Parathyroid Adenoma In a Young Male with Multiple Fractures and Varied Clinical Features

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Received: 20 February 2012 / Accepted: 21 February 2012 / Published online: 4 March 2012
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Abstract Primary hyperparathyroidism is due to parathyroid adenoma (80–85%), hyperplasia (10–15%), carcinoma (2–3%) of cases. The most common presentation is asymptomatic hypercalcemia. Multiple pathological fractures, nephrocalcinosis as a presenting feature of primary hyperparathyroidism due to parathyroid adenoma is extremely rare at the age of 19 years. A case of parathyroid adenoma with multiple fractures of left femur, renal calculi, nephrocalcinosis, weight loss, constipation, dyspepsia abdominal pain was presented. The case was investigated completely with biochemical investigations, X-ray of forearm bones and femur, ultrasonography of neck and abdomen, CT scan of neck and abdomen, MRI scan, Scintigraphy of the neck. Right inferior parathyroid adenoma was diagnosed and confirmed by histopathological examination after excision. The post operative serum calcium levels became normal.

Keywords Parathyroid adenoma · Ultrasonography · Scintigraphy

Case Report

Rohit 19 years old boy presented with supracondylar fracture of femur on trivial fall, abdominal pain, dyspepsia, pain during micturition. The previous history showed fracture neck of femur on trivial fall 2 months before. On examination showed swelling in the right lower lobe of thyroid region, moving with deglutition. Serum calcium (12.5 mg/dl), parathyroid

hormone (817 pg/ml), urinary calcium (438 mg/24 h of urine) levels were elevated. X-ray of forearm bones showing lytic expansile lesion of right 5th metacarpal bone involving the metadiaphysal region with endosteal scalloping. Ultrasonography of neck shows solid cystic lesion inferior to right thyroid gland (Fig. 1) with increased vascularity. Ultrasonography of abdomen showed multiple calcifications involving both kidneys in upper, middle and lower calyces suggesting nephrocalcinosis. CT SCAN of neck plain and contrast shows 3.4×1.7 cm cystic lesion with enhancing solid component noted inferior to right thyroid gland. MRI scan of the hip joints showed multiple cystic lesions of right ilium, left ilium, right femoral neck and upper shaft with pathological fracture of left femur neck. MRI scan of left knee joint showed expansion of the lower end of the femur with multiple cystic lesions and pathological fracture at metadiaphysal region (Fig. 2) with synovial effusion.

Parathyroid scintigraphy and SPECT CT study was done. 15 mci of ^{99m}Tc MIBI was injected intravenously. Early static images (15 min), delayed static images (40 min) and SPECT CT (20 min) were acquired. Early static image showed diffuse tracer activity of both lobes of thyroid gland with more intense activity at right lower lobe. Delayed static scans showed intense tracer activity at the right lobe of the lower aspect of thyroid gland with wash out of the tracer from the remaining part of the gland. SPECT CT study confirmed 3.88×1.7 cm soft tissue density nodule at the lower pole of right lobe of thyroid gland.

Under a definitive diagnosis of parathyroid adenoma, targeted excision of the enlarged right inferior parathyroid adenoma was done. The excised mass was well defined capsulated with a gray white cut surface with haemorrhagic areas and was measured as $20 \times 20 \times 10$ mm on gross examination. Histopathological examination revealed a parathyroid adenoma with sheets and trabecular

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Fig. 1 Image obtained by using technetium ^{99m}Tc methoxy isobutyl isonitrile (^{99m}Tc MIBI). Early images show uptake in the thyroid gland. The *right lower pole* is slightly more prominent, but the level

Fig. 2 X-ray showing lytic expansile lesion involving the metadiaphyseal region of right 5th metacarpal with endosteal scalloping

arrangement of chief cells which are round to polygonal with granular acidophilic cytoplasm and centrally placed round nuclei. Postoperatively the patient showed return of serum total calcium levels (10.3 mg/dl), phosphorus (4.0 mg/dl), albumin (3.0 g/dl), serum PTH (15 pg/ml) to normal and ALP (225 U/L) was raised. The patient was in regular follow up for a period of two months and the hormone levels monitored during this period.

Discussion

A parathyroid adenoma is a noncancerous (benign) tumour of the parathyroid glands, which are located in the neck.

of uptake is not different from the rest of the thyroid. Delayed ^{99m}Tc -MIBI image shows delayed washout from a parathyroid adenoma near the *lower pole* of the *right thyroid lobe*

Primary hyperparathyroidism is more common in people over the age of 50. It is rare below the age group of 20. If parathyroid adenoma occurs below the age group of 15 then it may be due to MEN syndromes [1]. The present patient is a young adult of 19 years age. Radiographic manifestations are seen in less than 2% of patients and include subperiosteal erosions, diffuse osteoporosis, cystic lesions (brown tumours), pathological fractures, ‘salt and pepper’ mottling of skull and loss of lamina dura in the mandible [3]. The patient showed all the radiological manifestations.

The gold standard of diagnosis is the Parathyroid immunoassay. In primary hyperparathyroidism both the serum calcium and PTH elevated but in secondary hyperparathyroidism only serum PTH elevated, serum calcium is normal or decreased. Tertiary hyperparathyroidism has a high PTH and high serum calcium. It is differentiated from primary hyperparathyroidism by a history of chronic kidney failure and secondary hyperparathyroidism. Once the diagnosis of primary hyperparathyroidism has been made by biochemical analysis, the site or sites of adenomatous or hyperplastic parathyroid tissue is identified by non-invasive and invasive studies. Non-invasive studies include, ultrasonography (US), computed tomography (CT) scanning, magnetic resonance imaging (MRI) and scintigraphy. If the findings of the non invasive studies are equivocal or non diagnostic, invasive procedures are performed, such as parathyroid selective arteriography and/or selective parathyroid venous sampling [4].

Normal-sized parathyroid glands are usually not visualized with US. On gray-scale images, parathyroid

Fig. 3 Ultrasonography showing hypoechoic lesion of 3.4×1.7 cms with cystic component noted *below right lobe* of thyroid

Fig. 4 Ultrasonography showing multiple calcifications noted in the *right kidney*

adenomas appear as a discrete, oval, anechoic or hypoechoic masses located posterior to the thyroid gland and frequently medial to the common carotid artery (Figs. 3, 4), as Gooding reported. Randel et al. [5] report that larger adenomas are more likely to have cystic changes, lobulations, increased echogenicity due to fatty deposition, and occasional calcifications (Fig. 5). A typical CT protocol for assessing is axial 2- to 3-mm images with a small field of view from the hyoid bone down to the carina, after the intravenous (IV) administration of contrast material [6]. An enlarged, enhancing soft-tissue mass near the expected location of the parathyroid glands is considered to represent a parathyroid adenoma. Parathyroid adenomas are identified on MRI as soft-tissue masses in the expected normal and ectopic locations of the parathyroid glands.

Fig. 5 Well capsulated parathyroid adenoma during excision

They commonly have low-to-medium signal intensity on T1-weighted images and high signal intensity on T2-weighted images, as reported. Seelos et al. [7] report that, if Gd-DTPA is administered, abnormal parathyroid glands have substantially enhancement on T1-weighted images, but not more than that achieved with conventional T2-weighted imaging.

Ferlin et al. [8] introduced the thallium ^{201}Tl -technetium $^{99\text{m}}\text{Tc}$ pertechnetate (thallium-pertechnetate) subtraction method. Thyroid tissue takes up both ^{201}Tl and $^{99\text{m}}\text{Tc}$ pertechnetate. Abnormal parathyroid tissue, such as parathyroid adenomas, hyperplastic parathyroid glands, and parathyroid carcinoma, take up ^{201}Tl but not $^{99\text{m}}\text{Tc}$ pertechnetate. Separate ^{201}Tl and $^{99\text{m}}\text{Tc}$ pertechnetate images are obtained in a single session without moving the patient. Then, the $^{99\text{m}}\text{Tc}$ -pertechnetate image is subtracted from the thallium image by using computer processing [8]. Any remaining activity usually indicates abnormal parathyroid tissue. Recently $^{99\text{m}}\text{Tc}$ sestamibi, $^{99\text{m}}\text{Tc}$ MIBI and $^{99\text{m}}\text{Tc}$ tetrofosmin were introduced [9]. In this patient scan was done with $^{99\text{m}}\text{Tc}$ MIBI.

Although a comprehensive 4-gland parathyroid exploration has traditionally been the standard, operating time and hospital stay can be decreased by performing targeted parathyroid surgery [10]. Proponents of 1-gland or unilateral parathyroid exploration maintain that this approach allows smaller incisions, regional anaesthesia, and same-day hospital discharge and that it may also reduce the risk of laryngeal nerve injury and postoperative hypocalcaemia. In the present patient with previous investigations localizing the adenoma we did target excision of right inferior parathyroid. Even though some authors argue in favour of bilateral surgery, they still use technetium $^{99\text{m}}\text{Tc}$ sestamibi scintigraphy before the operation and parathyroid hormone (PTH) assays or a gamma probe during the operation.

Fig. 6 Histopathological picture showing sheets of chief cells with eosinophilic cytoplasm admixed with clear cells and oxyphilic cells. The tumour cells are transversed with thin vascular sinusoids

Intraoperative PTH assay is often employed to predict surgical cure in patients with primary hyperparathyroidism. Histopathological examination confirms and differentiates adenoma, hyperplasia and malignancy (Fig. 6).

Conclusion

Parathyroid adenoma in young adults is rare, very few cases were reported in literature. A young adult with a fracture due to trivial fall is thoroughly investigated to identify its cause.

If adenoma is diagnosed then its exact site is identified with scintigraphy, other radiological investigations and excised completely to prevent recurrence.

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