

Management of Fragility Fractures due to Renal Osteodystrophy and Hypothyroidism Induced Osteoporosis - A Rare Case Report

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Abstract

Fragility fractures are lesions due to mechanical stress or trivial trauma which are not ordinarily resulting in fracture. The incidence of osteoporosis increasing day by day and now it is the most common metabolic disorder. Overt or subclinical thyroid dysfunction, renal dysfunction, post-menopausal women, ovarian failure, pregnancy, diabetes, hypertension and heart disease may increase the risk of fragility fractures. Thyroid hormone replacement stimulates calcium absorption and bone maturation, but recovery may be incomplete dependent on the duration and severity of hypothyroidism before treatment. Recent studies have demonstrated that the prevalence of fracture is high even in early stages of chronic kidney disease, including in those with age-associated renal impairment and leads to renal osteodystrophy which subsequently leads to osteoporosis. It's a case of 36yrs old young pregnant women carrying twin babies of 35weeks 6days primigravida who underwent In Vitro Fertilization due to premature ovarian insufficiency had a history of trivial trauma due to pre-eclampsia induced seizure and sustained right proximal humerus and left acetabulum fracture with ongoing treatment for hypothyroidism and renal osteodystrophy.

Keywords: Fragility; Fractures; Osteodystrophy; Hypothyroidism.

Introduction

Together with hypothyroidism and renal osteodystrophy induced osteoporosis are most common conditions encountered in a clinical endocrinology practice.⁹ Pregnancy and lactation-associated osteoporosis (PLO) is a rare form of osteoporosis. 18despite its relative rarity, it can be a dangerous condition that causes severe back pain, height loss and disability and fractures even due to trivial trauma. Normal physiologic changes during pregnancy, genetic or racial difference, obstetrical history and obstetrical disease, such as preterm labor or pregnancy-induced hypertension, are presumed risk factors of pregnancy-related osteoporosis. Traditional medications for osteoporosis are calcium/vitamin D and bisphosphonate.¹⁷ Concerns with bisphosphonate include accumulation in bone and fetal exposure

in subsequent pregnancies. Improvement in bone mineral density at the lumbar spine after 1 year of daily teriparatide therapy, as well as improvements in bone turnover markers in pregnancy. Patients with untreated hypothyroidism, bone turnover are decreased in both trabecular and cortical bone.³ However, in addition to the well-known effects of thyroid hormones on bone turnover mediated by thyroid hormone receptors (TRs), thyroid stimulating hormone (TSH) may also influence bone turnover directly, with high levels of TSH inhibiting bone resorption.¹² In patients with hypothyroidism, a transient loss of bone mineral and a parallel increase in fracture risk¹⁴ is observed within the first 2 years after initiation of levothyroxine substitution therapy, probably because of a transient increase in bone turnover with remodeling of accumulated old bone, and perhaps an increased risk of falls. Abnormalities

in bone turnover prevail in renal osteodystrophy (ROD), with high turnover due to secondary or tertiary hyperparathyroidism at one end of the spectrum and low turnover, such as adynamic bone disease and osteomalacia, at the other end. ROD is an important cause of morbidity, decreased quality of life, and increased risk of fractures.³ Renal osteodystrophy is a common complication of chronic kidney disease, which may lead to defective mineralization, altered bone morphology, and/or bone turnover.²

This is a case report about 36yrs primigravida pregnant women who underwent invitro fertilization because of ovarian failure and preeclampsia with comorbidities like hypothyroidism, hypertension, and renal osteodystrophy. Patient had right acetabular fracture and left proximal humerus fracture following a trivial trauma. This case is mainly about treatment of fracture in such osteoporotic bone and post-operative calcium and vitamin D usage.

Case Report

This is a case of 36 yrs female, carrying twin babies, and primigravida pregnant women with 35 weeks 5 days period of gestation. Patient was known case of preeclampsia/hypothyroidism/renal osteodystrophy under treatment. Patient had two times history of fall from bed during the episodes of seizure which was of 3-4 feet height and sustained injury of right hip and left upper limb. Patient brought to emergency with labor pains. As per history of attenders patient had 3 episodes of seizures, one lasted for 3-5 secs, had froth from mouth and post ictal confusion. With a gap of 30 mins she had another episode of seizure and it lasted for 10 sec, Patient was shifted into ambulance

and brought to emergency and she had a 3rd episode of seizure in hospital and it lasted for 10 sec, primary treatment was given and patient was shift to emergency labor room for lower segment caesarean section (LSCS). Post LSCS patient was referred to orthopaedician for clinical examination and required x-rays has been done.

On Examination

Left Upper Limb: - Patient had tenderness, swelling with ecchymosis over upper 1/3rd of left arm, restriction in movements of left shoulder joint without any neurovascular deficit. Right lower limb: - Patient had tenderness over right hip joint with restriction in range of movement of right hip joint with shortening of around 1 cm and without any neurovascular deficit. After through clinical examination required x-rays had been done.

Pre Operative Plain Radiographs Pelvis with Bilateral Hips and Left Humerus with Shoulder Joint



Fig. 1 Shows Breach in Ilioischiac Line and Iliopectineal Line Suggestive of Anterior and Quadrilateral Plate Fracture and Shows Impaction of Femoral Head to Roof.

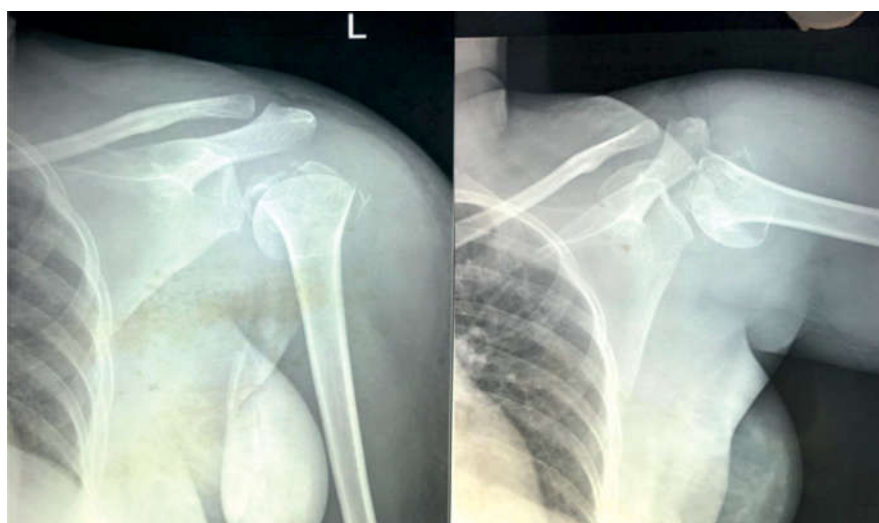


Fig. 2 Humerus with shoulder joint plain radiographs shows: proximal 1/3rd humerus comminuted fracture near classification {4 part fracture - 3parts are displaced with respect to 4th part}.

3D (VR) Computed Tomography Images



Fig. 3 Shows breach in ilioischial line and iliopectineal line suggestive of anterior and quadrilateral plate fracture and shows impaction of femoral head to roof and protrusion acetabuli on right side and no loose bodies (fracture fragments) in other views of ct.



Fig. 4 Proximal 1/3rd humerus comminuted fracture: neer classification {4 part fracture - 3parts are displaced with respect to 4th part} with superior migration of the shaft and head subluxated posteriorly.

Blood Investigations

- HB-13.2g/dl (before LSCS) HB-6.5g/dl (post LSCS), Platelet-1.55, Urea-37mg/dl, Creatinine-0.78mg/dl, Sodium-133meq/l, Potassium-4.44meq/l, Uric acid-7.6mg/dl
- 2 pint PCV transfused before planning for next operation and patient got operated in staged procedure. First proximal humerus fracture fixation done and pelvic fracture fixation done on later date.
- Marking of approach for quadrilateral and anterior column fracture fixation.

Intra-Operative Images

Using STOPPA (anterior intrapelvic approach) and ILOFEMORAL APPROACH anterior column and quadrilateral plate fixed with superior and inferior pectineal plate and bone graft from iliac crest placed in region of bone loss.

On the later date left proximal humerus fracture was fixed with PHILOS (Proximal Humerus internal locking system) plate using delto-pectoral approach.

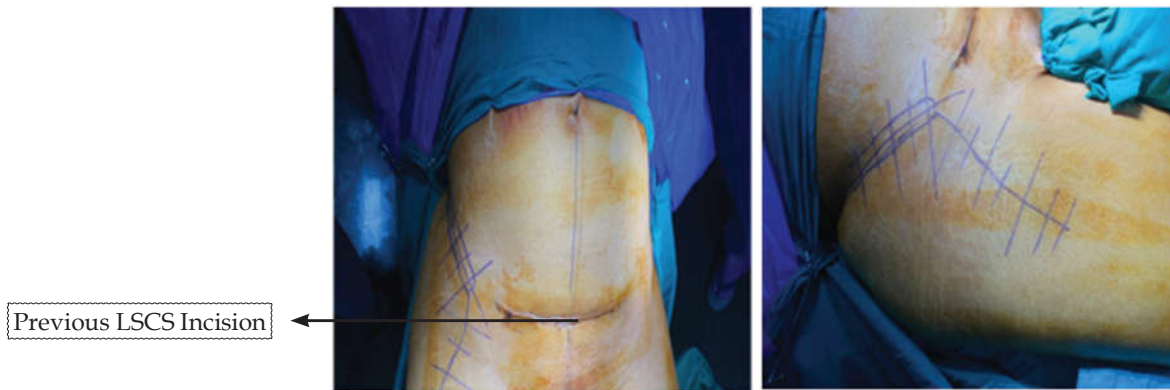


Fig. 5 Markings of Stoop and Iliofemoral Approach.

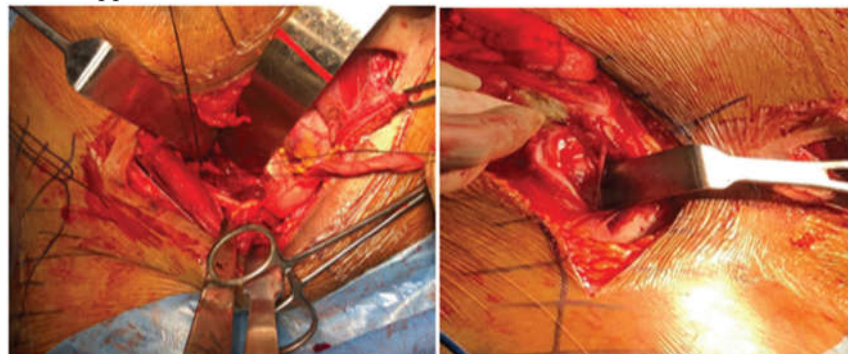


Fig. 6 Intra-Operative Images.

- Showing stoopa approach-identification of corona mortis over medial surface of superior ramus and ligation of corona mortis.
- Iliofemoral approach: for holding reduced

fracture fragment and for bone Graft from iliac crest, lateral femoral cutaneous nerve protected which is traced over sartorius around 2.5 cms distal to asis.



Fig. 7 Post Operative Images.



Fig. 8 Post Operative Images.

Plain radiography's of pelvis with bilateral hips, iliac and obturator views respectively showing fracture stabilization with inferior and superior pectineal plate and at closure the iliac osteotomy fragment reattached using single cortical screw.

Plain radiography's of left shoulder joint: proximal 1/3rd humerus fracture fixation with PHILOS (Proximal Humerus internal locking system) plate using delto-pectoral approach.

Discussion

Thyroid hormones are essential for skeletal development and are important regulators of bone maintenance in adults. Thyroid hormones have important effects on skeletal development, linear growth and the maintenance of adult bone mass and strength.⁸ The thyroid gland mainly secretes thyroxine (3, 5, 3', 5'-I-tetraiodothyronine, T4), and the circulating level of T4 is approximately fourfold higher than the concentration of the biologically active hormone 3,5,3'-I-triiodothyronine (T3)⁹. A classic endocrine negative feedback loop maintains an inverse relationship between the circulating concentrations of thyroid hormones and thyroid stimulating hormone (thyrotropin, TSH), thus establishing the hypothalamic-pituitary-thyroid (HPT) axis set-point. There was an increase in the risk of any fracture within the first 5 years after a diagnosis of hyperthyroidism, and the first 10 years after a diagnosis of hypothyroidism.¹⁰ Use of antithyroid drugs was associated with a significantly reduced fracture risk independently of the dose used¹ several factors are known to affect BMD. Overt hyperthyroidism has been recognized to be associated with an increased risk of fracture and decreased BMD, especially in the elderly. Interestingly, some studies showed that the risks of bone fracture and low BMD are increased in

patients with hypothyroidism.¹¹ Although overt Hyperthyroidism and overt hypothyroidism are related to osteoporosis, the relationship between subclinical thyroid dysfunction and the risk of fracture or low BMD is unclear.¹ Compared with overt thyroid dysfunction; subclinical thyroid dysfunction presents more subtle changes in thyroid function. Subclinical thyroid dysfunction is defined by abnormal serum thyroid-stimulating hormone (TSH) with free T4 (FT4) and free T3 (FT3) concentration within the reference range.¹⁶ Subclinical thyroid dysfunction is much more common than overt dysfunction. Some cross-sectional studies showed that subclinical hyperthyroidism and subclinical hypothyroidism were related to reduce BMD.

During the course of pregnancy, a remarkable series of physiologic changes occur, aimed at preserving maternal homeostasis while at the same time providing for fetal growth and development. These changes which have direct implications on calcium metabolism include falling albumin level, expansion of extracellular fluid volume, increase in renal function and placental calcium transfer.¹⁵

An inverse relationship between calcium intake and hypertensive disorders of pregnancy was first described in 1980. This was based on the observation that Mayan Indians in Guatemala, who traditionally soak their corn in lime before cooking, had a high calcium intake and a low incidence of preeclampsia and eclampsia. A very low prevalence of preeclampsia had been reported from Ethiopia where the diet contains high levels of calcium.⁹

WHO recommends an intake of 1.5-2.0 g elemental calcium/day with the total daily dosage divided into three doses (preferably taken at mealtimes) from 20 weeks' gestation until the end of pregnancy. Target group includes all pregnant women, particularly those at higher risk

of gestational hypertension and in areas with low calcium intake.¹⁷

As we discussed in the introduction bone turnover prevail in renal osteodystrophy (ROD), with high turnover due to secondary or tertiary hyperparathyroidism at one end of the spectrum and low turnover, such as adynamic bone disease and osteomalacia, at the other end.^{1,2,3,4}

Result

In this case patient was diagnosed with osteoporosis due to different possibilities like thyroid dysfunction, renal osteodystrophy, pregnancy and preeclampsia and she may even develop pregnancy and lactation-associated osteoporosis which is a rare phenomenon.

Calcium supplementation during pregnancy for women with deficient dietary calcium intake offers modest benefit in terms of preventing preeclampsia and preterm births and improving maternal and infant bone health. In this case we mainly discussed about different causes of osteoporosis and definitive treatment of fragility fracture following trivial trauma.¹⁷

Definitive fixation of fractures, appropriate calcium and vitamin D supplementation (WHO recommends an intake of 1.5–2.0 g elemental calcium/day divided into three doses for osteoporotic pregnant lactating women.¹⁷) is must and should for the patient with osteoporotic bone which helps in bone quality improvement and early mobilization.

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