Insufficiency Fractures of the Femur and Sacrum

ABSTRACT

Insufficiency Fractures (I.F) are non-traumatic fractures that occur in abnormal bone (low density bone). Usually occurs in elderly post-menopausal women and is non-traumatic. X-rays are unremarkable and MRI showed extensive bone marrow oedema and subchondral fracture.

Ms. Shirley Cooke, a 61 year old with a background of low bone mass, breast cancer, Diabetes Melitis type 2, HTN, splenic artery thrombosis came in with a dull pain on her left knee and occasionally some sharp element, with unremarkable examination on knees.

Recently, she was diagnosed with left ankle avulsion fracture of lateral maleolus and is wearing an ankle boot for healing.

It is important to make the correct diagnosis in order to avoid complications."

KEYWORDS: Insufficiency Fracture (I.F), low bone mass, management

An insufficiency fracture is a subtype of stress fracture, which occurs in abnormally weakened bone. Stress fractures can be classified as: a) fatigue fractures, b) pathological fractures, c) stress fractures (through normal bone) and d) insufficiency fractures.

The bone subjected to an insufficiency fracture may be histologically normal but lack mass (osteoporosis) or be intrinsically weak (osteomalacia). Osteoporosis, thinning bones, is associated with advancing age and is more common in woman and small framed individuals. It is found with a calcium poor diet, amenorrhea or menopause, inflammatory diseases such as rheumatoid arthritis, prolonged inactivity, such as following a stroke, smoking and excessive alcohol use. Osteomalacia, a disease of bone formation, is

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most commonly caused by a Vitamin D deficiency: poor diet or too little sunlight, Celiac disease interfering with GI uptake, liver or kidney disease and some medications. Insufficiency fractures can also occur in bone affected by Paget's disease or subjected to excessive radiation therapy. Although bisphosphonates are routinely used to treat osteoporosis, atypical proximal femoral fractures have been reported.[1] Insufficiency fractures occur most often in the vertebrae, sacrum, femoral neck, proximal femur (associated with bisphosphonates), femoral condyles, proximal tibia and talus. DM

Femoral neck insufficiency fracture

This fracture is seen in the elderly osteoporotic patient, often following a trivial event such as a slip without a fall. The resultant boney defect may be a compression fracture, which is inherently stable, or a transverse fracture, more common in older patients and is potentially much more serious; displacement can lead to avascular necrosis of the femoral head, reported in 10-15% of cases.

Treatment depends on the type of fracture, the bone quality, patient's life expectancy and, of course, the patient's preference. Undisplaced compression fractures can be managed non-operatively with carefully managed activity and serial x-rays. Surgery is generally required for displaced fractures with the choice of operation depending on the patient's general fitness. Options range from internal fixation to femoral head or total joint replacement.

Femoral condyle insufficiency fracture

Knee pain may be severe but in some cases the symptoms are so mild, an annoying dull ache after prolonged activity, that the patient may not initially seek treatment. The knee joint itself may exhibit no swelling or visible sign of trauma. The range of movement can be normal. Although the knee symptoms will always be unilateral, on the side of the meniscal tear, and are more frequent in older woman, the pain of an insufficiency fracture can easily be confused with that of other joint pathologies and therefore be easily missed.[1] This is particularly true in the elderly, those with dementia and other comorbid conditions.

Reports suggest that the insufficiency fractures may occur in a femoral condyle with low bone mass (and therefore a necessarily low osteocyte count) following meniscal injury. One hypothesis is that a sudden overload fractures the weakened bone with resultant loss of blood supply to the few remaining osteocytes and subsequent osteonecrosis.[2,3,4] A seemingly uncomplicated meniscal tear may be the cause of the insufficiency fracture. Based on this putative correlation researchers have suggested stem cell treatment

to enhance osteocyte growth.[5,6]

Insufficiency fractures in the femoral condyle are best identified on MRI (Figures 1, 2, 3).[7] Plain films and CT have low specificity. Treatment includes addressing the osteoporosis while the fracture management ranges from simply restricting weight bearing to internal fixation of the fracture.

Sacral Insufficiency Fracture

Diagnosing sacral insufficiency fractures can be very challenging since symptoms are easily confused with or overshadowed by complaints arising for the lumbar spine. The fracture can be invisible on routine spinal x-rays. The mechanism of injury may be so inconsequential that it is overlooked. The possibility of an insufficiency fracture should be considered in elderly osteoporotic patients, particularly women, following evenly seeming innocuous trauma to the posterior pelvis who exhibit constant buttock pain which may radiate to the thigh or groin and is unaffected by spinal movement. Once again the MRI is helpful showing high signal strength on the T2 weighted image. The "H" sign on bone scan is indicative of a bilateral sacral insufficiency fractures.

Treatment is difficult since mobility is frequently very

Figure 1: X-ray of knee not helpful

May show callus formation/linear sclerosis on metaphysis and epiphysis.

Figures 2 and 3: MRI is the gold standard to diagnose an insufficiency fracture

Diffuse marrow edema on T2 weighted image (Figure 2).

On the T1 weighted image focal abnormality is not directly subchondral but dark line is visible indicating an insufficiency fracture (Figure 3).

SUMMARY OF KEY POINTS

1. With regard to I.F of femoral Condyle—Although the knee symptoms will always be unilateral, on the side of the meniscal tear, and are more frequent in older woman, the pain of an insufficiency fracture can easily be confused with that of other joint pathologies and therefore be easily missed.[2]

2. With regard to I.F of Femoral Neck—This fracture is seen in the elderly osteoporotic patient, often following a trivial event such as a slip without a fall. The resultant boney defect may be a compression fracture, which is inherently stable, or a transverse fracture, more common in older patients and is potentially much more serious.

3. With regard to I.F of Sacrum—The possibility of an insufficiency fracture should be considered in elderly osteoporotic patients, particularly women, following evenly seeming innocuous trauma to the posterior pelvis who exhibit constant buttock pain which may radiate to the thigh or groin and is unaffected by spinal movement.

limited by pain and prolonged bedrest, particularly in older patients, carries a significant risk of DVT/PE, pneumonia and significant loss of muscle mass. Surgery is fraught with problems due to poor bone quality hampering fixation. More recently sacroplasty using bone cement to stabilize the sacral fracture, in a manner similar to kyphoplasty for vertebral body compression fractures, has gained popularity.

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CLINICAL PEARLS

MRI is the gold standard for Dx. I.F.

Symptoms and conventional tests may not be helpful, High Index of suspicious is needed.