RARE BILATERAL FEMORAL SHAFT STRESS FRACTURES IN A FEMALE LONG-DISTANCE RUNNER: A CASE REPORT

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INTRODUCTION

Stress fractures are a frequent injury in the running population, commonly affecting the lower limb and foot. The tibia is reported to be the most common site, representing up to 64 percent of stress fractures, while the metatarsals represent 21 percent.[1] Femoral stress fractures are less common and can be divided into those involving the femoral neck, condyles or shaft. Those of the femoral shaft are reported to comprise between 2.8 and 21 percent of femoral stress fractures in athletes.[1,2,4,5] There is debate as to whether they are more prevalent in the female population.[2,6] Bilateral stress fractures have been reported in the tibia and metarsals,[1] but have only been reported twice in the femur—one associated with an endocrine disorder, and one associated with bilateral tibia fractures.[7,8]

There are several factors that put athletes at risk for stress fractures. These include inappropriate training with overuse. Other suspected causes include malalignment, nutritional deficiencies, and endocrine disorders.[1,3,5,6,9] Stress fractures in the female athlete also are associated with the female athletic triad, involving disordered eating patterns, amenorrhea, and low bone mineral density.[3,6]

Here, we report a case of bilateral femoral shaft stress fractures in a 15-year-old female long-distance runner. To date, there has only been one other report of bilateral femoral stress fractures in a medically healthy runner, but that occurred following bilateral tibial fractures.[7]

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CASE REPORT

A 15-year-old female cross-country runner was seen in the sports medicine clinic complaining of bilateral thigh pain. The aching pain started following a training increase from 32 to 72 kilometres per week over a six week period. While at first the pain was only present with continued running, it soon occurred with walking, and was felt predominantly on impact. She continued running with two weeks of worsening pain and ultimately stopped running due to the pain.

Menstrual status was found to be normal and a healthy diet supplemented with additional calcium was being followed. There was no history of weight loss in the previous six months and anthropometric measurements established a BMI of 17.64. Physical exam of the lower extremities revealed no significant swelling or deformity. Thomas test and Ober's test were negative bilaterally. Bilateral lower limb motion, strength, sensation, flexibility, and tone were normal. Of significance, a unilateral leg hop reproduced the pain on each side with impact. A more directed physical exam of the proximal third of the left femur found it to be tender to palpation.

Bilateral long-leg lateral radiographs were normal with normal alignment. A technetium-99m bone scan of the both lower limbs revealed bilateral mid-femoral stress fractures localized to the posteromedial aspect on both sides, left worse than right (Figure 1).

Treatment initially involved low-impact conditioning using twice-daily pool workouts to maintain cardiovascular fitness. With a decrease in symptoms over one month, the intensity of her physiotherapy was increased to include cross-training with Nordic track, stationary bicycle, and aqua jogging, along with strengthening of both lower extremities using closed-chain activities. When she was free from pain, weight training with lunges was added. Following this, a 10-week gradual return to running program was instituted. This began with one minute of jogging followed by one minute of walking for a total of five minutes every other day over two weeks. Swimming therapy was continued on the other days for a total of five training days per week. This progressed to 10- and then 15-minute periods over the next four weeks. Finally the 15-minute regimen was performed for five days a week for two weeks, and increased to 20 minutes for the last two weeks of the pro-

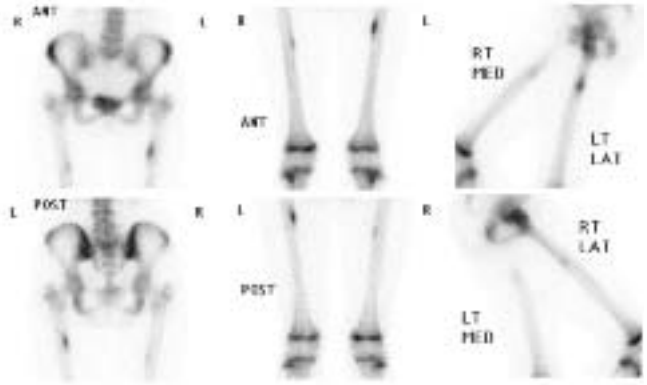

Figure 1. Anterior and posterior planar images and lateral views of the technicium-99m bone scan of the lower extremities. Increased tracer uptake in the posteromedial aspects of both femurs is consistent with femoral shaft stress fractures with findings on the left being worse than those on the right.

gram. After completing the 10-week return to activity program, she remained pain-free and returned to a normal running program.

DISCUSSION

This case illustrates some aspects of the clinical presentation of femoral stress fractures and the difficulties that may arise in their diagnosis and management. In addition, a practical rehabilitation regimen is outlined for the treatment of stable stress fractures.

A bone scan made the diagnosis that stress fractures occurred in both femurs, localized to both posteromedial shafts. This area of the femur has been shown to have the greatest strain in the sagittal plane, but is also susceptible to stress fracture due to the origin of the vastus medialis and the insertion of the adductor brevis.[2,9,10] The mechanism and etiology of stress fractures in general is debatable.[4,9] In cases of overuse and elevated bone stress, it is suspected that either muscle fatigue leads to a decrease in the ability to absorb shock, and/or highly concentrated forces act through small areas of tendinous insertion to overload bone. In the case of female athletes, there is controversy in the literature as to the role of the female athletic triad in increasing the risk of stress fractures due to decreased bone density and strength.[3,11] In our case, we describe an athlete who clinically does not fit the female athlete triad and who gives a history of bilateral thigh pain following a considerable increase in training intensity over a short period of time.

Successful rehabilitation protocols have been discussed in the literature.[4,9,12] In low-risk stable stress fractures,[13] a progressive loading regimen can usually be followed as directed by symptoms. A similar philosophy of low impact strength training and rest from running with a gradual return to activities was employed in our case. Reduced pain was used as a marker for improvement and progression of activity level. She did not at any time rest completely from all activities. We did not repeat a bone scan and would only have pursued further imaging if symptoms did not resolve or increased in intensity.

In conclusion, hip and thigh pain is a common complaint in runners. Femoral stress fracture should always be in the differential diagnosis. Bilateral femoral stress fractures are extremely uncommon, and in this case the etiology seemed to be overload of normal bone from significantly increased running mileage over a short interval. Femoral shaft stress fractures are stable stress fractures that can be treated with a progressive rehabilitation program as discussed here.

REFERENCES

1. **Matheson GO, Clement DB, McKensie DC, Taunton JE, Lloyd-Smith DR, MacIntyre JG:** Stress fractures in athletes. A study of 320 cases. *Am J Sports Med* 1987;15(1):46-58.
2. **Johnson AW, Weiss CB , Wheeler, DL:** Stress fractures of the femoral shaft in athletes – More common than expected. A new clinical test. *Am J Sports Med* 1994;22(2):248-256.
3. **Barrow GW, Saha S:** Menstrual irregularity and stress fractures in collegiate female distance runners. *Am J Sports Med* 1988;16(3):209-216.
4. **Monteleone GP:** Stress fractures in the athlete. *Orthop Clin North Am* 1995;26(3):423-432.
5. **Myburgh KH, Hutchins J, Fataar AB, Hough SF, Noakes, TD:** Low bone density is an etiologic factor for stress fractures in athletes. *Ann Intern Med* 1990;113:754-759.
6. **Callahan LR:** Stress fractures in women. *Clin Sports Med* 2000;19(2):303-314.
7. **Blatz DJ:** Bilateral femoral and tibial shaft stress fractures in a runner. *Am J Sports Med* 1981;9(5):322-325.
8. **Frelson M, Soyer J, Iborra JP, Hadjadj S, Pries P, Clarac JP:** An unusual cause of a stress femoral fracture in a long-distance runner: A case of bilateral fracture. *J Trauma* 2004;56(2):433-436.
9. **Boden BP, Speer KP:** Femoral stress fractures. *Clin Sports Med* 1997;16(2):307-317.
10. **O'Kane JW, Matsen LJ:** Mid-third femoral stress fracture with hip pain. *J Am Board Fam Pract* 2001;14(1):64-67.
11. **Bennell KL, Brukner PD:** Epidemiology and site specificity of stress fractures. *Clin Sports Med* 1997;16(2):179-196.

12. **Clement DB, Ammann W, Taunton JE, Lloyd-Smith R, Jesperson D, McKay H, Goldring J, Matheson GO:** Exercise-induced stress injuries to the femur. *Int J Sports Med* 1993;14:347-352.

13. **Kaeding CC, Spindler KP, Amendola A:** Management of troublesome stress fractures. *AAOS Instructional Course Lectures* 2004;53:455-469.