Richard Wahl

Division of Nuclear Medicine / PET, Department of Radiology and Radiological Science, Johns Hopkins University School of Medicine, USA

Clinical whole-body PET protocols commonly involve a static scan starting at a fixed time after tracer administration. This fixed uptake period is intended to allow for the radiotracer (e.g. FDG) to accumulate in regions (notably tumors) that exhibit high uptake, while allowing for the tracer to wash-out from normal tissue. However, dynamic PET acquisition has the ability to directly measure tracer kinetic information and to lead to more robust and quantitative characterization of tumors and assessment of treatment response. Nonetheless, dynamic protocols have not translated to the clinic, in part due to their increased complexity, particularly those involving invasive blood sampling to measure the plasma input function (PIF). Moreover, dynamic PET acquisition is generally confined to a single bed-position, and anatomic coverage is therefore limited (typically 15-20cm). We propose a transition to dynamic whole-body PET parametric imaging using novel and clinically feasible data acquisition and parameter estimation techniques that can potentially allow for routine adoption of dynamic PET imaging.
We have optimized and evaluated the proposed methodology using Monte Carlo simulations. Furthermore, n=6 dynamic whole-body FDG PET/CT patient studies have so far been performed under an ongoing research protocol. The protocol involves: initial 6min scan over the heart (to capture early PIF dynamics), followed by 6 whole-body passes (45 sec/bed; 7 beds/pass). We use a small region-of-interest in the atrium to quantify the PIF, including use of interpolations when the heart is not in the field-of-view. We subsequently generate parametric images using the Patlak plot, substituting the semi-quantitative standard uptake value (SUV) with the tracer influx constant Ki. Simulations and clinical data have indicated significantly increased tumor-to-background ratios. However, abovementioned acquisitions are achieved in ~45min, whereas we aim for ~30min acquisitions to facilitate routine adoption. Furthermore, standard regressions can lead to higher noise levels that can complicate clinical tasks. To tackle this, we are actively seeking enhanced parametric imaging using (a) advanced spatial-constraint regularization, (b) Patlak correlation analysis to filter voxels exhibiting poor correlations in the Patlak plot, and (c) directly estimating parametric images from dynamic sinograms (direct 4D approach). The proposed approach to parametric whole-body imaging promises to open up a wealth of kinetic information with the potential to provide enhanced quantitative surrogate markers of disease.

OP 097

Sunday, May 20, 2012

9:30-10:30, Sa'di Hall

Role of ^{18}F-FDG PET-CT in detection of occult multifocal tubercular involvement in skeletal tuberculosis

Sugandha Dureja[1*], Ishita Sen[2], Shankar Acharya[1]

[1]Sir Ganga Ram Hospital New Delhi, India
[2]Fortis Hospital, Gurgaon, India

Introduction: The worldwide prevalence of tuberculosis (TB) is about two billion cases or one-third of the total population, of which the incidence of skeletal tuberculosis is about 10-20%. The incidence of multifocal involvement in skeletal tuberculosis is reported to be low even in endemic countries, constituting only about 10-15% of all cases of skeletal tuberculosis. Diagnosis of skeletal tuberculosis is difficult due to indolent and non specific clinical presentation. A high index of clinical suspicion is essential for diagnosis, with the help of supportive evidence in the form of imaging and often histopathological sampling. Currently used conventional imaging modalities are not suitable for whole body imaging and hence under-report multifocal involvement in tuberculosis. PET CT serves as a whole body screening tool for tuberculosis and thus is more sensitive for detection of multifocality. It may also serve as a guide in identifying accessible sites for metabolic biopsy. Since structural changes lag behind treatment response by 2-5 months, PET CT, as a morpho-functional imaging modality may have a role in assessing realtime metabolic response to antitubercular treatment and early detection of multidrug resistance. Further, PET CT can delineate the nature and extent of multifocal involvement to aid in early diagnosis and intervention since concurrent multifocality and neurological involvement may change management decisions in skeletal tuberculosis.
Methods: A cohort of 26 patients of newly diagnosed, histopathologically and/or radiologically proven tuberculosis of the spine were selected, after initial clinical interview and physical examination. Whole body PET scan was carried out after the injection of 10-15 mCi of ^{18}F-FDG along with CECT.
Results: Of the 26 patients enrolled, 12 (46.15 %) had initially presented with clinical features suspicious for pulmonary tuberculosis. On PET CT scanning, multifocal involvement was seen in 18 of 26 patients (61.5 %), of which 7 patients (26.9 %) had metabolically active lung lesions along with non-contiguous metabolically active skeletal lesions while 11 patients (42.3 %) had only multiple active skeletal lesions, distinct from the site of initial presentation.
Conclusion: ^{18}F FDG PET CT as an isotropic whole body metabolic imaging modality has an incremental role in assessment of disease extent and planning nature and duration of treatment in patients with multifocal tuberculosis. The ability to detect metabolically active silent pulmonary and skeletal lesions can guide physicians in treatment planning, evaluating response to therapy, patient education and containing the spread of disease.

OP 098

Thursday, May 17, 2012

9:30-11:00, Hall 4

Imaging cerebral ischemic tissue at risk of infarction during stroke and estimation of reperfusion at different duration in rat brain with small animal single-photon emission computed tomography

Masoume Majidy[1*], Homayuon Naderian[2], Mahdi Sedighpoor[1], Abolfazl Azami[2]

[1]Tehran University of Medical Sciences, Tehran, Iran
[2]Anatomical Sciences Research Center, School of Medicine, Kashan University of Medical Sciences Kashan, Iran

Introduction: Imaging cerebral ischemic tissue at risk of infarction during stroke and estimation of reperfusion at different duration in Rat brain with small animal single-photon Emission computed tomography. To better understand the effect of time duration in both induction and reperfusion of cerebral ischemia that are involved in ischemia response of the brain, we have evaluated changes in rat hippocampus after induction of 15 min and 30 min transient global ischemia, followed by reperfusion for 24h and 72 h with small animal SPECT.
Methods: In this study, transient global cerebral ischemia was induced in wistar adult male rats for 15 and 30 min by bilateral occlusion of the common carotid artery, followed by reperfusion for 24 h and 72h (five animals per group). Five sham operated animals that had been treated under the same conditions served as controls. The changes were evaluated with spect imaging the infarct area because it has the potential role to estimate reserve capacity of the cerebral circulation.

Results: A detectable neuronal death was induced in rat brain after 15 min and 30 minutes of bilateral common carotid artery occlusion and then single-photon emission computed tomography (SPECT) have been used to assess cerebral perfusion and cerebral reserve.
Conclusion: our findings demonstrate that global cerebral ischemia activates process of changes in rat brain, and these changes can be demonstrated with nuclear imaging modality showing the progress of infarct in cerebral tissue with decreased upatake.

OP 099

Saturday, May 19, 2012

12:30-13:30, Hall 5

The relationship between retinopathy in diabetes mellitus type 2 with severity and extent of myocardial ischemia

R Hedayati [1,2*], H Malek [1], N Yaghoobi [1], F Rastgou[1], A Bitarafan Rajabi [1], H Amouzadeh [1], M Behnia [1], M Alvandi[1], A Khorami [1], N Tavakoli[1], H Firouzabadi[1]

[1]Department of Nuclear Medicine, Shaheed Rajaei Cardiovascular, Medical and Research center, Tehran University of Medical Sciences, Tehran, Iran
[2]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Diabetes mellitus type 2 (DM2) is one of the leading causes of morbidity and mortality owing to its role in the development of cardiovascular disease. These patients might have silent ischemia and the diagnosis of coronary artery disease (CAD) may not be achieved until the late stages even myocardial infarction. The presence of diabetic retinopathy is correlated with the presence of microangiopathy and in fact it can be an early sign of CAD in DM2. The purpose of this study is to evaluate the relationship between diabetic retinopathy and myocardial ischemia by single photon emission computed tomographic (SPECT) myocardial perfusion imaging (MPI).
Methods: We selected 33 patients with DM2 (age 59 ±8 years, 26 females, 7 males) with no history of prior myocardial infarction or revascularization. The patients with diabetes mellitus type 1 and nondiabetic retinal disease were excluded. An experienced ophthalmologist examined all of these patients for evidence of diabetic retinopathy and the patients were divided into two groups on the basis of the presence (group +DR) or absence (group –DR) of diabetic retinopathy. Gated SPECT MPI was performed for all patients and the results were blindly evaluated by two experienced nuclear medicine physicians.
Results: Eighteen and fifteen patients were categorized as +DR and –DR, respectively. Among the patients in group +DR, the severity of retinopathy was classified as mild nonproliferative (n=10), moderate nonproliferative (n=3) and severe nonproliferative/proliferative (n=5). Ischemia was significantly more frequent in +DR ($P<0.05$) (15 patients; mild ischemia:10, moderate ischemia :2 and severe ischemia:3) as compared to–DR (6 patients; all were mild ischemia). Multivariate linear regression analysis revealed that severe non proliferative/proliferative diabetic retinopathy is independently related to summed difference score (coefficients=13.2, $P<0.05$).
Conclusion: The results of our study suggest that the presence of diabetic retinopathy is a strong predictor of CAD and the degree of retinopathy is correlated with the extent and severity of ischemia in patients with DM2. Therefore, in diabetic patients with or without symptoms suggesting CAD, the presence of diabetic retinopathy increases the risk of abnormal perfusion and MPI is advised for all patients suffering form diabetic retinopathy in order to evaluate the presence of CAD.

OP 100

Friday, May 18, 2012

9:30-11:00, Sa'di Hall

Comparison of ^{99m}Tc-octreotate with CT scan for localizing neuroendocrine tumor

Ali Kiasat[1*], Mahasti Amoui[2], Mona Malekzadeh[3], Elahe Pirayesh[2], Babak Shafiei[4], Ghasem Raziei[2], Payam Azadeh[5], Isa Neshandar Asli[4]

[1]Nuclear Medicine Department, Golestan Hospital, Ahvaz University of Medical Sciences, Ahvaz, Iran
[2]Nuclear Medicine Department, Shohada-Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

[3]Radiotherapy Department, Shohada-Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[4]Nuclear Medicine Department, Taleghani Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5]Radiotherapy Department, Imam Hossain Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Introduction: Somatostatin receptor Scintigraphy (SRS) is a new modality for diagnosis of neuroendocrine (NE) tumor. Although, anatomic imaging is the standard method for staging of NE tumor with high sensitivity, however, receptor imaging could evaluate functional state of disease. The aim of this study was to assess if ^{99m}Tc-octreotate could localize any lesion more than CT scan and provide additional information in staging and metasatatic work-up of patients with NE tumor.
Methods: Patients with histologically diagnosed NE tumor were enrolled in this study. Standard CT scan and ^{99m}Tc-octreotate scan were carried out and compared as organ involvement in all patients.
Results: Twenty-two patients with mean age of 47 yrs. (24-75 yrs.) were studied. Tumor origin was well-known in 17 cases including pancreas, GI tract, adrenal, lung , thyroid and carotid body. In 15 of 22 of cases (68%), ^{99m}Tc-octreotate scan determined organ involvement similar to CT scan, 6 cases with normal study and 9 cases with abnormal findings. In one case , only ^{99m}Tc-octreotate could detect metastatic lesion in mediastinum and in 3 cases it localized metastatic lesions more than CT scan in epigastric Lymph node, bone , brain and liver . In other two cases, more lesions including spleen and para-aortic lymph nodes were identified by CT scan. Pelvic mass lesion and skeletal metastases were independently recognized by CT scan and ^{99m}Tc-octreotate scan in the other patient.
Conclusion: This study revealed that ^{99m}Tc-octreotate scan could identify organ involvement in NE tumors, comparable and sometimes more than CT scan. This is partly due to whole body and tomographic assessment of the procedure with subsequent additional information specially in neck, bone and brain as well as mediastinum .We concluded that SRS is a good complementary modality for standard CT scan to localize NE tumor.

OP 101

Saturday, May 19, 2012

11:30-12:30, Hall 3

Evaluation of ^{99m}Tc-Ubiquicidin 29-41 scintigraphy in differentiation of bacterial infection from sterile inflammation in diabetic foot

Armaghan Fard-Esfahani[1*], Davood Beiki[1], Babak Fallahi[1], Mohammad Reza Gharaie[1], Mohammad Reza Mohajeri-Tehrani[2], Nahid Rouhipour[2], Mohammad Eftekhari[1], Mohsen Saghari[1]

[1]Research Institute for Nuclear Medicine Tehran University of Medical Sciences, Tehran, Iran
[2]Endocrinology and Metabolism Research Center, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Ubiquicidin (UBI) 29–41 is a synthetic antimicrobial peptide that binds with the microbial cell membrane at the location of infection. This study was conducted to evaluate its probable efficacy as an infection imaging agent with potential to differentiate bacterial infection from sterile inflammation in humans.
Methods: Fifteen diabetic foot patients (10 males and 5 females) with suspected bacterial infection, prior to starting antibiotic treatment, were selected for this study. First a routine three phase bone scan and later a ^{99m}Tc-UBI scan was performed for all the patients. 555-740 MBq of ^{99m}Tc-UBI was injected intravenously. A 10 minute dynamic study was followed by spot views of the suspected region of infection and corresponding normal areas (liver and kidneys) at 60 and 120 min. Whole-body anterior and posterior images were also acquired. To interpret the studies as positive or negative, visual score (0 –3) was used, with scores of 0 (minimal or no uptake; equivalent to soft tissue) and 1 (mild; less uptake than in liver) being considered negative and scores of 2 (moderate; uptake equal to or greater than that in liver) and 3 (intense uptake equal to or greater than that in kidneys) being considered positive.
Results: Of 15 studies performed with ^{99m}Tc-UBI, all had positive bacterial cultures. The result of bone scan was positive for osteomyelitis in 12 patients (80%). ^{99m}Tc-UBI Scintigraphy was

positive in 6 patients, but negative in nine. The sensitivity of ^{99m}Tc-UBI for detection of infection was therefore 40%. From 12 patients who had positive bone scans, only 6 had a positive ^{99m}Tc-UBI (50%) indicating the sensitivity of 50% for 99mTc-UBI in osteomyelitis cases. ^{99m}Tc-UBI was not positive in any patient who had evidence of soft tissue infection in the bone scan.
Conclusion: Although ^{99m}Tc-UBI 29–41 was well tolerated by all the patients without any side effects, considering low sensitivity of this agent, this radiopharmaceutical is not of great value for diabetic foot infection diagnosis.

OP 102

Sunday, May 20, 2012

9:30-10:30, Hall 5

Autologous hematopoietic stem cell transplantation in patients with high risk neuroblastoma treated with/without ^{131}I-MIBG

Amir Ali Hamidieh[1], Davood Beiki[2], Babak Fallahi[2], Maryam Behfar[1], Mahdi Jalili[1], Armaghan Fard-Esfahani[2], Ashrafosadat Hosseini[1], Ardeshir Ghavamzadeh[1]

[1]Hematology-Oncology and Stem Cell Transplantation Research Center, Tehran University of Medical Sciences, Tehran, Iran
[2]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: The aim of this study is to compare two main strategies of Autologous hematopoietic stem cell transplantation (auto-HSCT) for patients with high risk neuroblastoma: (a) auto-HSCT alone in patient with negative diagnostic ^{131}I-MIBG and (b) auto-HSCT with therapeutic ^{131}I-MIBG before HSCT in patient with positive diagnostic MIBG.
Methods: We prospectively analyzed the outcome of 16 patients with high risk neuroblastoma who had undergone auto-HSCT between 2008 and 2011. Median age at transplantation was 5.1 years. According to the results of diagnostic ^{131}I-MIBG, patients were divided into two groups: ^{131}I-MIBG-avid (n=8) and non ^{131}I-MIBG-avid (n=8). ^{131}I-MIBG-avid patients received ^{131}I-MIBG (12mCi/kg) on day 21 before transplantation. The conditioning regimen used in all patients consisted of etoposide, carboplatin and melphalan.
Results: Engraftment occurred in all patients. No severe side effects were observed in any patients in ^{131}I-MIBG-avid group. With a median follow-up time of 14 months, 2 patients relapsed in ^{131}I-MIBG-avid group and 5 patients relapsed in non ^{131}I-MIBG-avid group.
Conclusion: The results of the study revealed that there was no significant difference between the two groups, but ^{131}I-MIBG-avid patients showed better survival and lower relapse rate. It is, however, necessary to study large numbers of patients to determine the role of ^{131}I-MIBG therapy in pre-transplant conditioning regimen for these patients.

OP 103

Thursday, May 17, 2012

16:00-17:30, Hall 4

Modeling the time dependent biodistribution of ^{177}Lu-maltolate, a new oral therapeutic complex for bone palliation radiotherapy purpose

Amir Hakimi[1, 3*], Simindokht Shirvani Arani[2], Amir Reza Jalilian[2], Ali Bahrami Samani[2]

[1]Department of Nuclear Engineering And Physics, Amirkabir University of Technology, Tehran, Iran
[2]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), Tehran, Iran
[3]Department of Medical Radiation Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran

Introduction: Development of oral therapeutic radiopharmaceuticals is a new concept in Radiopharmacy. Due to interesting therapeutic properties of ^{177}Lu and antineoblastic activity of maltolate (MAL) metal complexes, ^{177}Lu-maltolate (^{177}Lu-MAL) was developed as a possible therapeutic compound for ultimate oral administration. Biodistribution studies are expensive and difficult to carry out in humans, but such data can be obtained easily in rodents. The use of compartmental analysis allows the mathematical separation of tissues and organs to determine the concentration of activity in each fraction of interest.

Method: A pharmacokinetic model was developed for the new bone accumulating therapeutic agent 177Lu-Maltolate in normal mice to analyze the behavior of complex. We have developed a physiologically based pharmacokinetic model for scaling up data from mice to humans. The mathematical model uses physiological parameters including organ volumes, blood flow rates, and vascular permabilities; the compartments are connected anatomically.
Results: 177Lu-MaL is a possible therapeutic agent in human malignancies and/or bone palliation therapy. The concentration of radiopharmaceutical in various organs was measured at different times. The temporal behavior of biodistribution of the complex is modeled and drawn as function of time. Uptake of bone was maximum and increased post injection of 177Lu-Mal for first 48 hours and then decreased.
Conclusion: Due to the importance of bone palliation therapy in various metastatic carcinomas around the world, we focused on the development of a possible oral radiopharmaceutical for bone pain palliation therapy The variation of pharmaceutical concentration in all organs is described with summation of eight exponential terms and it approximates our experimental data with precision better than 2%.

OP 104

Thursday, May 17, 2012

16:00-17:30, Hall 4

Synthesis and evaluation of a novel ^{99m}Tc-carbonyl arilpiperazine derivative for imaging of serotonin receptors

Leila Hassanzadeh[1*], Mostafa Erfani[2], Seyed Esmaeil Sadat Ebrahimi[1], Reza Najafi[2]

[1]Department of Nuclear Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
[2]Nuclear Science Research School, Nuclear Science & Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Tehran, Iran.

Introduction: Serotonin and its various receptors are involved in numerous CNS functions and psychiatric disorders.1-(2-methoxyphenyl) piperazine pharmacophore, a fragment of the true $5HT_{1A}$ antagonist WAY100635, is being found in numerous selective $5HT_{1A}$ imaging agents. ^{99m}Tc is still the ideal radionuclide in the diagnostic nuclear medicine. In this study, a new arilpiperazine derivative was synthesized and radiolabeled via Triazole by ^{99m}Tc-carbonyl.
Methods: A bidentate alkyne was reacted with phenyl piperazine derivative in the presence of a catalytic amount of Cu(I) to form tridentate ligand. The desired structure was confirmed by IR, NMR, Mass spectrometries. The ligand was radiolabelled with the precursor [^{99m}Tc] $[(H_2O)_3(CO)_3]^+$ and characterized by HPLC. The labeling conditions were optimized in the aspect of PH, reaction temperature, time and amount of ligand. The radiochemical purity of the intermediate and final complex were evaluated by HPLC methods. Stability in human serum, Octanol/water partion coefficient, in vivo biodistribution of labeled compound were carried out in Wistar rat.
Results: Triazole complex could be ^{99m}Tc-Tricabonyl labeled in over 95% radiochemical purity that was determined by HPLC. Biodistribution studies have shown brain uptake of 0.43±0.12 %ID/g at 2min post injection. Radioligand had about over 6 hours, invivo stability in human serum albomin. Receptor binding assays indicated about 20% specific binding of radioligand to $5HT_{1A}$ receptors. The partion coefficient (logP) was calculated as 0.78±0. the labeled compound was stable even up to 24 hours in room temperature.
Conclusion: The results indicates that the way of synthesis is reliable and reproducible and has high yield steps. Radiolabeling of compound is high yield and has high radio chemical purity. The radio labeled compound is more than 24h stable. It has good lipophilicity, moderate brain uptake and binding to receptor. It can be good imaging agent for $5HT_{1A}$ receptors but needs further ligand modification to obtain an ideal brain receptor agent.

OP 105

Thursday, May 17, 2012

16:00-17:30, Hall 4

Synthesis and biological evaluation of ^{99m}Tc-pyridyltriazol ligand as $5HT_{1A}$ receptor imaging agent

Leila Hassanzadeh[1*], Mostafa Erfani[2], Seyed Esmaeil Sadat Ebrahimi[1], Reza Najafi[2]

[1]Department of Nuclear Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
[2]Nuclear Science Research School, Nuclear Science & Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Tehran, Iran

Introduction: Serotonin and its various receptors has been tightly implicated in the pathogenesis of depression, anxiety, schizophrenia, epilepsy and eating disorders. Specific radioligands and single-photon emission computer tomography (SPECT) or positron emission tomography (PET) allow for a quantitative imaging of brain 5-HT_{1A} receptor distribution in living animals and humans.1-(2-methoxyphenyl) piperazine pharmacophore, a fragment of the true $5HT_{1A}$ antagonist WAY100635, is being found in numerous selective $5HT_{1A}$ imaging agents. The successful development of ^{99m}Tc-TRODAT as a radioligand for the dopamine transporter has shown the feasibility of imaging specific transporters in the brain with radiotracers based on ^{99m}Tc. In this study, a new arilpiperazine derivative was synthesized and radiolabeled by ^{99m}Tc-carbonyl precursor.
Methods: A phenyl piperazine triazole derivative was prepared and desired structure was confirmed by NMR and Mass spectrometries. The ligand was radiolabelled with the precursor [^{99m}Tc] $[(H_2O)_3(CO)_3]^+$ and characterized by HPLC. The labeling conditions were optimized in the aspect of PH, reaction temperature, time and amount of ligand. The radiochemical purity of the intermediate and final complex were evaluated by HPLC methods. Stability in human serum, Octanol/water partition coefficient, in vivo biodistribution of labeled compound were carried out in Wistar rat.
Results: The synthesis of Triazole complex was carried out in over 90% yield and respectively labeled with ^{99m}Tc-Tricabonyl core in over 95% radiochemical purity that was determined by HPLC. Biodistribution studies have shown brain uptake of 0.95±0.07 %ID/g at 2min post injection. Radioligand had about over 6 hours, in vivo stability in human serum albumin. Receptor binding assays indicated specific binding of radioligand to $5HT_{1A}$ receptors. The partition coefficient (log P) was calculated as 1.35±0.08. The labeled compound was stable even up to 24 hours in room temperature.
Conclusion: The results indicates that the way of synthesis is reliable and reproducible and has high yield steps. Radiolabeling of compound is high yield and has high radio chemical purity. The radio labeled compound is more than 24 hr stable. It has more lypophilicity, higher brain uptake and binding to receptor than propargyl ligand in our previous studies. Regional brain distribution study showed a clear correlation between distribution of radioactivity and distribution of $5HT_{1A}$ receptors in the brain.

OP 106

Saturday, May 19, 2012

12:30-13:30, Hall 5

Formulation and evaluation of a novel product of Iranian traditional medicine for gastrointestinal intrusive activity reduction in myocardial perfusion imaging with ^{99m}Tc-MIBI, A preliminary report

Mohammad Mahdi Reyhani[1], Saeed Farzanefar[2*], Shadi Davari[2], Hossein Rezaeizadeh[3], Mehran Mirabzadeh[4], Mohammad Eftekhari[5]

[1]Secretary of Iranian Association of Nuclear Medicine Technologist, students' scientific research center, Tehran University of Medical Sciences, Tehran, Iran
[2]Valiasr Hospital, Tehran University of Medical Sciences, Tehran, Iran
[3]Faculty of Traditional Medicine & Students' Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran
[4]Faculty of traditional medicine, Tehran University of Medical Sciences, Tehran, Iran
[5]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Myocardial perfusion imaging with ^{99m}Tc-MIBI is the most commonly performed nuclear cardiology procedure in our country. In this study GI activity impedes interpretation accuracy of acquired images and increased the imaging time, that is why as a routine protocol the patients are instructed to have fatty meal to reduce gall bladder and hepatic activities. This method

is distasteful in patients who fast overnight, especially in hyperlipidemic and diabetic people. Formulation and replacing a novel pharmaceutical product of Iranian Traditional Medicine both to decrease this intrusive GI activity and provide patients` convenience is explored.
Methods: Cardiac to hepatic and cardiac to gall bladder ratio is compared between the new protocol after using the novel pharmaceutical product (N=64) and routine protocol with the fatty meal counterpart (N=100) in 15, 60 and 90 minutes post injection.
Results: So far 28 patients entered the study. Cardiac to hepatic ratio on 60 minutes and cardiac to gall bladder activity in 90 minutes are comparable in both groups.
Conclusion: It would be more comfortable for the patients to replace the fatty meal with a sweet herbal juice, if they have same effect on the GI activity elimination in myocardial perfusion images.

OP 107

Thursday, May 17, 2012

16:00-17:30, Hall 4

The new method for synthesis of ^{188}Re-sulphur colloids as a radiation synovectomy agent

B.A. Kalantari*, M.R. Davarpanah, R. Nickzad, M. Erfani, M. Ghannadi Maragheh, M. Mazidi, H. Mirfallah

Nuclear Science and Technology Research Institute, AEOI, Tehran, Iran.

Introduction: One therapeutic approach to rheumatoid arthritis besides surgical removal is radiation synovectomy using beta-emitting radionuclide to destroy the inflamed synovial tissue. Recently, rhenium radioisotopes have been paid attention more. ^{188}Re sulphur colloid is used for ablation of knee inflamed joints. Our goal is ^{188}Re sulphur colloid synthesis, fulfilling qualification control tests and biodistribution studies of this colloid.
Methods: After ^{188}Re sulphur colloid synthesis using acidic reduction of sodium thiosulphate in presence of perrhenate, below qualification control testes were implemented:
a) Radiochemical purity: this factor was calculated with TLC (solvent: acetone) and measuring one third TLC paper activity (RF=1/3).
b) Particle size: using DLS Instrument and optical microscope equipped with Motic Images Plus 2.0 software we obtained a good estimation of particle size range.
c) Toxicity studies: with inoculating synthesized sample in microorganism growth medium and successive studies this study was performed.
d) In vitro stability: up to 5 days radiochemical purity and particle size were measured.
In addition, animal studies were implemented with measuring activity of organs of rats been knees injected and killed within 4 days.
Results: Qualification control tests showed a) radiochemical purity more than 99%, b) more than 95% colloids particles lied in the range of 1-5mm, c) no toxicity and d) colloid was stable to 5 days out of living tissue. In addition, more than 90% of colloid activity was adsorbed in knee joints to four days.
Conclusion: Because of a) gamma rays emitting, b) suitable half-life and beta energy and c) preventing leakage to other organs by particle size controlling ^{188}Re sulphur colloid is a good alternative as a radiosynovectomy agent for Knee joints.

OP 108

Thursday, May 17, 2012

11:30-13:30, Hall 4

Use of anthropomorphic phantoms and advanced Monte Carlo simulations

George Loudos

Technological Educational Institute of Athens, Athens, Greece

Nuclear Medicine (NM) is a challenging medical field that exploits molecular mechanisms for diagnostic and therapeutic purposes. Since NM is based on molecular mechanisms it can provide personalized diagnostic and therapeutic tools. However at the moment its advantages have not been fully exploited, especially in clinical practice.
The use of anthropomorphic computer phantoms for optimization of reconstruction algorithms, imaging protocols and dosimetry applications is continuously gaining interest worldwide. Several

groups have developed a number of realistic phantoms that model human organs or even the entire body and incorporate simulation of cardiac and respiratory motion. XCAT anthropomorphic torso phantom is probably the most used nowadays. Those models can be used in order to carry out realistic simulations, since their geometry and functionality are known.
Monte Carlo simulations have already found a number of applications in NM and they allow design of optimized imaging systems by modeling physical parameters and radiation-matter interactions. GATE simulation toolkit has become a standard in Nuclear Medicine over the past five years and is supported by a network of collaborating institutions, which have formed openGATE collaboration. GATE can not only simulate imaging systems, but can introduce complicated structures such as CT scans and anthropomorphic phantoms, assign radioactivity to specific structures or organs and include cardiac and respiratory motion. In this way clinical diagnostic protocols and image correction algorithms can be evaluated and optimized. Recently GATE has extended its applications to the field of dosimetry and therapy including both radionuclide therapy and radiotherapy.
An increasing number of studies that combine Monte Carlo simulations with anthropomorphic phantoms are reported, providing new tools for researchers in the field and which are expected to have a clinical impact. This talk aims to cover the state of art in the use of anthropomorphic phantoms in NM for diagnosis and therapy. In addition, it will highlight the challenges in the field and possible topics for innovative scientific work.
This work is partially supported by the Program Archimedes II: “Optimization of Clinical Protocols for Personalized Cancer Diagnosis and Treatment, using Advanced Anthropomorphic Phantoms”.

OP 109

Friday, May 18, 2012

9:30-11:00, Hall 4

Targeted drug delivery using radiolabelled nanoparticles

George Loudos

Technological Educational Institute of Athens, Athens, Greece

Targeted drug delivery using multifunctional nanoparticles has become a rapid growing field due to their significant advantages. One of the most challenging properties is the incorporation of anticancer drugs in low quantities that are released at the target disease site and can maximize therapeutic effects, while minimizing toxic effects. In addition, nanoparticle vehicles can penetrate physical barriers, such as blood brain barrier and improve therapeutic efficacy. Moreover, magnetic nanoparticles can be used to improve drug delivery by applying hyperthermic treatment.
Due to the large variety of nanoparticles and the challenges of in vivo experiments, it is important to use a non-invasive imaging technique, to assess the spatiotemporal biodistribution of multifunctional nanoparticles. In this way it is possible to assess if nanoparticles have successfully reached the target organ, if they remain stable, if they concentrate on other non-desirable sites and even monitor therapy. Nuclear medicine provides interesting methods to this direction. Radiolabelling of multifunctional nanoparticles with SPECT or PET isotopes is possible, in order to use these standard techniques for their in vivo imaging.
However, the successful and stable radiolabelling of multifunctional nanoparticles must take into account several factors related to nanoparticles chemistry, in order not to alter their properties and ensure stability of the radiolabelled nanoparticles complexes. A number of radiolabelling strategies are under study and will be reviewed. In addition, significant research work still needs to be done towards the optimization of imaging protocols for SPECT and PET, to optimize quantification of imaging results, as well as determine optimal concentration of nanoparticles, radioactivity and imaging time. The increased interest in monitoring therapeutic effect has given birth to the field of “theranostics”, were multifunctional nanoparticles play a major role in imaging targeted drug delivery.
The number and content of now-running projects indicate that this field can further extend the role of nuclear medicine, both as a preclinical and clinical tool.

OP 110

Thursday, May 17, 2012

9:30-11:00, Hall 4

Dedicated small field of view systems for SPECT and PET imaging

George Loudos

Technological Educational Institute of Athens, Athens, Greece

Molecular imaging (MI) links the empirical diagnostics and experimentally tried treatment management protocols with the fundamental understanding of the underlying processes that generate the observed results. MI techniques are ideally based on technologies that have an intrinsically high resolution and allow the detection of low concentrations of target bio-molecules involved, such as nuclear medicine imaging, optical imaging, magnetic resonance imaging etc. The combination of CT with SPECT, PET, has been explored and has led to commercial products such as microPET and nanoSPECT. Recently there has been an increased interest in combining PET/MRI both in clinical and preclinical research.
However, low cost dedicated imaging systems remain a cost effective solution for several radiobiological groups that want to benefit from a tool that can in vivo screen new products and minimize the required number of animals in a study, as well as the overall cost. Besides Position Sensitive Photomultiplier Tubes (PSPMTs), a number of new developments have improved overall performance and decreased systems size and cost. The main advances are related to new collimator concepts, new scintillator materials and geometries, fast ADCs, FPGA electronics, as well as improved reconstruction and quantification software. Moreover the new Silicon Photomultiplier detectors, initially oriented to PET/MR applications, provide flexibility that can be used in dedicated geometries.
Such systems are not limited to animal imaging, but also for dedicated organs imaging including breast, brain and prostate. In this talk the current state of art in dedicated imaging systems for SPECT and PET will be reviewed, as well as current and future research directions.

OP 111

Saturday, May 19, 2012

9:30-11:00, Hall 3

Labyrinth task test based brain perfusion SPECT in alzheimer's disease

Arash Abolhassani[1], A Klissarova[2], S Popova[3], N Deleva[2], Saeed Farzanefar[4], Mehrshad Abbasi[4*], Alireza Emami Ardekani[5]

[1]Department of Nuclear Medicine, Behboud Hospital, Tabriz University of Medical Sciences, Tabriz, Iran
[2]Department of Radiology and Nuclear medicine, Prof. Paraskev Stoyanov Medical University of Varna, Varna, Bulgaria
[3]Dalla Lana School of Public Health, University of Toronto, Canada
[4]Department of Nuclear Medicine, Vali-asr Hospital, Tehran University of Medical Sciences, Tehran, Iran
[5]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran.

Introduction: To study brain perfusion defects in subjects with Alzheimer's disease with post rest and stress brain perfusion SPECT studies.
Methods: Forty two patients with clinical Alzheimer's disease (21 males) were allocated into two groups according to the results of Mini Mental State Exam (MMSE). Group A comprised 21 patients with mild cognitive impairment (MMSE: 26-21) and group B included patients with moderate to severe cognitive impairment (MMSE: 20-5; n =21). Patient underwent ^{99m}Tc-HMPAO brain perfusion SPECT by administration of 740 MBq at rest and then after Labyrinth task test (LTT) in the consequent day. The region of interest (ROI) was defined on the most pronounced hypo-perfusion regions from the temporal or the parietal lobe either from the left or right side. Perfusion index was calculated as the ratio of mean counts of hypo-perfusion ROIs and the mean counts of the reference areas in the cerebellum multiply by 100. Perfusion indices were calculated for both rest and post-LTT studies. A decrease of more than 5% in the perfusion index between rest and post-LTT was considered significant.
Results: In the rest images, hypo-perfusion zones were detected in 8/21 patients from Group A and in 20/21 patients in Group B. Significant reduction in perfusion index from rest to post-LTT studies was noticed in 14/21 patients from Group A and in 20/21 patients from Group B. Out of 13

patients with normal brain imaging at rest, 9 subjects showed reduced perfusion index in the post-LTT study.
Conclusion: We suggest comparison of brain perfusion in rest and after Labyrinth Task Test is a useful measure to enhance detection of perfusion abnormalities in patients with Alzheimer's disease.

OP 112

Thursday, May 17, 2012

16:00-17:30, Hall 4

Preparation and evaluation of a new labeled neurotensin analog for tumor imaging

Mostafa Erfani[1*], Nakisa Zarrabi Ahrabi[2], Kazem Parivar Ahrabi[2], Mohammad Mazidi[1], Mostafa Goudarzi[1]

[1]Nuclear Science Research School, Nuclear Science & Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Tehran, Iran
[2]Islamic Azad University, Science and Research Branch, P.O. Box: 14515-775, Tehran, Iran

Introduction: Neurotensin is a tridecapeptide localized in central nervous system and in peripheral tissues. Three different receptor subtypes have been described for it among which the first one showing high affinity binding for NT was observed in ductal pancreatic adenocarcinoma with high frequency. Since pancreas carcinoma is increasing in incidence and is among the most frequent causes of cancer deaths, the need to use new radiopharmaceuticals which are able to diagnose cancer in the early steps is evident.
Methods: A neurotensin analogue modified at the N-terminus by hydrazinonicotinamide was obtained by solid phase peptide synthesis technique and standard fmoc strategy. HYNIC-peptide conjugate was radiolabeled with ^{99m}Tc and characterized by ITLC and HPLC. Stability was tested in vitro in normal saline and human serum albumin. Binding and internalization studies were carried out in neurotensin receptor expressing HT-29 cells. In vivo distribution studies were performed in normal rats.
Results: The radiolabeled complex could be prepared at high specific activities and >95% radiochemical yield as determined by HPLC. Peptide conjugate showed about 60% specific binding to neurotensin receptor. The radioligand showed high and specific internalization into HT-29 cells (11.19% ± 0.41% at 4 h). In vivo distribution studies in rats have shown a low uptake of radioactivity in neurotensin receptor-negative organs, such as the blood, liver, bone, spleen, pancreas and muscle at 4 h post injection. A high uptake was found in the intestine, colon and kidneys.
Conclusion: Data show that this new labeled analogue exhibits favorable biodistribution pattern and is a specific radioligand for diagnostic of neurotensin receptor positive tumors.

OP 113

Thursday, May 17, 2012

11:30-12:30, Hall 3

Interventional radiology in Iran

Hossein Ghanaati

Tehran University of Medical Sciences

Interventional radiology give us new ways to treat patients. In each country establishment of this disipline have it's especial strategy. Interventional radiology have been born in Imam khomeini University Hospital in Tehran. First deidcated interventional departement have been started from 1996. Stablishment of percutaneous laser dics decompression, vertebroplasty, vascular procedure including Uterine artery embolization, aortic stenting and neurointerventional procedures one by one have been done. Our strategy was: 1-Stablishing each new procedure that haven't done in country one by one. 2-Publishing our results after gathering enough cases. 3-Funding a research center "Avdance Diagnostic and Interventional Radiology Research Center" in Tehran University of Medical Sceinces. 4-Educational and research cooperation with moderen interventional departement of advanced countries.

OP 114

Saturday, May 19, 2012

12:30-13:30, Hall 4

Preparation of a ^{99m}Tc-nitrido phenyl piperazin complex for brain receptor imaging

Mostafa Erfani[1*], Leila Hassanzadeh[2], Mohammad Mazidi[1], Mostafa Goudarzi[1]

[1]Nuclear Science Research School, Nuclear Science & Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Tehran, Iran
[2]Department of Nuclear Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Molecular imaging is a promising method of identifying various abnormalities in central nervous systems. Most of the PET studies in humans with mood disorders have focused on the neurochemical binding abnormalities related to serotonin and dopamine systems. The 5-HT_{1A} receptor antagonist ^{11}C-WAY-100635 is commonly used as a radiotracer to measure serotonin receptor levels in the brain. As ^{99m}Tc is still ideal radionuclide in the diagnostic nuclear medicine many attempts have been made by several groups to develop ^{99m}Tc complexes for 5-HT_{1A} receptor imaging. Here the synthesis and biological evaluation of a new radioligand as a serotonin receptor imaging agent are reported.
Methods: The phenyl piperazine was selected as the functional group and was conjugated to dithiocarbamat. The synthesis compound was radiolabeled with ^{99m}Tc-nitrido core and radiochemical purity was characterized by ITLC and HPLC. Stability was tested in vitro in normal saline and human serum albumin. The partition coefficient of the complex was determined by measuring the activity partitioned between the n-octanol and aqueous phosphate buffer (0.25 M, pH=7.4). Invivo biodistribution study of radioligand was carried out in normal rats.
Results: The conjugated compound was prepared with high yield and the radiochemical purity of ^{99m}Tc-nitrido complex was over 90% as determined by HPLC. Radio conjugate was stable with no special decomposition at room temperature over a period of 16 h. The partition coefficient (log p) value of ^{99m}Tc-complex was 0.7±0.05 which showed lipophilicity for compound. Invivo distribution studies in rats have shown a moderate initial brain uptake. Regional brain distribution showed that hippocampus had the highest uptake at 5 min post injection. In blocking study the hippocampus uptake was decreased obviously. After 60 min post injection high liver and kidney uptake was observed that showed hepatobiliary and urinary excretion of radioligand.
Conclusion: The result indicates that this complex has a favorable property and a further modification and biological investigation may lead to identify useful candidate for serotonin receptor imaging.

OP 115

Thursday, May 17, 2012

16:00-17:30, Hall 4

Radiolabeling of ofloxacin with ^{99m}Tc and its biological evaluation in infected mice

Mostafa Erfani[1*], Ali Reza Dorodi[2], Leila Hadisi[2], Mohammad Mazidi[1], Mostafa Goudarzi[1]

[1]Nuclear Science Research School, Nuclear Science & Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Tehran, Iran
[2]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Introduction: Infection and inflammation diseases are the major cause of mortality in all countries. Scintigraphic imaging is a powerful diagnostic tool in the management of patients with infectious or inflammatory diseases. Radiolabeled leukocytes are still considered the gold standard to detect infectious and inflammatory lesions in patients. However due to difficulties in preparation, there is a great interest in the development of new radiopharmaceuticals for infection imaging. ^{99m}Tc has been the isotope of choice for development of novel radiopharmaceuticals owing to its short half life and optimal gamma energy. Antibiotics are being used for the specific diagnosis of infection by exploiting their specific binding properties to the bacterial components, thereby making it possible to differentiate infection from sterile lesions. Ofloxacin is a broad spectrum antibiotic of the fluoroquinolone group which have structural similarity with ciprofloxacin and can be labeled with ^{99m}Tc.

Methods: Ofloxacin was radiolabeled with the precursor ^{99m}Tc and characterized by ITLC and HPLC. For labeled ^{99m}Tc-ofloxacin the radiochemical stability in saline, human serum and also in vitro binding with *staphylococcus aureus* were studied. Biodistribution of labeled compound in *staphylococcus aureus* infected mice muscles were studied using *exvivo* counting and scintigraphy.
Results: Labeling yield of >95% was obtained corresponding to a specific activity of 150 GBq/mmol. The stability of radiolabeled ofloxacin in human serum was 60% after 1 hour post incubation. *In-vitro* studies showed 45% of radioactivity was bound to bacteria. After injection into mice clearance from the circulation occurred mainly by biliary-renal clearance and site of infection was detected within 4 h post injection. Target to non-target muscle ratio was 2.03 ± 0.15 % at 4 h post injection.
Conclusion: ^{99m}Tc-ofloxacin showed favorable radiochemical and biological characteristics which permitted detection of the infection and could be considered as an alternative for ^{99m}Tc-ciprofloxacin for infection detection in nuclear medicine.

OP 116

Saturday, May 19, 2012

9:30-11:00, Hall 3

The Role of r-CBF SPECT in evaluation of dementia

Shahram Seifollahi-Asl

Arad Hospital, Tehran, Iran

Single photon emission computed tomography (SPECT) & positron emission tomography (PET) imaging of the brain are functional neuronuclear imaging techniques that allow noninvasive study of physiologic & pathophysiologic events in the human brain. Over past two decades, clinicians & researchers have gained substantial experience in using the three-dimensional imaging capabilities of SPECT & PET for identification & differential diagnosis of dementia. Overall, in many instances, findings of r-CBF SPECT & FDG-PET imaging in different types of dementias are similar. In era of using dedicated SPECT instrumentation & new quantitative regional cerebral blood flow (r-CBF) soft wares (particularly statistical parametric mapping-SPM), the sensitivity of r-CBF SPECT imaging results are also more closer to FDG-PET findings & in centers which PET imaging is unavailable, r-CBF SPECT has been approved for functional neuronuclear imaging evaluation of dementia. Alzheimer's disease (AD) is the most important & common degenerative brain disease. There is now agreement that AD is amenable to diagnosis and that the diagnosis should not be one of exclusion. Early detection, differential diagnosis, assessment of severity & follow up treatment of dementias (particularly AD) are the main purposes of recent studies of functional neuronuclear imaging which has been using measures of regional cerebral blood flow, glucose metabolism or oxygen utilization. Minimal cognitive impairment (MCI), is a pervasive defect in memory of individuals 50 years or older which typically dose not affect daily activities & cannot be explained by head trauma, drug effects, medical illnesses & psychiatric conditions including depression. Of individual affected, 12-15% progress to AD in one year & 47% in three years (vs. 1-2% of normal population). Therefore MCI is judiciously considered "a waiting room for Alzheimer's disease". Finding of FDG-PET, r-CBF SPECT (with using statistical parametric mapping) & volumetric MRI have been useful & approved for evaluation of MCI & early detection of dementia process. Different types of dementias including AD, vascular dementias, Lewy body dementia, dementia associated with Parkinson disease, different types of frontotemporal dementia (including Pick disease) & etc have particular patterns in r-CBF SPECT which are overall similar to FDG-PET findings & can be use in differential diagnosis & even some times classification of dementias.
The severity of regional cerebral blood flow or glucose metabolism deficits correlates with severity of dementia in most instances & many studies demonstrate usefulness of r-CBF & FDG-PET imaging findings in evaluation of treatment as well.

OP 117

Friday, May 18, 2012

14:30-15:30, Hall 4

Implications of the international basic safety standards on medical exposure with special regards to nuclear medicine

Mehdi Sohrabi, Ph.D.

Faculty of Physics, Amirkabir University of Technology, Tehran, Iran

The new international basic safety standards (IBSS); radiation protection (RP) and safety of radiation sources; international basic safety standards (Interim Edition, IAEA Safety Standard Series GSR Part 3 (Interim, 2011) reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation. The requirements of such standards are based on the ICRP updated radiation risk in ICRP 103 (2007). While ICRP 103 does not change the dose limits for occupational and public exposures, the methodology for calculating the doses has changed. ICRP and in turn IBSS now use a situation based approach to characterize the possible situations where radiation exposure may occur as: existing, planned, and emergency exposure situations. It applies one set of fundamental principles of protection for all these situations. In fact, medical exposure in this context is a planned exposure situation. Also the protection of individual patients and aim to guarantee good medical practice has been emphasized by the implementation of the principle of justification of individual medical exposures, strengthening the legal requirements for optimization of protection and for prevention of unintended exposures as well as making corresponding actions at national level to meet the revised legal requirements. Among others, requirement that staff exposure is also taken into account in justifying a medical procedure. The optimization of RP in medical exposure is substantially unchanged except that the use of diagnostic reference levels (DRLs) has been expanded to situations such as in interventional radiology, when appropriate.
Education, information, and training of workers, RP officers (RPO) and patients have been of prime importance by incorporation of existing requirements, mandatory introduction of RP course (s) in curriculum of medical and dental schools, dissemination of appropriate information relevant to RP in medical exposure on lessons learned from significant events, and new requirements for informing patients, recording patient doses, and recording, reporting and follow-up of accidental and unintended exposures. In order to meet the IBSS requirements for protection of workers, patients and public in medical and other applications, Iran has played a major role in education and training. Among others, the Faculty of Physics of the Amirkabir University of Technology has established a professional training centre so called the "Iran School of Health Physics" (ISHP) and is in the process of establishing a health physics option in its postgraduate program. The principle rational of "ISHP" is to provide standard professional train-the-trainers and task-specific national, and possibly regional/ international training events for radiation workers, RPOs, medical physicists, lawyers, etc. to meet the IBSS requirements. This is an independent educational institution with no regulatory interest conflicts for national training. In this paper, the new ICRP concepts and in turn those of IBSS 2011 as regards to the protection of workers, patients, and public from medical exposure and the program of "ISHP" are reviewed and discussed.

OP 118

Friday, May 18, 2012

14:30-16:00, Sa'di Hall

New technologies in sentinel lymph node biopsy

O.E. Nieweg[1*], O.R. Brouwer[2], R.A. Valdés Olmos[2]

[1]Skin and Melanoma Center and Department of Surgery, [2]Department of Nuclear Medicine, The Netherlands Cancer Institute, Amsterdam, the Netherlands

There are four new developments in sentinel node imaging that may facilitate the procedure. Single photon emission computed tomography combined with CT (SPECT/CT) is a hybrid imaging technique that depicts the sentinel node in its anatomic habitat. This new imaging technique visualizes more sentinel nodes compared to conventional lymphoscintigraphy. In some patients, SPECT/CT shows that the node is in another location than the conventional images suggest which leads to a change in the surgical approach. SPECT/CT can visualize second-tier nodes and enables the surgeon to determine their exact location. This may help deciding on the extent of the node dissection in case of an involved sentinel node.
The Sentinella is a portable gamma camera for intra-operative use. Our initial experience with this device is that the sentinel nodes can be visualized and harvested. Post-excision scanning of the operative field can reveal additional sentinel nodes.

Fluorescent tracers convert the wavelength of invisible near-infrared light into a different wavelength. Using a near-infrared light source and a special camera, the location of the tracer can be determined through a layer of tissue. A new tracer combines the radioactivity and fluorescence.
Freehand SPECT is a novel three-dimensional imaging modality based on acquisition of data on the location of a radioactive sentinel node using a hand-held detector. In several pilot studies, investigators at the Technische Universität München demonstrated that this approach can help the surgeon plan the incision and can visualize the depth of the node in the operating room.
These innovative techniques show a trend for combining physiologic and anatomic information and for moving the imaging into the operating room. We expect these new techniques to be of particular value in the difficult areas for lymphatic mapping like head and neck, the pelvis and the retroperitoneum.

OP 119

Thursday, May 17, 2012

9:30-10:30, Hall 3

Clinical application of quantitative ventilation/perfusion SPECT

Marika Bajc

Department of Clinical Physiology, University Hospital, Lund, Sweden

Introduction: To reassess the clinical value of ventilation –perfusion scintigraphy in light of recent advances of SPECT methodology (V/P_{SPECT}) and new holistic interpretation criteria.
Methods: V/P SPECT studies (V/P_{SPECT}) were performed in clinical practice from 2003 until end of 2011 in more than 11 000 patients. From 2004 all studies were quantified for segmental and subsegmental extension of PE and were treated accordingly. During 2 years period 1785 patients examined with V/P_{SPECT} were followed up for their outcomes.
Results: The normal finding was observed in 30%, PE in 30% of patients. 153 patients have been examined with multislice MDCT and V/P_{SPECT} to clarify suspicion of PE. Among patients not showing sign of PE, ventilation helped to explain perfusion defects of different nature such as obstructive diseases, parenchymal changes as pneumonia, tumor and heart failure. This group represented 39% of patients. Positive predictive value for PE diagnostic was 99 % and negative predictive value was 98%. We also quantify extension of PE. This has an impact on PE treatment. Patients with lung perfusion defects up to 40 % and ventilation defects up to 20 % are treated at home. Since 2004 until end of 2010 we found PE in ca 2000 patients. 5% of them were treated at home with no thromboembolic mortality. Inverted perfusion gradient allowed diagnosis of left heart failure with a positive predictive value in 88%. V/P_{SPECT} is also used for estimation of lung function and phenotype in patients with chronic obstructive lung disease. New standardized technique together with holistic interpretation reduced the rate of non-diagnostic reports to the level of 1%.
Conclusion: The low cost and the short time for study completion are attractive. V/P_{SPECT} can be performed in any patient, without the burden of contrast and with minimal radiation exposure. It offers a first hand method for diagnosis of PE. Since the extension of PE is well quantified, it is invaluable for the decision of outpatient therapy in selected patients and for their follow up. V/P_{SPECT} is also of great value for diagnostics of other diseases such as left heart failure, obstructive lung disease and pneumonia. No contraindication and low radiation exposure merit it as a first choice technique. With increasing number of tomographic gamma cameras V/P_{SPECT} should be applied in each hospital applying the standard software offered together with modern systems.

OP 120

Thursday, May 17, 2012

8:00-9:30, Main Hall

Myocardial perfusion imaging -from clinical aspects to endothelial function measurements

Keiichiro Yoshinaga

Department of Molecular Imaging, Hokkaido University Graduate School of Medicine, Japan

Coronary artery disease (CAD) continues to be a major cause of death in industrialized society and in developing countries as well. Diagnostic techniques for evaluating myocardial perfusion play an important role in the identification of CAD and determination of their prognosis.
Nuclear imaging has played an important role for diagnosis of CAD since early 1970. Myocardial perfusion SPECT has been applied for detection of extent and severity of myocardial ischemia. The risk assessment using myocardial perfusion SPECT is now well established based on large number of well designed studies. The myocardial perfusion SPECT has high capability to differentiate patients from low to high risk for future cardiac events especially in patients with intermediate likelihood of having CAD. This greatly contributes the clinical decision making and patient's care.
Positron emission tomography (PET) MPI has high diagnostic accuracy and can estimate regional myocardial blood flow (MBF) in patients with CAD. Recent data have shown better diagnostic accuracy compared to SPECT. PET MPI has also shown prognostic value in patients with CAD. Rubidium-82 (^{82}Rb) is a generator-produced PET myocardial perfusion tracer and has been widely used in North America in clinical practice. PET MBF estimation has additional diagnostic value and prognostic value over standard relative perfusion imaging. The non-invasive aspects and coronary specificity of measurements of MBF using PET with sympathetic stress make it widely applicable for the evaluation of endothelial function. PET MBF measurements and endothelial function measurements have been applied to a variety of subjects with coronary risk factors and have been shown to have value for risk assessment in these subjects.
Recent technological advances, such as PET, molecular imaging, , semiconductor SPECT, and new stress agents, have contributed to reduce data acquisition time and enhanced diagnostic accuracy. These new developments would further raise an importance of myocardial perfusion imaging for myocardial ischemia detection, early atherosclerosis detection, and hence patient's care.

OP 121

Saturday, May 19, 2012

9:30-11:00, Hall 3

Dopaminergic brain imaging

T. Brücke

Wilhelminenspital, Vienna, Austria

Differentiating Parkinson's disease (PD) from essential tremor or other parkinsonian syndromes solely by clinical examination can be challenging in some cases, especially in the early stage of the disease. Only half of the outpatients diagnosed as having PD fulfill clinical diagnostic criteria. Post mortem studies have shown that the accuracy of a clinical diagnosis of PD may not exceed 90 %, even when using strict diagnostic criteria.
Essential tremor and other tremor syndromes, drug-induced parkinsonism, vascular parkinsonism, parkinsonian syndromes in dementing disorders and atypical parkinsonian disorders such as multiple system atrophy (MSA) account for the majority of misdiagnoses. Brain SPECT imaging using dopamine transporter ligands such as 123I-β-CIT or 123I-Ioflupan (DatScan) enables the reliable documentation of dopaminergic degeneration in PD and atypical parkinsonian disorders even in early stages of the disease, and thus helps to differentiate these disorders from nondegenerative parkinsonian and tremor syndromes. Furthermore, dopamine transporter imaging can be used to differentiate dementia with Lewy bodies (LBD) from Alzheimer's disease (AD). Postsynaptic dopamine D2 receptor imaging using 123I-IBZM can help to differentiate PD from MSA and progressive supranuclear palsy. In this lecture an overview of typical SPECT findings in parkinsonian syndromes and clinical indications for SPECT examinations in these disorders will be presented.

OP 122

Sunday, May 20, 2012

9:30-10:30, Sa'di Hall

Juvenile osteoporosis

AbdulRahim Al Suhaili

Dubai Hospital, UAE

Osteoporosis name originated from bone (Osteon) with excessive holes (Porous) compared to a normal bone. Therefore there is either too little bone formation or excessive bone loss, or a combination of both. Although children and adolescents Osteoporosis is rare, but when it does occur, it is usually caused by an underlying medical disorder or by medications used to treat that disorder (Secondary osteoporosis). However, sometimes, the cause is not identifiable in a child (Idiopathic osteoporosis). Juvenile osteoporosis is a significant problem as it occurs during the prime bone-building years (from birth through the teens), children steadily accumulate bone mass, which peaks sometime before age 30. The greater their peak bone mass, the lower their risk for osteoporosis later in life. The diagnosis of juvenile osteoporosis should be done before a bone breaks with or without trauma. A bone mineral density (BMD) score below -2.0 should be considered as alarming sign. BMD is the most accurate way to detect reduction in bone mass early on. But this type of BMD can't be used like with adults. Bone scan can only show fracture but it may not show anything before that. The difference between BMD parameters in juvenile and adult Osteoporosis will be highlighted particularly the bone volume in relation to age and use of Z-score instead of T-score in reporting results obtained from different ages of children. I'll also present some examples from the following conditions: juvenile arthritis, diabetes, cystic fibrosis, leukemia, osteogenesis imperfecta, genetic metabolic disorder (homocystinuria), hyperthyroidism, hyperparathyroidism, cushing's syndrome, malabsorption syndromes, anorexia nervosa, kidney disease.

OP 123

Thursday, May 17, 2012

9:30-10:30, Hall 3

^{90}Y radioembolizayion in clinical interventional oncology

Arash Eftekhari

Department of Radiology, Vancouver General Hospital, University of British Columbia
Canada

Selective Intra-arterial chemoembolization is being used since late 1970s becoming an acceptable procedure for treatment of uncontrolled primary or metastatic liver tumors. Radioembolization is a newer form of intra-artetial approach for treatment of unrespectable tumors.
Y-90 microsphere is a favorable agent for transateral delivery to complicated neoplastic lesions. We present our experience and preliminary results at Vancouver General Hospital, University of British Columbia.

OP 124

Thursday, May 17, 2012

11:30-12:30, Sa'di Hall

Hybrid Imaging in Cardiology

Hee-Seung (Henry) Bom, MD, PhD

Chairman, ARCCNM Professor, Dept. of Nuclear Medicine, CNU Medical School, S. Korea

Myocardial perfusion imaging (MPI) using SPECT and PET has been used to evaluate ischemic heart disease for decades. Recently cardiac hybrid imaging was introduced, which consisted of the fusion of functional (myocardial perfusion and metabolism) and anatomical (coronary anatomy and stenoses) information. Hybrid imaging offers superior information on diagnosis and prognosis of coronary artery disease than stand-alone or side-by-side studies. It is particularly true in patients with multivessel disease. Possibilities of combining MRI, optical imaging as well as ultrasonography are also expected. Photoacoustic imaging can be a promising tool to evaluate vascular pathophysiology. Combination of multiple promoters or using multiple ligands for multiple imaging modalities was actively explored experimentally. Although significant number of studies are undergoing at specialized cardiac centers, bedside clinical benefits are still awaited. Targeted molecular therapy using both anatomical information of CT coronary angiography or MRI and functional information of SPECT, PET, and optical imaging techniques can be the future of cardiac hybrid imaging.

OP 125

Sunday, May 20, 2012

9:30-11:00, Hall 4

Technical aspects of SPECT/CT

Peter Knoll and Siroos Mirzaei

Dept. of Nuclear Medicine with PET Center, Wilhelminenspital, Vienna, Austria

Diagnostic imaging has a significant impact in the management of patients. Multimodality imaging uses two set of images of two independent modalities, single photon emission computed tomography (SPECT) and an anatomical procedure (X-ray CT) yielding a superior imaging study. SPECT is based on the use of single photon visualizing the function whereas X-ray CT is used for the precise localization and type of morphological changes that have occurred in the lesions.
Since only one photon is emitted a collimator is used in front of the detector to ensure that "only" photons are counted that falls perpenticiular on the detector surface. The projection data are acquired around the patient and are later used to calculate transactial slices. The application of hybrid studies have led to a revolution in the field of imaging, with highly accurate localization of tumor sites, assessment of invasion into surrounding tissues, and characterization of their functional status.
In this lecture we will give an introduction to gamma camera/SPECT design and will give also an overview of several image reconstruction techniques.

OP 126

Thursday, May 17, 2012

11:30-13:30, Hall 4

Technical aspects oF PET/CT

Peter Knoll and Siroos Mirzaei

Dept. of Nuclear Medicine with PET Center, Wilhelminenspital, Vienna, Austria

Positron Emission Tomography (PET) is an imaging modality that can provide functional information of the human body. A positron is emitted from the nucleus of a radionuclide. Once emitted this positron (or anti-electron) travels several millimeters until it meets a free electron from the surrounding atoms, at which time an annihilation event takes place. The masses of the electron and positron are converted into two "annihilation" photons. The energy of the two photons will equal the rest mass of the original electron and positron (511 keV). Both photons will be emitted in a 180 degree opposite direction to one another.
To be recorded as an annihilation coincidence event, the gamma rays detected by the opposing detectors must occur within a very short interval of time called the coincidence window.
The PET scanner continuously records the coincidence events, and this data must be reconstructed to generate transaxial images. Today iterative reconstruction methods are used because they allows to implement correction methods for attenuation and scatter more easy.
In this speech we will give an introduction to the technical aspects of PET such as detector design, acquisition modes (2D, 3D, 4D) and reconstruction algorithms.

OP 127

Friday, May 18, 2012

14:30-16:00, Sa'di Hall

SLN biopsy in urological cancers

Simon Horenblas

Dept. of Urology, Netherlands Cancer Institute, Amsterdam, The Netherlands

SLN biopsy was introduced in urology by Cabañas for squamous cell cancer of the penis. The procedure did not meet great enthusiasm initially, due to a high false negative rate. Only after improvement of the procedure, SLN biopsy became more and more integrated in urology. Nowadays SLN biopsy can be used for staging in almost every urological tumour.

Kidney Cancer: The role of the SLN biopsy in the management of renal cancer is unknown. Reasons being: insufficient knowledge of the drainage pattern and doubts about the therapeutic value of lymphadenectomy. A general notion is, that the draining LN's are in the hilar region branching off into the paracaval, interaorto-caval or paraaortal retroperitoneal LN's. However the metastatic pattern of renal cancer is also characterized by a high probability of hematogenic spread together with or even without lymphogenic spread. This latter aspect may explain the dubious therapeutic role of lymphadenectomy. A feasibility study showed that intraoperative identification is possible with all common surgical approaches. SPECT-CT is mandatory for correct identification. A concern is absence of lymphatic drainage in 30% of the patients so far.
Bladder cancer: The role of SLN biopsy in bladder cancer has been assessed in large series. It has been instrumental in exactly defining the various landing zones of bladder cancer. There is no doubt about the therapeutic value of removing small metastatic deposits in the lymphnodes. Hence the focus on a complete lymphadenectomy in the surgery of bladder cancer. Considering the relative high false negative rate (≥19%) and the therapeutic value of a complete removal of lymph node metastases, there has been reluctancy in the use of SLN biopsy as a mean of omitting lymphadenectomy in the absence of a tumor +ve SLN.
Prostate cancer: SLN biopsy is currently an integrated part of the diagnostic armamentarium in intermediate and high risk prostate cancer at our institute. The exact knowledge of the histopathology of the SLN is used for radiation planning and for risk stratification. In tumor –ve patients only the prostate is irradiated usually in combination with 6 months of anti-androgen therapy. In tumor +ve patients the radiation field is extended to the regional lymph nodes in combination with 2-3 years of adjuvant anti-androgen therapy.
Penis cancer: SLN biopsy in penis cancer has been at the heart of all SLN applications in urology. At our institution SLN biopsy for penis cancer has been used since 1994. A tumor –ve SLN permits omission of an inguinal lymph node dissection, a procedure not without serious morbidity. Now with more than 600 patients who underwent this procedure the negative predictive value, the sensitivity and specificity are: 98%, 88% and 100%
Testicular cancer: A complete retroperitoneal lymph node dissection, wait and see, a risk adapted strategy based on histopathology of the primary and adjuvant radiation have all been treatment modalities after removal of a stage I testicular cancer. A reliable SLN biopsy could make a trustful choice between these modalities. For this reason a clinical trial was started at our institution. So far no false negative SLN's have been found. PET-CT is mandatory to exactly localize the SLN.

OP 128

Saturday, May 19, 2012

9:30-11:00, Hall 5

Artefacts and pitfalls in myocardial perfusion imaging

Qaisar Hussain Siraj

Department of Nuclear Medicine, Farwania Hospital, Kuwait

Myocardial perfusion imaging is a powerful tool in the diagnosis and prognosis of coronary artery disease. Nuclear cardiac imaging involves a succession of stages, procedures and operations. This cascade of multidisciplinary processes is essential to the production of high-quality images. In order to consistently obtain optimum quality images, one should not only be cognizant of the idiosyncrasies of the equipment and software, but should constantly on the alert against various underlying causes of erroneous or inconsistent scan results, which may affect the quality and interpretation of individual images.
The inherent complexity of myocardial imaging and the multiple steps involved in the process makes it vulnerable to a number of pitfalls that might originate from radiopharmaceutical preparation and patient administration to image acquisition, processing and display. Not surprisingly, a significant proportion (15-25%) of cardiac scans is associated with attendant artifacts. A knowledge and awareness of the multiple sources of artifacts, either patient-related or technical in nature, is therefore essential to enable the identification, timely correction and prevention of such artifacts.
Prospectively, the technique and methodology should be optimized and tailored to the individual being investigated; retrospectively, knowledge of various sources of errors that impact on image

quality is important for correct interpretation. Identification and correction of artifacts is essential to obtain high standard diagnostic studies.

OP 129

Friday, May 18, 2012

14:30-16:00, Sa'di Hall

Use of intra-operative gamma camera for sentinel node detection in breast cancer: the UK experience

M. Keshtgar, D. Ghosh, V. Stafyla, T. Davidson, C. Wickham, D. MacCool

Departments of Surgery and Nuclear Medicine, Royal Free Hospital, University College London, United Kingdom

Introduction: Sentinel node biopsy (SLNB) is now the standard of care for staging of early breast cancer. Access to nuclear medicine department and sentinel node imaging remains an issue in number of hospitals in the UK and abroad.
We tested Sentinella, a new portable imaging camera used for real time visualisation and localisation of Sentinel nodes. Sentinella was tested in a controlled laboratory environment at our centre followed by clinical use. We report the first use of this novel technique in breast cancer patients in the UK.
Methods: Sensitivity and spatial resolution of Sentinella was compared with a CGC (conventional single headed gamma camera) in laboratory settings. This was followed by intra-operative use and its accuracy and sensitivity was compared with lymphoscintigrams and hand held gamma probe.
Sentinella scans of the axilla were obtained in 85 patients undergoing SLNB. All patients had a preoperative lymphoscintigram. Serial Sentinella scans were obtained after removal of every hot node.
Results: Sentinella resolution is comparable with the CGC for objects close to the camera and detects high radioactivity with equal accuracy and is faster than cGC, nearer the skin.
Sentinella scans correlated with all the lymphoscintigrams in the 85 cases studied. Serial decay in activity was seen with removal of every hot node. Extra nodes were picked up in 6/85 cases after the axilla was found silent using hand held gamma probe. In 2/85 cases extra nodes found had cancer that led to axillary clearance. Sentinella scans were extremely useful in differentiating between a hot sentinel node and signal from injection site in upper outer quadrants of small sized breasts.
Conclusion: Sentinella is accurate and fast in detecting radioactivity in the axilla. The anatomical shape of its collimator allows the operator to place it close to the axilla thus increasing sensitivity in cases of low radioactivity.Our independent tests and initial patient data confirms the excellent sensitivity and specificity. It's major advantage is that it can be used by surgeons to scan for residual nodes before completion of the procedure. It can resolve the problem of centres that do not have nuclear medicine departments on site and can potentially be a valuable tool for use in the developing world.

Poster Presentations*

***The abstracts published in this supplement have been edited by the Scientific Committee of 10th AOFNMB congress and were not subject to the standard reviewing process of the "Iranian Journal of Nuclear Medicine".**

P 001 Determination of the dosimetric characteristics of IrSeed ^{125}I brachytherapy source

Vahid Lohrabian[1*], Seyed Mahmoud Reza Aghamiri [1], Shahab Sheibani [2], Behroz Ghozati [1], Hossein Pourbeigi [1]

[1]Shahid Beheshti University, Tehran, Iran
[2]Nuclear Science Research School, Nuclear Science and Technology Research Institute, AEOI, Tehran, Iran

Introduction: low dose rate brachytherapy sources have been used widely for interstitial implants in tumor sites, particularly the prostate. Dosimetric characteristics of IrSeed ^{125}I (4.7mm length) brachytherapy source have been determined using the LiF TLD chips.
Methods: Dose distributions around the IrSeed ^{125}I source were measured in a Plexiglass phantom using TLD-100 LiF thermoluminescent dosimeters (LiF:Mg,Ti, TLD-100, Harshaw). In this work a PMMA slab phantom of dimensions 30 cm× 30 cm × 7.3 cm was used to measure the dose distribution around the sources.
Results: The dose rate constant, Λ, was measured to be 0.965±0.06 cGyh^{-1}U^{-1} using LiF TLDs in Plexiglass phantom and the radial dose function, g(r), of the IrSeed ^{125}I source was measured at 0.5 cm increments from 0.5 to 1 cm and 1 cm increments for distance between 1 cm to 7 cm using the LiF TLDs chips.
Conclusion: Basically, the dosimetric parameters that have presented for this new source, have many clinical and treatment planning applications.

P 002 Dual radioisotopes simultaneous SPECT of Tc-99m tetrofosmin and I-123 BMIPP using a semiconductor detector

Yasuyuki Takahashi[1*], Hayato Ishimura[2], Yoshiko Okizuka[2], Masao Miyagawa[2], Teruhito Mochizuki[2]

[1]Gunma Prefectural College of Health Sciences, Japan
[2]Ehime University Graduate School of Medicine, Japan

The energy resolution of a cadmium-zinc-telluride (CZT) solid-state semiconductor detector is about 5%, and is superior to 10% of the conventional Anger type detector. Also, the window width of the high-energy part and of the low-energy part of a photopeak window can be changed separately. Up to now, the method for performing dual radioisotopes simultaneous acquisition usually relied on separating the energy windows as much as possible by narrowing one or more of the energy windows, and a symmetric window was the only choice possible. In this study, we used a semiconductor detector (DiscoveryNM530c; GE Healthcare) and examined the effects of changing energy window widths for Tc-99m tetrofosmin and I-123 BMIPP simultaneous SPECT.
The energy "centerline" for Tc-99m was set at 140.5keV and that for I-123 at 159.0keV. For Tc-99m, the "low-energy-window width" was set to values that varied from 3 - 20% of 140.5keV and the "high-energy-window width" was independently set to values that varied from 3 - 6% of 140.5keV. For I-123, the "low energy-window-width" varied from 3 - 6% of 159.0 keV and the high-energy-window width from 3 - 20% of 159keV. The study imaged one point source or multiple point sources as well as a myocardial phantom. According to the point source, only single radionuclide or dual radionuclide changed energy window width, and compared an acquisition count, crosstalk ratio. The myocardial phantom study compared the following, the contrast of the defect section of the myocardial and different concentration by the myocardial partition (six partitions). And, a clinical study is dual radionuclide simultaneous SPECT by Tc-99m tetrofosmin is 555MBq and I-123 BMIPP is 111MBq.
The contamination to the I-123 window from Tc-99m (the crosstalk) was only 1% or less with cutoffs at 159.0keV -4% and 159.0keV +6%. On the other hand, the crosstalk from I-123 photons into the Tc-99m window mostly exceeded 10%. Therefore, in order to suppress the rate of contamination to 10% or less, Tc-99m window cutoffs were set at 140.5keV+3% and 140.5keV-7%. The results for a point source, the myocardial defect section phantom, and the myocardial partition phantom, inherently intermingled in dual radionuclide imaging, could be well separated

according to radioisotope. And, the clinical study also produced a good SPECT image. We suggest that dual radionuclide simultaneous SPECT of Tc-99m tetrofosmin and I-123 BMIPP using a CZT semiconductor detector is possible employing the recommended windows.

P 003 The role of thyroid scintigraphy in defining the spectrum of pediatric thyroid disorders

Samir Mohamed*, Maytha Shukaily

SQUH, Oman

Introduction: The aim of this study is to determine the role of thyroid scintigraphy in diagnosing the different thyroid abnormalities in the pediatric age group. Thyroid disorders are the commonest endocrinopathies in children and adolescence and early diagnoses and treatment is essential to prevent irreversible nervous system damage and developmental delay.
The screening program of congenital hypothyroidism has started on the 1/1/05 in Oman using umbilical cord blood sampling. The incidence of Congenital Hypothyroidism is 1 in 2700 live births however there are no other statistics available regarding the other thyroid abnormalities. Thyroid Scintigraphy is a safe method of imaging and essential for further characterization of the etiology of the different thyroid abnormalities.
Methods: This is a cross sectional study performed in SQUH on pediatric patients from birth to16 years with thyroid abnormalities who have undergone thyroid scintigraphy during 2005-2009. A total of 94 pediatrics patients underwent thyroid scintigraphy during this period.
All the patients were injected intravenously with 99mTc-99m pertechnitate and imaged 20minutes later, the dose was calculated according to the patient weight.
The thyroid scans were reviewed for visual uptake, homogeneity, position, percentage total uptake (normal uptake range is 1 and 4 percent) and nodules. Ultrasound findings were reviewed for site, size, echo-texture, nodules and cysts. The medical record were reviewed to correlate the radiological results with clinical information, biochemical and histopathology findings.
Results : Thyroid disease was commoner in females 62 patients with 2:1 ratio to males. The reasons for performing thyroid scintigraphy were Thyrotoxic 37%, hypothyroidism 33% and neck swelling 30%. Fine needle aspiration of the 9 solitary cold nodules confirmed neoplasm in 3 and 6 begnin lesions.
Conclusion: Thyroid scintigraphy is useful to differentiate pediatric thyroid abnormalities, especially the patients with congenital hypothyroidism. Ultrasound appears to be complementary to thyroid scans especially in patients with Hasimotos' thyroiditis to exclude thyroid nodules.

P 004 Paliative effect of strontium-89 in bone metastasis in breast cancer

Mehrdad Payandeh

Medical Oncology

From 2009 to 2011, 8 patients with breast cancer and painful bone metastases were treated with strontium-89 (200 MBq). Patients were allocated that form of treatment or strontium-89 (i.v. injection). After 4, 8 and 12 weeks pain sites were mapped, toxicity monitored, and all additional palliative treatments recorded. There was significant pain resolution in 6 patients (after>12 weeks); 33 weeks following strontium-89.
All treatments provided effective pain relief; improvement was sustained to 3 months with 66.1% after strontium-89. Fewer patients reported new pain sites after strontium-89. Platelets and leukocytes fell by an average 30-40% after strontium-89 but sequelae were uncommon, and other symptoms rare.

P 005 Pelvic schewanoma: A rare presentation for this pathology

Mehrdad Payandeh

Medical Oncology

Introduction: We report here a case of benign retroperitoneal schwannoma. retroperitoneal localization in the present case is unusual. Tumor was 41 × 18 × 23 cm in dimension and reached from the prostate to the vertebra L 3 level. Renal function tests results were in the normal range .In diagnostic biopsy schwanoma reported.Histological and immunohistochemical confirmed the diagnosis. Surgical excision was achieved by anterior laparotomy.
Methods: A 31-year-old male was admitted to our clinic with a mass in his pelvic. He suffer from dribbling and periodically urinary retention during six months.A biopsy was taken . The patient blood count and blood chemistry levels were in the normal range. Pelvic and transrectal ultrasonography showed a solid mass, 18 × 41 × 23 cm in size, located between the urinary bladder and the prostate, extending to the umbilical level. Abdominal computed tomography (CT) revealed a 18 × 41 × 23 cm capsulated solid mass originating from the retroperitoneum, with areas of cysts and necrosis, filling the abdomen and pelvis. patient had also mild bilateral ureterohydronephrosis, however, renal function test results were in the normal range. A capsulated retroperitoneal mass separate from the surrounding tissues without any sign of tissue invasion, was detected during operation.
Results: Schwannoma is usually a solitary tumor and arises from extensions of spinal nerves and intracranial nerves, and peripheral nerves of face, neck, body and extremities.Tumor diameter is usually < 5 cm, but mediastinal or retroperitoneal tumors are sometimes larger. tumor is prominent in third and sixth decades of life. Involvement of the urinary system is rare, Urinary system involvement is usually secondary to compression of the tumor to the bladder, ureter or kidney. 0.5–5% of all schwannomas are located retroperitoneally. In the present case, enlargement of the mass with no sign of metastasis in 1 years indicated the benign nature of the tumor. An exact diagnosis is made by pathological examination of the tumor. Immunohistologically, diffuse positivity of S-100 protein and NSE in the cytoplasm of tumor cells is necessary for the definitive diagnosis of schawannoma.
Conclusion: Complete resection of tumor is essential for treatment. Prognosis is usually good and recurrence is very rare. Surgical resection is necessary for recurrences. Adjuvant treatment is not recommended.CT 6 months after surgery showed no recurrence. The degree of hydronephrosis was diminished and renal function test results were in the normal range. The prognosis is favorable for total resection, even for large tumors.

P 006 Planar NaI-123 thyroid scintigraphy using a semiconductor SPECT system

Yasuyuki Takahashi[1*], Hayato Ishimura[2], Yoshiko Okizuka[2], Masao Miyagawa[2], Teruhito Mochizuki[2], Kenya Murase[3]

[1]Gunma Prefectural College of Health Sciences, Japan
[2]Ehime University Graduate School of Medicine, Japan
[3]Osaka University Graduate School of Medicine, Japan

A commercial semiconductor SPECT system (Discovery NM 530c; GE Healthcare) was designed mainly for cardiac imaging and has only a19×19cm field of view. However, we applied the system to planar thyroid scintigraphy and measured NaI-123 uptake ratios in patients. The system achieved better sensitivity than a standard gamma camera. This improved sensitivity can be traded for a shorter acquisition time. The static image was obtained using the front position (No. 12) among the 19 pinholes of this SPECT system. With myocardial SPECT, the No. 12 pin-hole is positioned to yield a lateral view; therefore, the detector was rotated 90 degrees for our static scintigraphy. A SPECT acquisition was also carried out. The planar imaging through the No. 12 pinhole was evaluated with respect to the uniformity of a 10cm-diameter flat phantom, the detectability and alignment of 25 1cm-diameter hot rods, and the visualization of a thyroid

phantom with and without a defect. The size of the defect section was set to a diameter of either 8, 10, 15 or 20mm. The thyroidal scintigraphy was compared with that using a conventional system (INFINIA; GE Healthcare). The thyroidal scintigraphy was undertaken at 24hrs after the oral administration of 7.4MBq of NaI-123 to 20 patients with hyperthyroidism. The acquisition was accomplished using list mode over to 10 minutes. Separate images for 1, 3, 5, 7, and 10 minutes of acquisition time were produced later. In the planar imaging, the uniformity was good, and the positions of the hot rods were faithful to the object. The thyroid-phantom image also was of good quality: any defect section with a diameter of 10mm or more could be detected. About the 24 time uptake ratio of thyroidal scintigraphy, about 10-17% count of INFINIA was higher thanDiscoveryNM530c surrounding the thyroid. Next, when the acquisition time was based on 15 minutes of INFINIA, as forDiscoveryNM530c, an image and measured value were stabilized in the short acquisition time for 3 minutes. Diagnosis by three medical practitioners was in agreement. However, the sensitivity of the left lobe of the SPECT image was remarkably high by 180 acquisitions. This study suggests that NaI-123 thyroidal scintigraphy is feasible using a single pinhole static image from a semiconductor SPECT camera designed for cardiac imaging.

P 007 Treatment Evaluation in Breast Adenocarcinoma Tumor Cells by Combination of Electrochemotherapy and Radiotherapy with Two Different Doses (3 and 5 Gy)

Negar Rahmatpour[1*], Azin Bandi[1], Elham Raeisi[2], Seyyed Aqamiry[1]

[1]Department of Medical Radiation Engineering, Shahid Beheshti University, Tehran, Iran
[2]Department of Radiation Medicine, Tarbiat Modarres University, Tehran, Iran

Introduction: In this study, we were about to evaluate the efficiency of treatment of invasive ductal carcinoma tumors in mice using radiotherapy, electrochemotherapy and also combination of them named electrochemoradiotherapy. Another aim was to apply two different doses (3 and 5 Gy) in radiotherapy and finally to compare the efficiency of the treatment. Naturally, tumoral plasma membrane has a limited permeability for cisplatin. This problem can be solved by different kinds of physical or chemical methods. One of the best physical methods is to apply local electric pulse to the plasma membrane, named electroporation. In this method, the permeability of plasma membrane increases, then the chemotherapy drug (cisplatin) enters the cell (electrochemotherapy).
Methods: The procedure of tumor growth was evaluated in an in vivo research on mice. After transplantation of tumor and reaching the indicated size, mice were divided randomly in treatment groups. In electrochemotherapy protocol, electric pulse was applied to tumors 3 minutes after intratumoral injection of cisplatin and the interval between pulse and radiotherapy was about 20 minutes. The radiotherapy was performed by gamma rays of Co-60 machine.
Results: In cisplatin group, tumor growth delay (TGD) was 5.54 days. TGD reached 11.32 days by combination of cisplatin with radiotherapy (3Gy). Increasing dose (cisplatin + radiotherapy (5Gy)), enhanced TGD by 7 days and made it 20.01 days. In electrochemotherapy group, TGD was 15.53 days. The best result obtained in electrochemoradiotherapy group where TGD was 25.68 days with 3Gy dose and 38.58 days using 5 Gy dose.
Conclusion: This work showed that radiosensitizing effect of cisplatin is potentiated by electroporation of tumors; therefore such treatment combination of electrochemotherapy with radiation can also have clinical applications, especially in cases where normal tissue sensitivity limits increasing the radiation dose to the tumors. Electrochemotherapy has already proved its effectiveness on many different tumor types: melanoma, adenocarcinoma and Kaposi sarcoma, which may also be candidates for electrochemoradiotherapy.

P 008 The role of 68Ga-peptide PET/CT in detection of distant metastasis in patient with hepatocellular cancer

Sudabeh Sobhani[*], N. Ozlem Kucuk, Elgin Ozkan, Erkan Ibis

Department of Nuclear Medicine, Ankara University, Turkey

Introduction : ^{68}Ga-peptide PET/CT has defined as a sensitive and specific method for diagnosis of neuroendocrine tumors. In this case we showed the ability of ^{68}Ga-peptide PET/CT to find hepatocellular cancer metastasis locations.
Methods : A 57 years old man with history of positive HCV was referred to gastroenterology clinic because of stomach pain and vomiting. In the following assessment liver biopsy was accomplished and hepatocellular cancer was reported. This patient has received 3 cures of chemotherapy and evaluated by laboratory, abdomen CT and MRI.
Results: Abdomen CT has showed hypo and hypertrophic areas in the liver and abdominal lymph nodes. Abdominal MRI has defined the same results. Bone scintigraphy could detect bone metastasis in right 6.costal bone. We have performed ^{68}Ga-peptide PET/CT to this patient and there were ^{68}Ga-peptide uptake in abdominal lymph nodes, right 6.costal bone and focal soft tissue in left supraclavicular region.
Conclusion: ^{68}Ga-peptide PET/CT has been known to diagnose the NET's and carcinoid cells. Besides, this imaging can be used to define other malignant cells like HCC metastasis. In contrast to conventional imaging we have the chance of scan of whole body by ^{68}Ga-peptide PET/CT, then finding distant or occult metastatic areas.

P 009 The effect of Direct Observation of Procedural Skill (DOPS) evaluation on the myocardial perfusion scan processing performance of nuclear medicine residents

Ramin Sadeghi*, Vahid Reza Dabbagh Kakhki

Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: One of the main duties of medical university teachers is to help the trainees to have the best performance possible in a cost effective way. Myocardial perfusion scan constitutes a major workload of everyday practice of nuclear medicine specialists. Having enough skill in computer processing of this kind of scan is of utmost importance and can have a huge clinical impact on the patients as well as their physicians. In the current study we evaluated the effect of Direct Observation of Procedural Skill (DOPS) on the myocardial perfusion scan processing performance of nuclear medicine residents.
Methods: A Direct Observation of Procedural Skill (DOPS) checklist was designed by the authors. The following aspects of myocardial perfusion scan processing were evaluated: Choosing the correct workflow, choosing the correct filter, evaluation of patients' motion using linogram and sonogram, motion correction, quality of gated images, subdiaphragmatic activity evaluation, LVEF evaluation. DOPS evaluations were done after each of the trainees had performed 200 processing of myocardial perfusion scan. The performance of the trainees after DOPS was compared with those without having DOPS examination. The included residents were also evaluated again one week after DOPS examination. Mann-Whitney U test and Wilcoxon signed rank test were used for statistical analyses.
Results: Overall 6 residents were evaluated by DOPS. The performance of the trainees before and after DOPS was better in a statistically significant fashion (Mean scores before and after DOPS=75 and 96 out of 100 respectively ($p<0.05$)). The performance of residents without DOPS examination was poor compared to the residents evaluated by DOPS (mean scores of DOPS and non-DOPS groups=96 and 73 out of 100 respectively ($p<0.05$).
Conclusion: DOPS can have a significant effect on improving the performance of resident regarding myocardial perfusion scan processing.

P 010 The effect of training simulator on improving the quality of sentinel node mapping in nuclear medicine specialists

Ramin Sadeghi

Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: Sentinel node biopsy is the standard method of axillary staging in early breast cancer patients. This procedure is multi-disciplinary and needs significant skill to be performed flawlessly. Several groups have evaluated the learning curve phenomenon and training simulator effects on the quality of sentinel mapping of surgeons. In the current study, we evaluated the effect of a training simulator on improving the quality of sentinel node mapping in nuclear medicine specialists.
Methods: A training simulator designed by UCL University was used to train the included trainees (group 1=6 persons). Each trainee had 6 injections under supervision on the simulator. Group 2 included 9 trainees which had conventional training namely oral presentations and 3 real patient injections under supervision. The performance of two groups was compared using Mann-Whitney U test.
Results: Group 1 has better performance compared to group 2 regarding tracer injection and lymphoscintigraphy technique (mean rank=12.5, 12.33 for group 1 and 5, 5.11 for group 2- p values=0.01, 0.02).
Conclusion: Training simulator can be an effective tool for improving the performance of nuclear medicine specialists for sentinel node mapping. We recommend training the nuclear medicine residents with this simulator and including this type of training in the educational curriculum of this discipline.

P 011 Fractal growth of cancer tumor

Salimeh Kimiagar*, Maryam Oweisi

Department of Physics, Islamic Azad University, Central Tehran Branch, Tehran, Iran

Nanobacteria possess unusual properties, making their detection difficult with standard microbiological methods. Scientists interested in nanoparticles, their origin, activity, and biological toxicity. The large number of publications on nanomaterials are in a wide range of fields, including chemistry, physics, materials engineering, biology, medicine, and electronics. Very small particles, so-called nanoparticles, have the ability to damage living organisms. This ability results primarily from their small size, which allows them to penetrate and travel within the circulatory systems of a host. We inhale them with every breath, and consume them with every drink. Nanobacteria play an important role in many chronic diseases where infectious pathogens have not been suspected. In this study, we have shown nanobacteria can act as crystallization centers for the formation of cluster structures. At high concentrations, nanoparticles tend to cluster, forming aggregates. Nanoparticles usually form atmospheric fractal-like dendritic aggregates. We have simulated the nanobactria growth based on epidemic model by Monte Carlo method. The result figures are fractal. We have compared these figures with brain and womb cancer tumor images. Fractal dimension has been found out by box counting method. Calculation of fractal dimension shows the same dimension for simulation results and cancer tumors for scales $100< R < 1000$.It means that we can categorize cancer tumors regard of their statistical properties such as fractal dimension. Nanoparticles are generally classified based on their dimensionality, morphology, composition, uniformity, and agglomeration. There are significant common fractal aspects between our simulation results and cancer tumor images.

P 012 Analysis of effect of milk consumption in dose decreasing of patients' heart perfusion scan with the use of TLD-100h

Navideh Aghaei Amirkhizi*, Sepideh Hekmat, Elham Shahhosseini

Nuclear Science Research School, Nuclear Science Technology Institute (NSTRI), AOEI, Tehran, Iran

In heart diseases that are reported widely in our country, patients' dose of injection is high. In this study the dose of liver and stomach is achieved with use of TLD-100h and for improvement of radiation protection and decrease of patients' dose, milk is suggested. Final results show, patients who have not drunk milk, their liver and stomach doses are much more than who have drunk.

P 013 Comparative evaluation of split renal function obtained with ^{99m}Tc-DTPA and ^{99m}Tc-DMSA scintigraphy

Sachin Tayal*, Anish Bhattacharya

PGIMER, Chandigarh, INDIA

Introduction: Renal clearance in the form of GFR (glomerular filtration rate) or ERPF (effective renal plasma flow) are commonly used parameters in the initial and follow up evaluation of several renal diseases. In patient management the question of relative contribution of each kidney to the renal function is often more important than the global function itself in order to check out whether one kidney is compensating for the other. To evaluate ^{99m}Tc-DTPA and ^{99m}Tc-DMSA studies performed on the same patient and to assess the difference in the calculated split renal function between the two methods.
Methods: In this retrospective analysis, we studied 40 patients (30 male, 10 female) in the age group of 1 month-12 years, who underwent 99mTc-DTPA and 99mTc-DMSA scan within a time gap of one week. Both the scans were processed manually to evaluate split renal function. Patients were divided into different categories on the basis of age and sex. Pearson's method was applied to find out the correlation coefficient between the split renal function calculated from two methods in all the categories of patients.
Results: The overall value of correlation coefficient for left kidney uptake was 0.916 and for right kidney uptake was 0.915, which showed a high degree of positive correlation between two methods. There was no significant difference between males and females. The degree of correlation was lower in infants (0-1 year age group) while there was a high degree of positive correlation in other age groups.
Conclusion: There was overall significant positive correlation between the split renal function calculated from ^{99m}Tc-DTPA and ^{99m}Tc-DMSA scans. Hence, either of the study can be used for evaluation of split renal function with equal sensitivity. However, significant correlation was absent in infant age group which signifies the utility of ^{99m}Tc-DMSA scan in this age group of patients for evaluation of split renal function.

P 014 Comparison between Tc99m-Sestamibi gated myocardial perfusion SPECT and echocardiography in assessment of left ventricular functional indices

Vahid-Reza Dabbagh[1*], Seyed Hashem Danesh-Sani[2], Leila Oskoueian[2]

[1]Nuclear Medicine Research Center, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran
[2]Cardiovascular Department, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: Left ventricular systolic functional indices influence the management of coronary artery disease. Gated myocardial perfusion SPECT(GMPS) allows the computation of left ventricular volumes (ESV & EDV) and ejection fraction (LVEF). Echocardiography is considered to be a routine method for the quantification of these indices. We sought to compare GMPS with 2D echocardiography in the evaluation of LV functional indices.
Methods: In a prospective study, fifty patients (22 men and 28 women) underwent rest Tc99m-Sestamibi ECG-GMPS and 2D echocardiography within 1 days of each other. Quantitative gated single-photon emission computed tomography algorithm (QGS; Cedars-Sinai Medical Center, Los Angeles) was used for computation of LV volumes and LVEF in GMPS images.

Results: 25 patients had normal while 25 patients had abnormal myocardial perfusion SPECT. The mean ESV, EDV and LVEF measured by QGS GMPS were 39.5±52.04, 77.6±55.10 and 62.2%±26.79% respectively while using 2D echocardiography, mean ESV, EDV and LVEF were 50.70±34.89, 87.3±39.05 and 50.40%± 16.06 respectively. There was good correlation between GMPS and echocardiography in ESV, EDV and LVEF.
Conclusion: In patients undergoing diagnostic work-up for CAD, the measurement of LV functional indices GMPS (using QGS algorithm) provides high correlation and satisfactory agreement with the results of echocardiography specially in larger LV cavities. The largest discrepancies were observed in patients with small ventricular volumes.

P 015 Quality control of $^{82}Rb^{m}$ as a PET radioisotope

A.Sattari*, M.Kiyomarsi, N.Shadanpoor

Nuclear Medicine Research Group, Agriculture and Medicine Research School.Karaj-Iran

Introduction: $^{82}Rb^{m}$ is a radioisotope with a half life of 6.5 hours, can be used in positron emission tomography(β+: 26%, $E_{\beta+}$= 0.80MeV and E.C.: 74%). This radioisotope can be used for heart ischemia and coronary stenosis.
Methods: ^{82}Rb was produced by 30 MeV Cyclotron (30Cyclon). ^{82}Kr gas with an isotopic purity of 30% in a special stainless steel compartment with a titanium window, was bombardment by 18 MeV proton energy with a current intensity of 10μA and total current of 5.5 μAh. After washing the compartment and extraction of $^{82}Rb^{m}$, 6.37% mCi/ μAh as total yield was obtained.
Results and Conclusion: Quality Control performed in three steps, radionuclide purity of 93% and radiochemical purity of $^{82}Rb^{m}$ 90% was obtained. For the chemical purity Aluminum, was determinate by polarograph no aluminum was shown.

P 016 Introduction of nuclear medicine phantoms for quality control

Arezoo Soltani

Babol University of Medical Sciences, Babol, Iran

Digital image processing in terms of image restoration assumes a thorough knowledge of the gamma camera transfer function in any clinical measurement. A phantom is designed which can simulate a slice of activity through an organ and hence can be used to determine the corresponding transfer function. The advantage of this phantom compared to an organ and the corresponding attenuation coefficient are not necessary. On the other hand the phantom can be used to determine the depth at which a line source should be positioned for measurement of a certain clinical situation.
Phantoms are shipped to survey participants who are asked to obtain images using the routine technical procedures and to return the results after marking the detected lesions on a square grid, together with the answers to a questionnaire on the measurement conditions.
In this article the type of phantoms in quality control of nuclear medicine procedures, their applications, their features and their Specifications are introduced.

P 017 A new $^{191}Os/^{191}mIr$ radionuclide generator using activated carbon produced by Tehran Research Reactor

Mina Jamre[1*], Nafiseh Salek[1], Mojtaba Shamsaee[1], Leila Moghaddam[2], Amir Reza Jalilian[2]

[1]Faculty of Nuclear Engineering and Physics Amirkabir University of Technology, Tehran, Iran

[2]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), Tehran, Iran

Ultrashort-lived ^{l9lm}Ir (4.96sec, 129 keVphotons) is potentially advantageous for first-pass radionuclide angiocardiography, offering the opportunity to perform repeat studies with very low absorbed radiation dose to the patient. This study describes an investigation on the production of 191Os/191mIr by Tehran Research Reactor (TRR). This radionuclide generator has been developed based on the adsorption of K_2OsCl_6 (Os-IV) on 140-230 mesh heat-treated activated carbon. 191Os-hexachloro-osmate was obtained by thermal neutron (4×10^{13} cm $^{-2}$ s^{-1}) irradiation of enriched ^{190}Os sample followed by fusion with KOH and KNO_3 in acidic media. ^{191}Os is loaded on an anion-exchange column and ^{191m}Ir eluted with normal saline. Each elution is 1ml of 0.9% saline at pH 6.5–7. The yield of generator was assessed for 2 weeks. ^{191m}Ir yield is 15–18% and ^{191}Os breakthrough is about $2\times 10^{-4} – 2\times 10^{-3}$.

P 018 A new method for sepration ^{192}Ir from ^{191}OS/^{191m}Ir radionuclide generator

Nafiseh Salek[1*], Mina Jamre [1, 2], Mojtaba Shamsaee [1], Leila Moghaddam [2], Amir Reza Jalilian [2]

[1]Faculty of Nuclear Engineering and Physics Amirkabir University of Technology, Tehran, Iran
[2]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), Tehran, Iran

The use of ultra-short lived single photon emitting radionuclides for radionuclide angiography (first-pass) offers several advantages including the opportunity to perform rapid repeat studies and a significantly reduced radiation exposure to both patient and personnel.
One of the important radionuclide impurities is ^{192}Ir that is produced during irradiation in reactor. The ^{192}Ir is produced by capture of a neutron by ^{191}Ir, which is formed by decay of the short-lived 4.96s ^{191m}Ir daughter produced by β-decay of ^{191}Os. Elution of even small levels of ^{192}Ir from the 1910s/191mIr generator results in a large proportion of the total absorbed radiation dose from the generator eluate. Purification of ^{191}Os by conversion to osmium tetroxide and isolation by both distillation and solvent extraction methods has been developed for the efficient removal of ^{192}Ir.
Separation this impurity from ^{191}Os is developed by a new approach in this research and the total recovery yield of ^{191}Os is about 99% and the total time required for completion the procedure is about 30 min. This method improved the yield and the time of performance in comparison with values published in literature.

P 019 A new method for diagnosis of stenosed vessel by using estimation of ultrasound signal backsattered by blood

Mohsen Mehrabi*, Saeed Setayeshi

Faculty of Nuclear Engineering and Physics, Amirkabir University of Technology, Tehran, Iran

Introduction: The most important features of the Doppler signal are its nonstationary nature and randomness, which make simulating these kinds of signals difficult. In this study, a method has been proposed for modeling of Doppler ultrasound signals obtained from blood flow passing through stenosed vessels with using simulation of RF signals obtained from moving scatterers (Red blood cells) in different times and depths.
Methods: In this study, it is supposed that a number of RBC are distributed randomly in the vessel. The RBC can be located in new positions according to their motion velocity in any time. Therefore, Doppler Effect can be observed in anytime, with changing of received signals shape obtained from moving scatterers (RBC). Also, the RF signals obtained from RBC are simulated by Slow-Time method.

Results: In order to calculate the accuracy of simulation the obtained RF signals is compared with velocity profile acquired from clinical data. Also, it is used the normalized root mean square for calculation of accuracy of simulation.
Conclusion: Input flow to the stenosed area is in the form of real pulse, i.e. pulsatile blood flow in the vessel and is based on womersley model. For similarity of considered fluid to blood fluid, the intended fluid is used in the form of Non-Newtonian fluid (Power Law). Moreover, distribution of blood flow velocity in stenosed vessels calculated by using of finite elements method (FEM). Also, the calculated NRMS is shown the expresses accuracy of this simulation.

P 020 High resolution small animal SPECT: HiReSPECT for preclinical imaging

Hossein Arabi[1, 2, 3*], Mohammad Hossein Farahani[1, 2], Navid Zeraatkar[1, 2], Saeid Sarkar[2, 4], Salar Sajedi[1, 2], Arman Rahmim[5, 6], Pardis Ghafarian[7], Mohammad Reza Ay[1, 2, 4, 8]

[1]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Parto Negar Persia Co, Tehran, Iran
[3]Department of Medical Physics, CancerCare, University of Manitoba, Canada
[4]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[5]Department of Radiology, Johns Hopkins University, Baltimore, MD, USA
[6]Department of Electrical and Computer Engineering, Johns Hopkins University, Baltimore, MD, USA
[7]NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[8]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

We have designed and constructed a high resolution small animal SPECT system (HiReSPECT) based on compact and high resolution detectors. The scanner is currently configured with two detector heads mounted on a rotating gantry. Each detector comprises a CsI(Na) crystal array (1x1x5 mm elements), two 52 mm square position-sensitive photomultiplier tubes (Hamamatsu H8500) and a ultra high resolution parallel-hole collimator. The active area of the each detector is 96 × 46 mm^2. A computer program was developed to automatically detect the region of each crystal element from the flood image and generate linearity and uniformity correction matrixes. The raw projections data are registered in 40 × 80 matrix, determined by the number of the crystal elements. In this study, phantom experiments were performed to characterize the planar and tomographic performance of the scanner. Beside phantom experiments, whole-body animal scan was conducted to evaluate the quality of in vivo images of small animals. The planar resolution measured with 1.1 mm capillary rods filled with Tc99 placed at the surface of the collimator was 1.6±0.1 mm FWHM. An in-house phantom including 1.6 mm to 2.6 mm hot rods (similar to Micro Deluxe) was built for evaluation of tomographic resolution. A dedicated iterative image reconstruction with the capability of resolution recovery was developed for 3D image reconstruction. In the reconstructed image of the phantom with applied resolution recovery, the 1.8 mm hot rods were distinguishable, that defines the SPECT resolution of the system 1.8±0.1 mm at minimum radius of rotation. The whole-body mice studies were done by injection of Tc99 (MDP) for skeletal scan and Tc99 (DMSA) for renal scintigraphy. The results of phantom experiments and also mice whole-body scans proved that the performance characteristics of the HiReSPECT are suitable for high resolution imaging of preclinical studies and small animal laboratories.

P 021 General preparation of radiopharmaceuticals in nuclear medicine

Arezoo Soltani

Babol University of Medical Sciences, Babol, Iran

Introduction: Teaching nuclear medicine students about working with radio nuclides and mention of key and practical points related to radio nuclides is important in nuclear medicine departments and a variety of educational methods for training students to correct their possible errors has the practical value.
Methods: A teaching poster was provided for correct preparation and use of radiopharmaceuticals. Installation and use of this poster for this purpose, a useful and applied way to introduce the radiopharmaceutical used, the dosage of each prescription and manner of preparing the radiotracer kits in Hot Lab of nuclear medicine department of Emam Reza hospital in Kermanshah have been carried out and for teaching practical units and training nuclear medicine students and thenuclearplanforcesfrom1388to 1390 has been installed and used.
Results: To achieve the results of this poster, the questionnaire was completed by the authorities and personnel departments. The positive results of the surveys were as follows:
- Reduce the error rate of new students in the preparation of nuclear medicine kits
- Reduce the dose received by trainees in the result of reducing technical errors and increase of their operation speed
- Reduce the risk of contamination in the Hot Lab
- Increased academic level of student
- Recall and retraining of personnel and the nuclear plan forces in nuclear medicine department
Conclusion: According to the principles of protection and high sensitivity of working with radio nuclides, people who work with radiation are required to reduce the amount of exposure their own and others and certainly it is very important in the Hot Lab, therefore the installation and use of this poster in nuclear medicine departments can be useful.

P 022 Systematic search of nuclear medicine papers published by iranian scientists

Arezoo Soltani*, Ali Shabestani Monfared, Mehrangiz Amiri

Babol University of Medical Sciences, Babol, Iran

Introduction: This study aimed to assess the research activities of Iranian specialists and experts and awareness of the scientific place of Iran in nuclear medicine scientists among some Asia–Oceania countries using comparison of published papers in scientific journals by systematic search of scientific data base.
Methods: The systematic search was done among the common national and international journals and websites in the field of nuclear medicine by Internet search and the number of published articles by Iranian specialists and others who work in nuclear medicine field compared with some other Asia–Oceania countries.
Results: The following papers were found to be published by Iranian nuclear medicine scientists:
494 papers in Iranian journal of Nuclear Medicine.
20 papers in JNMT.
1358 papers using the keyword "name of Iran's nuclear medicine specialist" in Pubmed
273 papers using the keyword "nuclear medicine in Iran" in Pubmed
67 papers using the keyword "Iranian Nuclear Medicine Article" in web of knowledge
Conclusion: Fortunately, this survey indicates that Iranian researchers' activity in Nuclear Medicine field is encouraging. However, it seems that providing a comprehensive data base network for accessing the nuclear medicine specialists activities is essential to have more reliable results for search.

P 023 Estimation of annual population dose due to diagnostic nuclear medicine procedures in Iran

Akram Safarzadeh*, Arezoo Soltani, Ali Shabestani Monfared, Mehrangiz Amiri

Babol University of Medical Sciences, Babol, Iran

Introduction: Nuclear medicine procedures are associated with exposure of personnel and patients as well as the community. The annual equivalent dose to the patients can be considered as a physical quantitative factor depends on administrated radioactivity and other parameters in each nuclear medicine departments that describes the radioprotection level and predicts the subsequent side effects of radiation exposure. Since the use of nuclear medicine knowledge has been growing in our country and studies has been done in relation to dose patients or staff, limited to a specific area or some departments, the estimation of dose per capita of nuclear medicine procedures in the entire country is very important and will have the national value. The aim of the present study is to estimate the national dose per capita due to diagnostic nuclear procedures in Iran.
Methods: A questionnaire study provided data about the total number of patients and some demographic information as well as administered activity for each patients during 5 years (2006-2011) for semi-random selected 15 from 42 governmental nuclear medicine departments in different geographical locations in Iran. However, we tried that major and central departments are included in the sampling. Using standard dosimetry tables the dose per procedure was determined and total dose of the procedures were divided by total number of population to estimate annual dose per capita in Iranian population due to diagnostic nuclear medicine procedures.
Results: Now, the questionnaires are sent to departments and after receive the information, the total number of patients and thereby the total doses calculated and the per capita dose is obtained by statistical methods and information of calculations with tables will be presented.
Conclusion: As nuclear medicine imaging is going to be more common in medical imaging in Iran, the estimation of population dose will be helpful for further radiation protection decision making authorities.

P 024 Evaluation of beta/gamma coincidence detection in determining of radionuclidic purity of Tc-99m eluate

Mohsen Roshan[1, 2*], Alireza Kamali Asl[1, 2]

[1]Medical Radiation
[2]Nuclear Medicine

Radionuclidic impurities of Radiopharmaceuticals may increase the radiation dose received by the patient, reduce the quality of imaging and caused to generate errors in in vivo measurements. Measurement of the radionuclidic purity of Tc-99m is particularly important since: this is the most widely used isotope in Diagnostic Nuclear Medicine and the radionuclide is produced in-house from a Mo-99/Tc-99m generator. Consequently, it is difficult to control the level of impurities than at a central manufacturing site. The limitations are defined for impurities of Tc-99m such as Mo-99, I-131, Ru-103, Sr-90, Sr-89 and etc. in pharmacopeia monographs. Activity of Mo-99 impurity usually is determined by a simple Dose Calibrator in nuclear medicine centers, but it is specially developed for Mo-99, and has limitations for identification of other radionuclides. Aim of this study is designing a Detection system for more impurities activity determining with specification of small size, efficient and usable in nuclear medicine centers. β/γ coincidence technique for radionuclides activity identifying is most widely used. Generally in this technique two detectors are used coincidentally (i.e., for beta and gamma respectively). Radionuclides with coincidence decay of beta and gamma are capable for detection in this technique. In addition, only beta-emitter Radionuclides could be weighted by turn off the gamma detector. Different geometries had been analyzed with several detectors. The last optimum geometry obtained via monte carlo simulation code (by MCNP4c code) and practical. Since the main problem is detection of beta, thus liquid scintillator is choosed as a beta detector. The liquid scintillator is mixed with Tc-99m eluate in a glass vial. Also NaI(Tl) is selected as a gamma detector and system's geometry are designed. The first pilot setup could measure the Cs-137 test source with activitiy of 44.7nCi without any shielding, and the results showed that it able to quantify impurities upper 0.01% of the main radionuclide. Some advantageous of this geometry setup are high efficiency beta detection, low background, low activity detection, easy source preparation and applicable in nuclear medicine centers.

P 025 A survey of ionizing radiation arrangements in Tehran hospital as a medical research institution

Syed Abbas Hosseini

Zahedan Medical Sciences University, Zahedan, Iran

The radiation of radioactive isotopes into the environment is nuclear medicine interest. The individual discharges of radiation from Shariati and Shohada hospital are relatively small but the discharges in some of rooms are quite large. The aim of this survey is to demonstrate the variation in the radioactive radiation that different medical institutions are disposed into the environment by various routes. Other relevant factors such as availability of site ventilation, monitoring, etc are also discussed. Material & Method: This work was accomplished by a portable detector to measure the levels of radiation discharged to the environment readily throughout the nuclear medicine department of two hospitals by the help of medical physicians who advise and supervise the radiation protection in most of the hospitals, Health services hospitals and medical academics institutions. Hence a wide distribution was achieved from two large hospital and teaching establishment in a large city. Results: A wide variation was found to exist in the arrangements connected with ionizing radiation. The variation was found in activity limits, storages radio isotopes times, radiation monitoring frequencies and in the used organizational aspects of radioactive isotopes by operator and patients. Conclusion: Nuclear medicine centre should be monitored more and accurately, from point of view of radiation dose in environment.

P 026 Energy deposition of ^{131}I in different volumes of thyroid using Monte Carlo simulation

Elham Bavarnegin*, Alireza Sadremomtaz

Department of Physics, University of Guilan, Iran

Radioactive iodine is the most widely-recommended permanent treatment of hyperthyroidism and thyroid cancer.Treatment takes advantage of the fact that thyroid cells are the only cells in the body which have the ability to absorb iodine.Dose calculation of thyroid and other organs are important in point view of radiation protection. In this study the dose of ^{131}I in thyroid was calculated using MIRD method and computational code MCNPX for various phantoms. And also the influence of thyroid volume on the energy deposition of ^{131}I was considered. Monte Carlo calculations show that the total energy deposition in adult phantom has a difference about 9.8% when the lobes' volume varies from 4ml to 50ml. This study can be useful for prescribing adequate and safe doses for better patient care and achieving favorable treatment outcome.

P 027 Exprimental dosimetry of MammoSite brachytherapy applicator in female chest phantom and comparison with multicatheter brachytherapy results

Mina Oshaghi

Student

Accelerated partial breast irradiation via interstitial balloon brachytherapy is a fast and effective treatment method for certain early stage breast cancers but skin, chest wall and lung doses have been correlated with toxicity in patients treated with breast brachytherapy. The purpose of this study was to investigate the percentage of the dose received with critical organs by using termoluminesce detector in MammoSite brachytherpy and compared the ability to control skin, chest wall and lung doses between MammoSite (MS) and MultiCatheter (MC) brachytherapy. Dosimetry carried out using a female-equivalent mathematical chest phantom and Ir-192 source for brachytherapy application.

Our initial results had shown good agreement for surface doses between those calculated from the treatment planning results and those measured from the termoluminescence detector. The mean Skin dose for the experimental dosimetry in MS was 2 Gy (56.76% of prescription dose) and the mean maximum chest wall dose was 3.5 Gy (111.76% of prescription dose). **T**he results shown that the MC method is associated with significantly lower mean skin and chest wall dose than is the MS. The MC technique is quite flexible and can be applied to any size of breast or lumpectomy cavity, But in MS technique, verification of balloon symmetry, balloon/cavity conformance and overlying skin thickness is essential to assure target coverage and toxicity avoidance.

P 028 Motion artifact compensation in pet imaging based on wavelet coefficients

Nikta Jalayer[1*], Majid Bagheri[2], Majid Pouladian[3]

[1]Medical Radiation Engineering Department, Islamic Azad University Science and Research Branch, Tehran, Iran
[2]Mechatronics Computer Department, Islamic Azad University Science and Research Branch, Tehran, Iran
[3]Medical Radiation Engineering Department, Islamic Azad University Science and Research Branch, Tehran, Iran

Recent developments in PET systems have enabled the spatial resolution to reach the 2 mm to 5 mm FWHM range. With such improvements in spatial resolution, even small amounts of motion during PET imaging will become a significant source of resolution degradation. In this work, after reviewing some current methods, the model is introduced which was developed with the help of NCAT phantom and Sim SET. Two phantoms were extracted, male and female, from NCAT to see the differences between the results with the changes in the anatomy of these two phantoms. Then sinograms were produced using Sim SET for all the phantoms available (with respiratory motion and without respiratory motion and for respiratory cycles of 4, 5 and 6 seconds for both male and female phantoms). The sinograms reconstructed using OSEM. Wavelet coefficients were extracted for each slice. The new model is introduced which is designed based on the respiratory cycle 5 seconds, using wavelet transforms. Model is a combination of mapping matrixes that transform non motion images to the images with respiratory motion and vice versa. This model can track and compensate motion due to respiration. The results show that for the first frame and the last one because of very smooth and slight motions the images with motion are not that different from the images without motion, so the proposed model is not responding better than the images with motion. However, for the rest of the frames the model provides better images compare to the images with motion. The model is designed directly from PET images and comparing to other methods, this model not only provides a good estimation for motion but also it does not include the errors caused by markers, monitoring systems and fusion artifacts.

P 029 Evaluation of radioprotective effects of some bis-thiosemicarbazone compounds

Zahra Mehdipour[1*], Alireza Shirazi[2], Amir Reza Jalilian[3]

[1]Nuclear Enginearing
[2]Radiation Protection
[3]Radiopharmacy

GTS, PTSM and ATSM are of derivatives of bis-thiosemicarbazone which are primary ligands for producing the cupper radio medicines.This work studies protective effect of these three compounds at different doses(20,40 and 80 microgram) that administrated one and four hours before whole _body irradiation .Afterward,survival diagram were plotted for different groups.Morever,effective doses of radioprotective compounds (ATSM,80 microgram and GTS,40microgram) were obtained from survival study were adminstered to mice and healthy

biochemical factors of liver (asparate aminotransferase and alanine aminotransferase ensymes) were determined.SGOT and SGPT enzymes diagram for the mice received 80 microgram ATSM showed no significant diefference in comparison with control group.Therefore,administration of ATSM did not produce serious side effects and hepatotoxicity .On the other hand,levels of SGOT and SGPT enzymes in the mice received 40 microgram of GTS showed significant difference in comparison with control group.Thus,it seems that ATSM molecule is a better candidate to carry outh further research on protection against irradiation.

P 030 Different boron distribution in normal male and female rats' brain: A BNCT approach

Samereh Goodarzi[1*], Ali Pazirandeh[1], Seyed Behnamedin Jameie[2], Nasrin Khojasteh[1]

[1]Department of Nuclear Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran.
[2]Basic Science Department, Faculty of Allied Medicine, Tehran University of Medical Sciences, Tehran, Iran.

Boron analysis and boron imaging in biological materials have been under investigation for Boron Neutron Capture Therapy during last decades. In spite of that, any statements of distinct sexual differentiation of boron uptake in brain tissue have not yet been reported. The purpose of this research was to study boron distribution in three regions of adult rat's normal brain tissue of different groups, 2, 4 and 6 hours after boron career injection. Adult Wistar rats were divided into males and females, control and trial groups and the other females group which is went under ovariectomy surgery. All animals except for the control ones received 2 ml shots of a neutral boron compound solution through intraperitoneal injection. After 2, 4 and 6 hours, the animals of each group were deeply anesthetized and perfused transcardially. Tissue samples of forebrain, midbrain and hindbrain of all groups were prepared. Coronal sections of 10 µm thickness of these samples were sandwiched between two layers of polycarbonate nuclear track detector -CR-39-. The sandwiched tissue sections were then irradiated with thermal neutrons. Alpha and Lithium tracks on surrounding polycarbonates resulted from 10B(n,α)7Li neutron capture reactions were detected after etching process. The numbers of tracks which represent the boron uptake were figured out for all tissue sections and were compared to each other statistically. Significant differences in the number of tracks were obtained in forebrain, midbrain and hindbrain sections of the three groups of animals with the highest quantity in 4 hours after boron compound injection. An obvious similarity were observed between males and ovariectomy females group results as well; which might be indicative for sex difference of boron uptake in different regions of normal brain tissue. In accordance with these findings, knowing about boron concentration in distinct parts of normal brain tissue and the time period of the highest boron uptake, could lead to a better modified treatment planning including thermal neutron flux and the appropriate time of irradiation.

P 031 Technetium-99m Labeled bis-cysteamide-folate Conjugate: Preparation and Biological Evaluation as a Potential Folate Receptor Imaging Agent

Esmail Mollarazi[1*], Amir Reza Jalilian[2]

[1]Department of Nuclear Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
[2]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), Tehran, Iran

In this study, we developed ^{99m}Tc-bis-cysteamide folate (^{99m}Tc-bCA-folate) as a possible folate receptor imaging agent. Folic acid was reacted with cycteamine after developing activated esters using N-hydroxysuccimide (NHS) and dicyclohexylcarbodiimide (DCC) at room temperature in two steps. After structure confirmation using conventional methods, the conjugated compound was labeled with ^{99m}Tc using two common labeling methods. The compound with >92% radiochemical

purity was stable in final formulation and presence of human serum at 37 ºC at least for 6 h. Biodistribution in wild-type mice, ^{99m}Tc-bCA-folate showed rapid clearance from the blood and excretion mainly through the renal/urinary pathway, with some elimination by way of the biliary route similar to other folate agents. Considering kidney and lung as possible folate target organs, compared to the other folate radiotracers, ^{99m}Tc-bCA-folate possess higher kidney:blood and kidney:muscle uptake ratios (31.8 and 138 respectively) and also significant lung:blood and lung:muscle uptake ratios (1.38 and 6 respectively) 4 h post injection. These findings could be of potential diagnostic interest in continuing ^{99m}Tc-bCA-folate studies for tumor imaging in tumor-bearing animal models.

P 032 Estimation of human effective absorbed dose of ^{111}In-DTPA-Buserelin based on biodistribution rat data

Afsaneh Lahooti[1*], Saeed Shanehsazzadeh[1], Amir Reza Jalilian[2]

[1]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[2]Radiopharmaceutical Research and Development Laboratory, Nuclear Sciences and Technology, Research Institute, Tehran, Iran

Introduction: In this study, we estimated the effective absorbed dose to human organs, following i.v. administration of ^{111}In–DTPA–Buserelin (one of the gonadotropin releasing hormone (GnRH) agonists) using biodistribution data from injected normal rats.
Methods: Rats were sacrificed at exact time intervals which were 0.25, 0.5, 1, 2, 4 and 24 hour after injections. The percentage of injected dose per gram of each organ was measured by direct counting from rat data. The Medical Internal Radiation Dose (MIRD) formulation was applied to extrapolate from rat to human and to project the absorbed radiation dose for various organs in the human.
Results: Our estimation shows that for humans if 185 MBq of ^{111}In–DTPA–Buserelin were injected in normal diagnostic tests might resulted in an estimated absorbed dose of 24.27 mGy to the whole body and the highest effective absorbed dose was in kidneys with 28.392 mSv and the organs received the next highest doses were spleen, bladder wall, Uterus, adrenals, lungs, pancreas, liver and ovaries which received (18.323 mSv), (16.130 mSv), (6.431 mSv), (5.626 mSv), (5.296 mSv), (5.224 mSv), (5.165 mSv), and (4.967 mSv), respectively.
The highest radiation-absorbed doses were calculated for the bladder wall (2.18 mGy/MBq), kidneys (1.28 mGy/MBq), spleen (0.82mGy/MBq), liver (0.70 mGy/MBq) ovaries (0.34 mGy/MBq), uterus (0.29 mGy/MBq) and adrenals (0.25 mGy/MBq). The lowest absorbed dose was in thyroid with less than 0.04 mGy/MBq. The total body dose was estimated to be 0.13 mGy/MBq
Conclusion: Our biodistribution results were in accordance with previous studies about Buserelin biodistribution. Since the estimation of effective absorebed dose of ^{111}In-DTPA-Buserelin in human shows more than 10 folds higher than ^{67}Ga-DTPA-Gonadorelin, therefore using ^{111}In-DTPA-Buserelin could not be appropriate for diagnosis of GnRH receptors malignancies in humans. In conclusion, this study is a good explanation of the importance of human absorbed dose estimations from rat data after getting promising results from the animals.

P 033 Characterization of different collimators for commonly used isotopes in nuclear medicine: a Monte Carlo study

Faraz Kalantari[1, 2], Mohamadeza Ramezani[3*]

[1]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Medical Physics, Tarbiat Modares University, Tehran, Iran
[3]Science and Research Branch of Islamic Azad University, Tehran, Iran

Introduction: An ideal parallel-hole collimator allows only transmission of incident photons that are parallel to its holes. Therefore it should be very thick with very thick septa and small holes diameter. However to increase sensitivity, usually thinner collimators with considerable holes diameter are used. Thickness of septal material should be sufficient to stop more than 95% of incident photons. Therefore, some photons pass the septa without interaction or experience scattering before they reach the detector. In this study we determined different contribution of collimator responses consist of geometrical response, septal penetration (SP) and scatter (SC) for low, medium and high energy collimators.
Methods: SIMIND Monte Carlo code was used. A point source of activity with common energies in imaging (Tl-201: 77keV and 167keV, Ga-67: 98keV, 188keV and 296keV, Tc-99m: 140keV, I-131:364keV and PET isotopes: 511keV) was simulated. Three collimators of Symbia-Siemens Company, consist of low energy high resolution (LEHR), medium energy all-purpose (MEAP) and high energy (HE) were simulated.
R**esults:** For LEHR collimator, SP was increased from 7% in 140 keV to 30% in 167keV and more than 75% in energies higher than 296keV. SC also was increased from 4% in 98keV to more than 15% in energies higher than 167keV and reached to its maximum (26%) in 296keV. For MEAP collimator, SP was suddenly increased from 6% in 186keV to 28% for 296keV and more than 50% for higher energies. SC was also increased from 4% in energies below 186keV to 15% in 296keV and about 30% for higher energies. For HE collimator, SP was about 20% for 364keV photons. SC was 15% for 364keV photons and only 65% of photons were geometrically collimated.
C**onclusion:** Even by using nominal suitable collimators, there are considerable SC and SP that influence the quantitative accuracy of planar and SPECT images.

P 034 Functionalized chitosan-g-poly(ethylene glycol)-folate as a nanoscale radionuclide delivery system for tumor-targeted imaging

Esmail Mollarazi*, Fatemeh Atyabi, Fariba Johari, Mostafa Erfani, Hossein Abbasi, Amir Reza Jalilian

Department of Nuclear Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran

The recent developments of nuclear medicine in oncology have involved numerous investigations of novel specific tumor-targeting radiopharmaceuticals for cancer imaging and therapy. The current progress in pharmaceutical nanotechnology field exploited tumor-targeting nanoscale polymeric carriers being able to deliver radionuclides in a selective manner to improve the outcome of cancer diagnosis and treatment. Among the polymers, chitosan is a hydrophilic and non-antigenic biopolymer and has a low toxicity toward mammalian cells. Conjugated to its excellent biocompatibility, chitosan composites result in a new class of biomaterials that possess mechanical, physicochemical and functional properties, which have potential for use in advanced biomedical imaging applications.
This work investigated the preparation of chitosan-PEG-folate nanoparticles (NPs) used as vehicles for radionuclides such as technetium-99m and targeted delivery into tumor cells. The morphologic characterization of chitosan-derivative nanoparticles was evaluated by scanning electron microscope (SEM). The average particles size was about 300 nm under the optimized conditions. In addition, the biological evaluation of chitosan-based-Tc-99m complexes showed remarkable cell binding and internalization into 4T1 cells.
Modified chitosan-g-PEG- FA nanoparticle can be a promising carrier due to its low cytotoxicity and targeting ability. The use of these specific tumor- targeting carriers constitutes a promising rally which will, hopefully in the near future, allow for earlier tumor detection, better treatment planning and more powerful therapy.

P 035 Improvement of arrangement to collimator sizes of Helmet in Gamma-Knife

Leila Moghaddam[1*], Saeed Setayeshi[2], Mohammad Ghannadi Maragheh[1], Mojtaba Shamsaee[2]

[1]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), AEOI, Tehran, Iran
[2]Nuclear Engineering and Physics faculty, Amir Kabir Technical University, Tehran, Iran

Gamma-Knife is a high precision instrument used to treat intracranial lesions. Gamma-Knife concentrates the photon beam irradiated from 201 sources of 60Co through different size collimator on the target area in intracranial lesions. Treatment planning system is also provided in Gamma-Knife. The algorithm for dose calculation is based on the beam profile and constant linear attenuation through tissue and its accuracy is 0.3mm.The final collimators of beam in Gamma knife are located in Helmet and consist of 4 sizes in 4mm, 8mm, 14mm and 18mm. The physician uses one of these sizes individually depend on treatment plan and the location of isocenter in tumor. In this project the improvement of treatment plan suggested by using the four sizes Helmet collimator together simultaneously. We developed a procedure to arrange the collimators in helmet to get optimum dose in tumor. To achieve the data the Gamma-knife simulated by MCNPX. For calculating the head dose, the Zubal Digital Phantom was used. 100 different arrangement of collimators were simulated and the head DVHs obtained and these data were used to train the ANN. After training, combination of ANN with nonlinear program and using DICOM image of brain and defining the tumor, the best design of collimators in helmet and the location of shots were suggested. By using this method, dose distribution in tumor has better coverage. The shape of each shot can be considered not only sphere but also other shapes to cover tumor especially in target boundaries and it can be flexible to the location of shots. This method preserves the time of treatment planning and improves the quality of location and shape of shots.

P 036 Development of an in vivo radionuclide generator by labeling thiosemicarbazone with ^{191}Os

Leila Moghaddam[1*], Amir Reza Jalilian[1], Mina Jamre[2], Nafiseh Salek[2], Mojtaba Shamsaee[2], Mohammad Mazidi[1], Mohammad Ghannadi Maragheh[1]

[1]Radiopharmaceutical Research and Development Lab (RRDL), Nuclear Science and Technology Research Institute (NSTRI), AEOI, Tehran, Iran
[2]Nuclear Engineering and Physics faculty, Amir Kabir Technical University, Tehran, Iran

In this study Osmium complex of thiosemicarbazone, i.e. 2-acetylpyridine thiosemicarbazone (APTS) was synthesized and spectroscopically characterized. Osmium-191 ($T_{½}$= 15.4d) was produced via the 190Os(n,γ)191Os nuclear reaction using natural target irradiated with thermal neutron in the Tehran Research Reactor for 15 days by $4\times10^{13}cm^{-2}.s^{-1}$ average neutron flux with subsequent fusion in a mixture of KOH-KNO_3. It results in ~325mCi/mgr specific activity with a radiochemical yield of 95%. The 191Os-K_2OsCl_6 was mixed with 2-acetylpyridine thiosemicarbazone for 30 min at room temperature to yield [191Os]APTS with a radiochemical yield of more than 80%. Colorimetric methods showed that residual chemical impurities in the product were below the accepted limits. Radio thin layer chromatography (RTLC) showed a radiochemical purity of more than 99%. The stability of the final product was checked in the absence and presence of human serum at 37°C for up to 3 h. The partition coefficient of the final complex was also determined. The biodistribution study for 191Os-hexachloro-osmate and 191Os-thiosemicarbazone were carried in wild type-mice up to 14 days. A few hours post-injection of 191Os-thiosemicarbazone, the radioactivity content increased in the kidneys and liver and this pattern remained constant out to 24 hours. Major part uptake of radioactivity accumulated was observed in the reticulloendothelial system including liver and spleen. Intestines exhibited a significant uptake which could be attributed to liver excretion of the tracer or metabolites. Lung uptake also showed increased during 24h and remained constant.
This research introduces 191Os-thiosemicarbazone in therapeutic studies as a possible in vivo generator for therapy because of beta emission (313 keV), and also, for localization and dosimetry

study in relevant organs by gamma emission of the daughter radio-nuclide. Our experiments have shown satisfactory quality, and stability suitable for future therapeutic studies.

P 037 Evaluation of crystals' detection efficiency in PET imaging using Monte Carlo simulation

Sahar Ghavidel[1*], Mansour Ashoor[2]

[1]Faculty of Nuclear Engineering and Physics, Amirkabir University of Technology, Tehran, Iran
[2]Nuclear Science and Technology Research Institute, AEOI, Tehran, Iran

In general, an appropriate choice of crystals along with the scatter and random correction algorithm within PET imaging systems is an important part to obtain qualified images in order to improve better diagnosis in medicine. The increase of the temporal and spatial resolutions in the real time images leads to better characterization of the metabolism of the organs and the related physiological parameters. In this study, BGO, LSO, GSO, $CeBr_3$ crystals have been deliberated as gamma rays converter to compare their special characteristics using Monte Carlo simulation. The sensitivity of crystals as a function of the width of crystal is investigated in various photon incident angles. The simulation results have been demonstrated that at the distinct width of crystal, detection efficiency of $CeBr_3$ was more than the other crystals in which the amount of scatter and random coincidences were decreased. However, the width of crystal in the various applications should be optimized with respect to the trade off among of signal to noise ratio, spatial and temporal resolutions, efficiency and the untrue coincidences. Also, estimation of the crystal width may be useful in collimator design in the PET imaging systems with the specific utilization.

P 038 Deterioration of prefrontal cortex in idiopathic normal pressure hydrocephalus

Mitsuyasu Kanai[1*], Suguru Satoh, Nobuo Sasaguchi

NHO Takasaki Hospital, Japan

Introduction: Idiopathic normal pressure hydrocephalus (iNPH) is a syndrome that is characterized by cognitive decline, gait disturbance and impairment in bladder control (Adam's triad), and is associated with ventriculomegaly in the absence of elevated cerebrospinal fluid (CSF) pressure. Diagnosis can be challenging due to its varied presentation and overlap with other disorders common in the elderly. The neuropsychological characteristics of iNPH have been much debated during recent years. Patients with iNPH suffered from executive dysfunction, even in early stage of the disease. This study evaluates the neuropsychological characteristics in patients with iNPH.
Methods: On the basis of Clinical Guidelines for idiopathic Normal Pressure Hydrocephalus, 3 participants (1 male and 2 female) were diagnosed with definite iNPH. We examined the scores of the Frontal Assessment Battery (FAB), trail making tests part A & B (TMT-A & -B), Kohs block design test and the Mini-Mental State Examination (MMSE). The regional cerebral blood flow (rCBF) was measured by N-isopropyl-123-P-iodo-amphetamine single photon emission computed tomography (SPECT), and the perfusion patterns of the cerebral cortex were measured based on three-dimensional stereotactic surface projection (3D-SSP) Z-score images.
Results: Initially, possible iNPH subjects were diagnosed as improvement of triad symptoms by tap test. After lumbar puncture, they were performed at lumbo-peritoneal shunt operation by neurosurgeons. Patients with iNPH were assessed before and after operation with neuropsychological batteries. The performance of FAB test improved better than that of MMSE. Two subjects showed significant improvements in the TMT-A and Kohs block design test, too. These batteries correlated with executive functions. They were shown to be sensitive to damage at the prefrontal cortex. 3D-SSP analyses of SPECT images revealed the decrease of the rCBF at the prefrontal cortex in iNPH patients. The post-surgical rCBF showed significant area of increased perfusion in the prefrontal cortex.

Conclusion: Damages of periventricular structures, such as frontal subcortical and cortical areas, are closely connected with impairments of iNPH. We suggest that the neuroimaging study should be used in cognitive evaluation.

P 039 Evaluation of magnetic resonance imaging safety in public hospitals of Tehran

Samane Mohseni*, Seyed Mohammad Entezarmahdi, Seyed Mahmoud Reza Aghamiri

University of Shahid Beheshti, Tehran, Iran

Introduction: MRI is a kind of diagnostic imaging that is safe respect to other methods since there is no ionization radiation. However, hazard of strong magnetic field and non ionizing radiation tends some organizations such that IEC, ICNIRP, HPA, and NRPB to legislate MR safety guidelines for personnel, patients and general public periodically. The first purpose of this study is to evaluate the personnel's awareness about these published provision and secondly assessing the safety of some MRI centers.
Methods: The survey contains 8 public MRI centers at Tehran, Iran. The staff and the MR responsible person (MRrp)'s awareness about MRI safety principles were evaluated separately through a quiz. Moreover, the performance of MR safety procedures for the patients and the staff was surveyed with a questionnaire filled by the staff. Supplementally, the MRrp filled out another question sheet about the condition of MR safety for the general public. At the end, the veracity of all the answers was assessed by the staff supervision at each MR center. The safety is clustered in 5 categories (very poor, poor, moderate, good, and excellent) with the k-means method.
Results: Results of the quiz showed the poor safety principles awareness both in the staff (Ave. = 5.12 from 20.00) and in the MRrp (Ave. = 8.03 from 20.00)**.**However, at the second study, results were obtained a good MR safety condition for patients, whereas, the safety for the general public was poor. Accordingly, no significant correlation between the personnel awareness and safety for the patients was seen (CC=0.29, p=0.15), where the personnel awareness and safety for the general public was highly correlated (CC=0.76, p
Conclusion: According to results, The MRI units at public hospitals in Tehran are safe enough for the patients while the hazard of unsafe situation for the general public in these units is not rejected. As the personnel awareness about the MR safety provision shows a robust correlation with the observance of safety principles for the general public, the regular MR safety courses for personnel is highly recommended.

P 040 Radiation protection principles observance in mammography divisions in a number of hospitals in Tehran

Zohre Shahpouri*, Zahra Siavashpour, Seyed Mohammad Entezarmahdi

University of Shahid Beheshti, Tehran, Iran

Introduction: Mammography is the most accurate method for diagnostic the breast cancer. According to high rate of mammography imaging nowadays, it accounts for one of the major portion of diagnostic radiation exposure to the general population. Hence, the radiation protection principles should be attended in mammography divisions. The purpose of this study was to investigate the observance of radiation protection principles and the status of radiological practice and equipment performance according to the protocols established by International Atomic Energy Agency (IAEA), in the mammography divisions of the hospitals under the supervision of Shahid Beheshti Medical University in Tehran.
Methods: Ten diagnostic mammography centers were evaluated in this study. Protocols related to the patients, the personnel (technicians and health physicists) and the installation structure were investigated by arranging three separate standard questionnaires. Moreover, the personnel's knowledge was appraised by a quiz contains radiation protection principles. In this study, the

radiation safety is ranked within 5 clusters (very poor, poor, moderate, good, and excellent) with the k-means method.
Results: According to the Results of the quiz, the health physicists knowledge were good (Ave. = 73%), whereas, the technicians grade was not good enough (Ave. = 59%). On the other hand, the results obtained the radiation safety totally were moderate for patients, while it belonged to good category for the personnel. Furthermore, the installation structure related to radiation safety for general public and quality control and quality assurance of the system within the mammography divisions was ranked poor. The difference radiation safety ranking among different hospitals was not significant (p-value = 0.43). Although, the results claim that there is a significant correlation between personnel's knowledge of radiation protection principles and the rank of radiation safety (CC =0.78, p
Conclusion: As the results show, in the surveyed hospitals, no efficient radiation protection procedures is performed according to reduce the patients dose. Moreover, these divisions are not safe enough for the general public. As there is no enough observation on these divisions, the safety issues and the radiation protection protocols do not applied correctly. Finally as the personnel awareness about the radiation protection provision shows a robust correlation with the observance of safety principles for the general public, the regular radiation protection courses for personnel is highly recommended.

P 041 The review of proton therapy

Vahide Moji Mamaghani*, Hoda Eskandari

University of Shahid Beheshti, Tehran, Iran

Proton beam therapy is a form of radiotherapy to treat tumors in patients whose surgical excision seems impossible, too dangerous or unsuccessful. It is well suited for irregularly shaped lesions with awkward configurations near critical structures. Physical advantage of proton beam over gamma rays and x-rays is deposition of energy at the tumor site which results in a better normal tissue sparing and increased tumor control probability (TCP). Protons deposit most of their energy in what is known as the Bragg peak, which occurs at the point of their greatest penetration depth in tissue. This depth is determined by the beam energy which can be controlled directly from the accelerator or precisely by range modulator situated in the gantry. The delivery techniques used to cover the target volume are passive scattering and spot scanning techniques. While the first technique utilizes different scatterers, the latter one uses scanning magnets and energy changes. Facilities in a proton therapy center consist of three main parts: 1) an accelerator, 2) a proton beam navigator system for delivering proton beam to different treatment rooms, 3) treatment room. Some important diseases which can be treated by this method include pediatric malignancy, sinonasal malignancy, nasopharyngeal carcinoma, oropharyngeal carcinoma, aye melanoma and central nervous system tumors.
Proton therapy fundamentals and facilities are reviewed in this paper. The technique is first placed in its historical context, pointing out the differences with other modalities in radiotherapy. The theoretical background of the method is described briefly and this provides a foundation for an explanation of the facilities of proton therapy in the preceding sections.

P 042 Up-regulation of gene expression in mouse brain after exposure to radiofrequency

Hashem Khanbabaei

Mashhad University of Medical Science, Mashhad, Iran

Introduction: The possible biological effects of mobile phone radiation especially in brain are a growing concern. The aim of this study is to investigate effects of RF (Radiofrequency), 1800MH at a whole body SAR of 2 W/kg on pro-apoptotic gene (Bax) in mouse cerebellum.

Methods: In this study 18 male Balb/C mice were divided into 3 groups, 6 in each group (the first group: sham-exposed (none exposed), the second group: were irradiated 4h (once a day), the third one: were irradiated 2h (twice a day). All groups were exposed for 30 days. RNA was extracted from all mice cerebellum and after that CDNA was synthesized. The expression level of pro-apoptotic gene (Bax) was evaluated. Gene expression levels were quantified with relative quantitative Real-Time PCR. Comparisons of the expression levels in irradiated and sham-irradiated samples were performed by using GAPDH as an internal control for normalization of the results.
Results: Up-regulation of Bax occurred in both exposed groups. The second group showed a significant difference with the third group (P=0.025) and sham-exposed group (p=0.04). But the difference between the third and sham-exposed group was not significant (P=0.3).
Conclusion: The results showed that RF exposure increases apoptotic gene expression level, and increasing of apoptosis can cause malfunction. But it can be decreased by dividing length of exposure time into several smaller periods.

P 043 The interference of thyroglobulin with thyroglobulin autoantibodies measurement

Snezana Zivancevic Simonovic[1*], Ljiljana Mijatovic [1], Olgica Vrndic [1], Ilija Jeftic [1], Irena Kostic [1], Zorica Jovanovic [1], Ljiljana Dimitrijevic[2]

[1]School of Medicine, University of Kragujevac, Serbia
[2]Institute of Virology, Vaccines and Sera, Torlak, Serbia

It is known that thyroglobulin antibodies (TgAbs) interference is the most serious problem affecting thyroglobulin (Tg) measurement, but possible interference of Tg with TgAbs measurements has not been tested previously. The aim of this study was to explore the influence of Tg on TgAbs concentration measured by a competitive "one-step" radioimmunoassay.
We have used standard Tg concentrations (53, 200 and 510 ng/ml) and 10 patient's sera with previously measured concentrations of TgAb (100-4245 IU/ml) and undetectable Tg concentrations. Patient's sera with known TgAb concentrations were preincubated with standard Tg concentrations (53, 200 and 510 ng/ml), volume ratio 1:1, during 30 min. After that, TgAb concentrations were measured by competitive "one-step" radioimmunoassay (*CIS biointernational*, France). In the same samples Tg concentrations were determined by immunoradiometric assay (THYRO) from the same manufacturer. The TgAb values measured in presence of standard Tg concentrations were compared with TgAb values measured without Tg.
In the 9 of 10 patient's sera the TgAb concentrations measured in the presence of Tg were unvaried (80-120% of expected value), while in one sera the TgAb concentration was below 80% of expected values. Decrease of TgAb concentration was obtained after preincubation with high Tg concentrations (200 and 510 ng/ml) and it was dose-dependent.
When measuring the concentration of Tg in the same samples, in the presence of 2 of 10 patients sera standard Tg concentrations were decreased (below 80% of expected values), one of these sera had low and another very high concentration of TgAb, but these samples are different from sera in which interference of Tg with TgAb measurement was shown. Since the Tg in patients sera could interfere with TgAb measurement, the assessment the level of Tg in patients with differentiated thyroid cancer seems more complex.

P 044 Evaluation of time required for the loss of air ionizing in radiotherapy

Mostafa Taghipuor, Behrooz Moradhasel[*], Sajad Shayesteh

Kermanshah University of Medical Sciences, Kermanshah, Iran

In this study we examined the Stability rates and the effects of ionizing air on the personnel and patient in the radiotherapy department. Air ionization, particularly large ions in high concentrations, are increasingly recognized as detrimental to health. At large doses, radiation

effects such as nausea, reddening of the skin or, in severe cases, more acute syndromes are clinically expressed in exposed individuals within a relatively short period of time after the exposure; such effects are called deterministic because they are certain to occur if the dose exceeds a threshold level. Thus the minimum time for the safe keeping of X and Gamma rays of the issues is essential. We compare different moods, before and after treatment, and we could measure the number of free ions in the unit time scale determined using the method described below will be specified.

P 045 Design a multileaf collimator with regular feild

Ali Zargham Taheri*, Hamid Reza Hemmati, Mohammad Vosoughizade, Alireza Kamali Asl

Department of Nuclear Engineering, Shahid Beheshti University, Tehran, Iran

Introduction: Nowadays, radiation therapy is one of the most used and most useful for the treatment of cancer where 40% is allocated to cancer treatment. In this method, tumor is irradiated with X or gamma ray to damage the cancer cells. To limit the field of irradiation and protect healthy organs, shields are used.
Methods: The new method of dynamic shielding is to use multi leaf collimators (MLCs) which are made of lead's or tungsten's blocks. These collimators are made of many leafs and use a lot of motors to move each leaf separately for shaping desire field. These tiny special motors need a complex control circuits and also raise the costs. Checking some of field for therapy showed that the most of fields have regular shape, so we decided to make regular fields. We test some methods such as camera diaphragm for circular field, square rotated fields, etc .finally with a simple but useful and Creative idea; we succeed to make any of regular fields such as circular, square, Triangular, hexagonal in a MLC base device. In this plan, we use only two motors, so the costs will be extremely low. It uses 6mm width leafs to make a 10*10 cm changeable field and changing of field size from 0 to max is performed by a cone or pyramid. By moving cone or pyramid down, field size is increased and when move it up, leafs come back to their position by spring force.
Results: we made a prototype model of this new device and checked device for good performance of field size, shaping, moving system. Also simulation of device performed with MCNP 4C code with some material and showed that at least 8.65 cm Thickness of an alley contains 91.5% tungsten, 2.8% copper, 5.7% Nickel is needed to reduce 6MeV beam to 10.55%.
Conclusion: in the some uses of radiotherapy a regular fields is necessary and making these fields with a good resolution and low cost can reduce prices for patients and also for clinics. A prototype model of mentioned device has been made that shows application of MLC and a real device is under construction in now.

P 046 Efficacy of high-energy collimator for sentinel node lymphoscintigraphy of early breast cancer patients

Kamran Aryana[1*], Mohaddeseh Gholizadeh[1], Mehdi Momennezhad[1], Mohsen Aliakbarian[2], Mohammad Naser Forghani[3], Ramin Sadeghi[1]

[1]Nuclear Medicine Research Center, Faculty of Medicine, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran.
[2]Surgical Oncology Research Center, Faculty of Medicine, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran.
[3]Cancer Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: Lymphoscintigraphy is an important part of sentinel node mapping in breast cancer patients. Sometimes star shaped artifacts due to septal penetration can be problematic during imaging. In the current study, we evaluated the possibility of high energy collimators use for lymphoscintigraphy.

Methods: 30 patients with early breast carcinoma were included. 30 minutes after radiotracer injection (Tc-99m antimony sulfur colloid), anterior and lateral images were acquired using a dual head gamma camera equipped with a parallel hole low energy high resolution collimator in one head and high energy collimator in another head. All images were reviewed by two nuclear medicine specialists regarding detectability and number of axillary sentinel nodes, and presence of star artifact.
Results: All images taken by low energy high resolution collimators showed star artifact of the injection site. No image taken by high energy collimator showed this effect. In two patients the sentinel node was visible only by high energy collimator. Tumor location in both of these patients was in the upper lateral quadrant and both had history of excisional biopsy. In two patients, additional sentinel node was visible adjacent to the first one only on the low energy high resolution images
Conclusion: High energy collimators can be used for sentinel lymph node mapping and lymphoscintigraphy of the breast cancer patients. This collimator can almost eliminate star-shaped artifacts due to septal penetration which can be advantageous in some cases. However, to separate two adjacent sentinel nodes from each other LEHR collimators perform better.

P 047 Comparison of ^{99m}Tc-EDDA-Tricine-HYNIC-Tyr3-Octreotate scan in active pulmonary tuberclosis and inactive pulmonary tuberclosis in patient refered to the pulmonary clinic of Imam Reza hospital

Javad Abedi, Mohammad Ali Qodsi Rad*

Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Introduction: Diagnosis of tuberculosis can not be performed with a single test and usually combination of several examinations such as sputum smear, chest X-ray, and PPD (Purified Protein Derivative) test are used for this purpose. These tests can not be helpful certain conditions such as COPD (Chronic Obstructive Pulmonary Disease), elderly, and immuno-suppressed patients. Bronchoscopy is invasive and sputum culture needs 2-8 weeks to be ready which can limit their routine use. The current study was performed to evaluate the application of ^{99m}Tc-EDDA-Tricine-HYNIC-Tyr^3-Octreotate in differentiation of active from in-active pulmonary tuberculosis lesions.
Methods: 10 Patients with proven pulmonary tuberculosis (with positive smear or culture) entered the study. 60 minutes post injection of 20 mCi ^{99m}Tc-EDDA-Tricine-HYNIC-Tyr^3-Octreotate planar imaging and 120 minutes post-injection planar and SPECT imaging of the lungs were performed. Semi-quantitative evaluation of lesion and non-lesion areas was performed. The scan was repeated with the same protocol post-standard treatment for tuberculosis after having negative sputum culture.
Results: Semi-qualitative evaluation of the lesions showed statistically significant higher uptake before treatment in both planar and SPECT images ($p=0.005$ and $p=0.007$ respectively). Lesion to non-lesion ratios were also higher in the pre-treatment sets on both planar and SPECT images (1.4 ± 0.2 vs. 1.2 ± 0.17, $p=0.001$ for planar images and 2.32 ± 0.55 vs. 1.32 ± 0.32, $p=0.0001$ for SPECT images).
Conclusion: ^{99m}Tc-EDDA-Tricine-HYNIC-Tyr^3-Octreotate can differentiate between active and in-active pulmonary tuberculosis. This is especially true for SPECT imaging.

P 048 A 16 years old boy with limb shortening and lytic bone lesions in extremities, case report of an unusual form of Ollier's disease

Zohreh Adinehpour*, Mohammad Ali Qodsi Rad

Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Ollier's disease include a group of syndromes which are heterogeneous , unilateral and congenital and are characterized by the presence of enchondromas - usually multiple -associated with skeletal malformations causing limb shortening, scoliosis, pathological fractures and pseudoarthrosis and other various deformities. However abnormalities like lytic bone lesions in extremities are somehow rare. We report a case of 16 year old male with limb shortening (left foot shortening), Pathologic fracture of the right humerus, and new onseting widening of the phalanges of the both hands. No previous medical investigation was done for him and he was referred by local orthopedics to the nuclear medicine center to detect other possible bony lesions and further work up for his disease. The bone scintigraphy revealed multiple of non homogenous tracer uptake in the left femur, left knee and left leg. Left foot shortening and deformity besides deformity of the left humerus due to previous fracture were also remarkable findings in the scan. Conventional X rays also showed these deformities and diagnosis was confirmed with bone biopsy. Although rare, Ollier's disease should be considered for patients with multiple unilateral bone deformities.

P 049 Nuclear medicine imaging in breast cancer

Reyhaneh Sadat Mostajaboddaveh

Breast carcinoma is a major health problem for women and its incidence is increasing. There is a great need for the development of new and reliable diagnostic methods of breast cancer in order to complement the existing diagnostic methods such as physical examination, mammography and other radiological procedures.
Nuclear medicine has been actively involved in the detection of breast cancer. SPECT or planar imaging consists of scintimammography (mainly using Tc99m-MIBI), imaging of radiolabelled monoclonal antibodies and peptides, receptor imaging (including somatostatin, estrogen or oestrogen receptors), evaluation of metastatic lesions by bone scan (Tc99m-MDP, Tc99m-sulfur colloid and Ga 67-citrate), and evaluation of sentinel node by techniques of lymphoscintigraphy and gamma probe.
PET imaging have demonstrated a high diagnostic accuracy not only in the detection of primary breast cancer but also in the evaluation of axillary lymph node involvement and systemic metastases. PET tracer can be divided into three categories: glucose metabolism, receptors imaging and methionine metabolism.

P 050 Use of radiolabeled microsphers in hepatic tumors

Shirin Abbas Nezhad

Yas Nuclear Medicine Center, Tehran, Iran

Hepatocellular carcinoma (HCC) is one of the most common cancers worldwide. The concept of metabolic radiotherapy via arterial administration is based on double vascularization of the liver. Tumoral blood flow arises mainly form the hepatic artery, while 80% of non tumoral liver tissue is perfused by portal vein. The intra-arterial admiration of ^{131}I-Lipiodol has proven effectiveness in treatment of HCC and as an adjuvant treatment for operated HCC, in which it reduces the risk of recurrence. This treatment is at least as effective as chemoembolization, but is much better tolerated. In palliative treatment it may lead to partial response or antalgic action. This therapeutic approach is disappointing in liver metastases. New methods of labeling lipiodol are being developed, in particular using ^{188}Re. The use of 90Y-labelled microspheres represents a potentially effective treatment, although experience with this method is less than ^{131}I-lipioldol. Finally, the development of radiolabelled antibodies is an avenue of research that will possibly lead to emergence of new therapeutic agents for use in intra-arterial metabolic radiotherapy.

P 051 Role of nuclear medicine in malignant melanoma

Saeedeh Asghari

Babol University of Medical Sciences

Malignant melanoma of the skin is one of the most lethal cancers. The disease may spread either locally or regionally and to distant sites through predictable or unpredictable metastatic pathways. Accurate staging and restaging of disease are required for appropriate treatment decision making. Routine protocols based on clinical examinations and traditional radiologic evaluations are not cost-effective for the detection of systemic disease. In the last decade, nuclear medicine techniques, such as lymphoscintigraphy-directed lymphatic mapping and sentinel node detection and 18F-FDG PET, have played key roles in nodal and distant staging of melanoma. More recently, anatomic–functional imaging has been improved with the development of PET/CT or SPECT/CT systems. 18F-FDG–sensitive intraoperative probes have been specifically designed to detect small nodal and visceral metastases from melanoma and may become important tools for the cancer surgeon. Nuclear medicine plays a pivotal role in the overall management of melanoma. Each procedure should be performed by taking into account the natural course of the disease. A large body of evidence has shown the utility of sentinel node detection in early stages of disease, whereas 18F-FDG PET is preferably indicated in advanced stages of disease. In addition, metabolic imaging with 18F-FDG has been proven to be the technique of choice for the post therapy monitoring of patients with melanoma. The recent introduction of combined PET/CT devices will significantly improve the diagnostic accuracy of metabolic imaging in the evaluation of patients with melanoma. Initial data also have highlighted the added value of hybrid SPECT/CT for the more accurate localization of sentinel lymph nodes with sentinel node lymphoscintigraphy, particularly in patients with head and neck melanomas and trunk melanomas.

P 052 Functional anatomical cardiac imaging: PET/CT molecular imaging

Mehrshad Abbasi[1*], Saeed Farzanefar[1], Alireza Emami[2], Mohammad Eftekhari[1, 2]

[1]Department of Nuclear Medicine, Vali-asr Hospital, Tehran University of Medical Sciences, Tehran, Iran
[2]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Comparable with the pure anatomical findings of the CT, the functional PET/CT imaging provides two additional advantages over the SPECT technique: attenuation correction and corresponding feasibility of absolute measurements. In cardiology, the absolute measures of myocardial blood flow and the myocardial flow reserve jointwiththe metabolic imaging can be used for noninvasive evaluation of subclinical as well as more advanced clinical abnormalities in the coronary function, tissue viability of the myocardium, left ventricular dysfunction and the response to therapy. The co-registration of PET/CT biological and morphological data with the higher accuracy for detection of trivialor balanced perfusion abnormalities and better assessment of the extent and severity of pathology would probably limit the number of superfluous invasive procedures in future. In this review the diversity of the usual tracers as well as endothelial and metabolic molecular markers (targeting apoptosis, inflammation, remodeling, and above all, reporter genes) with their current and possible forthcoming clinical applications are discussed.

P 053 Silent myocardial ischemia in diabetic patients: screening, diagnosis and early anti-ischemic pharmacotherapy

Mehrshad Abbasi[1*], Saeed Farzanefar[1], Alireza Esteghamati[2], Mohammad Eftekhari[1, 3]

[1]Department of Nuclear Medicine, Vali-asr Hospital, Tehran University of Medical Sciences, Tehran, Iran

[2]Endocrine and Metabolism Research Center, Vali-asr Hospital, Tehran University of Medical Sciences, Tehran, Iran
[3]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Diabetes is considered as myocardial infarction (MI) equivalent for the risk of subsequent MI and cardiac mortality; shouldn't diabetic patients undergo the workup of post-MI subjects? The cardiovascular mortality rate and complications are similar between diabetic subjects with asymptomatic and symptomatic ischemia underscoring the value of screening programs. The current recommendations suggest an individualized approach to the diagnosis and therapy for silent myocardial ischemia in diabetic subjects, based on patient's specific characteristics. The objective of this review is to evaluate the evidence based data pertaining to the benefits and limitations of screening, diagnosis and treatment of asymptomatic ischemia in diabetic subjects. The feasibility of discrimination between the high and low risk populations employing traditional and new risk factors, the role of exercise tolerance test and additional myocardial imaging or echocardiography, as well as alternative options including calcium score determination, and finally the decision to initiate early pharmacotherapy are discussed.

P 054 Borderline SSS in interpretation of cardiac scan and correlation with coronary angiography

Fariba Saddadi[1*], Hashem Sezavar[2], Reza Shokouhizadeh[1]

[1]Asia Nuclear Medicine Center, Tehran, Iran
[2]Rasul-e-Akram General Hospital, Tehran, Iran

Introduction: Although interpretation of severe reversible perfusion defects with a high SSS in Myocardial perfusion scan is easy but diagnoses of ischemia in patients with low or equivocal scan result are still difficult and is controvertial. Our aim is to evaluation minimal or mild perfusion defect with a low or borderline SSS (0-3) to compare with conventional coronary angiography.
Methods: 31patients with suspicious CAD who had mild ischemicscan results are selected for this study and coronary angiography was done for all cases during 1-3 weeks thereafter. Patients had age range of 45 to 81 years old. 13 patients were male and 18 female. One day protocol of MIBI cardiac SPECT was done for all patients, 10 with exercise stress test and 21 with pharmaceutical stress test. Quantitative interpretation was based on 20 segment scoring system and TID. Results were compared with standard angiography.
Results: SSS: 10/17 cases with SSS 0-3 show negative and 7 /17 had positive angiography result. 5/8 patients with SSS 4 has negative angiography and 3 are positive CAD. 1/ 6 cases with SSS 4-8 have negative angiography and 5 had positive angiography. TID: 8/10 Patients with TID has positive CAD and 2 are negative. 10/21 patients without TID have positive CAD and 11 had negative. Combination TID and SSS: 5 patients with TID and SSS 0-3: 3 had CAD and 2 had not. 3 patients with TID and SSS 4: all had CAD, 2 patients with TID and SSS > 4: all had CAD, In patients with borderline or equivocal scan, positive CAD is less than 20% but when TID is present the rate of positive coronary diseases rise to 78%.
Conclusion: In borderline scoring result, a clear cut diagnose of ischemia is truly difficult especially in symptomatic patients, therefore, other parameter of myocardial perfusion imaging like TID and more importantly quantitative assessment will enhance the accuracy of final interpretation.

P 055 Contribution of medial temporal hypoperfusion in immediate memory in alzheimer disease

Fereshteh Sedaghat[1, 2, 3*], Elleni Dedousi[4], Alexandra Papazisi[4], Ioannis Baloyannis[3], Stavros Baloyannis[3]

[1]Memory Clinic of Sedaghat Mashhad, Iran
[2]Nuclear Medicine Research Center of Mashhad University of Medical Sciences, Iran
[3]Department of Neurology Aristotle University of Thessaloniki, Greece

[4]Laboratory of Nuclear Medicine Aristotle University of Thessaloniki, Greece

Mini-Mental State Examination (MMSE) is a useful tool for diagnosing changes of cognitive function. Brain SPECT with HMPAO has been shown to have high sensitivity to detect neurodegenerative processes, which lead to dementia. The correlation between different subgroups of MMSE with perfusion defects is not well known. We compared these methods in order to find any correlation between the immediate memory and hypoperfusion in different regions of the brain using HMPAO brain SPECT, in 32 patients with AD (14M, 18F)(age 74±6)(MMSE 18±4). The MMSE subgroup of immediate memory was significantly correlated to left ($p \leq 0{,}002$) and right ($p \leq 0{,}04$) medial temporal regions perfusion (rCBF%) although global MMSE was not correlated to rCBF in these regions. This finding supports the view that the human medial temporal lobe may not only be important for long-term memory consolidation but also for certain forms of short-term memory.

P 056 Brain perfusion SPECT and magnetic resonance imaging in early diagnosing of neurodegenerative dementias

Fereshteh Sedaghat[1, 2, 3*], Eleni Dedousi[4], Alexandra Papazisi[4], Vasiliki Costa[3], Athanasios Dimitriadis[5], Stavros Baloyannis[3]

[1]Memory clinic of Sedaghat Mashhad, Iran
[2]Nuclear Medicine Research Center of Mashhad University of Medical Sciences, Iran
[3]1th Department of Neurology Aristotle University of Thessaloniki, Greece
[4]Laboratory of Nuclear Medicine Aristotle University of Thessaloniki, Greece
[5]Department of Radiology Aristotle University of Thessaloniki, Greece

Detection of atrophy pattern might give useful information for diagnosing dementia. To compare the diagnostic value of the perfusion pattern of SPECT and atrophy pattern of MRI for neurodegenerative dementia and its early detection we studied 112 patients with different types of dementia. The patients underwent MRI and SPECT using HMPAO. Our patients based on clinical diagnosis were categorized into 3 groups: a) Neurodegenerative dementia (ND) consisted of 61 patients (mean age71±9) with Alzheimer's disease (AD), frontotemporal dementia (FTD), dementia with Lewy bodies (DLB) and mixed dementia, b) Vascular cognitive impairment VCI consisted 27 patients (mean age 70±7), and c) Normal group included 19 persons (mean age 64±7). MR images and SPECT images were visually evaluated and grouped also into 3 categories: Neurodegenerative (ND) pattern, vascular impairment (VI) pattern and normal pattern. The sensitivity, specificity, positive and negative predictive value for MR imaging were72%, 98%, 97% and 77% and for SPECT 98%, 93%, 95% and 97% respectively. The sensitivity and specificity of visually evaluating MR images in the cases with mild stages of the disease was 47% and 95% and for SPECT 93% and 95% respectively. MRI helped us in detecting microangiopathies in our patients by showing white matter hyperintensities which can not be detected by SPECT. We conclude that visually evaluating of MR images dose not contribute to the early detection of neurodegenerative dementia in contrast to SPECT but rather to distinguishing vascular impairments. Hence the physician will need to compound these tools to obtain more accurate diagnosis.

P 057 P-tau is detectable in plasma of patients with MCI and DLB, showing a positive correlation with plasma bamyloid level: a study with SPECT confirmation

Fereshteh Sedaghat[1, 2, 3*], Alexandra Papazisi[4], Eleni Dedousi[4], Ioannis Baloyannis[3], Stavros Baloyannis[3]

[1]Memory clinic of Sedaghat Mashhad, Iran
[2]Nuclear Medicine Research Center of Mashhad University of Medical Sciences, Iran
[3]1th Department of Neurology Aristotle University of Thessaloniki, Greece

[4]Laboratory of Nuclear Medicine Aristotle University of Thessaloniki, Greece

Several studies have shown an increase in plasma $A\beta_{42}$ in MCI compared to normal and AD patients. We have found no study measuring phospho-tau (p-tau) level in plasma. The efficiency of Aβ peptides elimination in earlier stages of AD has proven in animal models. P-tau and $A\beta_{1-42}$ levels in plasma was measured in 74 patients; 29 patients with AD, 3 FTD, 6 DLB, 13 VCI, 7 MCI and 16 normal controls. The patients had underwent perfusion SPECT and some of them DaT scan. $A\beta_{1-42}$ was highly increased in the patients with DLB (229.9±125.9 pg/ml) versus other groups. There was also a significant increase of $A\beta_{1-42}$ in MCI (57.9±33.3) comparing AD and normal group ($p\leq0.000$). P-tau concentration was detectable in plasma of 14 patients (4 AD, 3 DLB, 4 MCI, 2 VCI, 1 FTD) and in none of the normal controls. There was a significant increase of p-tau in the patients with DLB (119±123 pg/ml) versus AD. P-tau was detectable (78±115 pg/ml) in 4/7 of patients with MCI and in 3/6 of patients with DLB. There was a significant positive correlation between plasma $A\beta_{1-42}$ and p-tau in our patients ($r=+0.538$, $p\leq0.000$). We suggest that the theory of elevated $A\beta_{42}$ and p-tau in MCI as biochemical risk factors, and as diagnostic biomarkers in DLB, should be taken in mind. More research in plasma and CSF with more number of patients having histopathological confirmation of the disease is needed.

P 058 The diagnostic value of ^{99m}Tc-ubiquicidin (UBI) scintigraphy for osteomyelitis and comparisons with ^{99m}Tc-MDP scintigraphy and magnetic resonance imaging

Majid Assadi[1*], Katayoun Vahdat[2], Iraj Nabipour[3], Mohammad Reza Sehhat[1], Fahimeh Hadavan[2], Hamid Javadi[4], Alireza Tavakoli[5], Jamshid Saberifard[1], Mohammad Reza Kalantarhormozi[3], Alireza Zakani[6], Mohammad Eftekhari[7]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Department of Infectious Diseases, The Persian Gulf Tropical Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[3]Department of Endocrine and Metabolic Diseases, The Persian Gulf Tropical Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[4]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences (GUOMS), Gorgan, Iran
[5]Department of Orthopedic Surgery, Faculty of Medicine, Bushehr University of Medical Sciences, Bushehr, Iran
[6]Department of Nuclear medicine, Imam Khomeini (Valiasr) Hospital, Faculty of Medicine, Tehran University of Nuclear Medicine, Tehran, Iran
[7]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: The discrimination of bacterial infections from sterile inflammatory processes is of great importance in the management of inflammation. Currently available techniques cannot decisively address this issue. In this respect, antimicrobial peptide ^{99m}Tc-ubiquicidin (UBI) 29-41 scans have been showing interesting results. The aim of this study was to determine ^{99m}Tc -UBI scan accuracy in the detection of osteomyelitis and to compare it with ^{99m}Tc -MDP scan and magnetic resonance imaging (MRI).
Methods: Twenty patients (mean age=48.90 years) with suspected osteomyelitis were included in this study. After evaluation of each patient through history taking, physical examination, appropriate laboratory tests, and other processes including bone probing, wound culture, and plain film radiography (PFR), MRIs, ^{99m}Tc -UBI scans, and ^{99m}Tc -MDP scans were performed. For quantitative analysis, the mean count of abnormal to normal region (A/N) was calculated for images acquired at 15, 30, 45, 60, 120, and 240 min to obtain the most favorable time for imaging.
Results: In total, osteomyelitis was detected in the 99m Tc-UBI scans of 17 patients—indicating 100% accuracy, compared with an accuracy of 90% for osteomyelitis detected in 3-phase bone scans. The maximum mean A/N was observed at 15 min after intravenous injection [median 1.91, interquartile range (1.54-2.94)]. MRI was performed in 12 cases only, with 75% accuracy. In addition, the A/N ratios for the ^{99m}Tc -UBI scans were not significantly different between patients with or without *Staphylococcus aureus* growth on wound cultures.

Conclusion: For fast imaging with high accuracy, ^{99m}Tc -UBI 29-41 is a suitable choice for the detection of osteomyelitis.

P 059 The association of rate pressure product (RPP) and myocardial perfusion imaging (MPI) findings: a preliminary study

Hamid Javadi[2], Mohammadreza Pourbehi[1], Mehdi Mogharrabi[3], Maryam Rayzan[1], Shahriar Semnani[2], Sara Jallalat[2], Abdullatif Amini[1], Maryam Barekat[1], Iraj Nabipour[4], Majid Assadi[1]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences, Gorgan, Iran
[3]Department of Nuclear Medicine, 5th Azar Hospital, Golestan University of Medical Sciences, Gorgan, Iran
[4]The Persian Gulf Marin Medicine Biotechnology Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

Introduction: The product of heart rate and systolic blood pressure, termed as Rate-Pressure Product (RPP), is a very reliable indicator of myocardial oxygen demand and is widely used clinically. There have been previous attempts to describe the relation of RPP to the onset of pain in angina pectoris. The current study aimed to evaluate the association of RPP results with scan findings.
Methods: In total, 497 patients with suspected coronary artery disease (CAD) underwent gated SPECT imaging with dipyridamole, exercise, and dobutamine stress, and were included in this study. Baseline and maximum heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and ECG results were recorded. The rate pressure product (RPP) was calculated as the product of heart rate and systolic arterial pressure. The difference between the RPP max and the basal RPP is known as the RPP reserve.
Results: 497 cases, including 426 patients with dipyridamole stress, 59 with exercise stress, and 12 with dobutamine stress, underwent myocardial perfusion imaging. Scan results were positive in 194 (45.5%) and negative in 232 (54.5%) patients with dipyridamole stress. In patients with exercise stress, the scan was positive in 24 (40.7%) cases and negative in 35 (59.3%) cases. In dobutamine stressed patients, the scan was positive in 6 (50%) cases and negative in the 6 remaining cases. In patients undertaking dipyridamole , there was a significant difference between HR at rest and at maximum in dipyridamole (28.95 ±24.53, p value< 0.0001); between systolic BP at rest and maximum (6.75 ± 12.50).
Conclusion: The study demonstrated that RPP is associated with MPI findings using gated SPECT imaging with dipyridamole stress. However, to confirm this preliminary result, further studies are mandatory.

P 060 Effect of mobile cell phone ringing on function of gamma camera

Zahra Azizmohammadi[2], Nastaran Baharfar [2], Hamid Javadi[3], Babak Shafiei[2], Sareh Delavari [2], Ali Akbar Babaei [2], Abdolmohsen Ahmadi [4], Majid Assadi[1], Isa Neshandar Asli [2]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Department of Nuclear Medicine, Taleghani Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences (GUOMS), Gorgan, Iran
[4]Telecommunication Company of Bushehr, Bushehr, Iran

After the start of renal scintigraphy in a 32-year-old woman, there was an abnormal view in frame six that was simultaneous with the start of ringing of a mobile cell phone that was in the patient's trousers pocket. In frame six of the flow phase, some bright dots were observed suggesting photomultiplier tubes (PMTs). Immediately after that frame, in spite of continued ringing of the mobile cell phone (up to 1-2 minutes), the imaging frames came back to a normal situation. In the case, electromagnetic interference from the mobile cell phone may disrupt the photoelectric functioning of PMT during scintigraphy.

P 061 Translation of cardiovascular imaging

Majid Assadi

The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

This subject is developed to make available in-depth learning of the imaging of the cardiovascular system at the human and whole animal levels as well as its use to the assessment of cardiovascular function and pathology. Emphasis will be located on a combination of preclinical and clinical imaging modalities and their applications to basic and translational science. The uses of these modalities to other fields of biology will also be discussed. Specific topics contain the establishments of molecular imaging and its value in preclinical and translational research, as well as current clinical practices and areas of investigation involving advanced imaging technologies. Concepts of biomarker imaging will be illustrated. This topic summarized a new generation of translational and molecular imaging methodologies and get better diagnostic accuracy, increase the understanding of pathophysiology and metabolism and also determine therapeutic efficacy. The translational and molecular imaging maintains and put together advances in imaging physics, engineering and image analysis.

P 062 Translational molecular imaging on neurology

Majid Assadi

The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

This subject is developed to make available in-depth learning of the imaging of the neurological system at the human and whole animal levels as well as its use to the assessment of neurological function and pathology. Emphasis will be located on a combination of preclinical and clinical imaging modalities and their applications to basic and translational science. The uses of these modalities to other fields of biology will also be discussed. Specific topics contain the establishments of molecular imaging and its value in preclinical and translational research, as well as current clinical practices and areas of investigation involving advanced imaging technologies. Concepts of biomarker imaging will be illustrated. This topic summarized a new generation of translational and molecular imaging methodologies and get better diagnostic accuracy, increase the understanding of pathophysiology and metabolism and also determine therapeutic efficacy. The translational and molecular imaging maintains and put together advances in imaging physics, engineering and image analysis.

P 063 Translational molecular imaging on oncology

Majid Assadi*, Moloud Abbaszadeh

The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

This subject is developed to make available in-depth learning of the imaging of the cancer as well as its use to the assessment of cancer pathology. Emphasis will be located on a combination of preclinical and clinical imaging modalities and their applications to basic and translational science. The uses of these modalities to other fields of biology will also be discussed. Specific topics contain the establishments of molecular imaging and its value in preclinical and translational research, as well as current clinical practices and areas of investigation involving advanced imaging technologies. Concepts of biomarker imaging will be illustrated. This topic summarized a new generation of translational and molecular imaging methodologies and get better diagnostic accuracy, increase the understanding of pathophysiology and metabolism and also determine therapeutic efficacy. The translational and molecular imaging maintains and put together advances in imaging physics, engineering and image analysis.

P 064 To determine relative biological effectiveness of I-131 beta particles relative to Co-60 gamma photones in glioblastoma spheroid cells by comet assay

Ali Mahmoud Pashazadeh[1*], Ali Neshasteh-Riz[2], Seyed Rabi Mahdavi[3]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Radiology Department, Tehran University of Medical Sciences, Tehran, Iran
[3]Medical Physics Department, Tehran University of Medical Sciences, Tehran, Iran

Introduction: In this research a new approach was considered to determine relative biological effectiveness (RBE) for a specific radiation.
Methods: RBE, in this study, was defined for ^{131}I beta particles, based on 1.25 MeV gamma photons of ^{60}Co source as reference radiation and DNA damages in U87MG Glioblastoma cells as a biological end effect were analyzed by alkaline comet assay technique.
Results: Comet assay revealed that there is a linear relationship between length of tail moment in cells and absorbed dose from beta particles. In this experiment the predicted RBE is 1.16.
Conclusion: Beta particles with average energy of 180 KeV is about 16% more effective than 1.25 MeV photons to produce single strand breaks in Glioblastoma cells DNA. This is partly due to the linear energy transfer differences and partly due to the secondary electrons that translate DNA damages at the microdosimetric level.

P 065 I-131 in nuclear medicine: from thyroid cancers to brain cancers

Ali Mahmoud Pashazadeh*, Mehdi Aghajani

The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

This paper, from physical and medical views, presents a review of radio iodine history in nuclear medicine, in treatment of thyroid cancer that began in 1941 to recent researches in treatment of brain cancers. This paper reviews the published works regarding in vivo and in vitro studies. ^{131}I, also called radioiodine, is an important gamma-beta emitter radioisotope of iodine with the half-life of about eight days. I-131 has an extensive use in nuclear medicine in both therapy and diagnosis. Short-range beta particles of radio iodine with the average range of 1 millimeter can lead to effective damages in cancer cells. The therapeutic use of radioiodine to treat hyperthyroidism from Graves' disease was first reported by Saul Hertz in 1941 and it is one of the most successful treatments in the field of radiation therapy. Physical properties of emitted particles of I-131 and advent of target therapy have made it a promising radioisotope in treatment of brain cancers such as glioblastoma and neuroblastoma. 131I-MIBG (131I-

metaiodobenzylguanidine) is an effective labeled agent with iodine that is using in both imaging and treating.

P 066 Clinical significance of mild inferolateral wall ischemia of the left ventricle on ^{99m}Tc-MIBI myocardial perfusion single photon emission computed tomography (SPECT)

Mahsan Assadi[1*], Alireza Abdi-Ardekani[2], Mohammadreza Pourbehi[2], Abdullatif Amini[2], Hamid Javadi[3], Iraj Nabipour[1], Dariush Iranpour[2], Maryam Barekat[2], Moloud Abbaszadeh[4], Majid Assadi[4]

[1]The Persian Gulf Tropical Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]Department of Cardiology, Fatemeh Al-Zahra Hospital, Faculty of Medicine, Bushehr University of Medical Sciences, Bushehr, Iran
[3]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences (GUOMS), Gorgan, Iran
[4]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran

Introduction: The mild ischemia in the inferolateral wall on myocardial perfusion imaging was seen frequently in practice .The aim of this study is to assess the importance of the above issue on myocardial perfusion SPECT with coronary angiography.
Methods: All patients with mild ischemia of the inferolateral wall on the myocardial single photon emission computed tomography with 99mTc-MIBI using 20 left ventricular segments model were enrolled to this study. For all cases, a questionnaire including type of chest pain, risk factors and, previous examinations were filled out. Then, all cases were follow up for one year. Luminal stenosis of >50% was classified as significant stenosis on coronary angiography. A p value < 0.05 was considered to be statistically significant.
Results: During 2 year investigation, 105 cases had mild ischemia on MPI which 36 subjects (22 male and 14 female) underwent coronary angiography. The mean age was 56.62± 10.23 year-old (age range; 36-73 year). The inferolateral wall was corresponded to left circumflex territory (LCX). Nineteen out of 36 (52.7%) cases had stenosis in LCX. Twenty-three of 105 (21.90%) underwent revascularization during one year follow up. In multiple logistic regressions with LCX stenosis on angiography as dependent variable, we observed that only the abnormal MPI was independently associated significantly.
Conclusion: The findings of the study may indicate that even mild perfusion defect in the inferolateral wall especially in high risk subjects for coronary artery disease should be carefully managed.

P 067 Improving the radiotherapy treatment planning of GBM by MR spectroscopy

Anahita Movahedi[1*], Seyed Rabi Mahdavi[2], Alireza Nikoufar[2]

[1]Department of Medical Radiation Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran
[2]Tehran University of Medical Sciences, Tehran, Iran

Since anatomical imaging, computed tomography (CT) and magnetic resonance imaging (MRI) do not exactly indicate the true extent of Glioblastoma multiforme (GBM), the optimal treatment volumes for this malignant brain lesion remain as a controversial issue. While MRI and CT provide images of excellent resolution, they do not provide sufficient contrast to identify regions of high cellular activity that might be targeted with boost doses. Magnetic resonance spectroscopy (MRS) is a noninvasive technique for measuring biochemicals in tissue so can aid target definition for radiotherapy treatment planning in conjunction with anatomical imaging. The purpose of this study was to evaluate the feasibility of replacing current method of target delineation by another

method based on the patterns of tissue metabolites concentrations such as choline (Cho) and creatine (Cr). 20 patients with Glioblastoma multiforme underwent MRS, MRI and CT scans. The choline to creatine ratio, which represents the degree of abnormality for each individual voxel on MRSI, was derived and converted to different colors from blue to red. We were able to successfully define the target volume in all the 20 cases based on the Cho:Cr ratio. There was a meaningful difference between all volumes of interest in radiotherapy ($p<0.05$). We found that using MRSI provides additional information to conventional imaging that may guide more accurate dose paintings in treatment planning of GBM. MRSI data of special metabolites changed target definition for radiation therapy.

P 068 Production of bulk and nano sized beta emitter praseodymium-142 in Tehran Research Reactor: ^{142}Pr as a promising therapeutic agent

Mohamadreza Khosravi Bakht[1*], Mahdi Sadeghi[2], Seyed Javad Ahmadi[3], Sodeh Sadjadi[3]

[1]Department of Medical Radiation Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran
[2]Agricultural, Medical and Industrial Research School, Nuclear Science and Technology Research Institute, Karaj, Iran
[3]Nuclear Fuel Cycle School, Nuclear Science and Technology Research Institute, Tehran, Iran.

Introduction: The use of radioisotopes and radiation is indispensable in pharmaceutical sciences. At present, radionuclide therapy in humans is based almost exclusively on energetic β^-particle emitting isotopes. ^{142}Pr ($T_{1/2}$ =19.12 h, E_{β^-}= 2.162 MeV (96.3%), Eγ=1575 keV (3.7%)) is one of praseodymium-141 (100% abundant) radioisotopes. A number of studies have attempted to assess the significance of ^{142}Pr in the therapeutic nuclear medicine. Additionally, preclinical studies demonstrate the high performance of nano sized radionuclides both in therapy and imaging in isolated tumor cells or in rodents. This abstract reported the production of bulk and nano sized ^{142}Pr in Tehran Research Reactor (TRR).
Methods: All chemicals used were of AR/GR grade from Merck™. Praseodymium nitrate hexahydrate was used as the precursor for synthesis of praseodymium oxide (Pr_2O_3) nanoparticles. The nanoparticles were characterized by XRD (Philips PW 1800), and TEM (LEO 912AB) tests. Then two quartz tubes charged with bulk and nano sized Pr_2O_3were flame sealed under vacuum and cold welded in aluminum can. ^{142}Pr was produced by thermal neutron bombardment of ^{142}Pr via a (n, γ) reaction in TRR at a flux of ~ 3×10^{13} n.cm^{-2}.s^{-1} for 19 hours. After irradiation, each sample was analyzed by Liquid Scintillation counter (LSC) and High Purity Germanium detector (HPGe). Radionuclide (RN) purity of ^{142}Pr samples was determined by high resolution gamma ray spectrometry using an HPGe detector (Silena International™2000) coupled to a multi channel analyzer (MCA). Measurements of radioactivity were carried out by using scintillation counter (Wallac 1220 Quantulus™).
Results: ^{142}Pr as an alternative can easily be obtained by irradiation in a research reactor such as TRR in a fairly short period of time due to its high thermal neutron cross section (11.4 barn) that is significantly higher than conventional beta sources such as ^{32}P (0.18 barn) or ^{90}Y (1.28 barn). However, the bulk ^{142}Pr was totally water-insoluble; the nano sized ^{142}Pr showed rather water-soluble characteristics. No considerable difference between the activities of bulk and nano sized ^{142}Pr was observed. Furthermore, ^{142}Pr owing to very low specific γ-emission could not only be a suitable radionuclide in order for biodistribution studies.
Conclusions: According to the medicinal purposes, the production of bulk and nano sized ^{142}Pr in TRR was described. High-energy (2.16MeV) beta radiation of ^{142}Pr can be utilized for high penetration in large tumors and large inflamed joints. Lastly, it appears ^{142}Pr are gaining importance as emerging therapeutic agents in nuclear medicine.

P 069 Lymphangiectasia detection in wireless capsule endoscopy images by using fisher transform method

Mahdi Alizadeh*, Alireza Talebpour, Hoda Eskandari

Department of Radiation Medicine Engineering, Shahid Beheshti University, Tehran, Iran

Finding borders in normal and abnormal images is important in researches and making decisions. Especially, finding borders in endoscopy images help clinicians to find abnormalities. In this paper, we investigate the Fisher Transform Method (FTM) for edge detection. FTM increases gradient of Endoscopy images. So, it has a better performance rather than traditional methods. We apply FTM to more than 20 normal and Lymphangiectasia small bowel images captured by Wireless Capsule Endoscopy (WCE). The results show that, it has a better performance rather than Color Operator Canny edge detector. The detection results were validated by analyzing with hand-drawn ground-truths. Moreover, by applying this method we detect 96% of borders in Lymphangiectasia and 75% of borders in normal images. In comparison, we detect 75% and 51% of Lymphangiectasia and normal images before FTM, respectively.

P 070 Effect of antiepileptic drugs on bone mineral density

Majid Assadi[1*], Hooman Salimipour[3], Iraj Nabipour[2], Sara Kazerooni[1], Hamid Javadi[4], Reza Nemati[3]

[1]The Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[2]The Persian Gulf Tropical Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran
[3]Department of Neurology, Faculty of Medicine, Bushehr University of Medical Sciences, Bushehr, Iran
[4]Golestan Research Center of Gastroenterology and Hepatology (GRCGH), Golestan University of Medical Sciences (GUOMS), Gorgan, Iran

Introduction: The effects of antiepileptic drugs (AEDs) on bone mineral density (BMD) are well-addressed; but, data in children especially with new antiepileptic medications is scarce. This study aimed to provide the impact of these drugs on BMD of ambulatory patients with epilepsy.
Methods: BMD and detailed clinical information were obtained in 113 patients. The patients were also categorized to two enzyme-inducing AEDs (EIAEDs) and non-enzyme-inducing AEDs (non-EIAEDs) groups. Also, they classified to two single therapy (ST) and multiple therapy (MT) groups. All patients filled a questionnaire of 63 questions. In this study, the raw value of BMD, T-score and Z-score of the spine, neck of femur, total hip and forearm were analyzed.
Results: A total of 113 patients, including 62 (54.9%) females and 51 (45.1%) males, with a mean age of 21.79+-10.31 years, took part in the study. The mean time of therapy was 43.17+-30.78 months. Also, 71 cases(62.8%) had more than 18-year-old and 42 cases (37.2%) had less than 18 year-old . 57 cases used ST and 56 MT. 72 cases used EIAEDs and 41 cases used non-EIAEDs. In patients >18 year-old , 18 cases had osteopenia and 3 cases had osteoporosis in lumbar region as well as 11 cases had osteopenia and 4 cases had osteoporosis in hip region . There was no significant difference in BMD in two ST and MT and also in two (EIAEDs) and (non-EIAEDs) groups . In multivariate linear regression analysis revealed that BMI was only important factor associated with low BMD in lumbar , total hip and forearm .
Conclusion: antiepileptic drugs therapy especially new generations diet are associated with low bone density. The presented these data stressing the clinical and diagnostic points, in hope of stimulating a high index of suspicion to facilitate early diagnosis and preventive care.

P 071 Simulation of electrical field and energy deposition in tissue by using of gold nanoparticles

Mahdi Alizadeh[1*], Alireza Talebpour[1], Vahid Qaradaghi[2], Masoumeh Parsi[3]

[1]Department of Radiation Medicine Engineering, Shahid Beheshti University, Tehran, Iran
[2]Department of Nanomaterial, TarbiatModares University, Tehran, Iran
[3]Department of Radiation Medicine Engineering, Amirkabir University of Technology, Tehran, Iran

Gold nanoparticles with an optimal light absorption capacity in the near-infrared region, small size, and spherical shape, perfect for penetrating cancer cells and burning them up. The gold nanoparticles have been chosen, which nearly perfect spheres are, in the radius size from 10 to 40 nanometers. Also, we simulated these ranges of nanoparticles for different wavelength. 3D simulation of gold nanoparticles investigated through software such as DDSCAT and COMSOL. The input optical pump laser assumed plan wave. We assumed that all heat absorbed in tumor. Also, we assume that gold nanoparticle distribution around the tumor is uniform. Our simulation shows that with gold nanoparticle radius about 50nm with 25 nm distance to each other, the heat absorption peaks would be 90% at wavelength of 8μm.

P 072 Image quantification for biodistribution investigation of ^{99m}Tc-MDP in patients following bone scintigraphy

Mohsen Cheki*, Daryoush Shahbazi-Gahrouei, Masoud Moslehi

Department of Medical Physics and Medical Engineering, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

Introduction: Image quantification in nuclear medicine with planar or tomographic methods is used to estimate activity in human subjects for the calculation of radiation dose. The aim of the present study was to describe a method to obtain the mean uptake activity of organs in different time periods after injection of ^{99m}Tc-MDP.
Methods: In this study, each patient was injected 25 mCi of ^{99m}Tc-MDP. Patients were imaged with a gamma camera. Whole-body images from the thirty patients were acquired at 10, 60, 90, 180 minutes after ^{99m}Tc-MDP injection. Regions of interest (ROIs) were drawn around source organs on each time frame. The same set of ROIs was used for all scans and the count per minute (cpm) of each ROI was converted to activity using the conjugate view counting method.
Results: The mean uptake activity was measured in different time periods after injection of ^{99m}Tc-MDP for each organ. In this study kidneys received uptake activity maximum in 10 minute after injection and liver received uptake activity maximum in 60, 90, 180 minutes after injection. The minimum of uptake activity received for spleen in different time periods after injection.
Conclusions: According to results obtained in study the highest uptake in organs were in initial minutes after injection and also with the time elapsed declined uptake in organs. The study results were consistent with the results of other studies.

P 073 Dosimetric comparison between 3D TPS (treatment planning system), Monte Carlo simulation and gel dosimetry in nasopharyngeal phantom for HDR brachytherapy

Zeynab Fazli[1], Mahdi Sadeghi[2], Mohammad Hasan Zahmatkesh[3], Seyed Rabi Mahdavi[4], Alireza Nikoofar[4], Claudio Tenreiro[5*]

[1]Nuclear Engineering Department, Science and Research Branch, Islamic Azad University, Tehran, Iran
[2]Agricultural, Medical and Industrial School, P.O. Box 31485-498, Karaj, Iran
[3]Novin Medical Radiation Institute, Tehran, Iran

[4]Department of Medical Physics, Faculty of Medicine, Tehran University of Medical Sciences (TUMS), Tehran, Iran
[5]Department of Energy Science, SungKyunKwan University, 300 Cheoncheon-dong, 440 - 746, Suwon, Korea

Introduction: This study investigates to what extent the computed dose received by nasopharynx tissue in a commercially available treatment planning system (TPS) for ^{192}Ir high-dose-rate Nasopharyngeal brachytherapy is accurate in view of tissue inhomogeneities and presence of head bone.
Methods: A head phantom was made with plexi glass and head skeleton. A CT scan of the head phantom was used to simulate it in MCNP5. An implant involving ^{192}Ir with 140 programmed source well positions was simulated using the MCNP5 code. A normoxic radiosensitive polymer gel MAGICA was fabricated under normal atmospheric conditions and poured into the phantom. Using ^{192} Ir brachytherapy source, the phantom were irradiated with remote after loader system. Also calibration tubes were irradiated between zero and maximum dose regions with linear accelerator.
Results: The results were compared with the corresponding commercial TPS in the form of isodoses in Nasopharynx and head skeleton. The comparison of Monte Carlo results , Gel dosimetry and TPS calculation showed that relative error was 3.92% in comparison between MCNP5 simulation with TPS isodose curves. Difference was 6.45%.between the results Gel dosimetry and TPS.
Conclusion: Taking into account with comparison of normoxic polymer gel MAGICA and TPS, practical errors with calculating errors were represents. Also comparison of MCNP5 and TPS represent calculating errors that occurs in TPS. If in Treatment Planning System, non homogeneity and photon energy spectrum are considered, these errors will be decrease and accuracy of Treatment Planning will be increase. MC simulation and Gel dosimetry perform better simulation, because non homogeneous and photon energy spectrum is simulated.

P 074 Prediction of palladium-103 production using the Monte Carlo code MCNPX

Mahbobeh Mahmodi [1], Mahdi Sadeghi[2], Claudio Tenreiro [3, 4*]

[1]Physics Department, Zanjan University, P. O. Box: 451-313, Zanjan, Iran
[2]Agricultural, Medical and Industrial Research School, Nuclear Science and Technology Research Institute. P.O. Box: 31485/498, Karaj, Iran
[3]Department of Energy Science, Sungkyunkwan University, 300 Cheongcheon-dong, Suwon, Korea
[4]University of Talca, Talca, Chile

The radionuclide palladium-103 ($T_{1/2}$=16.991 d; decays almost exclusively by EC to ^{103m}Rh, $T_{1/2}$=56.114 min) has been of great interest in prostate and eye cancer therapy due to its suitable half life and decay characteristics. Palladium-l03 has been produced by proton irradiation of a rhodium target through the ^{103}Rh(p,n)^{103}Pd reaction. The experimental production ^{103}Pd activity in 15 hours of irradiation at 200 A was calculated 685 mCi. In this study, the comparisons of the experiment data and Monte Carlo simulation (MCNPX) of induced activity in the production of ^{103}Rh were presented. MCNPX was used to calculate the energy distribution of the proton flux on the Rh target. The activity based on the MCNPX was calculated 674.58 mCi. Good agreement between the theoretical and the experimental data of the ^{103}Pd activity and the activity estimation based on MCNPX calculation was observed. This study demonstrated that MCNPX provide a suitable tool for the simulation of radionuclide production using proton irradiation.

P 075 The influence of PET and CT data misalignment in cardiac PET/CT examination: an analytic simulation

Pardis Ghafarian

Telemedicine Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
Chronic Respiratory Disease Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Introduction: With advent of PET/CT scanners, simultaneous viewing of anatomical and functional data is possible. In addition to advantages of CTAC there are some limitations including misalignment between the emission and transmission images due to difference of acquisition time two modules that lead to make serious problem. But as attenuation correction is vital for PET imaging and the amplitude of artifacts that seen from motion-induced in reconstructed PET images are related to respiratory and cardiac phase of attenuation map, In this study we seek to develop CT-based attenuation correction of PET data by CT data attained in various breath hold and cardiac phase to better alignment with PET data.
Methods: For accurate quantitative analysis, we used XCAT phantom to generate activity and attenuation maps in various respiratory and cardiac phases. For each phase two types of binary files were generated. We defined activity maps value and the characteristic of normal respiratory and cardiac phase is assigned to visible man datasets. The emission data were attained by forward projection of XCAT phantom using STIR software. Images were evaluated through qualitative and quantitative analysis in corporation of VOI-based analysis by drawing numerous VOIs uniformly distributed at all regions of the myocardial wall in each PET dataset to obtain correlation plots, correlation coefficients, as well as Box and Whisker plot. For comprehensive assessment of the activity distribution in myocardium wall, bull's eye view model was evaluated and PET images were also reoriented along the short axis, horizontal and vertical long axis views.
Results: significant overestimation and underestimation of uptake value in the Apex region (27.94, 16.17) of PET image was observed using attenuation map at end-exhalation and end-inhalation respiratory phase respectively. The study showed using attenuation map at end-exhalation of respiratory phase had consistent overestimation activity in all segments of myocardial wall as opposed to the end-inhalation attenuation map, So that changes were large in the lateral and anterior regions.
Conclusion: Misalignment can introduce artifactual nonuniformities in apparent myocardial uptake value. Respiratory effect at end-exhalation can introduce large errors compared to end-inhalation. Though using of attenuation map at mid-inhalation and mid-exhalation of the respiratory phase can introduce little overestimation of activity in all region of myocardial wall, the errors cannot cause erroneous interpretation of PET image with compare to use attenuation map obtained by averaging respiratory and cardiac phase.

P 076 The influence of metallic artefact reduction on the accuracy of attenuation map generation in cardiac PET/CT imaging

Pardis Ghafarian

Telemedicine Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
Chronic Respiratory Disease Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Introduction: With the advent of 64-slice CT and combined with dedicated PET scanner, full cardiac protocols are possible as an adjunct to myocardial viability and perfusion examination. In addition to advantages of CTAC in correction of PET data, metallic artefacts arising of the presence of pacemakers and implantable cardioverter defibrillator (ICD) leads that located in various regions of the atria and ventricles of patients can produce the propagation of CT artefacts into PET data and lead to erroneous interpretation of PET images. The aim of this study is assessment of quantitative and quantitative metallic artefacts and evaluation of effectively MAR algorithm in reduction these artefacts arising in both CT images and attenuation maps (μ-maps).
Methods: This study was performed using 14 patients with ICD, pacemaker and ECG leads. For accurate quantitative analysis we used of pacemaker and ICD leads attached at the right ventricle

of RSD thorax phantom. The effect of an image-based MAR algorithm that is implemented on commercial software provided on the Biograph TP 64 scanner was assigned to CT images. The severity and magnitude of metallic artefacts arising from metallic leads were evaluated on CT images and μ-maps. Volume of interest-based analysis and regression plots were done for regions related to the lead locations and vicinity of that.

Results: though the metallic artefact was obvious on CT images, it was pronounced much less on μ-maps especially after applying the MAR algorithm. While in related to the patients with ECG lead, no significant artefacts were clear in μ-maps without and with MAR. By VOI analysis, the mean relative differences between generated μ-maps without and with MAR in both white and dark regions introduced that ICD leads can show intense artefacts in both regions in comparison with pacemaker and ECG leads.

Conclusion: The artefacts from the metallic shock coil of ICD leads were more severe versus of pacemaker leads due to larger lead diameter in CT images. It should be emphasized that MAR was more robust in decreasing artefacts associated with ICD leads than those associated with pacemaker leads and particularly can be effectively useful in related to multiple ICD leads attached to the myocardial wall and can lead to improve the magnitude of metallic artefacts in μ-maps images.

P 077 Development of a fully 3D image reconstruction for a pinhole animal SPECT

Sayed Masoume Khamesi[1, 3*], Alireza Kamali Asl[3], Masoud Masoudi[1, 3], Navid Zeraatkar[1, 2], Mohammad Reza Ay[1, 4, 5]

[1]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Parto Negar Persia Co, Tehran, Iran
[3]Shahid Beheshti University, Tehran, Iran
[4]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[5]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Despite of the limited use of pinhole single photon emission computed tomography (SPECT) in human studies; this technique has been developed during the last couple of years in order to be applied in small animal imaging. Even though, a pinhole collimator provides a smaller field of view in comparison with a parallel-hole collimator, it offers the highest spatial resolution among the collimators available in conventional nuclear medicine imaging and is well suited to image the small organs of body. The purpose of this study was to develop a fully 3D image reconstruction technique for pinhole animal SPECT imaging for our High Resolution SPECT (HiReSPECT) system. The performances of pinhole animal SPECT imaging were evaluated using computer simulations with Micro Deluxe phantom and NEMA phantom. The results from the computer simulations indicate that the rotation-based Maximum-Likelihood Expectation Maximization (MLEM) method provides overall image quality improvement. The results of the reconstructed images of the phantoms with MLEM algorithm, showed that spatial resolution reach almost 1.44 mm at the worse case. To conclude, we have successfully developed a valid fully 3D image reconstruction technique for single-pinhole animal SPECT imaging. This technique can be simply extended to multi-pinhole animal SPECT imaging. In the future, this collimator will be used as an accessory in the HiReSPECT system.

P 078 The Influence of opening angles and collimator material on the spatial resolution of pinhole collimator in animal SPECT Imaging

Masoud Masoudi[1, 3*], Alireza Kamali Asl[3], Sayed Masoume Khamesi[1, 3], Hossein Arabi[1, 2], Mohammad Reza Ay[1,4, 5]

[1]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Parto Negar Persia Co, Tehran, Iran
[3]Shahid Beheshti University, Tehran, Iran
[4]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[5]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

High spatial resolution of small animals SPECT imaging is often obtained by multi-pinhole collimator. In pinhole collimator, penetration and scattering of gamma radiation at edge of aperture has significant effect on the spatial resolution of the system. The attenuation coefficient of the aperture material and also the opening angle of pinhole are main factors that determine the amount of penetration and scattered radiation in pinhole collimator. In this study we evaluated the influence of collimator material and opening angle on penetration and scattered radiation.
The parameters and experimental results of the High Resolution small animal SPECT (HiReSPECT) were used for simulation and validation of this work. This system uses 80×40 pixelated crystal array detectors with a 1mm crystal element size and 100×50 mm^2 useful detector area. A knife edge pinhole collimator with a 0.5 mm aperture diameter was designed and simulated. The collimator has the focal distance of 35 mm with a Radius of Rotation (ROR) of 14 mm that provides field of view (FOV) of 20 mm and a magnification factor of 2.5 for the system. The amount of penetration and scattered radiation in pinholes aperture was characterized for uranium, gold, tungsten, and lead materials at different opening angles of aperture. The results showed that by changing the opening angle from 45º to 30º, the percentage of penetration photons decreased from 25% to 17%. The spatial resolution of the system for Lead, Tungsten, Gold, and Uranium was 0.72, 0.65, 0.61, and 0.57 mm (FWHM) respectively. For constant aperture diameter and channel height, the FWHM decreases when going from lead to uranium but at the cost of decreasing sensitivity.

P 079 PET and its clinical (oncologic and non-oncologic) applications in the advanced era of fused imaging technology

Morteza Bahri Iraii

Iranian Hospital Dubai

PET, PET/CT and even most recently PET/MR have been increasingly used as effective imaging modalities for the management of patients with cancer, neurologic diseases, cardiovascular diseases and infectious disease. The aim of the study is to provide essential information and scientific utilities of the PET and its fused imaging technology in medical imaging fields not only in oncology, but also an overview of the non-oncological clinical applications mainly done by 18F-FDG PET and PET/CT. Currently the combined imaging modalities apply in pediatric PET/CT, and in radiation therapy planning, as well as assess inflammatory and infectious disorders. The current utility of the PET in cancers diagnosis, therapeutic responses, and radiation therapy planning, so-called ‘‘Oncologic Applications,’’ are now-a-days well developed and addresses high promising results for the closed future. The “oncologic applications” describes the role of PET and PET/CT in the management of specific diseases, providing descriptions of indications and comparisons with other imaging modalities. Moreover pearls and pitfalls in the interpretation of PET and combined images emphasize critical concepts and attention to these techniques. On the other hand, the application of PET and its fused images has been developing in the medical fields such as Neuro-psychiatry cases, Cardiologic patients, and in infection and inflammation status. The outstanding selected images are clear, illustrative, and informative. This article may serve as a valuable review and teaching profile in such interesting cases in the brilliant era of PET and fused technology roles for sharpening the current and future clinical consultation skills. Finally, PET, PET/CT and PET/MR is to be an essential tool for assessment of rather oncologic and less common but growing non-oncological diseases with the latter technology may apply particularly in Neuro-Psychiatry patients.

P 080 In vitro screening of new triazol and oxadiazole derivatives as benzodiazepine receptor agonists using radioligand receptor binding assay

Fatemeh Ahmadi[1*], Soraya Shahhosseini[2], Davood Beiki[1,3]

[1]Department of Nuclear Pharmacy, School of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Medicinal Chemistry, School of Pharmacy, Shahid Beheshti University of Medical Science, Tehran, Iran
[3]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Radioligand binding assays are a relatively simple but extremely powerful tool for studying receptor .This technique is very popular and widely used in various fields in medicinal chemistry, based on known structure activity relationship (SAR) of ligands and receptor binding site new ligands as agonist or antagonist of receptors are design and synthesized, but measuring each variant of series in vivo can be both costly and time-consuming. Radioligand receptor binding assay, study interactions between the targeted receptor and the ligands of interest, frequently used to quickly and inexpensively narrow the field and identify a lead compound for further investigation. Radioligand binding assay includes two types of experiment: a) saturation binding studies b) competition binding studies. In saturation binding studies the maximum density of receptors (B_{max}) and the equilibrium dissociation constant (K_d) are measured whereas in competition binding experiments, competition data are analyzed to yield (IC_{50}) value, which can be used to rank the relative receptor binding affinities for a series of ligands. In the present paper we set up this method for in vitro screening of new triazol and oxadiazole derivatives as benzodiazepine receptor agonists, the main goals in this work are divided to following stages: (1) Preparation of benzodiazepine receptor from rat 's brain and Determination of amount of protein in the brain tissue, (2) Determination of steady-state, (3) Determination of total binding, specific binding, non-specific binding, (4) Using standard radioligand in saturation binding assay and after that investigation of (K_d) and (B_{max}) by statistical analysis, (5) Study of radioligand and synthesized radio ligand in competition binding assay, (6) Determination of (IC_{50}) value and (K_d) synthesized radioligand by statistical analysis, (7) Comparison of the result and choosing effective ligands for future studies.

P 081 Hepatopulmonary syndrome

Ahmad Mehrazin

Khatamolanbia Hospital, Zahedan University, Iran

The functional relationship between the liver and lung originally Recognized in1935 is now called hepatopulmonary syndrome (HPS). The syndrome consist of a triad of : (1) Liver disease, (2) increased alveolar – arterial oxygen gradient, and (3) intrapulmonary vasodilatation. Patients usually present with a combination of symptoms indicative of both liver and lung disease: esophageal varices ,gastrointestinal bleeding , spider nevi, ascites, and splenomegaly , indicative of liver disease, and dyspnea ,clubbing ,platypnea , and orthodeoxia, indicative of lung disease. Platypnea is dyspnea in an upright position, which is relieved by assuming a supine position. Orthodeoxia is arterial deoxygenation, exaggerated in the upright position and relieved by recumbency. platypnea and orthodeoxia , which were found only in a small percentage of patients with cirrhosis (5 %) , are much more frequent and severe in intensity in 2 patients with HPS ,often reaching as high as 88 – 100%. Chest X-Ray changes consist of either finely diffuse spidery infiltrates or focal arteriovenous malformations. Pulmonary artery pressure remains normal or slightly low. Severe hypoxemia (PaO2 < 60 mmhg) in the absence of primary lung disease, in combination with liver disease clinically should raise the suspicion of HPS. The pulmonary capillaries, which normally measure 8-15 micrometere, dilate up to 100 micrometere in diameter, often forming spider nevi on the pleural surface. MAA of 15-150 micrometer in diameter normally get trapped almost completely within the pulmonary capillary bed after intravenous injection. Tc-99mMAA particles readly pass through the dilated pulmonary capillaries in patients

with HPS and enter the systemic circulation to be trapped in normal size capillaries of the brain , liver ,kidney and other organs , in proportion to their blood supply. Normally less than 6% of Tc-99mMAA particles bypass the lung to lodge in other organs. it is theorized that the liver in HPS either produces vasodilatators or is incapable of inactivating vasadilatators produced elsewhere. Incriminated vasadilatators include 3 prostaglandins, vasoactive intestinal polypeptide, calcitonin, glucagon, nitric oxide, and atrial natriuretic factor, etc.

P 082 QCT technique optimization by dual energy CT

Azadeh Emami[1*], Hossein Ghadiri[1, 2], Pardis Ghafarian[4, 5], Mohammad Reza Ay[1, 2, 3]

[1]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[3]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[4]Telemedicine Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5]Chronic Respiratory Disease Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Introduction: Quantitative computed tomography (QCT) has been widely investigated and applied in recent years as a means for noninvasive quantitative bone mineral determination. Variation of parameters like error ratio highly affects the densitometry results that may induce some level of uncertainty in diagnosis. The dual-energy mode (DEQCT) appears to provide the ability to detect small changes in bone mineral with a precision of better than single-energy (SEQCT).
Methods: In this study several phantoms consisting of soft tissue- and bone-equivalent material were devised to accurately test QCT systems: a QCT quality control, quality assurance, and Plexiglas cylindrical phantoms as a spine phantom. The SEQCT data presented in this study refer to the measurements with 120 kVp. To evaluate with dual energy, the scans were performed at 80kVp, and 140kVp in all densities. In SEQCT technique the mean CT number of the solutions was plotted against their true mineral density concentrations and the linear regression was calculated. For the dual energy technique each density was scanned twice at different energies, and the BMD was computed using Subtraction method, as well as, Simultaneous Equation method. We use a measurement of known density (0, 50, 100, and 200 mg/cc of K_2HPO_4 and fat-equivalent standard) as a calibration phantom and analytical calculation to compute the CT number of pure K_2HPO_4 and water.
Results: It is demonstrated that by decreasing of bone mineral densities an increasing trend in error ratio of measured densities is happened that may cause some level of uncertainty in low densities. The error ratio of QCT varies from 1.51 to 0.21 in single energy and 1.353 to 0.348 in dual-energy subtraction method for 20 to 100 mg/cc K_2HPO_4 concentrations, whereas the error ratio of dual energy Simultaneous Equation technique varies from 0.264 to 0.245.
Conclusion: BMD was measured by single-energy and two dual-energy methods. The expected densities are higher in the single- than in the dual-energy mode. The significant difference between error ratio in SEQCT and DEQCT is shown. The DEQCT by Simultaneous Equation method showed excellent capability for decreasing error ratio .We suggest that, this method should be used for accurate bone mineral densitometry in low density region.

P 083 Nuclear medicine nurse

Rafat Rezapour

School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran

The aim of this article is to demonstrate the role of nurses during nuclear medicine procedures and the influence of nurses in quality of patient care. Nuclear Medicine Nurses educate patients and their cares in order that they can make informed choices about their investigations and treatment. Nurses perform an important role in various tasks in assisting the technologists and physicians to carry out nuclear medicine procedures. Nuclear Medicine is the use of radioactive materials in diagnosis and lesser extent therapy. It is undertaken using radioisotopes which are natural elements. These natural elements decay with the emission of three type of radiation: Gamma Rays, Beta and Alpha. The Nursing Roles Nurses are essential in providing quality patient care and saving patient's lives during an emergency in nuclear medicine. Nurses also are a key role in alleviating the anxiety and fear of the patient, especially children, regarding the procedure.
1-Education: Educate patients and their carers in order that they can make informed choice about their investigations and treatment, in a way that they can understand. Educate nursing and medical staff about nursing care and basic nuclear medicine principles and procedures.
2-Clinical Effectiveness : The nurse needs to be aware that the role can be diverse and change quite quickly. Adaptability is thus a key requirement. In addition, a good general knowledge of Nuclear Medicine, Be flexible to meet the needs of patients and procedures ,will be required.
3-Liaison : Staffs from many different specialties contribute to the work in nuclear medicine, including pharmacists, radiographers, technologists, doctors, physicists, clinical scientists, administrative staff, nurses, laboratory technicians and research technicians.
4-Equipments Control: Often the nurse has a responsibility for the routine testing of essential equipment such as resuscitation equipment. Also responsibility for the ordering and purchasing of everyday stock and major equipment such as ECG machines.
Nurses working in nuclear medicine need the technical skills to undertake many complex tasks and the ability to support patients who are likely to be anxious about their diagnosis and the effects of radiation and other procedures. There are a number of career advancing opportunities available for nurses to participate in various radioisotope meetings to learn about radionuclide imaging, radiation safety and how to take care of patients receiving radionuclide.

P 084 Correlation of contrast-CT scan and RBC liver SPECT in diagnosis of liver hemangioma

Morteza Bostani*, Azra Izanloo, Farah Raoofi

Nuclear Medicine Department, Razavi Hospital, Mashhad, Iran

Introduction: Hemangioma is the most common benign liver mass that usually needs no treatment; however, distinction from other lesions mainly malignant tumors and metastases is important.
Methods: In 80 patients with suspected liver hemangioma that had performed contrast CT previously obtained RBC-liver SPECT in our department in dynamic as well SPECT scan after injection of in vitro labeled RBCs with 99m Tc- pertechnetate and the results was compared with CT-scan. In all patients RBC scan interpret as positive or negative for hemangioma and the CT results classified as compatible and incompatible with hemangioma. Positive RBC scan regarded as gold-standard for evaluation of CT results. Chi-squar T-test was used to detect relation-ship between CT and RBC-scan results.
Results: 53 women (66%) and 27 men with age between 13-84 years were evaluated. CT of 47 (36.7%) subjects show hemangioma; however, in 44(55%) patients liver hemangioma was detected on scintigraphy. Overally 78 hemangioma was detected on CT scan and 65 numbers in RBC-scan, respectively. No significant different was noted between CT and RBC scan results in detection of liver hemangioma (p=0.47). In 63 lesions ≥ 15mm, 38 (60%) and 37 (58 %) hemangioma were detected on CT-scan and scintigraphy respectively. In this group, when positive scintigraphic result considered as gold standard, using the Chi-squar t-test, the sensitivity, specificity, positive predict value and negative predict value of CT-scan for detection of scintigraphic-positive hemangioma calculated as 70%, 40%, 68% and 42%, respectively.
Conclusion: for improvement of liver hemangioma diagnosis combination of CT scan and RBC-liver SPECT is recommended.

P 085 ^{18}F-FAHA PET signatures of histone deacetylase activity in the transgenic mouse model of Alzheimer's disease

Ren-Shyan Liu[1, 3, 4*], Jung-Wen Kuo[1], Kuan-Hao Su[2], Chun-Yi Wu[1, 4], Chi-Wei Chang[3], Irene Han-Juo Cheng[5], Hsin-Ell Wang[4], Allen Cheng Chang[4]

[1]MAGIC/NRPGM, National Yang-Ming University, Taiwan
[2]Molecular Imaging Center, Chang Gung Memorial Hospital, Taiwan
[3]NPCC, Taipei Veterans General Hospital, Taiwan
[4]Department of Biomedical Imaging and Radiological Sciences, National Yang-Ming University, Taiwan
[5]Institute of Brain Science, National Yang-Ming University, Taiwan

Introduction: Epigenetic aberrations have been characterized in neurodegenerative diseases including Alzheimer's disease (AD). Several histonedeacetylase (HDAC) inhibitors have been proved effective to restore cognition and recovery memory in transgenic (Tg) AD animal models. For further understanding the deacetylation condition of the brain with AD, ^{18}F-6-(fluoroacetamido)-1-hexanoicanilide (FAHA) was used to assess the HDAC activity in Tg AD mouse model.
Methods: Transgenic mice of J20 line, which overexpress mutant human amyloid protein precursor (APP), were studied at 19-20 months. Static PET-scans were acquired with ^{18}F-FDG (0.74 MBq) and ^{11}C-Pittsburgh Compound B (^{11}C-PIB, 37 MBq). Then a 60-min dynamic PET scan was performed with ^{18}F-FAHA (0.37 MBq). Image-derived cardiac input functions estimated from each experiment were used for quantification. The ^{18}F-FAHA parametric images were analysed using a simplified-three compartment model (S3CM) to assess the HDAC activity.
Results: The cerebral accumulation of FDG in the APP+ mice decreased when compared with that of non-Tg (APP-) mice. The amyloid imaging of the APP+ mice showed ^{11}C-PIB retention in the cortex at 20 m. The static images of FAHA did not demonstrate the difference of the HADC activity between two groups, whereas the quantification method using S3CM showed a monotonic increasing of the HADC activity in APP+ mice but not in APP- mice. The ^{18}F-FAHA parametric images of the APP+ mice revealed increasing K_i and k_3 of the brain from 0.024 to 0.037, and from 0.032 to 0.61, respectively, in contrast to no change in non-Tg mice. Furthermore, the quantitative results exhibited a discrepancy between the k_3 and K_i images, indicating that a tissue with high perfusion needs not to be a tissue with high HDAC activity.
Conclusion: The quantitative FAHA PET imaging showed a great potential for assessing the HDAC activity of brain in the Tg AD animals. A combined interpretation of the k_3 and K_i images is a feasible approach to analyse the HDAC activity in AD.

P 086 Gorham's disease: the disappearing bone

Rong-Hsin Yang*, Cheng-Pei Chang

No. 201, Sec. 2, Shih-Pai Road, Taipei 112, Taiwan. R.O.C.

Gorham's disease is a rare benign disorder characterized by proliferation of vascular channels that results in destruction and resorption of osseous matrix. The clinician's acute awareness and high degree of suspicion are required for diagnosis because of its rarity and variable clinical presentation. Distinctive radiological and histopathological features may help in this regard. We report such a case in a 31-year-old male patient who underwent image examination due to progressive weakness of the lower limbs in the past 6 years. Routine blood investigations were essentially within normal range. And the radiograph revealed T-12/L-1 compression fracture and almost complete osteolysis (absence) of the left lower rib cage. The vertebra bodied of T-12 and L-1 also showed a few lytic lesions with some fragmentation. Tentative diagnosis is occult malignancy with bony metastasis. However, all the tests for malignacy or autoimmune markers were unremarkable. Thus, the patient underwent a CT-guided bone biopsy. Histopathologic findings revealed small fragments of destructed bone trabeculae with a few thin-wall vessels proliferation. Diffuse hemorrhage is distinctive. Osteoblastic activity was absent. No callus

formation, re-osteolysis of formed callus, calcification, or new bone formation were found. There was no evidence of cellular atypia or malignancy. The above features are consistent with bone hemangioma. It was compatible with Gorham disease, a rare disease. This case indicate that bone scan combined CT is a useful modality for detecting bone lesions and helpful for the diagnosis.

P 087 Muscle man: Visualizing critical-illness myopathy on FDG PET/CT scan

Rong-Hsin Yang*, Yum-Kung Chu

No. 201, Sec. 2, Shih-Pai Road, Taipei 112, Taiwan. R.O.C.

Critical illness myopathy (CIM) is a syndrome of widespread muscle weakness and neurological dysfunction which can develop in critically ill patients receiving intensive care. CIM are often distinguished largely on the basis of specialized electrophysiologic testing or muscle and nerve biopsy and its causes are unknown, though they are thought to be a possible neurological manifestation of systemic inflammatory response syndrome usually developing in patients after a brief period of stay in the Intensive Care Unit (ICU). Here we report a patient, who is a 60-years-old male with pneumonia admitted to the intensive care. Sudden onset of weakness over the lower limbs and ventilation dependent developed. Series studies was arranged and the tentative diagnosis is critical illness myopathy, which may accompany with malignancy. PET was thus arranged as a part of maliganacy work-up . The scan results showed extensive whole-body skeletal muscle uptake. These characteristics is compatible with the diagnosis of critical illness myopathy. Health professionals working at critical care unit should be aware that any ICU patient may develop CIM. And although PET/CT is used for evaluating malignancy, explict intrpretation of muscular tracer uptake maybe of diagnostic value in some case.

P 088 Effects of enhanced external counterpulsation on myocardial perfusion in patients unsuitable for invasive interventions

Babak Mahmoudian[1*], Shahram Oskoie[2], Fariba Eslamian[3]

[1]Tabriz Gamma Scan Nuclear Medicine Center, Tabriz, Iran
[2]Nuclear Medicine Ward, Imam Reza Hospital, Tabriz University of Medical Sciences, Tabriz, Iran
[3]Department of Physical Medicine and Rehabilitation, Tabriz University of Medical Sciences, Tabriz, Iran

Introduction: Enhanced external counter-pulsation (EECP) is a non-invasive outpatient treatment used for angina pectoris. In patients with intractable angina who were symptomatic after medical and invasive strategies, several novel techniques are considered including EECP. EECP produces an acute hemodynamic effect that is presumed to be similar to that produced by the invasive intra-aortic balloon pump. By applying a series of compressive cuffs sequentially from the calves to the thigh muscles upon diastole and rapidly deflating the cuffs in early systole, an increase in diastolic and decrease in systolic pressure is created. The purpose of this study was finding effects of EECP on status of myocardial perfusion in patients, unsuitable for invasive interventions.
Methods: In this study, 50 consecutive patients (34 male, 16 female) with known coronary artery disease, which was found on coronary angiography, were treated with EECP and followed for one month post treatment. For all patients ECG Gated Myocardial Perfusion Single Photon Emission Computerized Tomography (SPECT) with 99mTc - MIBI in rest and stress was carried out before and one month after completion of treatment with 30 session EECP. Any differences in myocardial perfusion before and after EECP were compared qualitatively and semi-quantitatively and analyzed statistically.
Results: The mean age was 62.18±8.67 years. A significant difference was found in Summed Rest Score (SRS) before and after EECP treatment (p=0.010). Differences between pre and post treatment Summed Stress Score were not significant (p=0.058). Before and after EECP treatment

Summed Difference Score (SDS) were significant (pand Left Ventricle Ejection Fraction (LVEF) were not changed after treatment (p=0.67). Severity of ischemia is diminished significantly after EECP compared to before that (p=0.044), however, extent of ischemia showed no significant changes (p=0.105). Difference of fixed defects extension was also not significant before and after treatment (p=0.051).
Conclusion: This study demonstrated that EECP is a useful method in improvement of myocardial perfusion in patients who are not suitable for intervention such as PCI and CABG, which is more prominent at rest status. So could be assumed that EECP augments angiogenesis in diseased myocardium after cardiovascular incidence.

P 089 Quantification of the influence of respiratory motion induced misalignment between PET and CT data on diagnosis of heart disease in cardiac PET/CT imaging

Mahdi Sedighpoor[1*], Mohammad Reza Ay[1,2,3], Pardis Ghafarian[4], Parastoo Farnia [1]

[1]Department of Medical Physics and Biomedical Engineering, Tehran University of Medical Sciences, Tehran, Iran
[2]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[4]Chronic Respiratory Disease Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

In PET/CT To accurately measure the activity concentrations use CT. in cardiac pet/ct imaging misalignment between pet and ct image cause the attenuation correction factors are potentially inaccurate and make 60% error in the PET image in the critical regions of diagnostic interest. Artifacts caused by misalignment are particularly disconcerting in cardiac imaging because they can present themselves as perfusion abnormalities or erroneous information on myocardial viability. This paper is an attempt to quantify influence of respiratory motion induced misalignment between CT and PET data on the diagnosis accuracy of heart disease in cardiac PET/CT imaging. The proposed method is a simulation-based method for quantification of respiratory motion artifact in PET/CT imaging of the heart. Using XCAT phantom, which can model the respiratory and cardiac motion and heart defect with predefined parameters. Two sets of data were generated, emission maps and attenuation maps (μmap). Using STIR software, the sinograms of emission maps were produced. These sinograms were attenuated with corresponding attenuation maps. Thereafter, attenuation correction of sinograms was done with the matched and mismatched attenuation maps and PET images were reconstructed with OSEM algorithm. We use polarmap analyze to evaluation the effect of misalignment in cardiac imaging. Depending on the lesion size and location uptake of heart change between 2.5% to 65% in some area of heart. The magnitude of errors depends on the lesion size, location and motion amplitude. For smaller lesions misalignment was more significant and compensation techniques seems to be necessary. Mismatched attenuation correction, can be partly compensated by using respiratory-averaged CT as the attenuation map. This study suggests that it can be critical to correct for respiratory motion in clinical practice to improve diagnosis and treatment due to PET/CT imaging.

P 090 Evaluation of myocardial perfusion and function after renal transplantation by Gated SPECT myocardial perfusion scintigraphy

Armaghan Fard-Esfahani*, Babak Fallahi, Sahar Mirpour, Ali Gholamrezanezhad, Mohammad Karimi, Davood Beiki, Mohammad Eftekhari, Mohsen Saghari, Alireza Emami Ardekani

Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Introduction: The aim of this study was to evaluate the effect of successful kidney transplantation on myocardial perfusion and left ventricular function by both qualitative (visual) interpretation and

quantitative parameters, using myocardial perfusion scintigraphy with gated-single photon emission computed tomography (gated-SPECT) in end-stage renal disease patients.
Methods: From a total of 38 patients who were candidates of renal transplant, twenty-six patients (16 female, 10 male, mean age: 47.5 yr, range: 24- 64 yr) who had successful kidney transplantation were included. Gated-SPECT myocardial perfusion scintigraphy was performed both before and after surgery (mean: 24 months). Perfusion and function status was evaluated by both qualitative and quantitative parameters.
Results: Our data showed qualitative evidence of perfusion and functional abnormality in pretransplant scans as follows: Abnormal perfusion in LAD, LCX and RCA territories in 42.5%, 53.8% and 65.4% of cases, respectively; dilation in 57.7% and inhomogenity of uptake in 53.8% of cases. However no statistically significant change was noted after transplantation, i.e. p values for summed stress score (SSS), summed rest score (SRS) and summed difference score (SDS), summed motion score (SMS), summed thickening score (STS), ejection fraction (EF) were 0.9, 0.2, 0.3, 0.1, 0.3 and 0.8, respectively.
Conclusion: Renal transplant has no considerable long term effect on myocardial perfusion and function in patients with chronic renal failure. This could be due to either non-reversible myocardial changes or continuing effect of degrading factors on myocardium.

P 091 Simulation study of a new method for respiratory motion compensation in PET imaging

Majid Bagheri[1*], Nikta Jalayer[2], Majid Pouladian[2]

[1]Mechatronics Computer Department, Islamic Azad University Science and Research Branch, Tehran, Iran
[2]Medical Radiation Engineering Department, Islamic Azad University Science and Research Branch, Tehran, Iran

Motion is a source of degradation in PET/CT images. As PET images represent the sum of information over the whole respiratory cycle, in case of attenuation correction with help of CT images, there is some limitation that causes artifacts in lung and cardiac reconstructed images. Which lead to misinterpretation, imprecise diagnosis, impairing of fusion with other modalities, etc. Solution like respiratory gating correlated dynamic PET techniques, list-mode data based techniques; motion modeling and others have been tested, which lead to improvements over the spatial activity distribution in lung lesions. But they have disadvantages of requiring additional instrumentation or the need discarding part of the projection data used for reconstruction or using complicated mathematical models which do not specified for each patient. We propose motion correction method which without any external instruments for monitoring the respiratory motion or increasing mathematical computation, regards to all of data which received, could compensate the motion artifacts of lung and cardiac images. To validate this method, we have developed a realistic and complete simulation of the PET data acquisition and reconstruction process based on NCAT/SIMSET simulation packages.

P 092 Preparation of ^{153}Sm-labelled hydroxyapatite particles for use in radiation synovectomy

Sima Attar Nosrati*, Mohammad Reza Davarpanah, Hosseinali Khoshhosn, Mohsen Harati

Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran, Tehran, Iran.

Radiation synovectomy is the ablation of inflamed synovium by means of an intraarticular injection of a beta-emitting radionuclide in colloidal or particulate form. Hydroxyapatite ($HA[Ca_{10}(PO_4)_6(OH)_2]$, is one of the preferred particulates for this application as it is a major chemical constituent of skeletal bone matrix and is converted into Ca^{2+} and PO_4^{3-} ions in the body by natural metabolic process and is completely eliminated over a period of six weeks. There are several radionuclides available for this treatment such as, ^{90}Y, ^{165}Dy, ^{166}Ho, ^{186,188}Re, etc.

However, ^{153}Sm because of the production feasibility and favourable nuclear properties may find use as a suitable radionuclide for radio-synovectomy. Samarium-153 has a half-life of 46.3 hr, maximum beta-energy of 0.81 MeV and an average soft-tissue penetration of 0.8 mm. In this report we present a new radiosynovectomy agent is designed with desired characteristics: favorable particle size, biodegradability, high affinity to the target organ and high in vitro and in vivo stability. For the preparation of ^{153}Sm labeled HA particles, 40 mg of HA particles added to a 2ml conical vial, 0.8 ml of saline solution, the suspension was stirred for 5 minutes at room temperature. 100 µL of samarium chloride solution (~185 MBq of ^{153}Sm) was added and the mixture was shaken for 1 h at room temperature and the radiolabeled particles were then separated from free ^{153}Sm activity by centrifugation. The radiolabeled particles were resuspended in 2 ml saline, shaken for few minutes and centrifuged to determine the labeling efficiency. The radiolabelling yield was more than 98% and the radiochemical purity of the labelled product was 98%. Particle size distribution of the product was 2-10 µm. Stability studies in vitro showed that ^{153}Sm-HA particles were stable in saline as well as at least 3 days. Biodistribution experiments in rats showed good localization of the particles in the synovium of the knee joint. HA particles labeled with^{153}Sm can be prepared with high labeling efficiency for radiosynovectomy applications. The ^{153}Sm -HA particles are stable and the method is convenient for routine production of this radiopharmaceutical.

P 093 Preparation, formulation and quality control of a new HYNIC-Bombesin kit labeled with ^{99m}Tc for tumor imaging

Nourollah Sadeghzadeh

Mazandaran University of Medical Sciences, Sari, Iran

As a variety of human tumors like prostate and breast cancer can express bombesin receptors. Aim was to prepare and evaluate radiochemical and radiobiological of a new freeze-dried kit of peptide HYNIC conjugate for the labeling with^{99m}Tc using tricine as coligand. Synthesis of the HYNIC peptide was carried out on Rink Amide MBHA (4-Methylbenzhydrylamine) resin. ^{99m}Tc labeling was performed in the presence of Coligand: Tricine and to evaluate an imaging agent for GRP receptor-positive tumors. Radiochemical evaluation was carried out by Reversed phase HPLC and ITLC-SG. In-vitro internalization was tested using human prostate cancer PC-3 cells with blocked and non-blocked receptors. Biodistribution was determined in normal mice.[^{99m}Tc-(Tricine) $_2$-HYNIC^0, D-Tyr^5, D-Tyr^6, D-phe^{13}] Bombesin (6-14) was obtained with radiochemical purities >97%. Results of in-vitro studies demonstrated a high stability in serum and suitable internalization. Biodistribution data showed a rapid blood clearance, with renal excretion and binding towards GRP receptor-positive tissues such as pancreas. This novel Bombesin conjugate with ^{99m}Tc has promising Characteristics for the diagnosis of malignant tumors.

P 094 Comparison of absorbed doses and images quality for low-dose and standard-dose CT scanning of the paranasal sinuses

Parniya Jamshidi[1], Peyman Shahrjerdi[1*], Mohammad Bayat[1, 2], Faranak Saghatchi[1]

[1]School of Paramedical and Health, Zanjan University of Medical Sciences (ZUMS), Zanjan, Iran
[2]Education and Treatment Center of Mousavi

Introduction: To compare the image quality of the low-dose to the standard-dose protocol of MDCT scanning of the paranasal sinuses, and assessment the patient's radiation dose between these two protocols.
Methods: 80 adult patients (aged 20 to 40). Prior to scanning, anterioposterior (AP) and biparietal (BP) diameters of the patient's head were measured. Another group of patients who had similar AP, BP diameters were also studied. Half the patients were scanned with low-dose method and the other half the patients were scanned with standard-dose method. Some of the patients were

positioned prone and some others were positioned supine for scanning. Radiation doses were measured by CTDI. Standard-dose and low-dose protocols were same, and only different was mAs, that for standard-dose (100mAs) and for low-dose (30 mAs), ultimately images were reviewed by radiologist.
Results: The average radiation dose for standard-dose protocol was 22.52±1 mGy and for low-dose protocol was 8.83±0.43 mGy. This study showed no significant difference in the diagnostic image quality and the anatomical structures assessment between the two protocols, neither did it show any difference between the radiation dose in supine and prone positions.
Conclusion: With modern MDCT technology, low-dose CT of the sinuses can be used in diagnostic image quality because reduction of mAs from 100 to 30 resulted in a significant reduction of the radiation doses to the 40.18â„… respectively without causing any significant effect to the diagnostic image quality and assessment of the anatomical structures.

P 095 A survey of some parameters related to patient treated with ^{131}I in nuclear medicine iran

Nematollah Ahmadi Jeshvagane[1*], Reza Paydar[1, 2], Behzad Fasaei[1]

[1]National Radiation Protection Department
[2]Tehran University of Medical Sciences

There are many important parameters of patients treated with ^{131}I sodium iodide regarding to radiation protection of patient and public. In this study, some of these parameters such as Administered activity, Exposure dose rate after Administration, Exposure dose rate after released, Estimated Effective half life (h) and Residual Activity (MBq) was investigated in 6 nuclear medicine centers out of total 7 centers in Iran and totally 330 patient was surveyed. ED of patients was measured by physicists of the centers during 6 months (May-Nov2009) at 1 meter distance from thyroid of each patient at 1st, 2nd and 3rd days after administration by a calibrated survey meter. The mean value of Administered activity was obtained 5.24 as well as the mean value of treatment day that was 2.17 day. Maximum and Minimum values of ED were 21 and 11µSv/h respectively. Furthermore the Maximum and Minimum values of RA during release of patient were 720 and 250 MBq, respectively. The estimated mean effective half life was calculated 12.6 hours.

P 096 Evaluation the influence of detector parameters on the Performance of dual head small animal PET scanners as a simulation study

Nafise Ghazanfari[1, 2*], Mohammad Ay[1, 2, 3], Saeed Sarkar[1, 2], George Loudos[4]

[1]Tehran University of Medical Science
[2]Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[4]Department of Medical Instrument Technology, Technological Educational Institute, Athens, Greece

Small animal imaging is a significant tool at the disposition of biological researchers to use in non-invasive study of preclinical animal models. In the last two decades, commercialization of these technologies has significantly increased due to the specifications and ability of them. However, several groups try to develop high-resolution and high-sensitivity dual head systems, which are cost benefits and can satisfy requirement of basic PET studies. It is well known system performance significantly depend on different crystal factors such as material, size, thickness. In this study pixilated dual head animal PET scanner using GATE MC package was modeled. In order to assess the influence of crystal dimension on system performance numerous pixel size, ranging between 0/5×0/5 to 3/0×3/0 mm by increment of 0/5 mm and crystal materials BGO, LSO, and GSO was considered. For all measurements a point source with the activity 1 MBq was placed

at the center of FOV. According to the achieved result, by increasing pixel size sensitivity will be increased from %1 to %7 and percentage of mis-positioned events will be decreased between the range %76 to % 45 and spatial resolution in different design will be lost from 0/6 to 2/6 mm. But by increment of crystal length from 10 mm to 15 mm, sensitivity enhance from %2 to %6, percentage of mis-positioned events increased from % 89 to % 59 and also spatial resolution changed from 0/6 to 3/5 mm. The simulation illustrated that BGO based scanners have higher sensitivity than equivalent size of LSO and GSO and also less registration of mis-position events. The results of the evaluation demonstrate to achieve proper dimension of crystal size, can be said, considering pixel size 2 mm, crystal thickness 10 mm could provide the best situation to get better system performance**.**

P 097 Synthesis and quality control of ^{188}Re-HEDP and its biodisturbution studies in rats

[1]B.A. Kalantari*, M.R.Davarpanah, M. Ghannadi Maragheh, M. Erfani, M. Zoghi

Nuclear Science and Technology Research Institute, AEOI, Tehran, Iran.

Introduction: Bone metastases, a common sequel of solid malignant tumors, can lead to severe pain. Conventional methods used to control bone pain include analgesics, hormonal manipulation, chemotherapy and radiation. Systemic radionuclide therapy represents a very promising alternative. In this study, we report the synthesis of the ^{188}Re-HEDP complex and its biodistribution in rats.
Methods: The rhenium ethidronate is formed by reduction of perrhenate in the presence of stannous chloride and labeling with HEDP. Biodistribution studies of ^{188}Re-HEDP were performed in rats weighing 100-150g. The 3-rat were sacrificed at 4, 24, 48 hours after injection of approximately 3.7MBq (100µci) of the product in a volume of 0.1 ml via the tail vein. Selected organs including the femur bone were removed, weighed and the radioactivity was determined with a well-type gamma counter. Radioactivity was also measured in a sample of blood. The results were expressed as percentage of injected dose per gram (%ID/g) of tissue.
Results: The optimized condition for the preparation of ^{188}Rhenium-HEDP are [$SnCl_2$] =6mg, [Ascorbic acid] =3mg, ^{188}Re=150mci ([$HReO_4$] =0.8mgr), pH=1, Reaction time=20min, with heating (95-100^{o}C). Under optimal conditions the radiochemical yield of complexation ^{188}Re–HEDP reached more than 95% and the specific activity Rhenium formed was ~ 5mci/mg HEDP. Under optimal conditions, ^{188}Re-HEDP was stable completely when stored at 20-25 ^{0}C for 48hr. Biodistribution studies of ^{188}Re-HEDP in rats showed markedly taken up by the kidneys. ^{188}Re-HEDP had uptake by femur bone (1.01% ID/g) in four hours post injection which remained almost constant up to 24 h. Activity in other organs was negligible after 24 h.
Conclusion: ^{188}Re has a short physical half life (16.9). This allows for higher doses compared with long-lived radio nuclides. Furthermore, the same property reduces the problems of radioactive waste handling and storage. A further advantage comes from the fact that ^{188}Re is conveniently produced from an alumina-based ^{188}W/^{188}Re generator system similar to the current ^{99}Mo/^{99m}Tc generator. The gamma rays emitted from ^{188}Re can be utilized to monitor leakage and biodistribution of ^{188}Re-HEDP.

P 098 The calculation of absorbed dose from ^{131}I-Chlorotoxin in tissues using MCNP code

Seyed Pezhman Shirmardi[1*], Mostafa Erfani[2], Roohollah Adeli[1], Mostafa Goudarzi[2], Elham Saniei[3]

[1]Nuclear Fuel Cycle Research School, Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Tehran, Iran
[2]Nuclear Science Research School, Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Tehran, Iran
[3]Amirkabir University of Technology, Tehran, Iran

Introduction: Chlorotoxin is a peptide derived from the venom of the scorpion Leiurus Quinquestriatus. It can bind with mmp2 receptors on glioma cells. in this research,we used Monte carlo method to calculate the absorbed dose in organ of interest.
Methods: The peptide was synthesized by standard Fmoc solid-phase synthesis on Rink amide MBHA resin with substitution of 0.69 mmol/g. Labeling of product was performed by chloramine-T method. Peptide (40 µg) was dissolved in PBS buffer (50 µl, 0.25 M, pH=7.5) then was added to a solution of 200 µci Na131I (in 0.1 N NaOH), followed by 50 µl chloramine-T (4 mg/ml in PBS 0.05 M, pH=7.5). For ex vivo counting mice were sacrificed after 1, 4 and 24 h and various organs were dissected, weighed and counted for radioactivity. The obtained data from organs was used in monte carlo method (MCNP code) to calculate the tissues dose according to MIRD principles.
Results: Our results suggest that, this labeled chlorotoxin derivative might be useful in determining tumor extent and also tumor therapy of gliomas or possibly other cancers. The overall radiolabeling efficiency was about 80% at a specific activity of 0.740 GBq/µmol. The liver of mouse was assumed as target organ. The sum of gamma and beta particles dose emitted by 131I were used to calculate total absorbed dose to liver. The results show that the delivered dose to liver was very small and 98% of total dose is due to beta particles.
Conclusion: In this study, we have shown a synthetic approach toward preparation of a chemically and metabolically stable chlorotoxin derivative. Iodine-131 radiolabeling of these novel conjugate was performed in order to assess the most optimum conditions for radiolabeling and potential usage in clinical applications. We calculated the absorbed dose in liver using MCNP code. Liver as a target organ absorbed very small dose as mentioned above.

P 099 Study of LaBr3:Ce and NaI(Tl) scintillation detectors by using MCNP 4C Code and experimental data

Seyed Pezhman Shirmardi[1*], Reza Bagheri[1, 2]

[1]Nuclear Fuel Cycle Research School, Nuclear Sciences and Technology Research Institute (NSTRI), AEOI, Tehran, Iran
[2]Amirkabir University of Technology, Tehran, Iran

The detection of ionizing radiation by the scintillation light produced in certain materials is one of the oldest techniques on record. Both of the $LaBr_3$:Ce and NaI(Tl) are inorganic scintillators that due to their high light output rate in compare with organic scintillators and almost other inorganic scintillators are significant. In this research experimental data for identical measurement of sealed button sources with $LaBr_3$:Ce and NaI(Tl) detectors at the presence of shield and without shield were compared with simulation data by using MCNP 4C code. Obtained results from radioactive sources measurements with $LaBr_3$:Ce and NaI(Tl) detectors represented that for low energy gamma rays there are noticeable difference between experimental and simulation data whereas for high energy gamma rays simulation data have well agreement with experimental ones. Also all simulation data similar to experimental ones represented efficiency of $LaBr_3$:Ce detector is more than NaI(Tl) detector where for gamma rays with higher energies this inequality is further. Simulation results for shielded button sources have also fine agreement with experimental data in much source energies.

P 100 Image processing of infrared vein pattern for personel identification

Elham Saniei[1*], Saeed Setayeshi[1], Seyed Pezhman Shirmardi[2]

[1]Amirkabir University of Technology, Tehran, Iran
[2]Nuclear Sciences and Technology Research Institute (NSTRI), AEOI, Tehran, Iran

In this study a novel approach to analyze the infrared vein patterns of the back of the hands for biometric purposes has been proposed. The research performed in three stages, including enrollment, feature extraction and verification. In the first stage a near infrared imaging technique

was used to capture the vein patterns. This technique utilizes the features that took from the vein patterns using wavelet transform. A neural network is proposed to person identification purposes. The experimental results show that the algorithm reaches 3% of the false acceptance rate (FAR) from a database of 97 distinct subjects. This indicates that the neural network can be used to perform personal identification tasks. The paper also presents a preprocessing technique to obtain the vein pattern as well as an in-depth study on the tolerance of the processed errors in case of loss of features and geometrical displacement.

P 101 Sentinel node lymphoscintigraphy

Mansoureh Darvishha

Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

The lymphatic system is a network of small channels that circulate lymph and lymphocytes throughout the body. Lymph nodes, which act like a filter for foreign bodies such as germs, viruses and pollen, are located along this network. Lymphoscintigraphy is a sensitive, inexpensive, relatively noninvasive method to identify lymphatic drainage patterns and is a technique that is used to determine the sentinel lymph node. In addition, anuclear medicine physician performs this modality to plan a biopsy or surgery that will help assess the stage of cancer and create a treatment plan and also identify points of blockage in the lymphatic system. Many radiopharmaceuticals have been used to study the lymphatic system. An ideal imaging radiotracer for lymphoscintigraphy would have rapid clearance from the interstitial space into the lymphatic system, produce high-quality images, and deliver a low radiation dose to the patient. In addition, good retention of the radiotracer in the regional lymph nodes is essential for successful gamma probe localization at surgery. This article describes the definition, usefulness of lymphoscintigraphy and lymphoscintigraphic sentinel node detection technique.

P 102 New bone pain palliation radiopharmaceuticals in Iran

Marzieh Ebrahimi*, Mahbbobeh Assadi, Mahan Mohammad Rezaei

Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran

Bone metastasis is a major complication of several solid cancers; the prostate, breast, lung, kidney, bladder and thyroid. Two-thirds of the patients with prostate cancer or breast cancer and one-third of the patients with lung cancer will have symptomatic skeletal metastases. Prostate and breast carcinoma together probably account for more than 80% of cases of metastatic bone disease. Bone pain will afflict up to two-thirds of patients with bone metastases. Some radiopharmaceuticals control pain while cause only transient bone marrow depression, which is usually mild. This article describes some new bone pain palliation radiopharmaceuticals such as ^{153}Sm-EDTMP, ^{186}Re-HEDP, ^{177}Lu-EDTMP and ^{188}Re-HEDP which are recently prepared and manufactured by AEOI in Iran.

P 103 Conjugation of DOTA and DTPA with Rituximab to be easily labeled with ^{90}Y and ^{111}In for NHL radioimmunotherapy

Nazila Gholipour[1*], Soraya Shahhosseini[2], Ali Khalaj[1], Mohamad Hossein Babaei[1]

[1]Department of Nuclear Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
[2]Faculty of Pharmacy, Shahid Beheshti University of Medical Sciences, Tehran, Iran

The monoclonal antibody rituximab has become a standard treatment for relapsed or refractory CD20-positive low-grade non-Hodgkins lymphoma (NHL). Rituximab is a chimeric antibody with high binding affinity to the CO20 antigens. The CD20 antigen is expressed on the surface of normal and malignant B-lymphocytes but not on stem cells or other healthy tissues. Since lymphocytes and lymphoma cells are highly radiosensitive, radioimmunotherapy is used alone or in combination with other therapies in the treatment of CD20 lymphomas with the goal of improving efficacy. For this purpose beta emitting radioisotopes are coupled to anti CD20 antibodies. The pure high-energy β-emitting isotope ^{90}Y with high potency for Rituximab labeling is used in radioimmunotherapy in relapsed NHL. Since ^{90}Y has minimum amount of penetrating radiation, it can be administered for outpatient. Due to the millimeter-range of β-particles the so-called cross-fire effect allows cells which lack antigens or which cannot be reached due to poor vascularization and intratumoral pressure in a bulky tumor to be irradiated and killed. The use of ^{111}In as a surrogate for ^{90}Y is necessary for pre-therapeutic dosimetry. In this study, Rituximab would be conjugated to DOTA and a new derivative of DTPA. Labeling would be done with ^{90}Y and ^{111}In. Number of chelators per antibody molecule would be determined using arsenazo method. Immunoreactiviy and stability studies would be done. The final goal is to have a kit formulation of DOTA-Rituximab to be easily labeled before administration to patient.

P 104 Quality of life in patients with differentiated thyroid carcinoma treated by radioactive Iodine-131

Seid Kazem Razavi Ratki[1*], Babak Fallahi[1], Mohsen Saghari[1], Alireza Emami Ardekani[1], Davood Beiki[1], Arash Mirabzade[2], Fariba Akhzari[1]

[1]Research Institute for Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Psychiatry, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran

Introduction: In modern medical practice, the assessment of disease and treatment impacts on the patients' quality of life (QOL) is a standard component of patients' management. Regarding the excellent prognosis of differentiated thyroid carcinoma (DTC) and long-term survival in patients with DTC the quality of life is increasingly being considered even more than other conventional outcome measures of the disease treatment. This study was aimed to evaluate the quality of life and associating factors in DTC patients treated with radioactive iodine (RAI).
Methods: The study was conducted on 540 patients with DTC. The participants were screened for major psychological disease by a psychiatrist short interview. A structured and previously validated questionnaire namely European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire (EORTC QLQ-C30 (+ 3) and a complementary check list for data collection about socio-economic, demographic and clinical states of the patients were used. QOL was evaluated in three main domains, i.e. general health, function and symptoms. Fifteen sub-domains were also assessed.
Results: Among 460 patients, the response rate to our query was 94.5 % (435 participants). Most of them were female (77%), educated (81.4%), married (81.4%), house wives (54.1%) and 89.2% had papillary carcinoma. The mean age was 42±14.25 years (range: 15-83). QOL had significant association with gender (female), marital status (married), number of surgery (<2), number of RIA therapy (<2) and recurrence (<1) (P-value<0.001).
Conclusion: Socio-demographic variables and factors which increase the number of hospitalization had more influence on QOL.

P 105 Racial variations in bone scintigraphy

Qaisar Hussain Siraj [1]* and Rayjana Allie[2]

[1]Department of Nuclear Medicine, Farwania Hospital, Kuwait
[2]Department of Nuclear Medicine, Royal Hospital Haslar, Gosport, Hampshire, UK

By merit of its high sensitivity for early detection of bone pathology, bone scintigraphy remains the modality of choice for investigating sports injuries. The nuclear medicine department at the Royal Hospital Haslar regularly performs bone scanning on military patients referred for musculoskeletal problems for the early detection of stress fractures and other musculoskeletal pathologies. For some time we had noticed that there appears to be a difference in the bone-to-soft-tissue uptake between Caucasians (whites) and Afro-Caribbeans (blacks). Bone scans of 54 military recruits including 41 males (43% blacks) and 13 females (38% blacks) were analysed. All subjects were injected and imaged according to departmental protocol using the same Gamma camera. Regions-of-interest were plotted over bone and the adjacent soft-tissue to obtain bone-to-soft-tissue ratios. These were compared for each ethnic group. The results showed a significant statistical difference ($p=0.005$) between the two groups. These findings were independent of gender, dose and waiting times. There was also a significant difference in respect to acquisition times ($p=0.004$) for 500k counts spot view image. Though many options were explored, no obvious cause could be determined for this phenomenon. More research is required to shed further light on this matter; however, the various plausible hypotheses will be discussed.

P 106 Parathyroid scintigraphy revisited

Qaisar Hussain Siraj

Department of Nuclear Medicine, Farwania Hospital, Kuwait

Parathyroid scintigraphy is an important nuclear medicine procedure for the localization of hyperfunctional parathyroid adenomas. The dual isotope subtraction technique utilizing Tc-99m pertechnetate or Iodine-123 and thallium-201 was first introduced in 1980s but was later supplanted by isonitrile imaging mainly with Tc-99m sestamibi. The early and late planar MIBI imaging and/or SPECT/SPECT-CT are now routinely performed in patients with hyperparathyroidism for presurgical localization. However, anatomical, physiological and pathophysiological factors significantly influence scintigraphic localization. Several cases are presented with examples of false-positive and false-negative scan results and techniques for improving the diagnostic yield of the nuclear medicine studies are presented.

P 107 Comparison of different techniques for assessment of thyroid functional status in patients with hyperthyroidism

Q. H. Siraj[1,2*], S. Renilson[2], M. Masoomi[2], U. Afzal[1], I. Shammari[1]

[1]Department of Nuclear Medicine, Farwania Hospital, Kuwait
[2]Department of Medical Physics, St. Mary's Hospital Portsmouth, UK

Introduction: I-131 uptake is a established test for estimating thyroid activity diagnostically and prognostically prior to I-131 therapy. Tc-99m thyroid scan is performed in hyperthyroid patients to help diagnose the underlying pathology visually and through quantitation of thyroid activity by uptake parameters such as Tc-99m uptake index or by using a simple thyroid/background ratio. In this pilot study, the Tc-99m uptake parameters were compared with the 24-hr I-131 uptake in hyperthyroid patients to compare their relative sensitivity in the assessment of thyroid overactivity and also to investigate the potential relevance of thyroid uptake parameters for radioiodine therapy dose planning.
Methods: The report includes retrospective data from a total of 192 patients investigated at the nuclear medicine departments of the Farwania Hospital Kuwait and the St. Mary's Hospital Portsmouth. The 3 radionuclide quantitative parameters were correlated with serum T4.
Results: The correlation between serum T4 and the 24-hr I-131 uptake was statistically significant (r 0.29, p 0.007) but quite low (r2 0.08). There was good correlation between serum T4 and the thyroid/background ratio (r 0.53, $p<0.0001$, r2 0.28). The correlation between serum T4 and the pertechnetate uptake was the highest (r 0.63, $p <0.0001$, r2 0.40). There was good

correlation between the 24-hour I-131 uptake and the pertechnetate uptake (r 0.37, p 0.0004, r2 0.13). However, a higher correlation was seen between the 24-hour I-131 uptake and the thyroid-to-background ratio (r 0.63, $p < 0.0001$, r2 0.40).

Conclusion: Quantitative thyroid scintigraphic uptake parameters are superior to the 24-hour I-131 uptake test for the assessment of thyroid function. Technetium uptake is the most reliable quantitative parameter for the assessment of thyroid function and may be substituted for the radioiodine uptake test in the majority of patients for the pre-radioiodine therapy assessment of hyperthyroid patients.

Author Index

Iranian Journal of Nuclear Medicine

Subscription Form

(Individual Rates) Domestic: 30,000 Rls, Elsewhere $30
(Institutional Rates) Domestic: 60,000 Rls, Elsewhere $60

Please enter my subscription to 2 biannually issues of Iranian Journal of Nuclear Medicine:

□ At the individual rates
□ At the institutional rates

Name: ……...
Address:……..……
……
……
City:……...…

Country: ……

Editorial Office
Iranian Journal of Nuclear Medicine, Research Institute for Nuclear Medicine,
Shariati Hospital, North Kargar Ave. 1411713135, Tehran, Iran

Tel: ++98 21 88633333, 4 Fax: ++98 21 88026905
E-mail: irjnm@tums.ac.ir http://irjnm.tums.ac.ir