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Femoral neck fatigue fracture on morbid obesity: A case report

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Abstract
Introduction: Fatigue fractures are a type of stress fractures, and are due to abnormal stresses on normal bone. They most frequently occur in weight-bearing bones. The femoral neck localisation is rare.
Objective: The aim of our study is to present a case of femoral neck fatigue fracture due to obesity and sedentary life style treated by double screwing.
Observation: It is a 27-year-old female patient who presented with a 2-month history of left hip pain. There was no history of trauma, he is obese with the BMI of 32.4 with sedentary life style. A physical examination revealed left hip tenderness and internal and external rotation were almost impossible due to pain. Plain radiographs and CT-Scan of the left hip showed tension-type non-displaced left femoral neck fatigue fracture (Blissenstaff-Morris type II). The double screwing with cancellous screws was performed under the C-arm fluoroscopy.
Conclusion: The fatigue fracture most frequently occur in weight-bearing bones and the femoral neck localisation is rare. Athletes are at high risk of fatigue fractures. However sedentary life style and obesity are among other causes. The surgical treatment with screwing results in satisfactory clinical course.

Keywords: Femoral neck fatigue fracture - Obesity - Sedentary life-Screwing

Introduction
There are 2 main types of stress fractures: fatigue fractures and insufficiency fractures. Fatigue fractures are a type of stress fracture, and are due to repeated abnormal stresses on normal bone over time. They should not be confused with an insufficiency fracture, which occurs due to normal stresses on abnormal bone. Fatigue fractures most frequently occur in weight-bearing bones, such as the tibia, metatarsals and navicular bones. Less common are fractures to the femur, pelvis, and sacrum. Femoral neck localisation ranges from 0.3 to 4.7% in a military population [1, 2]. In general, non-displaced femoral neck fatigue fractures (FNFF) are treated conservatively, but displacedfractures are treated operatively. This article presents a case of femoral neck fatigue fracture in the obese adult femalepatient with a sedentary life style, treated operatively and resulting in a good clinical course.

Case Report
A 27-year-old female patient without past medical and surgical history presented with a 2-month history of left hip pain and reduced walking perimeter. Her height was 175cm and body weight was 99 kg. She presented a gynecoid obesity with the BMI (body mass index) of 32.4.
A physical examination revealed:
- walking with a pair of crutches with left limp
- the patient hasthe antalgic gait
- absence of inequality of the lower limb length
- left hip pain tenderness, but internal and external rotation was almost impossible due to pain.
- left hip muscle strength was graded 3 out of 5

Plain radiographs showed sclerosis of the left femoral neck on the anteroposterior (AP) view and transverse fracture with sclerosis on the lateral view. This fracture was classified as tension-type (Blissenstaff-Morris-type II) (Fig 1).

The bone scan confirmed non-displaced left femoral neck fracture. Magnetic resonance imaging (MRI) was not performed.

We selected operative treatment with a double screwing of the femoral neck under C-arm fluoroscopy with 2 x 6.5 mm cancellous screws (Fig 2).

Three days postoperatively, use of crutches was permitted. Rehabilitationfor improvement of muscle power and range of motion was started 1 week later. Half weight-bearing was permitted for 3 months and walked with crutches, and later, full weight bearing was permitted. After four months, she could ambulate without pain and had no functional loss. Plain radiographs showed callus formation but no evidence of necrosis (Fig 3). After 27 months, the left hip muscle strength was 5 out of 5. The control X-rays showed the union of the fracture, screws well placed and without signs of femoral head necrosis (Fig 4).

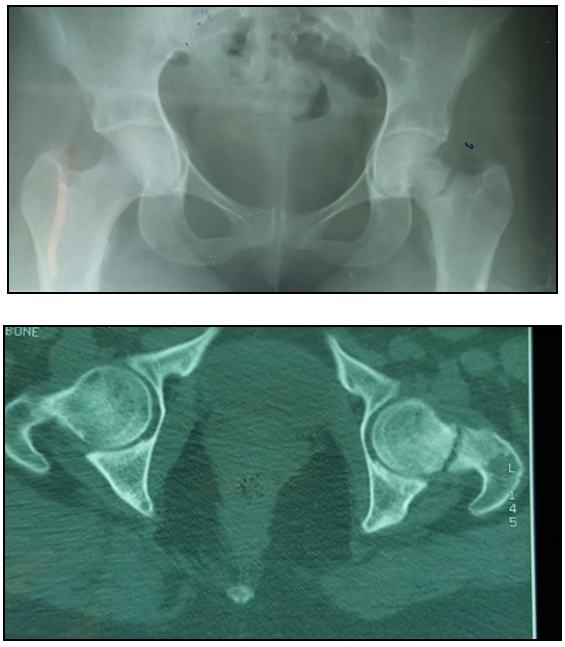

Fig 1: Stress fracture in X ray and Scan bone

Fig 2: X ray post operative control

Fig 3: X ray control after 4 months

Fig 4: X ray control after 27 months

Discussion

The femoral neck fatigue fracture is less common and most often associated with intense sport practices. In a military population, it ranges from 0.3 to 4.7% of all diagnosed fatigue fractures [1, 2]. In a series of 142 athletes treated for fatigue fractures, Orava [3] found 20 cases of the femoral neck fatigue fractures.Bones are constantly attempting to remodel and repair themselves. Over time, if enough stress is placed on the bone that it exhausts the capacity of the bone to remodel, a weakened siteon the bone may appear. The fracture does not appear suddenly. It occurs from repeated traumas, none of which is sufficient to cause a sudden break, but which, when added to gether, overwhelm the osteoblasts that remodel the bone [4].

The genesis of the femoral neck fatigue fracture is controversial [5]. Early theories on the cause of femoral neck fatigue fractures centered on biomechanical considerations. Repetitive loading, which leads to muscle fatigue and loss of the muscle's shock-absorptive capacity, was thought to be an underlying mechanism for stress fractures in general. If the abductor muscles fatigue and can't provide normal tension, the tensile stress in the femoral neck is also increased. In addition, muscle fatigue affects the position of the body's center of mass and alters the stress and strain patterns within the femoral neck.

Risk factors are generally grouped into intrinsic risk factors (gender, age, race, menarches, menstrual disturbances, insufficiency in calcium and vitamin D, mineral density) and extrinsic risks factors (characteristics of training, type of sport, sports equipment and hormonal therapy [6].

Thus, improper training is the most obvious cause for a stress fracture. Increasing the duration, frequency, and/or intensity of training too quickly does not allow for proper bone and supporting muscle adaptation, resulting in microscopic damage to the bone, which cannot be healed quickly.In the military population, trainees who have initially lower levels of fitness and higher body mass indexes are at an increased risk of stress fractures. A history of a previous stress fracture is also a risk factor for a recurrence. Other hypothesized risk factors for FNFF include improper footwear, leg-length discrepancies, and a change of the running surface.

Females with the female athlete triad (i.e, disordered eating, menstrual dysfunction, premature osteoporosis) are also at increased risk for stress fractures.

In our case, the patient did not practice sport. The fracture would be linked to obesity and sedentary life style.

The patient reports a gradually worsening deep, achy pain in the hip, groin, or thigh. Usually, pain initially occurs after an activity. As the stress of training continues, pain occurs

during training and becomes more intense.Physical examination reveals the patient to have anantalgic gait.Unlike many other stress fractures, it is not possible to palpate the femoral neck and determine the presence of the usual bony tenderness of a fatigue fracture. However, hip palpation may suggest another diagnosis, such as a hip flexor strain, if pain is present at the anterior inferior iliac spine and upon hip flexion. It is difficult to determine if anterior hip pain is due to a hip flexor strain or an FNFF by examination alone. Other possible diagnoses include greater trochantericbursitis, adductor strain, or a pubic ramus stress fracture. This may delay the diagnosis of FNFF [7, 8].

X-Rays usually do not show evidence of new femoral neck fatigue fractures, but can be used 3 weeks after onset of pain when the bone begins to remodel (sensitivity 10%). A CT-Scan and MRIAmay be more effective for early diagnosis [7, 9, 10]. In the past, bone scintigraphy allowed early diagnosis in 96% of cases with signs of hyper-fixation between weeks 4 and 6. MRI is as sensitive as bone scanning but is of higher specificity, both in isolating the exact anatomic location and in distinguishing fractures from tumors or infection and other peri-articular affections [11]. Thus, Lambert [12] found a fracture of fatigue of the lower border of the femoral neck in a female doctor practicing running based on the MRI while the scintigraphy had proved negative.

In our case, the fracture was diagnosed at the eighth week.

Secondary displacement represents the indicative factor of complication of FNFF in case of delayed diagnosis. Treatment of FNFF depends on the fracture type. The treatment of tension-type fractures as in our case is preferably surgical given the risk of displacement. A compression fracture usually heals with conservative treatment as the risk of displacement is low [14]. In a series of 19 displaced FNF reviewed with the mean age of 18 years, 74% of patients presented complications such as osteonecrosis or severe osteoarthritis [15]. Thus in the absence of displacement, the prognosis is excellent, hence the importance of the early diagnosis [16].

Conclusion

Fatigue fractures are a type of stress fractures, and are due to abnormal stresses on normal bone. They most frequently occur in weight-bearing bones and a FNFF is less common. Improper sport practices is the most obvious cause for a fatigue fracture. However it can occur in sedentary life style and obesity.The surgical treatment with screwing results in satisfactory clinical course.

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