

CLINICAL NOTE

Femoral Neck Stress Fracture Presenting as Gluteal Pain in a Marathon Runner: Case Report

Mark P. Scott, MD, Jonathan T. Finnoff, DO, Brian A. Davis, MD

ABSTRACT. Scott MP, Finnoff JT, Davis BA. Femoral neck fracture presenting as gluteal pain in a marathon runner: case report. *Arch Phys Med Rehabil* 1999;80:236-8.

A case is described of a 50-year-old man with a femoral neck stress fracture presenting as gluteal pain. An operative pinning procedure of the femoral neck was performed for stabilization. Femoral neck stress fractures are often misdiagnosed early in their presentation. The signs and symptoms can mimic those of more commonly seen disorders. Appropriate psychiatric history and physical examination, along with indicated studies, will help prevent misdiagnosis and potentially serious complications associated with musculoskeletal pathology.

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THE FIRST CASE of femoral neck stress fracture was reported in 1905, as cited by Blickenstaff and Morris.¹ These fractures can become displaced, resulting in significant associated morbidity. Therefore, early diagnosis is critical so that appropriate management can be initiated and complications can be prevented. With the increased public interest in exercise, the incidence of sports-related musculoskeletal problems, including stress fractures, has escalated.² A review of the medical literature on femoral neck stress fractures found no previous report of presenting symptoms localized to the gluteal region. Our case demonstrates that femoral neck stress fracture may present with symptoms localized to the gluteal area.

Stress fracture is a commonly seen sports-related injury, comprising 5% to 10% of all injuries seen by sports medicine physicians and 4.7% to 15.6% of injuries to runners.³ Stress fractures are more common in women athletes than in men.^{4,5} According to Matheson and colleagues,³ the areas most commonly involved are, in descending order of frequency, tibia (49.9%), tarsals (25.3%), metatarsals (8.8%), femur (7.2%), fibula (6.6%), pelvis (1.6%), sesamoids (0.9%), and spine (0.6%).

Stress fractures occur because of repetitive loading of the bone, which results in microstresses and fatigue that eventually lead to failure and fracture.⁶ Stress is defined as force distributed over a given area. Fatigue is the behavior of material under repetitive loading. Three different events can lead to stress fracture: increase of the applied force, increased repetition of

applied stress, and decreased surface area over which force is applied.⁷

There are two main theories explaining stress fractures. One hypothesis is that muscle fatigue causes decreased shock absorption, resulting in redistribution of forces on the bone, thereby increasing the stress at focal areas of bone.^{8,9} The other theory suggests that the forces applied to the bone by repetitive muscle contraction are enough to produce stress fracture.^{10,11} Both mechanisms likely play a role in stress fracture pathophysiology.

There are several different proposed classification systems for femoral neck stress fractures. Devas¹² described two types of femoral neck stress fracture: a compression fracture, located on the inferior or compression side of the femoral neck, and a transverse fracture, defined as a fracture that occurs transversely across the line of force applied to the bone, whether in a line of tension or compression.

Blickenstaff and Morris¹ defined three types of femoral neck stress fracture: type I has a callus without a fracture line; type II has a fracture line across the neck or in the calcar without displacement; and type III is a displaced fracture.

Fullerton and Snowdy¹³ more recently proposed a modified system that incorporates these classifications schemes into three categories. The first is tension (superior) side femoral neck stress fracture. These fractures tend to become displaced if left untreated.⁹ The second is compression side femoral neck stress fracture. These are considered to have a more benign natural history and typically do not become displaced. The third category is displaced fracture.

We present a case demonstrating how the diagnosis of femoral neck stress fracture can easily be missed if appropriate history and physical examination, coupled with a high index of clinical suspicion, is not performed.

CASE STUDY

A 50-year-old healthy male marathon runner, previously training for the Boston Marathon, presented to our clinic with severe gluteal pain of approximately 3 months' duration. The patient had recently increased his running mileage, from 20 to 25 miles a week to 25 to 30 miles a week. He had his first long training run (20 miles) the weekend before the pain developed. The pain was initially located in the right gluteal region with no radiation or sensory changes. It was worse when the patient was running.

Because of the pain, the patient modified his training regimen by decreasing his running mileage to 10 to 15 miles per week and began a cross-training program that included a stair-stepper machine and weight lifting. The patient also attempted alternative health care treatments of acupuncture and massage, which provided temporary symptomatic relief, but the pain would return to its previous level within 24 hours.

The pain continued to worsen and to radiate into the lumbar area, groin, and anterior thigh. It also began to occur with normal ambulation; the patient remained relatively pain free with non-weight-bearing activities. He attempted to participate in the Boston Marathon but withdrew because of pain after running only a few blocks.

From the Department of Physical Medicine and Rehabilitation, University of Utah School of Medicine, Salt Lake City, UT.

Submitted for publication April 30, 1998. Accepted in revised form August 18, 1998.

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit upon the authors or upon any organization with which the authors are associated.

Reprint requests to Mark P. Scott, MD, Department of Physical Medicine and Rehabilitation, University of Utah Hospital, 50 North Medical Drive, Salt Lake City, Utah 84132.

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0003-9993/99/8002-4999\$3.00/0

After returning from Boston, the patient was evaluated by his primary care provider and diagnosed with sciatic pain. He was placed on naproxen and instructed to further decrease his level of activity. The pain continued to increase, and 3 days later he was given a prescription for hydrocodone. Magnetic resonance imaging (MRI) of the lumbar spine showed mild disc bulges at L4-5 and L5-S1, diffuse mild spondylosis, and a grade I spondylolisthesis of L5 on S1 associated with bilateral spondylolysis of L5. No significant neuroforaminal narrowing or canal stenosis was seen. The pain worsened further, and the patient was evaluated in a local emergency department. Again, the patient was diagnosed with sciatic pain and was given a refill of hydrocodone.

On initial evaluation at our clinic 3 months after the onset of his symptoms, the patient continued to have the symptoms reported earlier with the addition of a diffuse sensation of numbness over the right anterior thigh and weakness throughout the entire right lower extremity. He denied bowel or bladder urgency or incontinence.

Physical examination was significant for minimally antalgic gait with slightly decreased stance phase on the right lower extremity. The patient had notable atrophy in the right gluteal region and thigh. Tenderness to palpation was elicited in the right gluteal musculature just inferior to the iliac crest. There were no palpatory findings in the lumbar region. Lumbar range of motion was intact. The patient reported pain in his right hip when the hip was flexed, abducted, and externally rotated (Patrick's test). Strength and sensation were intact in both lower extremities except for hip flexion and abduction, which were limited by pain. Reflexes were $+1/4$ and symmetric at the knees and ankles, with both toes downgoing with plantar stimulation. Dural tension signs were negative in the seated and supine positions.

Anterior-posterior and right groin lateral radiographs of the right hip were obtained. The radiographs were significant for a slightly displaced fracture through the base of the neck of the right proximal femur.

The patient was instructed to maintain a strict non-weight-bearing status in the right lower extremity and was referred to an orthopedic surgeon. The surgeon performed an operative pinning procedure of the right femoral neck using three 7.0mm cannulated Synthes screws with a 32mm long thread, placed in the superior-anterior, superior-posterior, and central-inferior positions, respectively. Excellent fixation and compression across the fracture site was obtained. No intraoperative or postoperative complications occurred.

The patient was maintained non-weight-bearing on his right lower extremity for 6 weeks after the surgery, and immediately began an upper extremity conditioning program. Two weeks postsurgery, the patient was allowed to perform water running while wearing a life jacket for suspension. At 6 weeks postsurgery, the patient was started on a progressive weight-bearing program using crutches to assist ambulation. By 12 weeks, he began a running program and advanced well, with no complications.

DISCUSSION

Femoral neck stress fracture is a rare cause of pain in the lumbar region and has not previously been reported to cause localized gluteal pain. Differential diagnosis for pain in this area is extensive and includes myofascial pain, radiculopathy, spinal stenosis, herniated nucleus pulposus, facet syndrome, muscular strain, ligamentous sprain, spondylosis, arthritis of the hip, bursitis, infectious processes, visceral disorders, malignancy, sacroiliac joint dysfunction, and vascular claudication.

A high index of suspicion and a detailed history and physical

examination are important in the recognition of femoral neck stress fracture. The onset is typically insidious and heralded by pain occurring after a new or recent alteration in vigorous physical activity, as in this case. The pain is made worse by continuation of the activity and is relieved by rest.¹⁴ The pain is most frequently located in the anterior groin region with tenderness to palpation of the inguinal area overlying the hip joint.¹³ Pain is also commonly exacerbated with weight-bearing or "hopping" on the injured side.^{1,3} Pain at extremes of hip motion are the most frequent and constant physical findings.¹³ Patrick's test often reproduces the patient's symptoms. Signs and symptoms not associated with femoral neck stress fracture that may suggest another etiology for pain in this region include the following: bowel and bladder dysfunction, fever, night sweats, weight loss, anorexia, abnormal findings on neurologic examination, exact replication of pain with palpation of muscle or bursal sites, weak or absent peripheral pulses, and decreased hair distribution over the lower leg and foot.

Our patient reported numbness in his right anterior thigh and displayed atrophy in his right gluteal and thigh regions. The numbness may have been caused by a myofascial trigger point in his gluteal or adductor musculature. Myofascial pain is commonly associated with musculoskeletal disorders and can cause altered sensation in a predictable, nondermatomal distribution. The atrophy of the right gluteal and thigh musculature probably resulted from pain inhibition of right leg exercise.

Initial diagnostic studies should include anterior-posterior and true lateral radiographs of the hip. These fractures, however, often do not appear on radiographs until 3 weeks to 3 months after their occurrence, and sometimes radiograph findings remain negative in the presence of stress fracture.³ If the radiographs do not show a stress fracture and a high index of clinical suspicion exists, bone scan should be ordered. Bone scans are positive within 6 to 72 hours after fracture¹⁵ and are positive in 96% of stress fractures.¹⁶ Alkaline phosphatase level, calcium phosphate level, and sedimentation rate have not been shown to be useful.^{1,17,18}

The standard of care for compression side femoral neck stress fractures is bed rest with serial x-ray examinations for the first week to ensure no progression. If no progression occurs, the patient is maintained at bed rest until full active range of motion in the hip can be performed without pain, after which the patient is begun on a progressive weight-bearing program using crutches, then advancing to a cane and finally to independent ambulation. If progression of the fracture is noted, the patient requires internal fixation on a semiemergent basis. The patient is allowed to be out of bed on the first day after surgery, using crutches and maintaining non-weight-bearing status until full active range of motion can be performed pain free.¹³

For tension side stress fractures, the treatment is more controversial. As noted previously, this type of fracture may rapidly progress to a complete, displaced femoral neck stress fracture.⁹ Several studies, however, have indicated that if the patient is placed at complete bed rest, progression may not occur.^{1,12,13,17} Prolonged bed rest may not be practical for the patient, and compliance may be difficult to ensure. Complications associated with fractures that progress to displacement include avascular necrosis, nonunion, and varus deformity.^{1,2,8} Therefore, it may be beneficial to perform early fixation of tension side stress fractures in selected cases.

Displaced femoral neck stress fractures require emergent internal fixation or hemiarthroplasty.^{1,12,13,17} Depending on the type of fixation performed, postoperative rehabilitation programs and physical activity restrictions vary. These limitations

may compromise the patient's ability to remain a participant in activities such as long distance running.

A study by Bargren and Tilson²⁰ evaluated the incidence of progression to displacement after initiation of physician education on the signs and symptoms of femoral neck stress fractures. The results demonstrated a significantly decreased incidence of displacement after implementation of this program. This study illustrates the importance of proper physician education in the prevention of serious complications associated with the misdiagnosis or late diagnosis of femoral neck stress fracture.

CONCLUSION

In our case, a routine physiatric history and physical examination resulted in the appropriate diagnosis and treatment of this difficult problem. During the diagnosis and treatment of the patient with femoral neck stress fracture, the gravity of the potential complications should always be kept in mind. Prevention of such complications is the objective of early diagnosis and treatment.

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