

Incidental Meningioma Identified on ^{99m}Tc - Sestamibi Parathyroid Imaging: A Case Report

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ABSTRACT

Meningiomas are the most common intracranial tumors and frequently observed in older adults with a high prevalence in females. This report presents the case of a 71-year-old woman with known diabetes mellitus, hypertension, ischemic heart disease and history of tuberculosis, who was under evaluation for mildly raised parathyroid hormone level. She was eventually referred for a ^{99m}Tc - Sestamibi SPECT parathyroid scan—in which a meningioma was incidentally detected.

Keywords: ^{99m}Tc - Sestamibi, meningioma, parathyroid SPECT scan.

Bangladesh J. Nucl. Med. Vol. 28 No. 2 July 2025
DOI: <https://doi.org/10.3329/bjnm.v28i2.89160>

INTRODUCTION

Meningiomas are extra-axial brain tumors arising from the meningocytes or arachnoid cap cells of the meninges and located anywhere that meninges are found (1). They are more common in women with a ratio of 2:1 intracranially and 4:1 in the spine. Many small meningiomas are found incidentally and are asymptomatic (1). The reported case is that of a 71-year-old woman, presenting with mildly elevated parathyroid hormone (PTH), and normal serum calcium with associated diabetes mellitus (DM), hypertension (HTN), ischemic heart disease (IHD), and previous history of tuberculosis (TB), in whom a meningioma is incidentally detected during a ^{99m}Tc -Sestamibi scan performed for diagnosis of parathyroid adenoma.

CASE SUMMARY

A 71-year-old woman was referred to the nuclear medicine department for a ^{99m}Tc -Sestamibi scan, with mildly elevated PTH and normal serum calcium. She had multiple co-morbidities including DM, HTN, IHD, and a previous history of TB. Her laboratory findings were raised parathyroid hormone level of 131.0 pg/mL (normal

range-18.5-88 pg/mL) and blood calcium level of 8.6 mg/dL (normal range 8.5-10.5 mg/dl). High resolution neck ultrasound shows a few complex cystic nodules in the right lobe of thyroid gland, with no demonstrable parathyroid lesion.

Later ^{99m}Tc -Sestamibi SPECT imaging was performed for parathyroid evaluation, in which early images (20 minutes) showed diffusely uniform radiotracer accumulation in the thyroid, without any focal area of increased concentration elsewhere. Significantly, an area of increased radiotracer concentration was noted in the left high parietal region. Delayed images (2 hours) showed washout of radiotracer from the thyroid gland, without any retained activity close to thyroid bed/neck. Focal activity in the left parietal region was retained in the delayed images (figure 1).

In line with the findings, CT scan showed an oval-shaped, well-demarcated, mostly hyperdense lesion in the left high parietal region, with evidence of thinning out of adjacent parietal bone, measuring about 39 x 34 x 33 mm in size (24 to 178 HU, mean 88 HU). SPECT-CT findings showed an area of increased radiotracer accumulation in the left parietal region which corresponds to the soft tissue lesion on CT. However, no abnormal focal uptake or nodular lesion was evident in the anterior neck and upper chest (figure 2).

Consequently, an MRI was requested, which revealed a hyperintense oval-shaped well-defined extra-axial mass, measuring about 35 x 33 x 29 mm, in the left high parietal region on T2 sequence. Post contrast images showed marked enhancement with an enhancing dural tail, consistent with meningioma (figure 3). The patient was subsequently referred to Neurosurgery department for further management.

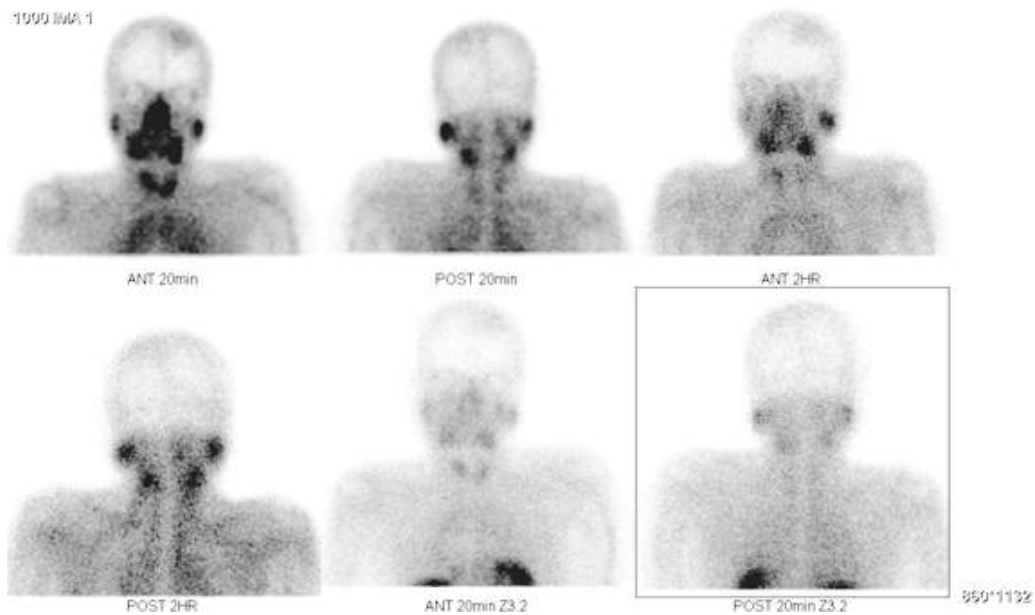


Figure 1: ^{99m}Tc -Sestamibi scan planar images showing an area of increased radio-tracer concentration at the left parietal region in early phase (blue arrow) with retained activity in delayed phase (red arrow).

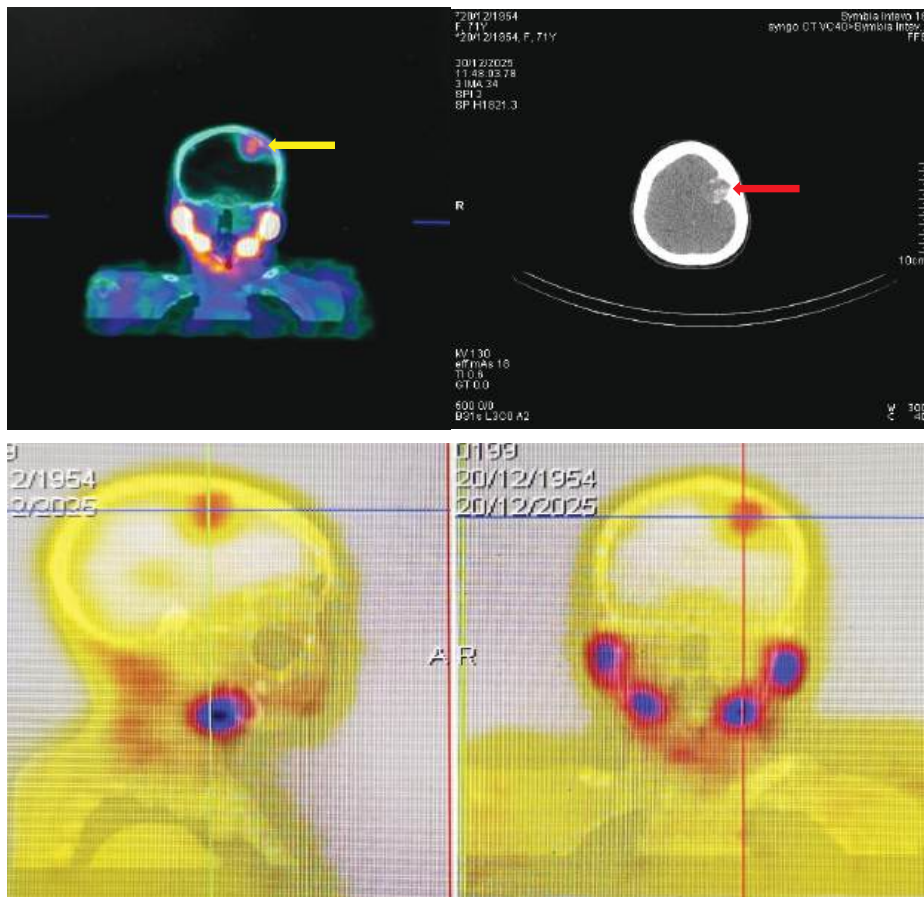


Figure 2: ^{99m}Tc -Sestamibi SPECT-CT images showing an oval shaped well demarcated area of increased radiotracer concentration in left parietal region (yellow arrow), which corresponds to the hyperdense soft tissue lesion on CT (red arrow).

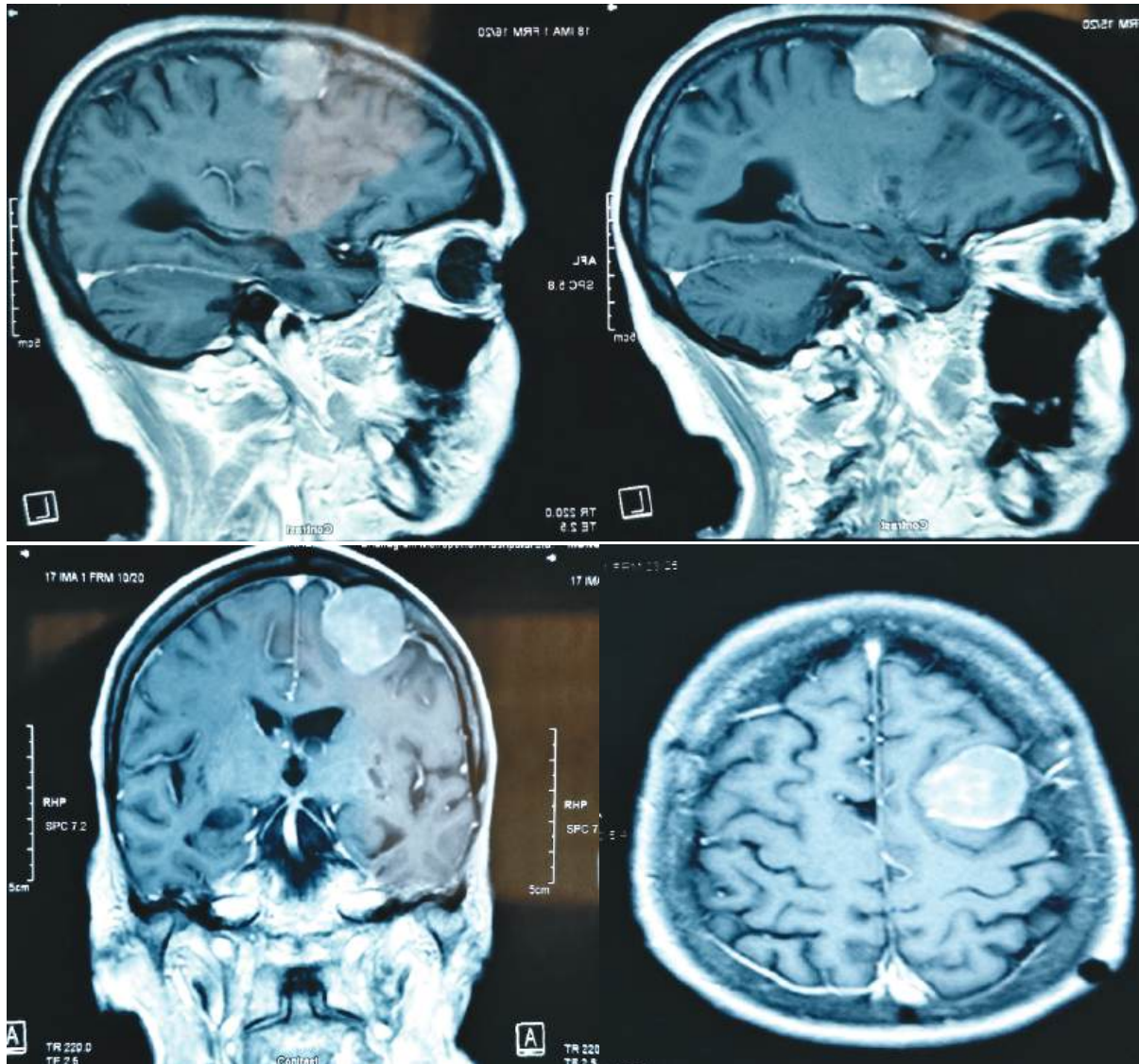


Figure 3: Multiplanar and multisequence MRI with contrast showing a well-defined hyperintense mass with marked post-contrast enhancement, associated with enhancing dural tail—suggesting meningioma.

DISCUSSION

Meningioma accounts for approximately 39% of all primary central nervous system tumors. They are usually benign, slow-growing neoplasms that are thought to arise from meningotheial (arachnoid) cells (MECS) (1). Incidence of meningioma increases with age, with the median age at diagnosis being 66 years old (2-4). Benign meningiomas are more common than the malignant ones, with an incidence of 2.33% and 1.12% respectively (2). Many small meningiomas are detected incidentally and may be asymptomatic. However, larger tumors can present with a variety of symptoms, such as headache, paresis, and change in the mental status etc.

Meningiomas may also become clinically apparent from the symptoms due to the mass effect depending on their location. They are more likely to be found at the skull base, parasagittal convexity, sphenoid ridges, torcular and intraventricular regions (5). MRI remains the investigation of choice for the diagnosis and characterization of meningiomas, demonstrating hallmark features as heterogeneous hyperintensity signal, strong homogeneous gadolinium enhancement and characteristic dural tail sign (6).

^{99m}Tc-Sestamibi is largely used in different nuclear medicine imaging, including myocardial perfusion imaging and parathyroid scans. Chemically it is a

lipophilic cation member of the iso-nitrile family. Radiotracer uptake is related to the parathyroid adenomas' high vascularity and cellularity, where it localizes and retains in the region of increased mitochondrial activity. The large number of mitochondria in oxyphil cells in parathyroid adenomas are responsible for its avid uptake and slow release.

Beyond its normal brain distribution, (except for the choroid plexus and pituitary gland), ^{99m}Tc- Sestamibi can selectively accumulate in the mitochondria of primary and metastatic brain tumors and abscess (6). The uptake of ^{99m}Tc- Sestamibi in meningiomas is also associated with high mitochondrial density within the tumor cells and increased vascular perfusion.

In 2021, Koysombat.K et al. reported the first case of an intracranial tumor detected on routine parathyroid ^{99m}Tc- Sestamibi scan. In 2025 Dasar M. et al reported another case of incidental detection of a meningioma on ^{99m}Tc- Sestamibi SPECT-CT, which showed sestamibi uptake in the midline of the right frontal lobe.

In this case, no significant radiotracer uptake was observed in the neck, consistent with a negative study for parathyroid adenoma. However, focal radiotracer accumulation in the left high parietal region raised suspicion for meningioma, which was subsequently confirmed on MRI.

CONCLUSION

Although ^{99m}Tc-sestamibi uptake is highly specific for the detection of parathyroid adenoma, it may also assist

in identifying other conditions characterized by increased mitochondrial activity. In this case, the unusual uptake is attributable to the highly cellular and vascular nature of the meningioma. Incidental uptake on ^{99m}Tc- sestamibi scan may also be seen in other mitochondria-rich or hypermetabolic conditions, including thyroid nodules, breast and lung malignancies, lymphomas, brain tumors, bone lesions, and inflammatory or infectious processes.

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