

Papillary thyroid cancer with metastases to brain, lung and kidney: A case of dosimetry proven privilege of surgical resection of organ metastases

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(Received 19 June 2017, Revised 24 October 2017, Accepted 25 October 2017)

ABSTRACT

A 45-year-old woman presented with a headache and visual complaints. Brain MRI revealed a large mass in the right occipital cortex. The tumor was surgically removed and pathological examination showed papillary carcinoma originating from thyroid gland. She had a history of thyroid surgery 27 years ago indicating papillary thyroid cancer with central neck lymph node involvement followed by no additional treatments. CT scan showed a mass in the right kidney and multiple liver cysts. She was referred and treated with curative dose of radioiodine. A post therapeutic iodine scan showed accumulation of the tracer in the right kidney and disseminated uptake in the lungs and neck, with no focal uptake in the liver. To increase iodine accumulation in the lungs with curative intention, the right kidney was surgically resected. Forty-five days after nephrectomy, the patient received her second dose of radioiodine. In the second post therapy scan, the uptake in the lungs and neck was significantly enhanced. The ratio of lungs to whole body uptake was 17.2% and 46.2% in the first and second post therapeutic scan, respectively. Not only unilateral kidney metastasis from PTC is rare incidentally noticed non-metastatic multiple liver cysts in this patient are interesting to report, also the benefit from metastasectomy of asymptomatic visceral metastasis is documented. Such a visceral metastasectomy could result in optimal radiation to other sites, being lung metastases in this case.

Key words: Papillary thyroid carcinoma; Kidney metastasis; Metastasectomy; Dosimetry

Iran J Nucl Med 2018;26(1):58-61

Published: January, 2018

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

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INTRODUCTION

Treatment of patients with multiple metastases originating from papillary thyroid cancer (PTC) has been limited to systemic therapy, and individualized radiation and surgery are preserved to prevent complications [1]. Recently many oligo-metastases or even cases with multiple metastases are operated with therapeutic intentions. The goal of such treatments is to extend progression-free survival [2]. Differentiated thyroid cancer (DTC) is among malignancies [3] with an optimal prognosis and many patients achieve permanent cure [1]. However, treatment would be suboptimal in certain cases with distant metastases or those who are unresponsive to radioiodine [4]. Distant metastases to the liver, kidney, and brain are uncommon and mostly occur in patients with follicular thyroid cancer (FTC) [5, 6]. Visceral metastases rarely occur in patients with PTC [7, 8]. Metastasectomy in patients with DTC is a controversial topic, mainly aiming at prevention of complications.

In the current report, we present dosimetry evidence for the therapeutic advantage and benefit of visceral metastasectomy in a patient with lung, brain, and renal metastases as well as remnant tissue in the neck.

CASE HISTORY

A 45-years-old otherwise healthy woman presented with headache and visual complaints. Brain MRI revealed a large mass in the right occipital cortex (Figure 1).

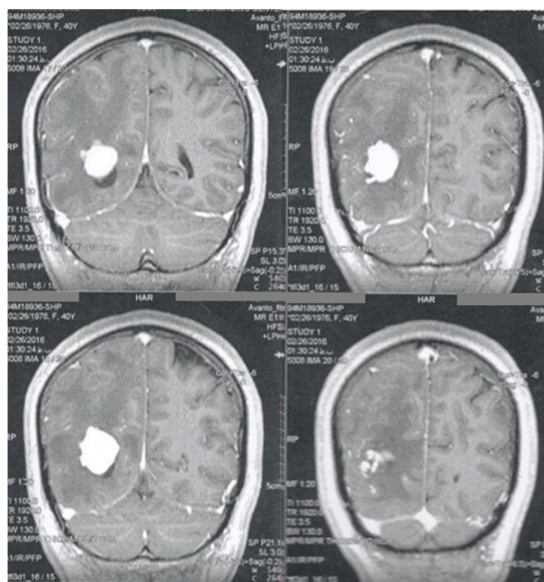


Fig 1. Brain MRI indicating a large mass in the right occipital cortex. Surgery showed the origin of tumor was papillary thyroid cancer.

Surgical removal of the tumor was planned to treat the headache and provide a diagnosis. One third of the occipital lobe and the tumor were excised. Pathological examination revealed a 4.5 cm metastatic tumor originating from PTC. IHC was confirmatory. She had a history of total thyroidectomy and neck lymphadenectomy twice, 27 years ago. The pathological report indicated PTC with regional lymph node involvement. The size and other specifications of the tumor including vascular and capsular invasion were not available. Radioiodine treatment was not employed for the patient at that time. After excision of the brain tumor, the patient underwent adjuvant brain radiotherapy and was then referred to our department for treatment with radioiodine. She had left homonymous hemianopia with no other symptoms. The patient was hypothyroid and neck ultrasonography showed post-surgical remnant thyroid tissue suspicious for recurrence with no remarkable lymph nodes. A mass in the right kidney and multiple liver cysts were seen on CT images but no macroscopic lung metastasis was detected (Figure 2).

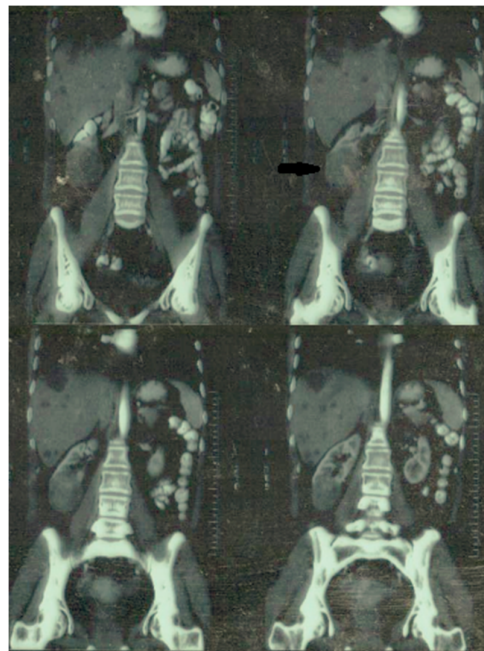


Fig 2. CT scan indicating multiple liver cysts and a mass in the lower pole of right kidney (black arrow). Biopsy of one of the liver cysts was negative for malignancy. Nephrectomy showed metastatic PTC in the kidney.

One of the liver lesions was biopsied that was negative for malignancy. Retrospectively, radiological characteristics of the hepatic lesions corresponded to the findings of multi-cystic liver disease. The condition of the patient was discussed in multi-

disciplinary team (MDT) and no further surgical operation was planned. She was admitted and received 300 mCi ^{131}I without any complications. In the morning of radioiodine therapy (RIT), she had a TSH level of 11, a thyroglobulin level of more than 2000, and an anti-thyroglobulin level of 15. A post therapeutic Iodine scan showed accumulation of the tracer in the right kidney with additional disseminated uptake in the lungs and neck. No uptake was detected in the liver and the uptake in the brain was very faint at the site of neurosurgical operation. To enhance the accumulation of the radioiodine in the lungs with curative intention, surgical resection of the right kidney was discussed in the MDT. The patient was notified that nephrectomy was not a definite treatment for her condition and she decided to undergo right nephrectomy. The operation was accomplished with no complications and the pathological examination and IHC confirmed the metastatic origin of PTC for the renal mass with clear margins. In the morning of second RIT, TSH, thyroglobulin, and anti-thyroglobulin levels were 13, >2000 and 23, respectively. Forty-five days after nephrectomy and 166 days after first radioiodine administration, the patient received the second dose of radioiodine (250 mCi) without complication and the post therapy Iodine scan was acquired. The regions of interest were drawn around the whole body and the organs illustrating high uptake.

DISCUSSION

On the second post-therapy scan after the second therapeutic ^{131}I dose, the uptake in the lungs and neck

was significantly enhanced in the absence of uptake in the resected right kidney. The lungs to whole body uptake ratio was 17.2% and 46.2% on the scans after first and second treatments indicating almost double dose accumulation in the lung metastases (Figure 3). The absence of uptake in the brain after the second RIT may indicate that microscopic metastases at the bed of the site of neurosurgery were successfully ablated after the first RIT. At the time of this report, the patient is doing well without any symptoms. The patient is now planned to receive her third RIT. The MDT is considering initiation of sorafenib better therapeutic achievement.

In the current case, metastasectomy of asymptomatic visceral metastasis increased radiation to lung metastases as the only remaining site of metastasis. This optimization was evident from the dose deposition analysis of post-treatment scans before and after nephrectomy. The uptake of ^{131}I usually reduces in lung metastases after repeated doses of ^{131}I , due to either un-differentiation or elimination of the malignant cells. In this case, the uptake in the lung metastases increased remarkably after second RIT which could be attributed to surgical eradication of the renal metastatic mass. This is an interesting case with a number of unusual features: multiple metastases from PTC including brain metastases decades following original diagnosis as extremely rare. Also, to our knowledge, renal involvement in PTC is reported in only 7 cases [9].

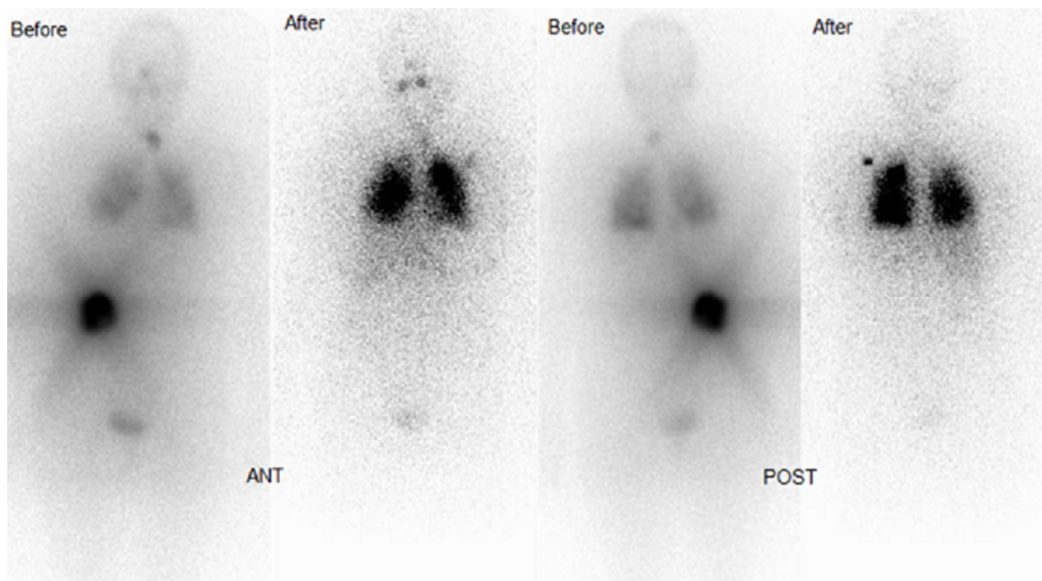


Fig 3. Whole body post therapeutic iodine-131 scan before and after right nephrectomy (166-day time lap). Preferential tracer uptake in the lungs after nephrectomy is evident; lung to whole body uptake ratio was 17% and 046% before and after nephrectomy, respectively.

Renal involvement by FTC has been reported frequently, in at least 25 cases according to our search, however, FTC may present with skeletal or cerebral involvement more frequently [10, 11]. Lastly, most renal metastases from PTC involve both kidneys [12], but only one kidney was involved in the case.

The treatment rate of lung micro-metastases from DTC is high [13, 14]. Because the brain metastasis in this patient was surgically resected followed by adjuvant radiotherapy, we believe that nephrectomy and radioiodine therapy slowed down disease progression due to higher absorbed dose in the lung metastases.

CONCLUSION

This report may change the current thought that asymptomatic metastases from DTC to other organs in cases with multiple metastases may be optimally managed non-surgically. The surgical resection of an iodine avid metastasis may enhance the ablative effect of radioiodine to other area of tumoral involvement and increased the overall survival.

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