Case Report
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Proximal Femoral Stress Reaction in A Military Recruit - A Treatment Prospect

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What to Learn from this Article?

Suspecting and treating Femoral stress fractures.

Abstract

Introduction: Stress fractures occur in individuals in whom repetitive strenuous muscle and tendon force act on bone; that have not adapted to such forces. Under a constant load, osteoclast resorption and osteoblastic reconstruction of bone are in equilibrium, resulting in normal remodeling. If loading increases, additional bone resorption occurs. Increased osteoclastic activity at sites of stress may cause local weakening and predispose to micro damage. If allowed to progress, such micro fractures may progress to complete fractures.

Case Report: A 30-year-old man presented with right thigh pain for 3 days without any history of significant trauma. He was a military recruit with history of running 5 miles a day for last 12 years and was running 20 miles a day for last 5 days before he developed pain. Examination revealed pain to palpation along the proximal medial and lateral right thigh. Range of motion was painful and limited. Radiograph of right hip showed fracture line in intertrochanteric region of femur.

Conclusion: Here we have reported a case of stress fracture of proximal femur in intertrochanteric region which to our knowledge has not been reported in the literature so far. This fracture is important to recognize early as there are high chances of displacement resulting in increased risk of complications. We suggest immediate anatomical reduction and stable internal fixation to prevent complications and early mobilization to decrease the morbidity.

Keywords: Intertrochanteric, Osteonecorsis, Insufficiency fracture, Osteoblast, Osteoclast.

Introduction

Stress fractures occur in individuals in whom repetitive strenuous muscle and tendon force act on bone; that have not adapted to such forces.[1-3] Stress fractures can be subdivided into fatigue fractures, caused when normal bone is exposed to repeated abnormal stress, and insufficiency fractures, where normal stress is applied to abnormal bone.[4] Under a constant load, osteoclast resorption and osteoblastic reconstruction of bone are in equilibrium, resulting in normal remodelling. If loading increases, additional bone resorption occurs.[5,6] Increased osteoclastic activity at sites of stress may cause local weakening and predispose to micro damage.[7] If allowed to progress, such micro fractures may progress to complete

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Figure 1: Pre-op antero posterior view.

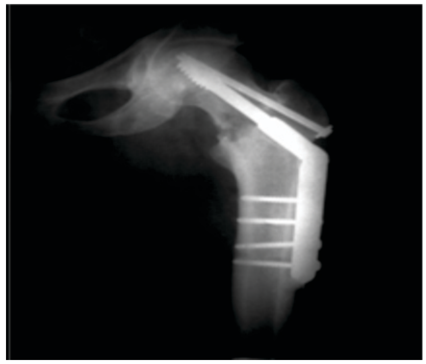
Figure 2: Pre-op antero posterior view.


Figure 3: Post- op view.

fractures.[8]

Although stress fractures can arise at any site, the most common locations are postero-medial tibia, particularly in runners; metatarsals in runners, dancers, and military recruits; iliopubic and ischiopubic rami in military recruits, gymnasts, dancers, and soccer players; and femur in cross-country runners. Calcaneum is also a common site of involvement.[1,4]

Stress fractures of the femur are usually seen in osteoporotic elderly people, but in healthy young athletes they are less common. Stress fractures of neck of femur have been reported several times in previous years. Fractures localized to the superior surface of neck of femur are termed tension fractures, and those localized to the inferior surface, compression fractures.[9] To our knowledge, the literature contains no reports of stress fracture of proximal femur in intertrochanteric region.

Here, we describe a case of stress fracture of the proximal femur in intertrochanteric region in a male military recruit. The patient was informed that data concerning the case would be submitted for publication, and he consented.

Case Report

A 30-year-old man presented with right thigh pain for 3 days without any history of significant trauma. He was a military recruit with history of running 5 miles a day for last 12 years and was running 20 miles a day for last 5 days before he developed pain. Examination revealed pain to palpation along the proximal medial and lateral right thigh. Range of motion was painful and limited. Radiograph of right hip showed fracture line in intertrochanteric region of femur. Presumptive diagnosis of stress fracture was made. Patient was admitted and further investigated to rule out any other pathology. All blood investigations including serum levels of calcium, phosphorus, PTH and creatinine were normal except for low 25-hydroxy vitamin d3 levels (22.4 ng/ml). Reports of 99m-Technetium MDP bone scan, Magnetic resonance imaging (MRI) and Computed tomography (CT) were consistent with stress fracture with no other pathology. Dual- energy X- ray absorptiometry was also normal. Patient was managed by Closed reduction and internal fixation with Dynamic hip screw with anti-rotation screw. Initially patient was molilised toe touch walking with cruch support with regular follow up and at the present time patient is walking full weight wearing, no pain, without support and performing his daily routine activities and joined his duties as well.

Discussion

The literature renders different opinions and data with regard to stress fractures and the structural integrity of bones. A number of authors feel that Wolff's Law is applicable with stress fractures in that the bone is attempting to adapt to the ongoing stresses. It appears that bone resorption with accelerated repetitive stress occurs at a greater rate than bone deposition. The end result is a stress fracture from repetitive, cumulative stress exceeding the structural strength of the bone.[6]

Histologically, as humans mature from adolescence, the bone in the femoral neck undergoes internal remodeling of circumferential lamellar bone to adult osteonal bone.[10] Experimentally, the greater the percentage of osteones with lamellar bone, the greater the resistance to failure with repeated loading. Fractures appear to be related to the rate of loading, if the rate of loading exceeds the rate of there modeling of bony buildup, then a fracture may occur with stress.[5,6]

Stress fractures of neck of femur are well described in literature. The femoral neck is subjected to loading forces several times body weight and with stands considerable tensile and compressive forces. It is important to consider these two distinct forces separately because they lead to different injury types and outcomes. Tensile forces occur at the superior aspect of the femoral neck, where as compressive forces occur at the inferior aspect. [11]Tension side femoral neck stress fractures are at higher risk for nonunion and displacement. [12-14]Other biomechanical factors, such as leg length inequality, coxavara, and pescavus, may also be important in the development of compressive and tensile injuries at the femoral neck. Femoral neck stress fracture has many associated complications such as nonunion, malunion, osteonecrosis, and arthritic changes. [14,15]These complications may occur more frequently in the setting of a displaced fracture. Treatment is based on the anatomic location of the fracture. Many authors suggest that tension side femoral neck stress fractures require internal fixation because of potential instability and high rate of complications; however, there are reports of successful conservative management for non-displaced tension side fractures [11,12] Compression side fractures are generally treated conservatively with a period of rest followed by gradual return to activity and exercises. Femoral neck stress fractures treated conservatively should have frequent radiographic monitoring for progression given the high incidence. Return to running is considered when full weight bearing is asymptomatic, there is no tenderness to palpation on physical examination, and imaging studies are consistent with healed fracture.

Literature is not available on stress fracture in pertrochanteric region so biomechanics related to it is not clear. The pertrochanteric region is quite variable in its combination of cortical and cancellous bone structure. The well-vascularized pertrochanteric region is dependent on the structural integrity of a laminated cancellous bone arcade from the femoral head and epiphyseal scar, around Ward's triangle to the lesser trochanter, where the solid nature of the structure changes to a tubular construct with the origin of the femoral medullary canal; the strong plate of bone posteriorly is named the calcar femorale. This is the region most affected with the posteromedial fracture comminution leaving only the anteromedial cortex potentially stable.

The main structural attachments to the proximal femur include the hip capsule and the musculotendinous junctions of the gluteus medius and minimus (greater trochanter), iliopsoas (lesser trochanter), pirifomis and short external rotators (posterior trochanteric region from the greater trochanteric region to the lesser trochanter), the oblique head of the rectus femoris (anterior capsule), and the vastus lateralis (lateral femur distal to the greater trochanter). The hip capsule is especially important in reduction of pertrochanteric fractures and its continuity with the distal fragment is the soft tissue attachment on which a stable reduction is possible. With capsular disruption, the displacement of the fracture fragments is dependent on the musculotendinous attachment to the respective fragments. The greater trochanter is abducted and externally rotated by the gluteus medius and short external rotators, the shaft is displaced posteriorly and medially by the adductors and hamstrings. This accounts for the usual shortening and coxavara deformity of displaced fractures.

Lambotte described the four components of surgical treatment of fractures at the turn of the twentieth century, and they are as applicable today as then. [16,17] The first is exposure of the fracture, which today means visualization of the fracture deformity, and the safest approach to ensure reduction and placement of the implant in the correct position. The second is reduction of the fracture, which is critical to the stability and functional recovery of the patient. Inadequate reduction is the major preventable etiology for lost reduction and implant failure in pertrochanteric fractures. The third step is provisional fixation in an anatomically reduced position; this is frequently the most neglected step in hip fracture surgery. This involves the reduction of the fracture and then maintenance of the fracture with either provisional Kirschner pins and/or clamps to hold the fracture in position while the bone is prepared for the definitive implant. The last step is definitive fixation, which should maintain the reduced fracture in an acceptable anatomic and functionally correct position until fracture healing is complete. [Lambotte principal of fracture management was basically given for traumatic fractures that is still followed for such injury. Stress fracture and its management was not very much common in twentieth century. We applied the same principal of Lambotte in stress fracture and found satisfactory result. It means lambotte principal of fracture management can be applied for fracture caused by severe trauma and also for stress fracture.]

Conclusion

Here we have reported a case of stress fracture of proximal femur in intertrochanteric region which to our knowledge has not been reported in the literature so far. This fracture is important to recognize early as there are high chances of displacement resulting in increased risk of complications. We suggest immediate anatomical reduction and stable internal fixation to decrease the morbidity and prevent complications.

Clinical Message

Stress fracture in the intertrochanteric region in proximal femur is very rare. So any patient particularly military recruit if presented with mild pain in groin during activity and relieved by rest must be suspected for insufficiency fracture. If on plane radiography lesion is not visible, go with the most common investigation i.e. MRI. If the fracture is displaced, it should be fixed to prevent complications and early mobilization to decrease morbidity of patient.

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