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Parathyroid adenoma in total knee replacement: A case report of missed diagnosis and treatment challenge

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Abstract

Background: Primary parathyroid adenoma is a diagnostic challenge especially in asymptomatic patients. We report a late diagnosed case of primary parathyroid adenoma in a patient who underwent bilateral total knee replacement.

Case Presentation: A 65 year old female patient underwent bilateral Total Knee Arthroplasty (TKA) for tri-compartmental osteoarthritis. Since intra-operatively the bone was extremely soft, a metabolic workup was done. Serum calcium and parathyroid hormone was extremely high and phosphorus was low immediate post-total knee replacement. The DEXA scan of hip, spine, distal radius showed density less than -2.5 SD. Ultrasound scan and nuclear imaging was suggestive of parathyroid adenoma. Patient underwent focused parathyroidectomy of right inferior parathyroid after 1 month. Post parathyroidectomy, PTH, serum calcium and phosphorus levels reverted back to normal. At six months follow up after bilateral TKA, patient is walking without any symptoms.

Conclusion: Delayed diagnosis of parathyroid adenoma, especially in arthroplasty surgeries, leads to intra-operative complications, but it can be avoided. Proper metabolic workup of all the arthroplasty cases and a multi-disciplinary approach is necessary.

Keywords: Hyperparathyroidism, parathyroid adenoma, total knee replacement, hypercalcemia, parathyroid hormone, bone mineral density

Introduction

Parathyroid hormone (PTH), secreted by the Parathyroid glands located behind the thyroid, plays a major role in the haemostats of calcium [1]. PTH increases plasma calcium level by liberating calcium from bone, increasing intestinal absorption and decreased urinary excretion. PTH also decreases phosphate level by inhibiting reabsorption in the kidneys. Hyperparathyroidism is a condition characterised by increased production of parathyroid hormone which may be due to primary, secondary or tertiary causes. Primary hyperparathyroidism (pHPT) is caused by solitary parathyroid adenoma is 80% cases, four gland hyperplasia accounts for 10-15%, multiple adenoma 5%, parathyroid malignancy 1% [2]. Primary hyperparathyroidism patients may be asymptomatic or present with non specific symptoms secondary to high calcium levels like fatigue, joint pain, weakness, mild depression and decreased concentration [3].

Variable presentation of pHPT makes it a diagnostic challenge especially in developing and under developed countries [4]. Because of limited facilities, and lack of proper workup in developing countries leads under diagnosis of primary hyperparathyroidism. Also in most of the cases, earlier stages of primary hyperparathyroidism is asymptomatic leading to a delay in diagnosis.

This is a case report of unidentified severe primary hyperparathyroidism in a patient who underwent primary bilateral total knee arthroplasty for tricompartmental osteoarthritis of bilateral knees. Primary parathyroid adenoma is a condition that is likely to be missed. Therefore, at least serum calcium and parathyroid hormone levels should be checked prior to replacement surgeries.

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Case Presentation

A 62 year old female, known case of mixed hyperlipidemia and essential (primary) hypertension, presented with history of pain in both knees for the past eight years. Since past one month she was walking with assistance. Clinical examination and imaging confirmed tricompartmental osteoarthritis in both knees. On examination of both knees, patient was walking with varus thrust and both knees in varus alignment; there was fullness in supra- and para-patellar fossa, and on palpation there was joint line tenderness. Range of movement - Left knee 10 degree fixed flexion deformity; further flexion is upto 70 degree. Right knee flexion is 0 - 80 degree and varus is correctable partially on both the sides. X ray showed decreased general bone density which we assumed to be an age related change rather than a pathology.

Patient underwent bilateral total knee replacement in single sitting with Gap Balancing technique. Intra-operatively, the femur and tibia on both sides were found to be extremely soft whereas the ligaments were quite normal in consistency. Intra-operative period was uneventful except that we took extra care for taking bone cuts. Post-operatively patient was given low molecular weight heparin, analgesic and antibiotic; also mechanical measures were taken to prevent deep vein thrombosis. Knee mobilisation exercise and static quadriceps exercises were started immediate post operatively whereas walking was delayed for 2 days. Against our usual protocol of weight bearing on the next day, we decided to delay the weight bearing since the bone was extremely soft, and we opted for a metabolic workup. Serum calcium was high (13.6 mg/dl), phosphorus low (2.62 mg/dl), Parathyroid hormone was increased 457.0 pg/ml (Normal Range 14 - 72 pg/ml). Serum creatinine was 1.4 mg/dl and urine calcium creatinine ratio 0.37, Alkaline Phosphatase level of 122 IU/L. DEXA spine, hip and wrist showed density T-score -5 SD, -3.6 SD and -3.2 SD respectively. Ultrasound of neck and nuclear scintigraphy (99mTc-MIBI) was suggestive of parathyroid adenoma. X ray of both knees shows good alignment and rotation of the components. The endocrinology and surgery team decided to go ahead with excision of involved parathyroid gland after one month from bilateral total knee arthroplasty. The patient was treated with Zoledronic acid, calcium and vitamin D. Patient underwent focussed parathyroidectomy of right inferior parathyroid gland. One week post parathyroidectomy, the serum PTH, Calcium and Phosphorus values reverted back to near normal. At six months follow up, clinically, patient is walking without any pain, with bilaterally 0 - 110 degree flexion, and functional score improved.

Discussion

Parathyroid hormone is the most important hormone involved in calcium homeostasis and bone remodelling. Hyperparathyroidism is a condition of over production of PTH due to primary, secondary or tertiary causes. Primary hyperparathyroidism presents with a spectrum of clinical

features ranging from completely asymptomatic disease, vague subjective symptoms including neuropsychiatric, cognitive, musculoskeletal gastrointestinal complaints to frank skeletal and renal manifestations like osteoporosis, fragility fractures, nephrolithiasis^[5]. Primary hyperparathyroidism was considered to be rare in developing countries but recent experience has shown that its apparent rarity may be due to paucity of reports from these countries and also due to limited diagnostic facilities^[6]. Unlike the western world, where primary hyperparathyroidism is diagnosed by routine biochemical screening, by the time of clinical presentation in the developing world there is often a high incidence of advanced metabolic bone disease. Most cases are reported in women and peak in the seventh decade of life^[7]. Our patient was a typical case of delayed diagnosis which was not supposed to be missed. Asymptomatic hyperparathyroidism diagnosed intra-operatively can be an orthopaedic surgeon's nightmare as far as (knee) joint replacement surgeries are concerned as the disease is associated multiple intra- and post operative complications. Intra-operative complications include peri-prosthetic fractures, ligament avulsion, loosening of pin while placing the cutting jig and even intra-operative subsidence of the tibial base plate prosthesis. Peri-prosthetic osteolysis, aseptic loosening and prosthetic subsidence are commonly encountered in the post operative period. A certain systematic analysis^[8] in Scottish population suggests that the incidence of peri prosthetic fracture was 0.9% for primary THR and 4.2% for revision THR at five years; the fracture rate increased to 1.7% for primary THR and 6.2% for revision procedures by ten years. The incidence of fracture was 0.6% for primary TKR and 1.7% for revision procedure at five years and 1.3% and 2.2% respectively at ten years. This risk of peri-prosthetic fracture increases manifold in conditions of poor bone stock of which hyperparathyroidism is a major cause.

With the increase in number of TKRs, there has a proportional rise in revision procedures as well. Pooled data from registries worldwide identifies that most common indication for revision surgery is aseptic loosening^[11]. All of these leads to a poor outcome following joint replacement surgeries. Primary hyperparathyroidism is characterised by the persistent elevation of total serum calcium levels with correspondingly elevated, or at times, inappropriately normal PTH levels^[5]. A normocalcemic variant also has been identified that presents with high PTH but normal total and ionised serum calcium levels^[9]. The apparent normocalcemia might be due to hypoalbuminemia of malnutrition or chronic illness masking the high serum calcium levels^[10]. With a heterogeneous clinical presentation and symptoms often overlapping with those of physiological ageing, a complete biochemical evaluation including serum calcium, PTH, creatinine and 25-hydroxyvitamin D level forms the crux of the diagnosis in a suspected case of pHPT^[5].

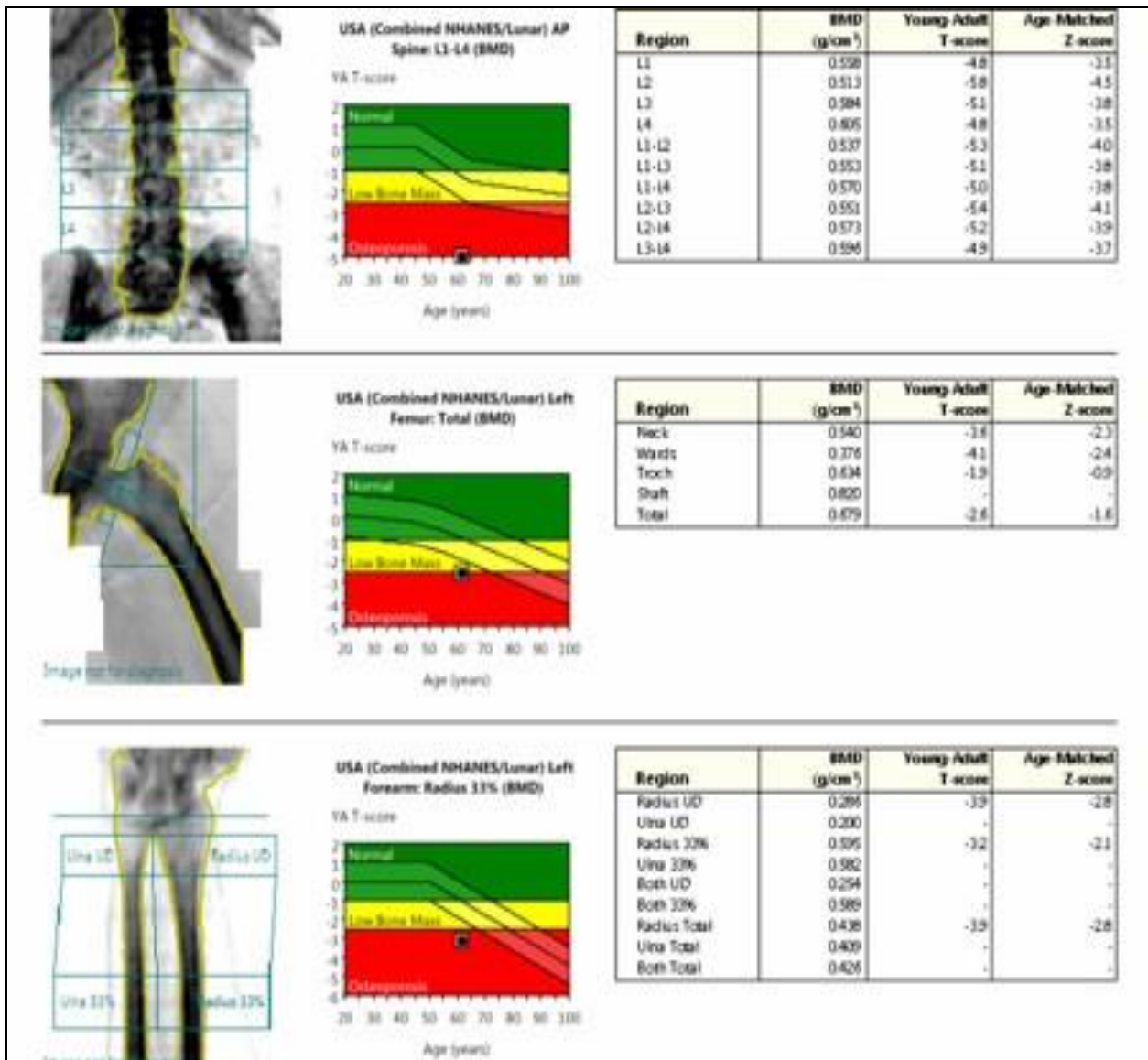


Fig 1: DEXA hip, spine and wrist

ULTRASOUND OF NECK

Clinical details: ? Parathyroid adenoma.

Right lobe of thyroid measures 2.9 x 1.5 x 1.1 cm

Left lobe of thyroid measures 2.5 x 1.1 x 1.3 cm

Isthmus measures 3 mm

There is a well-defined heterogeneous hypoechoic lesion noted in the postero-inferior aspect of the right lobe of thyroid measuring 1.5 x 0.4 cm, showing significant internal vascularity.

Thyroid gland appears diffusely mildly atrophic with normal echotexture and vascularity on colour doppler.

No lymphadenopathy in the neck.

Great vessels of neck grossly normal.

IMPRESSION:

A well-defined heterogeneous hypoechoic lesion noted in the postero-inferior aspect of the right lobe of thyroid. In the clinical setting of hyperparathyroidism this could represent a parathyroid adenoma.

Fig 2: Ultrasound of neck report

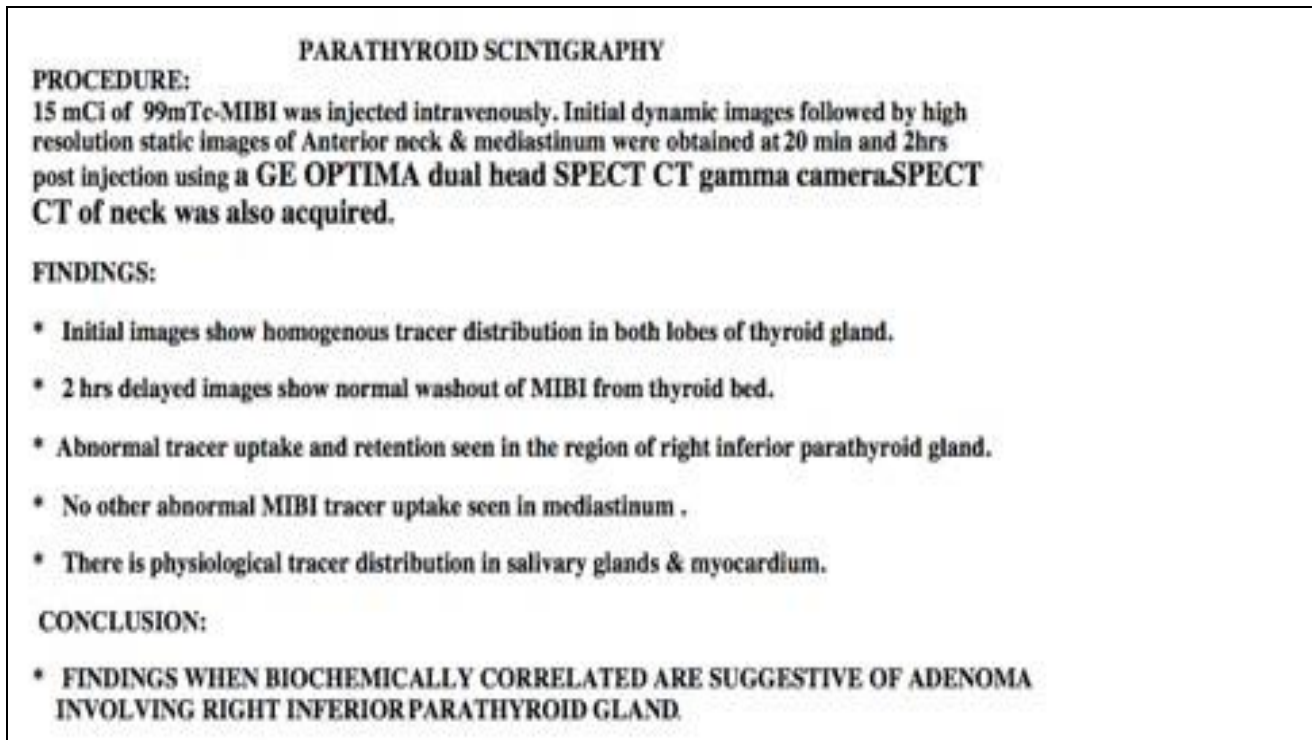


Fig 3: Parathyroid Scintigraphy report



Fig 4: Pre-operative X Ray of spine AP view



Fig 5: Pre-operative X Ray bilateral Knee Lateral and AP view



Fig 6: Immediate post operative total Knee Replacement X Ray



Fig 7: Six months post operative Total Knee Replacement X Ray lateral and AP views

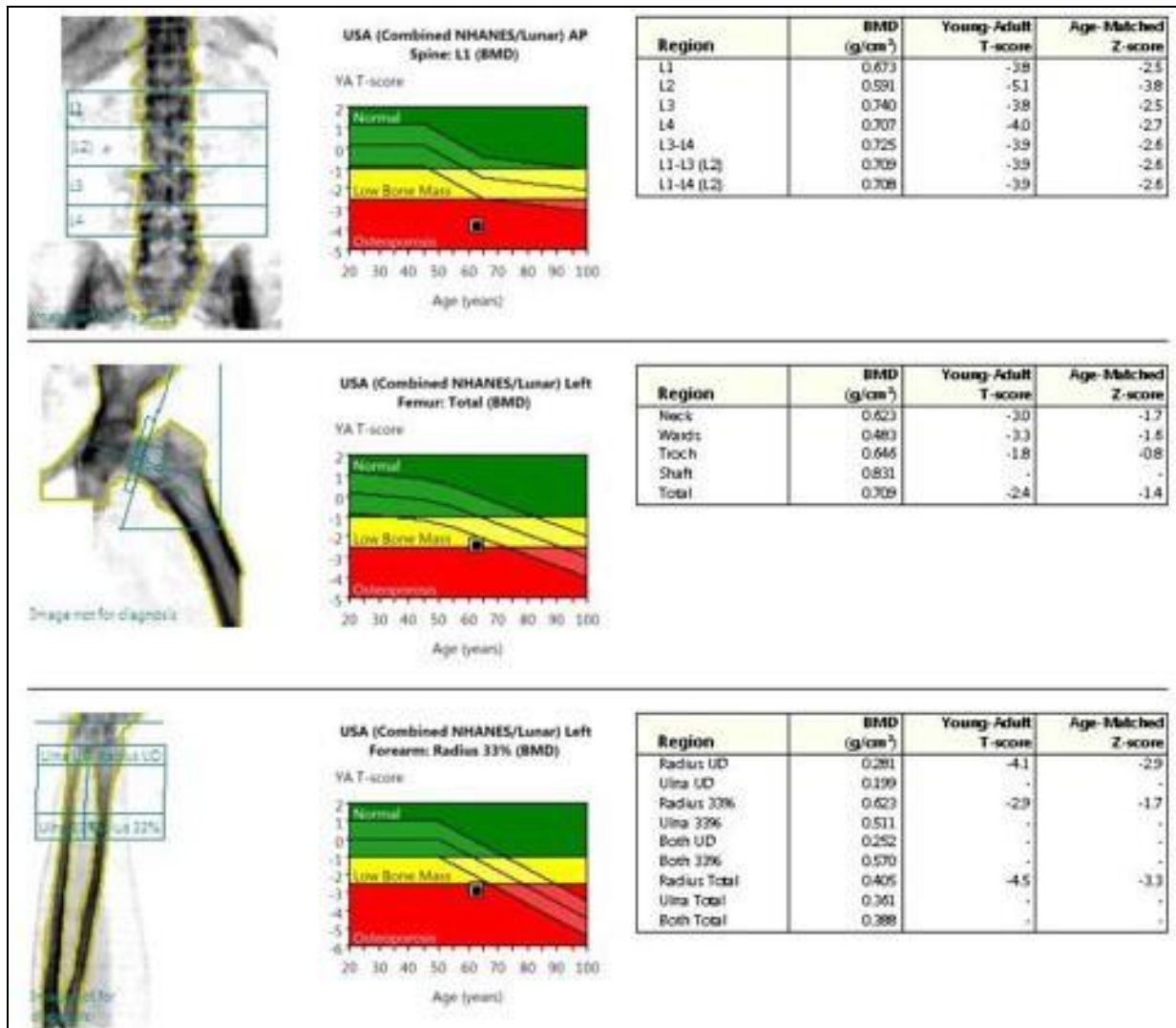


Fig 8: Post operative DEXA spine, hip, wrist

Conclusion

Primary hyperparathyroidism remains either completely undiagnosed or under diagnosed in developing countries. Delayed diagnosis of parathyroid adenoma especially during arthroplasty surgeries leads to numerous intra operative and post-operative complications. Proper metabolic work up and a multi-disciplinary approach preoperatively is suggested to avoid this situation. Basic bone profile and density studies are valuable in all arthroplasty cases especially in elderly when there is high index of suspicion.

Consent

Written informed consent was obtained from the patient for publication of this case and any accompanying images.

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