Complete remission after primary single dose of radioactive iodine in metastatic papillary thyroid carcinoma: a case report

Nayyar Rubab[1]*, Muhammad Shahzad Afzal[1], Muhammad Shahbaz[2], Muhammad Babar Imran[1]

European Journal of Medical Case Reports
Volume 5(12):345–349
https://doi.org/10.24911/ejmcr/173-1630476749

ABSTRACT

Background: Papillary thyroid cancer (PTC) accounts for 90% of the thyroid malignancies with predominance in females. Distant metastasis is usually seen in lungs and bones. The treatment of metastatic papillary cancer thyroid is total/near total thyroidectomy followed by radioactive iodine (RAI) ablation. Lung metastasis shows good response to RAI therapy.

Case Presentation: We describe a case of 22-year-old female, referred to nuclear medicine department after surgery for RAI ablation. Patient was diagnosed case of PTC. First dose of 100 mCi of RAI under steroid cover was given. Post-therapy scan showed bilateral pulmonary metastasis. However, follow up I-131 whole body imaging after 2 years showed no evidence of functioning thyroid tissue/metastasis.

Conclusion: PTC with lung metastasis has good prognosis and better survival in young patients treated with RAI. A single dose of RAI (I-131) may cure extensive lung metastasis.

Keywords: Papillary CA thyroid, Pulmonary metastasis, RAI ablation, Case report.

Received: 01 September 2021 **Accepted:** 22 October 2021 **Type of Article:** CASE REPORT **Specialty:** Nuclear Medicine

Correspondence to: Nayyar Rubab
*Department of Nuclear Medicine, PINUM Cancer Hospital, Faisalabad, Pakistan.
Email: nayyar611@yahoo.com
Full list of author information is available at the end of the article.

Background

Papillary thyroid cancer (PTC) is the most common type of differentiated thyroid cancer (DTC), accounting for 90% of thyroid malignancies [1]. Women are more commonly affected than men. Papillary cancers may present as asymptomatic lesions or with cervical lymph node metastasis at the time of presentation. Distant metastasis, although less frequent than follicular tumors, may occur to lungs, bones, brain or liver [2].

Surgery followed by radioactive iodine (RAI) ablation is an effective treatment for patients with pulmonary metastasis from PTC. PTC is one of the best treatable cancers with excellent prognosis following radioiodine therapy [3].

Case Presentation

A 22-year-old female patient was referred to nuclear medicine department for RAI therapy. She was a diagnosed case of PTC. Total thyroidectomy with lymph node biopsy was done. Its histopathology showed PTC, classical variant, lesion was 9 cm in size, tumor less than 1mm of nearest resection margin. No extrathyroidal extension seen and one lymph node was positive for metastasis carcinoma. Second surgery was done (neck dissection) was done after 4 months which showed two out of eight lymph nodes positive for metastatic PTC. According to tumor, node, metastasis classification (eight edition), patient was categorized as stage I (pT3, N1, Mx).

Patient was advised to stop thyroxine for 4 weeks. After 4 weeks her thyroid stimulating hormone (TSH) > 50 mIU/l (normal range 0.17-4.05 mIU/l), serum thyroglobulin (Tg) was 43.8 (normal < 50 ng/ml), anti-Tg < 20 (normal 29 IU/ml). Patient was admitted and administered first dose of 100 mCi of RAI under steroid cover as per guidelines. Her hospital stay in isolation room was uneventful and she was discharged on third day of admission with exposure of 3.8 mR/hour. Levothyroxine was started on third post-therapy day and patient was called on tenth day for post therapy scan which showed bilateral pulmonary metastasis (Figure 1). Due to distant metastasis, patient was restaged in stage II (pT3, N1, M1)

Patient missed instructions and came for follow up after 2 years. Patient was off levothyroxine with TSH >50 mIU/l. I-131 whole body scan was done 72 hours after oral administration of 2 mCi of I-131 which showed no evidence of functioning thyroid tissue or metastasis including lungs (Figure 2). Serum Tg at that time was 0.60 ng/ml (normal < 50 ng/ml), anti-Tg 4.21 IU/ml (< 29 IU/ml). To confirm complete regression of pulmonary

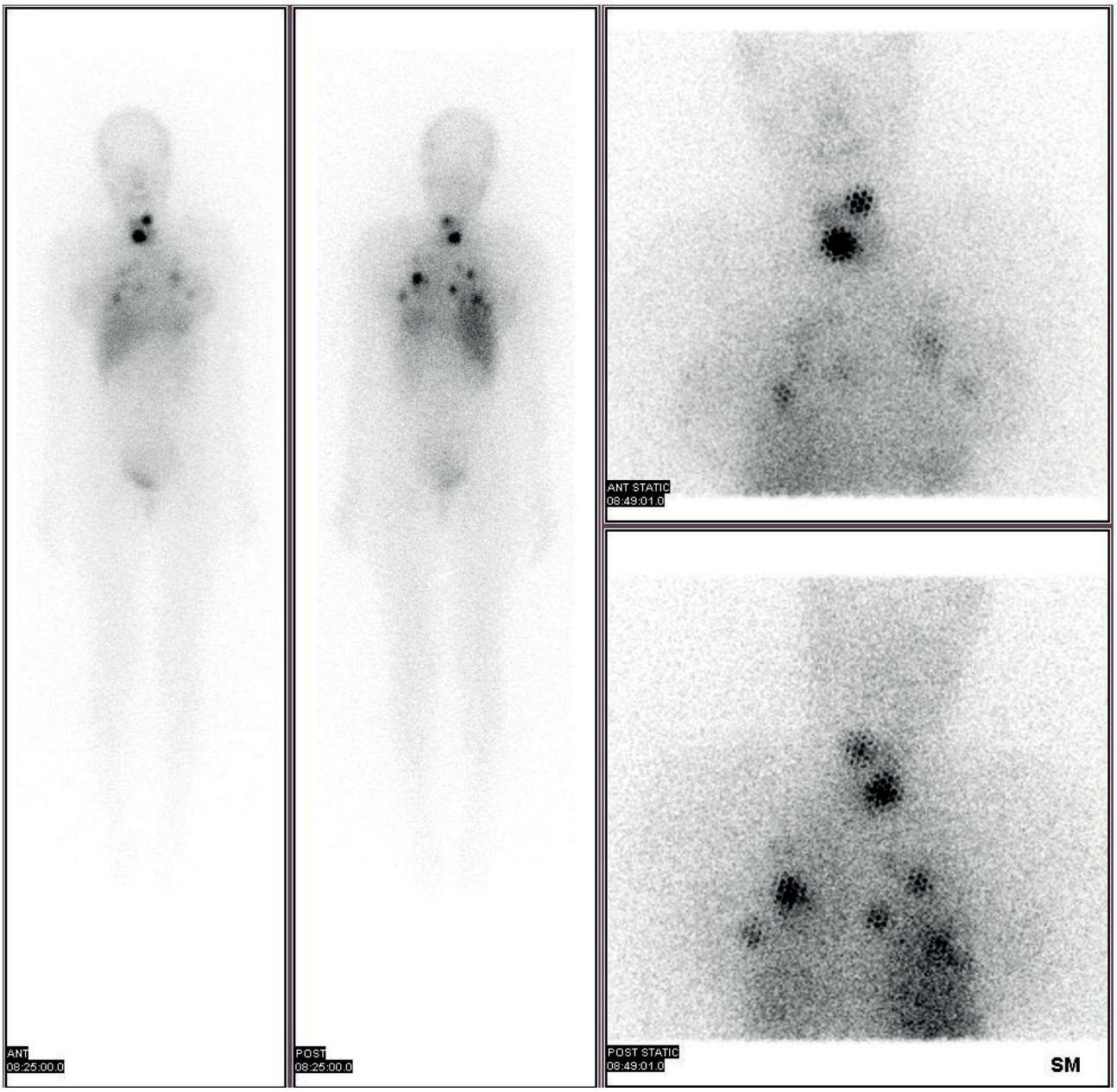

Figure 1. *Post-therapy I-131 whole body imaging showing residual thyroid tissue and bilateral pulmonary metastasis.*

metastasis, patient was advised computerized tomography (CT) chest with contrast which showed no evidence of residual thyroid tissue in neck and lung metastasis (Figure 3). At present, she is on levothyroxine and doing well.

Discussion

DTC arises from thyroid follicular cells and includes PTC and follicular thyroid cancer (CA). Females have higher incidence rate than males. DTC is generally slow growing tumor with excellent long-term survival rates. The long-term survival rate is >95%, despite the relatively high rate of nodal and distant metastases [4].

Total thyroidectomy followed by RAI therapy is considered as the standard treatment. For DTC. I-131 whole body imaging is done after RAI administration to stage the disease and document the I-131 avidity of any structural lesion. [5]. Metastasis primarily occur in regional lymph nodes in papillary CA thyroid. Distant metastasis is rare and accounts for 5% of patients. Lungs and bones are the most frequent sites of distant metastasis in PTCs [4]. In this case, patient was administered RAI under steroid cover to limit risk of acute tumor swelling and compromised function [6]. Patient in this case had nodal and lung metastasis.

The lung metastases in PTC are usually asymptomatic, seen as miliary metastasis or multiple nodules, widespread lymphadenopathy, or pleural effusion [7]. Nodules are multiple, of variable size and seen in lungs bilaterally. When the largest lung metastatic lesion of DTC measures<1 cm, it is called micronodule and when lesion is >1 cm, it is macronodule. RAI ablation (100-200 mCi) is mainstay treatment in patients with distant metastasis [2,5]. Metastasectomy, radiofrequency ablation, and

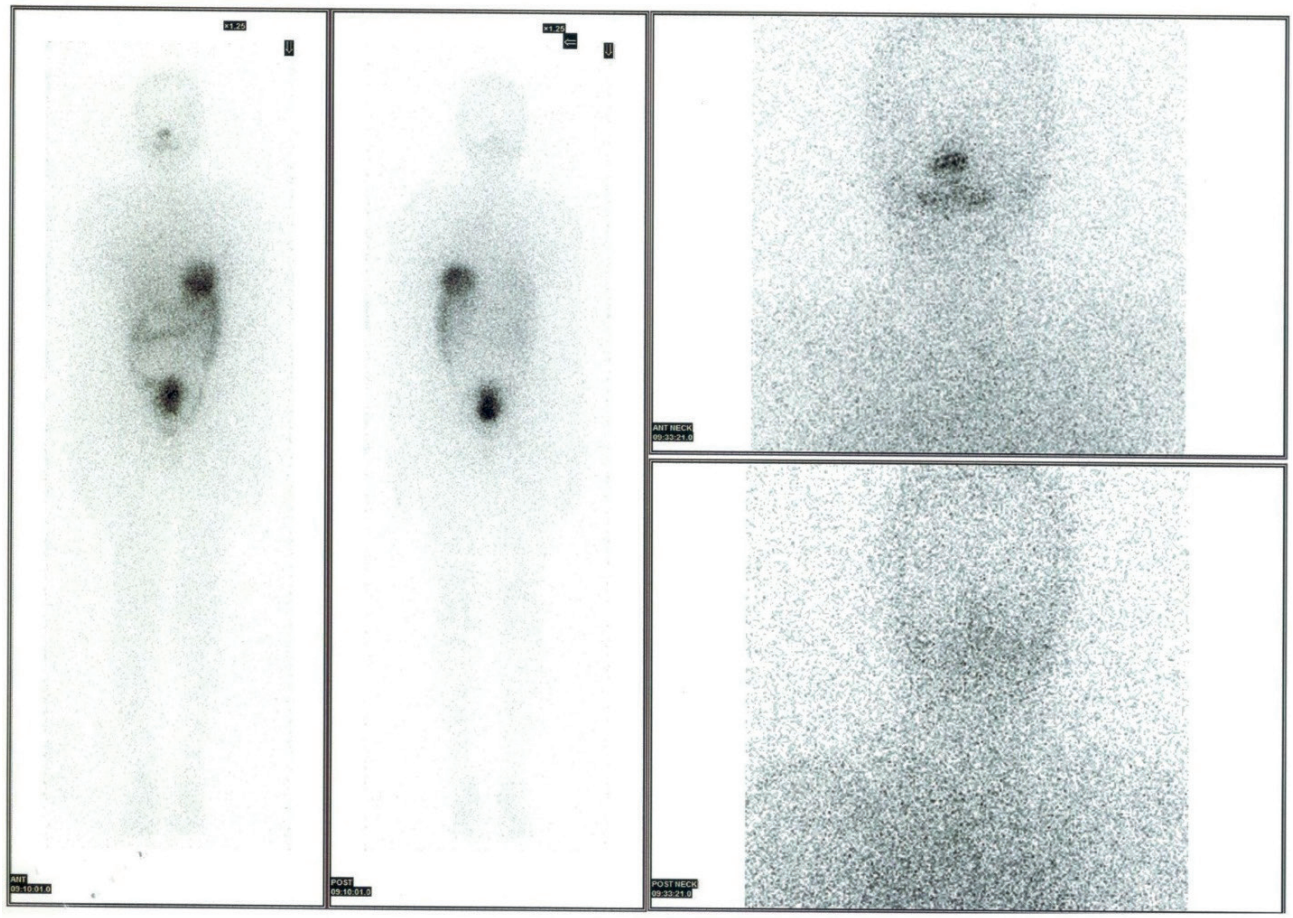

Figure 2. *Follow up I-131 whole body imaging showing no evidence of residual thyroid tissue or functioning metastasis. Complete regression of pulmonary metastasis.*

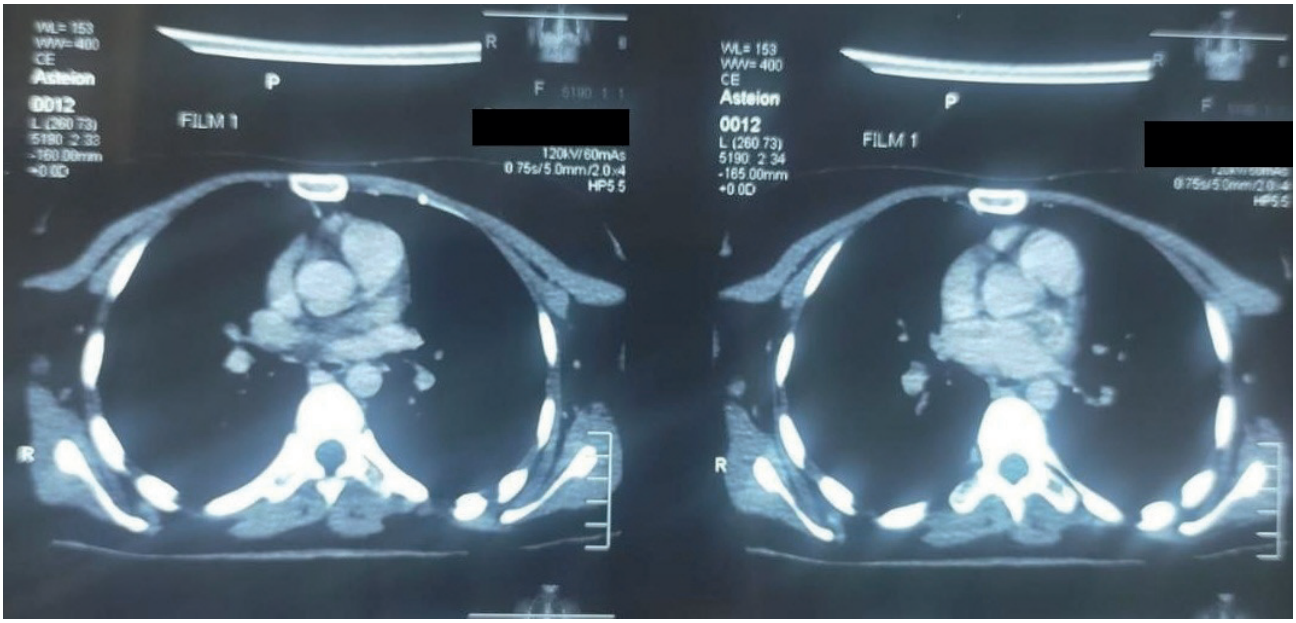

Figure 3. *CT of chest with contrast showing no evidence of residual thyroid tissue and complete regression of pulmonary metastasis.*

systemic therapy with tyrosine kinase inhibitors are other treatment options for selected patients of lung metastasis in DTC [5].

I-131 avidity is well-recognized prognostic factor for lung metastases from DTC. Efficacy of RAI ablation is associated with histopathology, age, gender, size of metastasis, timing of metastasis diagnosis, expression of sodium-iodide symporter, and the presence of non-lung distant metastasis. I-131 avid pulmonary metastasis has better prognosis and overall survival and progression free survival rate as compared to non-iodine-131 avid lung metastasis [2].

Previous studies have shown that patients with PTC, age <55 years, females, micro-nodular metastasis, metastasis found by initial RAI uptake and presence of pulmonary-only metastasis have more favorable clinical outcome than others [8]. In this case, patient was young female with diagnosis of PTC. Lung metastasis were found on I-131 whole body post therapy imaging; however, nodule size was not assessed with CT scan. Lung metastasis in our case were iodine avid and showed completed recovery after single dose of RAI. To the best of our knowledge, this is the first case of PTC with extensive lung metastasis in the literature which showed completed remission after single dose of RAI therapy.

Follow-up after total or near-total thyroidectomy and RAI ablation in patients with DTC is done with ultrasound neck, serum Tg and anti-Tg levels. Neck ultrasound helps in detecting residual thyroid tissue and metastatic cervical lymph nodes. Serum Tg level has high high-sensitivity in recurrent or persistent disease and to verify the absence of disease [5]. In patients with high risk of recurrence additional imaging is recommended even if serum Tg levels become un-detectable in order to rule out dedifferentiation of tumor. Diagnostic I-131 whole body scan can be carried out during follow-up because of its high specificity for thyroid tissue. [^{18}F] 2-fluoro-2-deoxy-D-glucose-positron emission tomography is recommended imaging for patients with RAI-refractory disease. CT scan is helpful in neck and chest imaging [5,9]. In this case, follow up serum Tg level was 0.6 ng/ml, I-131 whole body imaging showed no evidence of residual thyroid tissue or lung metastasis and CT chest was unremarkable, all suggesting complete remission of disease.

Treatment response in DTC is categorized as excellent, biochemically incomplete, structurally incomplete and indeterminate [5]. Our patient showed excellent response to treatment with negative imaging and serum Tg level < 1ng/ml.

Conclusion

Papillary CA thyroid with lung metastasis has good prognosis and better survival in young patients treated with RAI. The better prognosis of these patients is mainly related to the age at the diagnosis of lung metastases, I-131 avidity, size of the lung metastases, and the presence of only lung metastases. A single dose of RAI (I-131) may cure extensive lung metastasis.

What is new?

Papillary CA Thyroid with lung metastasis has good prognosis and better survival in young patients treated with RAI. A single dose of RAI (I-131) may cure extensive lung metastasis.

Acknowledgment

None.

List of Abbreviations

DTC	Differentiated thyroid cancer
mCi	Milli curie
PTC	Papillary thyroid cancer
RAI	Radioactive iodine

Conflict of interest

None.

Funding

None.

Consent for publication

Informed consent was obtained from the patient to publish this case.

Ethical approval

Ethical approval is not required at our institution for publishing a case report in a medical journal.

Author details

Nayyar Rubab[1], Muhammad Shahzad Afzal[1], Muhammad Shahbaz[2], Muhammad Babar Imran[1]

1. Department of Nuclear Medicine, PINUM Cancer Hospital, Faisalabad, Pakistan

2. Department of Medical Physics, PINUM Cancer Hospital, Faisalabad, Pakistan

References

1. Qiu ZL, Shen CT, Sun ZK, Song HJ, Zhang GQ, Luo QY. Lung metastases from papillary thyroid cancer with persistently negative thyroglobulin and elevated thyroglobulin antibody levels during radioactive iodine treatment and follow-up: long-term outcomes and prognostic indicators. Front Endocrinol. 2020;10:903.
2. Cook JGR, Maisey MN, Britton KE, Chengazi V. Clinical nuclear medicine. 4th ed . Dordrecht, Netherlands: Springer; 2006. 733 p.
3. Nguyen QT, Lee EJ, Huan MG, Park YI, Khullar A, Plodkowski RA. Diagnosis and treatment of patients with thyroid cancer. Am Health Drug Benefits. 2015;8(1):30–40.
4. Erden ES, Babayigit C, Davran R, Akin M, Karazincir S, Isaogullari N, et al. Papillary thyroid carcinoma with lung metastasis arising from dyshormonogenetic goiter: a case report. Case Rep Med. 2013 ;2013:1–4. http://dx.doi.org/10.1155/2013/813167.
5. Filetti S, Durante C, Hartl D, Leboulleux L, Locati LD, Newbold K, et al. Thyroid cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. Ann Oncol. 2019;30:1856–83. http://dx.doi.org/10.1093/annonc/mdz400.
6. Haugen BR, Alexander EK, Bible KC, Doherty GM, Mandel SJ, Nikiforov YE, et al. 2015 American Thyroid Association Management Guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association guidelines task force on thyroid nodules and differentiated thyroid cancer. Thyroid. 2016;26(1): 1–33. http://dx.doi.org/10.1089/thy.2015.0020.
7. Shah MK, Begum N, Hossain M, Chawdhuary SI, Ahsan MS. Management of papillary carcinoma of thyroid with pulmonary metastases in Institute of Nuclear Medicine and Allied Sciences, Rajshahi-two case reports. Bangladesh J Nucl Med. 2015;18(2):179–82.

8. Zhang X, Liu1 DS, Luan ZS, Zhang F, Liu XH, Zhou W, et al. Efficacy of radioiodine therapy for treating 20 patients with pulmonary metastases from differentiated thyroid cancer and a meta-analysis of the current literature. Clin Transl Oncol. 2018;20:928–35.

9. Marcus C, Whitworth DS, Surasi D, Pai SI, Subramaniam RM. PET/CT in the management of thyroid cancer. AJR. 2014;202:1316–29. http://dx.doi.org/10.2 214 /A JR.13.116 73.

Summary of the case

1	**Summary of the case Patient (gender, age)**	Female, 22 ygears old1
2	**Final diagnosis**	Metastatic CA thyroid2
3	**Symptoms**	Nil3
4	**Medications (generic)**	RAI4
5	**Clinical procedure**	RAI ablation, I-131 whole body imaging5
6	**Specialty**	Nuclear medicine6
7	**Objective**	Diagnosis and treatment of I-131 avid lung metastasis7
8	**Background**	A 22-year-old female was referred to nuclear medicine department after surgery for RAI ablation.8
9	**Case report**	Complete remission after primary single dose of RAI in metastatic PTC: a case report.9
10	**Conclusions**	Papillary CA thyroid with lung metastasis has good prognosis and better survival in young patients treated with radio-active iodine. The better prognosis of these patients is mainly related to the age at the diagnosis of lung metastases, I-131 avidity, size of the lung metastases and the presence of only lung metastases. A single dose of RAI (I-131) may cure extensive lung metastasis.10
11	**MeSH keywords**	Papillary CA thyroid, pulmonary metastasis, RAI ablation, case report11