

## Massive hepatomegaly in $^{99m}\text{Tc}$ -octreotide scintigraphy: The value of $^{99m}\text{Tc}$ -sulfur colloid scan

Elahe Pirayesh

Department of Nuclear Medicine, Shohada-e-Tajrish Medical Center, School of Medicine,  
Shahid Beheshti University of Medical Sciences, Tehran, Iran

(Received 7 July 2020, Revised 26 August 2020, Accepted 31 August 2020)

### ABSTRACT

$^{99m}\text{Tc}$ -octreotide scintigraphy, performed during the following up a 58-year old man with neuroendocrine tumor demonstrated massive hepatomegaly demonstrating multiple areas of increased and decreased uptake. Due to severe hepatomegaly concurrence of any other abdominal soft tissue lesions could not be excluded. A  $^{99m}\text{Tc}$ -sulfur colloid scan was done and thoroughly compared with  $^{99m}\text{Tc}$ -octreotide scintigraphy showing mismatched lesions compatible with liver metastases. Our case demonstrates the importance of multimodality imaging and highlights the forgotten role of  $^{99m}\text{Tc}$ -Sulfur colloid liver and spleen scan as useful supplementary technique especially when SPECT/CT is not available.

**Key words:** Neuroendocrine tumor;  $^{99m}\text{Tc}$ -octreotide;  $^{99m}\text{Tc}$ -Sulfur colloid; SPECT

**Iran J Nucl Med 2021;29(1):45-48**

Published: January, 2021

<http://irjnm.tums.ac.ir>

**Corresponding author:** Dr. Elahe Pirayesh, Department of Nuclear Medicine, Shohada-e-Tajrish Medical Center, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: [elahe\\_pirayesh@yahoo.com](mailto:elahe_pirayesh@yahoo.com)

## INTRODUCTION

Neuroendocrine tumors (NETs) are a wide group of tumors originating from the neuroendocrine system. Although, gastrointestinal tract is the most common site of origin, they can be found in the pancreas, lungs and the rest of the body [1]. Over the last decades, the incidence and prevalence of NETs has risen, due to increased diagnosis of early stages tumors. Since, Somatostatin receptors (SSTR) are widely expressed on the surface of neuroendocrine cells, molecular imaging of SSTR has improved the detection of both primary tumor and metastases, compared with conventional cross-sectional anatomical imaging. Octreotide scan has recently become a necessary clinical tool for management of patients with NETs [2].

NETs show a relative preference to metastasize to the liver, irrespective of the primary site. Since, patients with metastatic NET have worse prognosis, especially with unknown primary origin, detection of the primary site and metastases are important [3].

We introduce a NET case with unknown primary origin presented as huge hepatomegaly harboring multiple metastatic lesions. We demonstrated how  $^{99m}\text{Tc}$ -sulfur colloid ( $^{99m}\text{Tc}$ -SC) scan help to exclude any other abdominal metastatic lesions, especially when SPECT/CT is not available.

## CASE PRESENTATION

A 58-year-old man, known case of well-differentiated NET of un-known primary origin, was referred to our nuclear medicine department for SSTR scintigraphy. Following different therapeutic approach, including radioembolization of liver metastases. Octreotide scan, obtained 3 hours after IV injection of 740MBq  $^{99m}\text{Tc}$ -Octreotide showed severe hepatomegaly with non-homogeneous distribution of radiotracer and multiple large areas with decreased and some lesions with increased radiotracer uptake (Figure 1). CT scan revealed multiple metastases and necrotic masses in the liver, normal hepatic tissue could not be delineated in the octreotide scan (Figure 2). In addition, other concomitant soft tissue lesions, such as lymph nodes or extra-hepatic abdominal tumoral masses could not be excluded. For these reasons and since SPECT/CT is not available in our center, a  $^{99m}\text{Tc}$ -sulfur colloid (SC) scan (Figure 3) was performed revealing large photopenic areas, prominently in the left hepatic lobe, suggestive of liver metastases. Side-by side comparison of two SPECT studies (Figure 4) were mostly mismatched and showing  $^{99m}\text{Tc}$ -octreotide uptake in most of the photopenic  $^{99m}\text{Tc}$ -SC lesions, except for previously radioembolized necrotic lesions. Additionally, some normal hepatic tissue was delineated in the posterior segments with normal  $^{99m}\text{Tc}$ -octreotide uptake and no extra hepatic soft tissue lesions were detected.

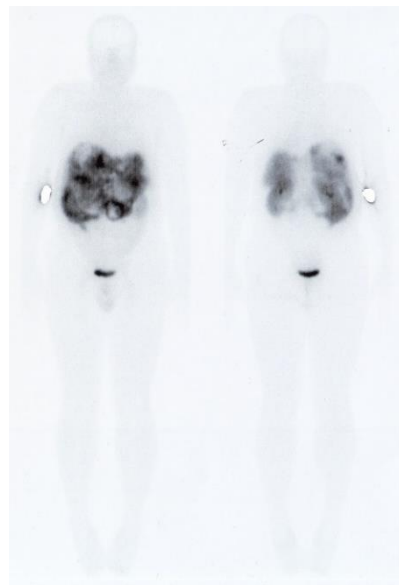


Fig 1. Whole body scan of  $^{99m}\text{Tc}$ -Octreotide shows severe hepatomegaly and non-homogenous uptake throughout the liver.

## DISCUSSION

Different diagnostic modalities have low sensitivity for detecting midgut NETs, despite being the most prevalent source of occult primary lesions. As a result, up to 46% of NETs patients may remain as unknown primary origin, potentially leading to worse prognosis [4]. Imaging of NETs requires a multimodality approach. Although, anatomic imaging is the initial imaging procedure, functional imaging could have complementary role by revealing radiologically occult lesions and/or unsuspected metastatic disease. In evaluation of various liver lesions, different imaging modalities are not competitive, but rather complementary. Optimal diagnostic approach depend on several factors including the clinical indication, equipment availability and cost benefit issue [5]. Lack of correlate anatomic information is the most important limitation of nuclear medicine studies. Physiological uptake of SSTR radiotracers in the liver, spleen and gastrointestinal activities can reduce the sensitivity of SSTR scintigraphy. Although, hybrid-imaging techniques can relatively solve the problem, it may not be available in all centers. For improving the overall sensitivity and specificity of SSRS scintigraphy, multimodality imaging techniques can be useful. There are some reports about the role of denatured RBC scan and colloid scan to differentiate splenic tissues from NETs [6-10].  $^{99m}\text{Tc}$ -Sc scan was used to be a primary imaging modality for evaluation of liver masses; however, with current advanced anatomical modality its usefulness as a physiologic tool is forgotten. Therefore, it is not used commonly in nuclear medicine centers anymore and its application has been limited for evaluation of liver function reserve in limited conditions [11].

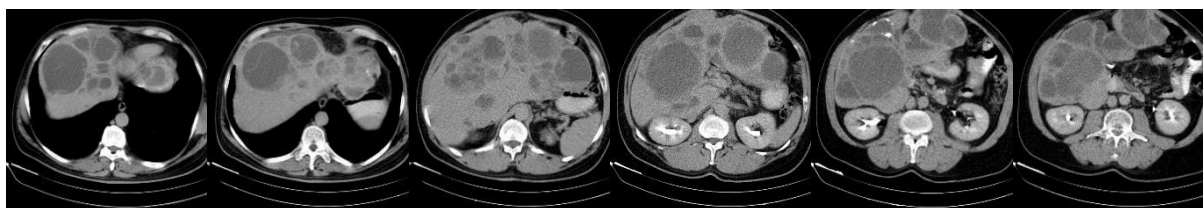


Fig 2. Axial CT of the abdomen showing multiple liver metastases.

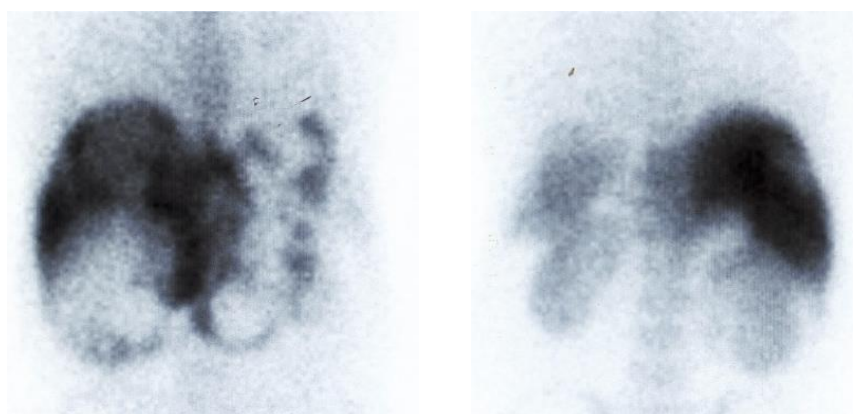


Fig 3.  $^{99m}\text{Tc}$ -Sulfur colloid static images of the abdomen reveal non-homogeneous uptake in the liver with multiple large photopenic regions (Left: anterior view; Right: posterior view).

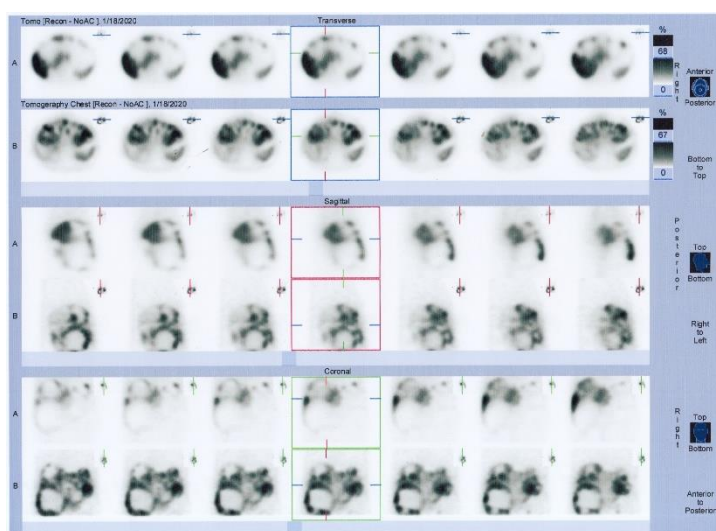


Fig 4. Side-by-side comparison of  $^{99m}\text{Tc}$ -Sulfur colloid (on the top) and  $^{99m}\text{Tc}$ -octreotide (on the bottom) are well mismatched, except of central necrosis of masses.

Nevertheless, regarding the importance of anatomic information for precise interpretation of nuclear medicine scans, it could be potentially a valuable correlative imaging modality for evaluation of liver lesions, especially if SPECT/CT is unavailable.

As demonstrated in our case,  $^{99m}\text{Tc}$ -SC scan was very useful to exclude any extrahepatic tumoral lesion and to confirm the presence of SSR positive lesions exclusively in the liver.

## REFERENCES

1. Chauhan A, Yu Q, Ray N, Farooqui Z, Huang B, Durbin EB, Tucker T, Evers M, Arnold S, Anthony LB. Global burden of neuroendocrine tumors and changing incidence in Kentucky. *Oncotarget*. 2018 Apr 10;9(27):19245-19254.
2. Kunikowska J, Lewington V, Krolicki L. Optimizing somatostatin receptor imaging in patients with neuroendocrine tumors: the impact of <sup>99m</sup>Tc-HYNICTOC SPECT/SPECT/CT versus <sup>68</sup>Ga-DOTATATE PET/CT upon clinical management. *Clin Nucl Med*. 2017 Dec;42(12):905-911.
3. Riihimäki M, Hemminki A, Sundquist K, Sundquist J, Hemminki K. The epidemiology of metastases in neuroendocrine tumors. *Int J Cancer*. 2016 Dec 15;139(12):2679-2686.
4. Bartlett EK, Roses RE, Gupta M, Shah PK, Shah KK, Zaheer S, Wachtel H, Kelz RR, Karakousis GC, Fraker DL. Surgery for metastatic neuroendocrine tumors with occult primaries. *J Surg Res*. 2013 Sep;184(1):221-7.
5. Baxi AJ, Chintapalli K, Katkar A, Restrepo CS, Betancourt SL, Sunnapwar A. Multimodality imaging findings in carcinoid tumors: A head-to-toe spectrum. *Radiographics*. 2017 Mar-Apr;37(2):516-536.
6. Collarino A, del Ciello A, Perotti G, Rufini V. Intrapaneatic accessory spleen detected by <sup>68</sup>Ga DOTANOC PET/CT and <sup>99m</sup>Tc-colloid SPECT/CT scintigraphy. *Clin Nucl Med*. 2015 May;40(5):415-8.
7. Wen Z, Edwards KW, States LJ, Zhuang H. Heat-Damaged Red Blood Cell Scintigraphy in Helping Interpretation of <sup>68</sup>Ga-DOTATATE PET/CT. *Clin Nucl Med*. 2019 Nov;44(11):927-928.
8. Werner C, Winkens T, Freesmeyer M. Splenic scintigraphy for further differentiation of unclear (<sup>68</sup> Ga-DOTATOC-PET/CT findings: Strengths and limitations. *J Med Imaging Radiat Oncol*. 2016 Jun;60(3):365-9.
9. Maffey-Steffan J, Uprimny C, Moncayo R, Kroiss AS, Virgolini JJ. Usefulness of combined imaging with <sup>68</sup>Ga-DOTATOC PET/CT and spleen scintigraphy in differentiating a neuroendocrine tumour of the pancreatic tail from splenic lesions in a patient with posttraumatic splenosis. *Rev Esp Med Nucl Imagen Mol*. 2018 Sep - Oct;37(5):325-327.
10. Aggarwal R, Wagner T, Navalkisoor S. Case report of tc-<sup>99m</sup> sulfur colloid single-photon emission computed tomography/computed tomography study differentiating tumor from accessory spleen. *World J Nucl Med*. 2013 Sep;12(3):129-31.
11. Matesan MM, Bowen SR, Chapman TR, Miyaoka RS, Velez JW, Wanner MF, Nyflot MJ, Apisarnthanarax S, Vesselle HJ. Assessment of functional liver reserve: old and new in <sup>99m</sup>Tc-sulfur colloid scintigraphy. *Nucl Med Commun*. 2017 Jul;38(7):577-586.