CASE REPORT

Double parathyroid adenoma and brown tumor—imaging with Tc99m MIBI: A case report

Farkhanda Gillani[1*], Muhammad Babar Imran[2], Saeed Ashraf Cheema[3], Muhammad Shahzad Afzal[4]

ABSTRACT

Background: Dual phase parathyroid imaging with Tc99m methoxyisobutylisonitril (MIBI) is well known for the detection of parathyroid adenomas. We describe a unique case of brown tumor and double parathyroid adenomas in the neck.

Case presentation: A 56-year-old female visited the Nuclear Medicine Department for parathyroid scanning. She underwent left parathyroidectomy 4 months ago and histopathology confirmed the diagnosis of parathyroid adenoma. However, her parathyroid hormone levels (2213 pg/ml) were consistently raised, even after the surgery. The patient was again referred to the Nuclear Medicine Department for parathyroid scanning. The second MIBI scan showed an abnormal area of radiotracer retention in the neck, near upper pole of right lobe of thyroid gland, favoring parathyroid adenoma with a focus of increased uptake in the chest on left side.

Conclusion: This report emphasizes the importance of dual phase Tc99m MIBI scintigraphy in persistent hyperparathyroidisim following the parathyroid surgery. It also highlights possibility of double parathyroid adenoma or the ectopic parathyroid adenoma.

Keywords: Brown tumor, double parathyroid adenoma, ectopic parathyroid adenoma, dual phase MIBI scintigraphy, case report.

BACKGROUND

Parathyroid scanning with Tc99m methoxyisobutylisonitril (MIBI**)** is well known for the detection and localization of parathyroid adenomas and hyperplasia [1]. Parathyroid adenomas accounts 85% of the cases of primary hyperparathyroidisim. However, in 10% of the cases parathyroid adenomas can be in ectopic location [2].

The aim of presenting this case is to characterize the presence of extraparathyroidal lesions on MIBI parathyroid scintigraphy and to discuss some of the vital practical problems faced during the interpretation of the Parathyroid imaging done with Tc 99m MIBI.

CASE PRESENTATION

A 56-year-old female presented with generalized bone pains. Metabolic bone profile was done including serum parathyroid hormone (PTH) levels (2413 pg/ml) and the patient was labeled as hyperparathyroid. Her Parathyroid scinitigraphy was done with Tc99m MIBI and scan findings were consistent with parathyroid adenoma/hyperplasia in the left superior parathyroid gland (Figure 1). Her left parathyroidectomy was done 4 months later and histopathology confirmed the diagnosis of parathyroid adenoma. Two months after surgery, she again presented with bone pains and her PTH level was 2,213 pg/ml. The physician once again referred the patient to nuclear medicine department for parathyroid scanning.

Her Parathyroid scanning was done with dual phase Tc 99m MIBI scanning. Planner images showed an abnormal area of radiotracer retention in the neck near upper pole of right lobe of thyroid gland, favoring parathyroid adenoma. A focus of increased uptake was also appreciated in the chest on left side (Figure 2). One of the differentials of this abnormal focus in the left side of chest was ectopic parathyroid adenoma.

Single photon emission computed tomography/computed tomography (SPECT/CT) imaging showed a photon-avid focus in the neck in the region of right superior parathyroid gland. Another focus of increased uptake was seen in the left side of chest, which was localized as bony density lesion, measuring 1.1 × 1.2 mm involving the left third rib near the costochondral junction (Figure 3a,b).

To further characterize the lesion, Tc99m Methylene diphosphonate (MDP) bone scanning was done after 1 week which showed intense uptake in the left third rib near costochondral junction along with diffusely increased uptake in skull, focus of increased uptake in left fourth rib posteriorly and nonhomogeneous uptake in spine and

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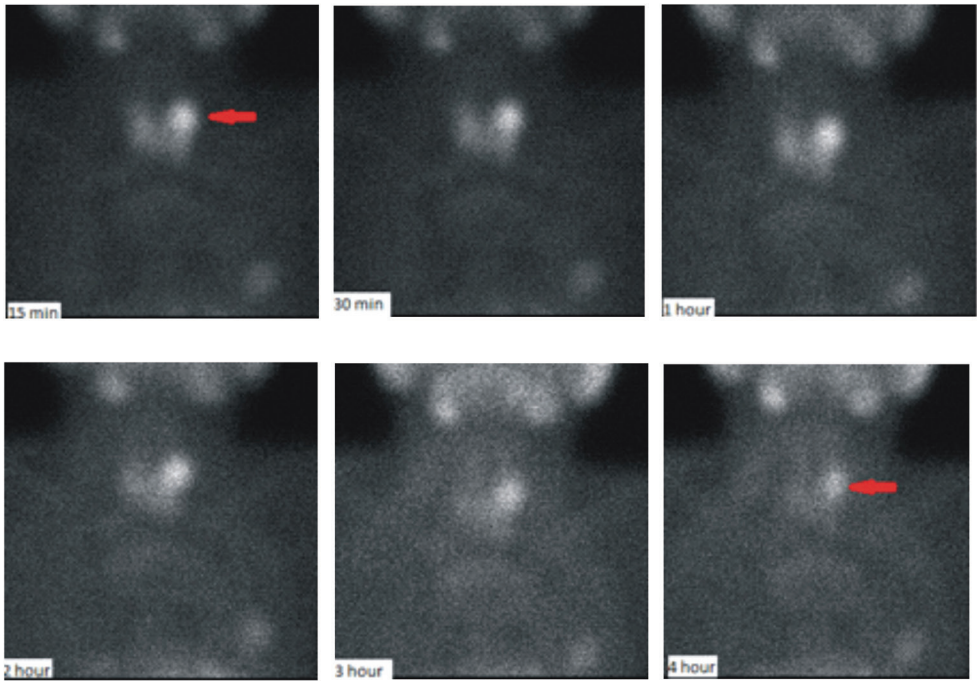

Figure 1. Parathyroid scan done with Tc99m MIBI preoperatively: Findings are consistent with parathyroid adenoma / hyperplasia in the left superior parathyroid gland (red arrows).

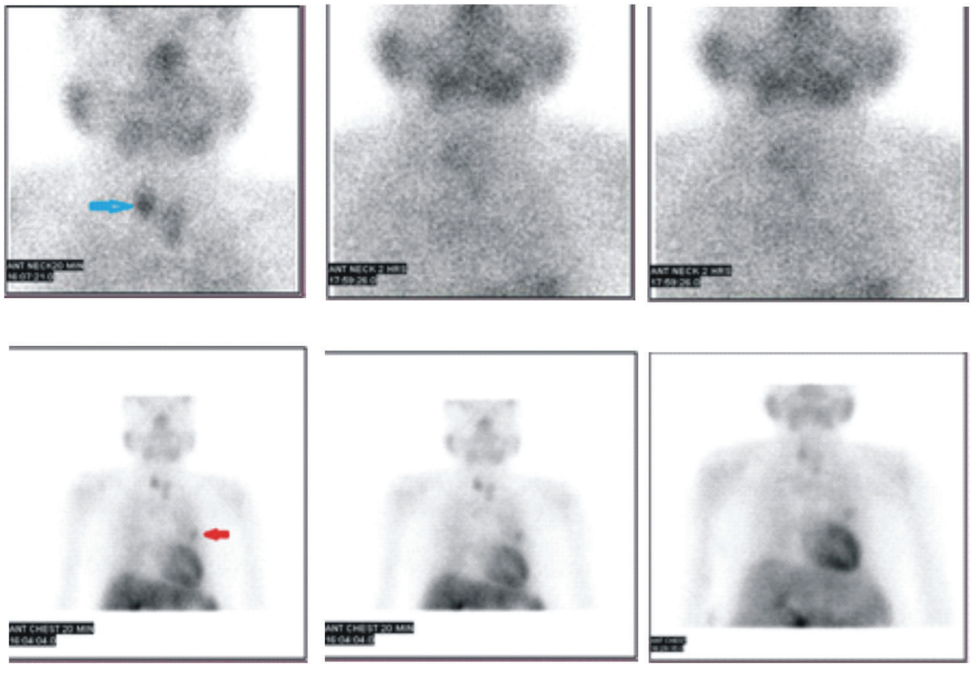

Figure 2. Tc99m MIBI scintigraphy postoperatively showed an area of radiotracer retention in the region of upper pole of right loçbe of thyroid gland (blue arrows), compatible with diagnosis of parathyroid adenoma. Another focus of increased uptake in left side of chest (red arrows).

both SI joints, favoring the sequelae of hyperparathyroidisim (Figure 4). Uptake of MDP in rib excluded any possibility of ectopic parathyroid tissue.

DISCUSSION

Surgical excision of hyper-functioning parathyroid glands is the definitive treatment of primary hyperparathyroidism. Blood sample is drawn for PTH assays before (baseline) and after the excision of a hyper-functioning gland. The

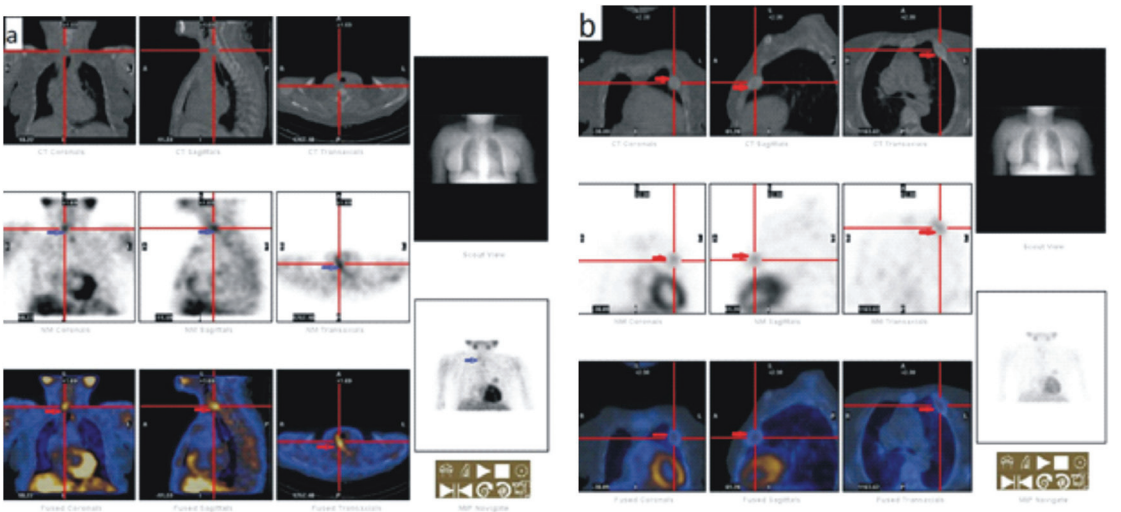

Figure 3. (a) Single photon emission tomography + X-ray computed tomography (SPECT-CT) images showed a photon-avid focus in the neck in the region of upper pole of right lobe of thyroid (blue arrows) (b) SPECT-CT images of Tc-99m MIBI scan, showing a distinct photon avid focus in the chest on left side as bone density lesion (red arrows) measuring 1.1 × 1.2 mm involving left 3rd rib near the costochondral junction.

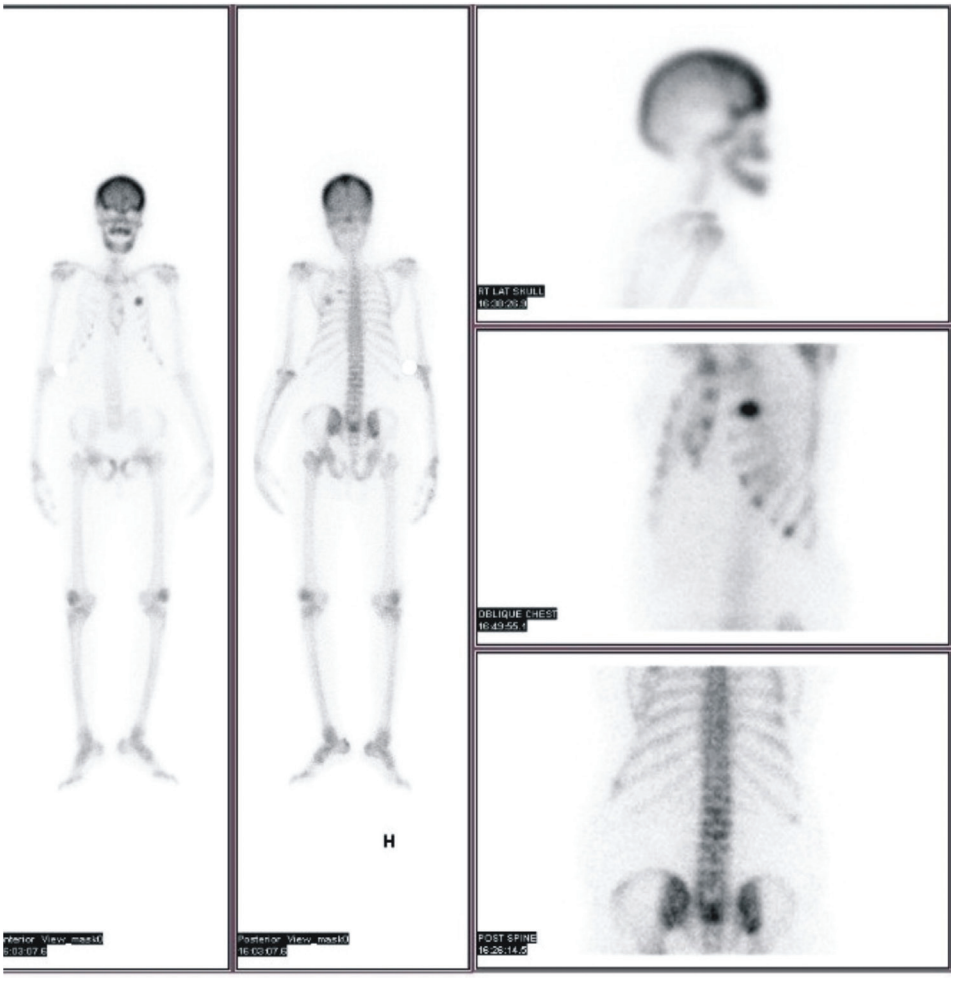

Figure 4. Tc 99m MDP showed intense uptake in the left 3rd rib near costochondral junction along with diffusely increased uptake in skull, focus of increased uptake in left 4th rib posteriorly and nonhomogeneous uptake in spine and both SI joints, favoring the sequelae of hyperparathyroidisim.

reduction of more than 50% in PTH level at 5–10 minutes after surgery is suggestive of a single site of primary hyperparathyroidism (generally, a single parathyroid adenoma). If such a drop does not occur, either double parathyroid gland adenomas or four-gland hyperplasia is likely the diagnosis [3]. Another common cause of post-surgical or persistent hyperparathyroidisim is ectopic parathyroid adenoma [1].

One of the advantages of preoperative imaging with Tc 99m MIBI is the preoperative detection of unsuspected ectopic parathyroid adenomas. Occasionally, the abnormal uptake of MIBI in the chest may indicate ectopic parathyroid tissue and in such cases surgery can be planned accordingly [1,4]. In present case, it was a lesion in bone, favoring the well-known phenomena of Tc99m MIBI uptake in brown tumors in patients with hyperparathyroidisim [5].

Brown tumor is a complication of hyperparathyroidism, occurring in more advanced stages of hyperparathyroid bone disease, particularly in patients with chronic kidney disease [6]. The presence of hemorrhage, hemosiderin, and hypervascularity leads to brownish color and thus the name [7]. Tc99m MIBI is less sensitive than bone scan done with Tc99m MDP. The exact mechanism of MIBI uptake in brown tumor is unknown, however it may be related to increased cellular mitochondrias, increased blood flow, increased capillary permeability, altered potassium potentials across mitochondrial and plasma membranes [8].

Focus of increased uptake in the right superior parathyroid location, raises the suspicion of double adenoma / hyperplasia with parathyroid gland of variable sizes.

Double parathyroid adenoma has been reported to occur in up to 9% of patients with primary hyperparathyroidisim [9]. Parathyromatosis refers to multiple areas of hyperfunctioning parathyroid tissue in neck [10]. Rarely does it become hyperfunctioning after total or subtotal parathyroidectomy causing recurrent or persistent hyperparathyroidisim [11].

CONCLUSION

Abnormal focus of increased uptake in the chest should be evaluated thoroughly keeping in mind the well-known phenomenon of Tc99m MIBI uptake in brown tumors in patients with hyperparathyrodisim, in addition to ectopic parathyroid adenomas.

Multiple parathyroid adenomas with differential uptake may pose a challenge during MIBI scanning. However, after surgery, relatively less active adenoma may become active and detected on scinitigraphy.

List of Abbreviations

MIBI Methoxyisobutylisonitrile
MDP Methylene diphosphonate
PTH Parathyroid hormone
SPECT-CT Single-photon emission computed tomography + computed tomography.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this report.

Funding

None.

Consent for publication

Written informed consent was taken from the patient.

Ethical approval

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

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