

Femoral Neck Stress Fracture: Early Identification and Treatment

RICHARD BUI

Department of Kinesiology and Sports Medicine; Rice University; Houston, TX

Category: Undergraduate

Advisor / Mentor: Papadakis, Zacharias (zacharias.papadakis@rice.edu)

ABSTRACT

CLINICAL PRESENTATION & EXAM: Femoral neck stress fractures have devastating consequences if not detected and treated early, since as much as 60% of athletes diagnosed fail to return to pre-injury performance levels. Patients' histories identify dull aching pains aggravated by high-impact or weight-bearing activity, and is alleviated with rest. Patients often recall an uncharacteristic increase in exercise intensity; e.g. marathon training. The pain is poorly localized to the lateral thigh, hip, or groin. An antalgic gait and non-capsular pattern of limitation of hip motion is observed. Pain and a marked decrease in mobility is noted at the end range of motion for hip abduction, flexion, and external rotation. Physical examination reveals extreme muscle tenderness in the anterior superior iliac spine, and deep palpation elicits pain. Passive straight leg raise, thigh log roll, single leg hop, rectus femoris stretch (Ely's test), and Thomas tests confirm localization and pain. **ANATOMY & PATHOLOGY:** The femoral neck connects the femoral head and shaft and serves as a muscular junction for major hip motion muscles. The femoral circumflex arteries supply blood through the femoral neck to the femoral head and upper hip bone. Damage to the femoral neck hinders blood flow, potentially leading to avascular necrosis (AVN) of the hip and other issues. The femoral neck absorbs 3-5 times the body weight when running. Continual loading of the femoral neck through rhythmic activity without rest initiates microscopic fractures, and without time for proper healing mechanisms, a stress fracture propagates. Weight-bearing loads create compressive forces on the inferior-medial aspect and tensile forces on the superior-lateral aspect of the femoral neck. There are 3 classifications of femoral neck stress fractures. Compression fractures are less severe and can be managed conservatively for full recovery while tension fractures are more severe and have greater risk of displacement. Displacement fractures result from unchecked progression of compression or tension fractures. **DIAGNOSTIC TESTING & CONSIDERATIONS:** Plain X-ray films usually yield negative results until 3 weeks after fracture onset. MRIs locate and differentiate between fractures types and determine severity. Bone scintigraphy further confirms the fracture. CT scans provide 3-D imaging if surgery is considered. Laboratory blood tests for metabolic abnormalities in calcium or phosphate levels indicate whether low bone density is a cause of fracture. Holistic assessment of diet, training regimen, gait biomechanics, baseline fitness, and medication should be performed. **TREATMENT & RETURN TO ACTIVITY:** Treatment options vary based on femoral neck stress fracture type and severity. Incomplete compression fractures, or <50% of femoral neck width, are usually successfully treated using conservative methods following the PRICE technique: protection, rest, ice, elevation, medication, modalities. If compression fracture severity is >50%, surgical fixation with dynamic hip screws is necessary. Tension or displacement fractures require immediate surgical fixation. Regardless of fracture type, non-weight bearing status should be maintained until relatively pain-free activity in the hip region. Physical therapy and cross-training can be introduced to regain flexibility and strength. Increase weight bearing activity, with no more than a 10% increase in strenuous volume per week, until full-weight bearing capability. Additional radiography during recovery ensures no fracture redevelopment or complications like AVN.