Abstract:
Primary Hyperparathyroidism is usually diagnosed as an incidental finding of hypercalcemia in blood tests or due to symptoms secondary to the high calcium. Overt bone disease is an extremely rare presentation. Fractures in hyperparathyroidism are unusual and usually affect the vertebrae. Pathological fractures have been described in patients with parathyroid carcinoma. We report on two patients with benign parathyroid adenoma who primarily presented with pathological fractures of long bones. Excision of the parathyroid adenoma and immobilization of the fractures resulted in the return of the serum chemistry to normal and improvement of bone healing.

Keyword: PRIMARY HYPERPARATHYROIDISM, PARATHYROID ADENOMA, PATHOLOGICAL FRACTURE

Case 1:
A 21 year old female was admitted with the history of accidental fall following which she developed weakness of left upper limb. She had a similar history in June 2008 and found to have bilateral femur shaft fracture. That time the Serum calcium was 9.2 mgs%, Serum phosphorous was 3.0 mgs%, Serum alkaline phosphatase was 969 IU/L and PTH was 61.3 pg/ml (12-72). She was treated with bilateral ORIF and interlocking nailing. Left femur got infected so the nail was removed and converted to limb reconstructing system in June 2009. Limb reconstructing system was removed after union. Now on examination patient was found to have swelling of left arm with bony crepitus. X-rays showed fracture shaft of left humerus, (figure 1) and old united fracture on the right and left shaft of femur (figure 2). Basic investigations were within the normal limits, serum calcium was 13.1 mgs%, serum phosphorous was 4.3 mgs%, Serum alkaline phosphatase was 724 IU/L and PTH was 661.3 pg/ml (12-72). USG neck showed a well defined 2.1 x 2.0 x 1.8 cm hypo echoic lesion just inferior to the lower pole of the right lobe of the thyroid.
gland representing a parathyroid adenoma. Other parathyroid glands were not identified. No mass was identified at their locations. (figure 3).

The left humerus fracture was treated conservatively with above elbow cast. She was taken up for right inferior parathyroidectomy (figure 4). Intra operatively she found to have a well defined 2.0 x 2.0 x 1.5 cm mass in the right inferior parathyroid. All other parathyroids were found to be normal. Both thyroid lobes were normal. During the post operative period patient developed 3 episodes of hypocalcemic tetany which was treated effectively with I.V calcium infusion along with oral calcium and Vitamin D₃. Histopathological examination suggestive of benign parathyroid adenoma (figure 5). Post operatively serum calcium was 9.2 mgs% and serum PTH was 40.2 pg/ml. Now the patient is on oral calcium with oral Vitamin D₃ and on regular follow up.

figure 1: X-ray left humerus PA view showing pathological fracture with diffuse osteoporosis

figure 3: USG neck showing well defined hypoechoic lesion of right inferior parathyroid

figure 2: X-ray showing old united fracture in the shaft of left femur.

figure 4: intra operative picture showing a well encapsulated mass in the right inferior parathyroid
Case 2:
A 32 years old female admitted with the history of trivial fall and inability to move her right lower limb. There was no similar history in the past. No h/o abdominal pain and urinary complaints. X-ray showed fracture shaft of right femur with diffuse osteoporotic changes. The Serum calcium was 9.8 mgs%, Serum phosphorous was 3.0 mgs%, Serum alkaline phosphatase was 788 IU/L and PTH was 834 pg/ml. USG neck showed a small hypo echoic lesion in the right inferior pole of the thyroid gland suggestive of parathyroid adenoma (figure 6). Other parathyroid glands were not identified.

Discussion:
Primary hyperparathyroidism is more common in females. Peak age incidence is between 30 to 50 years and incidence increases with age, though patient aged as young as 14 years was documented. The annual incidence is around 0.2% in patients > 60 years\(^1\). Both patients in our series are females aged 20 years and 32 years. By far the most common lesion found in patients with primary hyperparathyroidism is the solitary, benign...
parathyroid adenoma, occurring in 80% of patients. While in most cases, a single adenoma is found, multiple parathyroid adenomas have been reported in 2-4% of cases. These may be familial or sporadic. Parathyroid adenomas can be discovered in many unexpected anatomic locations. The most common sites for ectopic adenomas are within the thyroid gland, the superior mediastinum, and within the thymus. Occasionally, the adenoma may ultimately be identified in the retroesophageal space, the pharynx, the lateral neck, and even the alimentary submucosa of the oesophagus. In approximately 15% of patients with primary hyperparathyroidism, all four parathyroid glands are involved. There are no clinical features that differentiate single versus multiglandular disease. The etiology of 4-gland parathyroid hyperplasia is multifactorial. It may be associated with a familial hereditary syndrome, such as multiple endocrine neoplasia, Types 1 and 2a. As in the case of parathyroid adenomas, underlying molecular mechanisms are heterogeneous. Very rarely, in fewer than 0.5% of patients with primary hyperparathyroidism, the parathyroid disease will be malignant. In our series of 2 patients both of them were diagnosed to have solitary parathyroid adenoma. Two distinct types of bone lesions are described in primary hyperparathyroidism. The slowly progressive type leads to cortical thinning and osteoporosis & the rapidly progressive type. Pathological fractures may occur through a cyst or in a weakened long bone. A principal test at present is the ‘Immunoassay’ for PTH 1-84 as it distinguishes the hypercalcemia of malignancy from that of hyperparathyroidism. Diagnosis of primary hyperparathyroidism is suggested by hypercalcemia, hypophosphatemia and raised intact PTH in appropriate clinical settings. In presence of normal serum calcium with raised PTH levels, secondary hyperparathyroidism needs to be excluded by detailed clinical and biochemical evaluation. This biochemical picture may also be seen in primary hyperparathyroidism with vitamin D deficiency and low dietary calcium intake and as a manifestation of early stages of primary hyperparathyroidism. Once the diagnosis of primary hyperparathyroidism has been made by biochemical analysis, the site or sites of adenomatous or hyperplastic parathyroid tissue must be identified. Some authors advocated ‘Exploratory neck operation’ as most adenomas are localized in the neck. CT scan and Thallium subtraction scans are useful for detecting parathyroid pathology in normal as well as ectopic locations. USG of neck can be helpful in picking abnormal parathyroid tissue but CT scan and MRI are more sensitive to assess ectopic sites. In our series of 2 cases, High Resolution Ultrasound Scan of neck helped in localizing the parathyroid adenoma. Excised parathyroid gland has to be subjected to histopathological examination to confirm and differentiate adenoma, hyperplasia and malignancy. Histopathological examination in both cases confirmed the diagnosis of parathyroid adenoma. Primary hyperparathyroidism is cured when abnormal parathyroid tissue is removed. Since this is the only definitive approach to primary hyperparathyroidism, surgery is an acceptable approach to this disease even if patients are completely asymptomatic. Following parathyroid surgery, there is a prompt return to normal of serum and urinary calcium levels along with the parathyroid hormone level per se. Studies of bone markers are limited but indicate a reduction in these markers of bone turnover following successful surgery. Parathyroid surgery leads to a 10-12% increase in...
bone density at the lumbar spine and hip. The increase at the lumbar spine and femoral neck is prompt, with the greatest increment in the first postoperative year. Increases at the lumbar spine, hip and distal radius are sustained over 10-15 years following surgery.

**Conclusion:**
A high index of suspicion is necessary to diagnose this unusual presentation of primary hyperparathyroidism. A pathological fracture in young lady with marked osteopenia is highly suggestive. Patients may be present with the normal calcium in spite of having hyperparathyroidism. Any patient with multiple pathological fractures should be evaluated for primary hyperparathyroidism even if the serum calcium levels are normal. A combination of biochemical tests, including serum levels of calcium, phosphorus, alkaline phosphatase and parathormone assay will help in diagnosing primary hyperparathyroidism in 90% of the cases. High Resolution Ultrasound Scan of neck provides valuable preoperative information in selected cases. Surgical excision and calcium supplementation along with external or internal splinting of fractures allowed the fractures to heal.

**REFERENCES:**
2. R.G.Deshmukh, S.A.L.Alsagoff, S.Krishnan et al. Primary hyperparathyroidism presenting with pathological fracture