Optimizing Therapy in Medullary Thyroid Cancer: The Contribution of ^{68}Ga-DOTATATE PET/CT

Dr. Fatima Yousaf[1], Dr. Sana Munir Gill[1], Dr. Hajira Ilyas[2]

[1]Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore
[2]Shaukat Khanum Memorial Cancer Hospital and Research Centre, Peshawar

OBJECTIVE

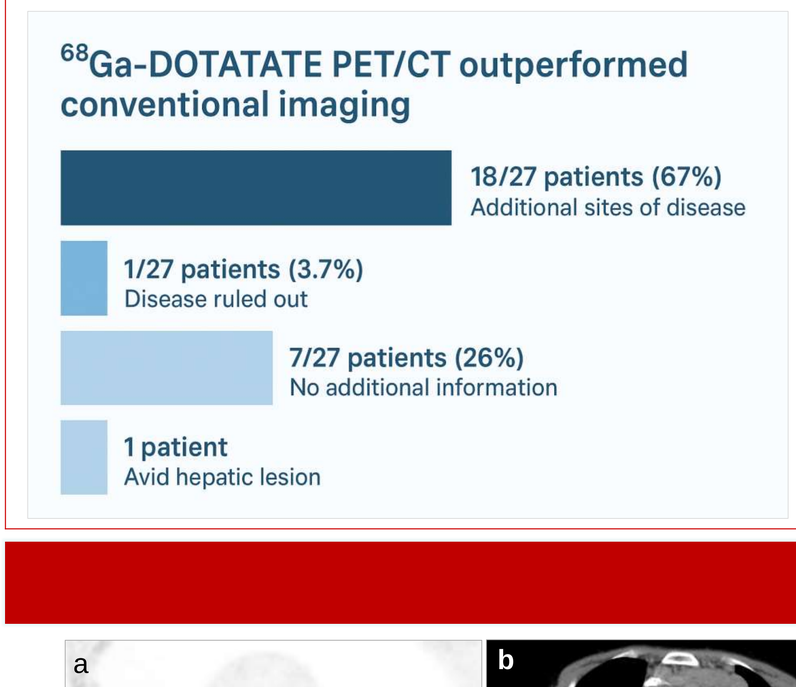
Medullary thyroid cancer (MTC) is a rare type of thyroid cancer which arises from the neuroendocrine C cells of the thyroid gland. There is no single diagnostic imaging modality that can detect all MTC recurrences or metastases.^{68}Ga-DOTATATE PET/CT can be used in management of MTC with up trending tumor markers. Objective of this study is to reveal the clinical efficacy and impact of ^{68}Ga-DOTATATEPET/CT on the management of MTC.

METHODS

- Retrospective analysis was conducted on 27 patients with MTC patients who underwent ^{68}Ga-DOTATATE PET-CT scans.
- Demographics, scan indication, histopathology, prior treatments, tumor markers, SUV of primary and metastatic sites were noted
- Findings were correlated with the most recent conventional radiological imaging ensuring there was no treatment in between.
- Consensus review was performed to assess additional value of ^{68}Ga-DOTATATE PET-CT, particularly in cases with discordant results.
- Impact of Ga68 DOTA PET-CT was evaluated by reviewing multidisciplinary team (MDT) discussion.
- We also looked at the histopathological parameters and their association with the rate of recurrence.

RESULTS

- Mean age of the patients was 42.1 years. Among them 62% were male while 33% were female.
- Most scans were restaging, mainly due to rising tumor markers or suspicion of recurrence on conventional imaging.
- 68Ga-DOTATATE PET/CT outperformed conventional imaging in ***18/27 (67%)*** patients by detecting additional disease sites — nodal in 12, osseous in 4, and both nodal and osseous in 2 patients. One hepatic lesion was false positive (hemangioma on MRI). In ***1/27 (3.7%)***, DOTA ruled out disease, confirmed negative on FNAC. In 26% of cases, no additional findings were noted on PET/CT.
- Among 19 metastatic patients, potential poor histopathological features were evaluated. Extranodal extension (ENE) was most frequent, seen in ***10 (52.7%)*** patients. Lymphatic invasion was found in ***2 (10.5%)***, vascular invasion in ***2 (10.5%)***, ENE with lymphatic invasion in ***3 (15.8%)***, and lymphatic with vascular invasion in ***2 (10.5%)***. ENE appeared to be the most significant factor associated with distant metastases.
- Clinical management changed in ***16/27 (59%)*** patients based on DOTA findings, including one where disease recurrence was ruled out. Of the remaining, ***4 (29%)*** received radiotherapy to local recurrence, ***3 (21.3%)*** had radiotherapy to metastatic sites, ***3 (21.3%)*** underwent surgical clearance, ***1 (7.1%)*** received TKI therapy, ***2 (14.2%)*** had combination treatments, and ***1 (7.1%)*** was referred for palliative management.



Histopathological Feature	Patients (n=19)	%	Clinical Significance
ENE	10	52.7%	Most frequent; strongly linked to distant spread
Lymphatic invasion	2	10.5%	Minor contributor
Vascular invasion	2	10.5%	Minor contributor
ENE + Lymphatic invasion	3	15.8%	Indicates aggressive biology
Lymphatic + Vascular invasion	2	10.5%	Suggests multifactorial spread

CASES

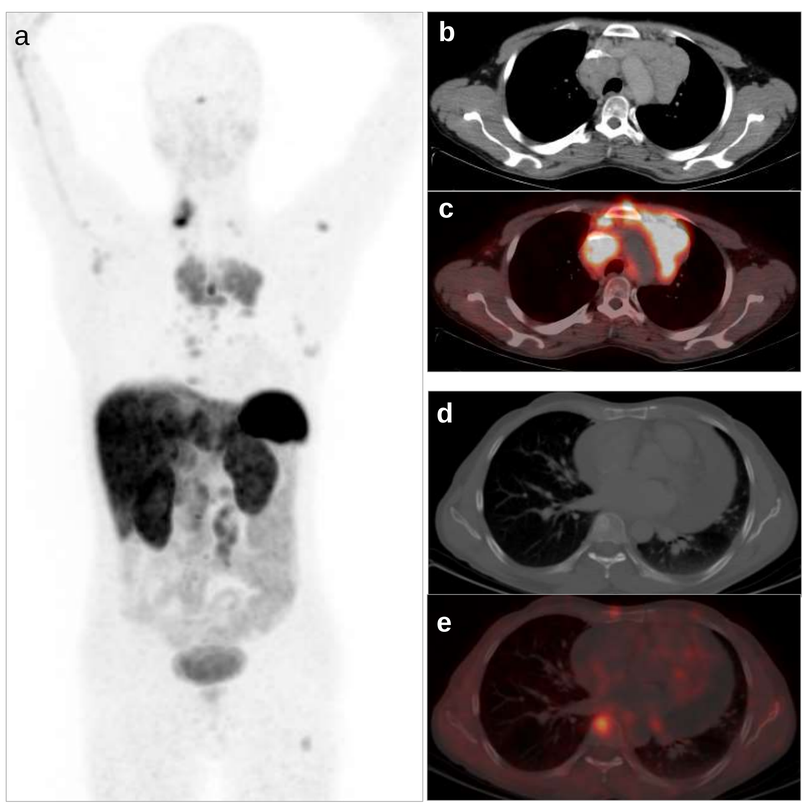
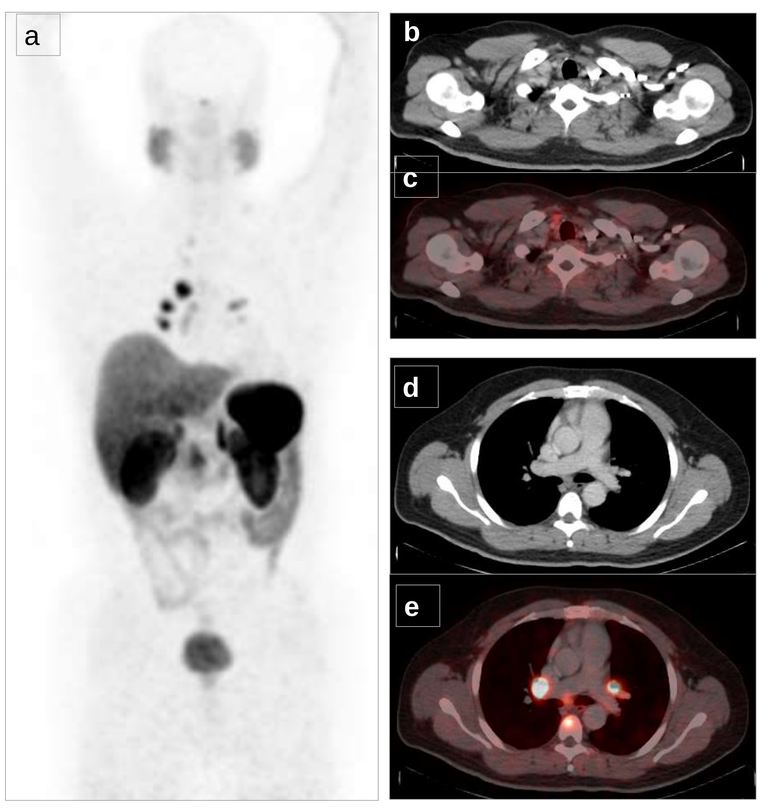


Figure 1: 37 years old male diagnosed with MTC on cervical node excision biopsy. Status post total thyroidectomy and bilateral radiotherapy. A year later, restaging 68Ga DOTA PET-CT was done. MIP (a), CT only fused PET/CT images (b-e) showed interval development of avid right cervical, mediastinal and retroperitoneal lymphadenopathy and multiple DOTA avid sclerotic osseous metastasis.
Calcitonin: 18974 pg/mL
CEA: 6127 ng/mL
Referred to palliative medicine.

Figure 2: 41 years old male, diagnosed with MTC on total thyroidectomy and bilateral neck dissection. He later developed recurrence in cervical nodes which were resected. Two years later, tumor markers uptrended for which 68Ga DOTA PET/CT was acquired. MIP (a), axial CT & fused (b,c) images showed faintly avid small right thyroidectomy bed nodule. Also avid enlarged mediastinal nodes and sclerotic focus was seen in T5; CT and fused axial (d,e)
Calcitonin: 7858 pg/mL
CEA: 305 ng/Ml
Referred for TKIs



CONCLUSION

^{68} Ga-DOTATATE plays crucial part in work-up of Medullary Thyroid Cancer, outperforming conventional imaging in (67%) patients and altered the clinical management (59%) patients. ENE was seen to be the main contributor to distant metastatic spread, suggesting it may have more impact than lymphatic or vascular invasion alone or in combination.

SHAUKAT KHANUM MEMORIAL
CANCER HOSPITAL & RESEARCH CENTRE

7-A Block R III, Johar Town, Lahore, Pakistan

www.shaukatkhanum.org.pk