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Fibula Mass; Unusual Presentation of Stress Fracture with Pseudarthrosis: A Case Report

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Abstract

Stress fracture is a common diagnosis of pain in the lower extremity in the lack of obvious trauma history. Nowadays, with better recognition of its pathophysiology and advanced diagnostic facilities, it is more convenient to distinguish stress fracture. But in some cases, it is troublesome to differentiate stress fracture from serious conditions such as neoplasm. The current case report described an unusual case of proximal fibula stress fracture presenting with mass and local tenderness without history of trauma or vigorous activity.

Keywords: Stress Fracture, Insufficiency Fracture, Fibula, Neoplasm

1. Introduction

A stress fracture is caused by repetitive overloading of a bone, more than its mechanical capability. Two groups can be characterized: Fatigue fractures caused by excessive loads in normal bones, and insufficiency fractures, with normal loads acting over bones with reduced mechanical capacities (1, 2).

Risks to develop a stress fracture include: Gender, age, race, hormonal status, nutrition, neuromuscular function, genetic, abnormal bony alignment, improper technique, poor blood supply to specific bones, and sport related disorders (3, 4).

Although they are often linked with sport, some patients may present with stress fracture without any history of prolonged activity. Walker et al., reported that only half of their 34 retrospectively reviewed cases with stress fractures participated in sports (5, 6).

Tibia, metatarsals, and fibula are the most frequently reported anatomic sites for stress fractures.

Fibular stress fractures account for 7% - 12% of all stress fractures. The most common site for stress fracture of the fibula is distal third, and proximal third is known as the second common site (7-9).

Signs and symptoms of fibular stress fractures include a history of progressive pain during activity, focal tenderness, and localized swelling (9). The location of stress fractures is classified as high-risk and low-risk. Those fractures established on tension side of the bone (anterior tibia, fifth metatarsal, tarsal navicular, femoral neck (lateral side), patella, and first metatarsal sesamoid) have a tendency toward complete fracture, delayed union, nonunion, and usually require surgical intervention and are classified as high-risk stress fractures (10-12).

Low-risk fractures are usually established on compression side of the bone with less likely conduce to nonunion or have a significant complication and predominantly heal with conservative treatment and include stress fractures in femoral shaft, medial tibia, fibula, calcaneus, and first to forth metatarsal (3).

It is important to consider that the cause of stress fractures is multi-factorial, as mentioned by Miller and Kaeding (4), and it has a wide list of differential diagnoses in which neoplasm and infection are the most important alliances.

2. Case Presentation

A 34 year-old female was referred to an orthopedic oncology clinic by an orthopedic surgeon with the diagnosis

of a tumoral lesion of the proximal fibula. She complained an insidious beginning pain in her right leg from eight years ago that aggravated in the last six months. She declined a history of trauma. The pain increased during walking and was centralized to the proximal fibula. She also reported night pain. She did not have any weight loss or constitutional symptoms in this period of time. The pain aggravated with single-leg hop testing. Tenderness found in proximal fibular shaft, but knee range of motion (ROM) was normal. Counting blood cells (CBC), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), calcium, phosphor, and alkaline phosphatase of serum were within normal limits.

Anteroposterior and lateral radiographs of the leg showed lytic line in proximal fibular diaphysis with peripheral sclerosis and extensive periosteal new bone formation (Figure 1).

Computed tomography (CT) scan showed complete fracture line in the central portion of the lesion, sclerosis in the medullary canal, and all around the fracture line (Figure 2). The lesion had increased uptake in bone scintigraphy (Figure 3).

The magnetic resonance imaging (MRI) showed heterogeneous hyposignal mass at T1- and T2-weighed sequences without soft tissue extension (Figure 4). Based on the imaging studies, the most probable diagnose was healing response to the fracture, but based on the unusual presentation and the lack of a trauma history and participation in sport the surgical team decided to perform a biopsy of the lesion to rule out malignancy.

Figure 1. Anteroposterior and lateral radiographs of the leg show lytic line in proximal fibular diaphysis and extensive periosteal new bone formation

Core needle biopsy was performed and a diagnosis of reactive bone formation, compatible with callus, was made.

With the diagnosis of a pseudarthrosis after stress fracture, she underwent partial fibulectomy.

In the follow-up, after three months, she had no pain or local tenderness and returned to normal daily activity without limitation (Figure 5).

3. Discussion

Fibula is the third common site for stress fracture, after tibia and metatarsal (7-9).

Most stress fractures can be easily identified based on the clinical history, plain X-ray, and MRI findings. However, in some cases there is a lack of a particular history, or the imaging findings are mysterious. In some cases, stress fractures can be difficult to distinguish from infection, or malignant neoplasm.

Although they are often connected with organized sport, Walker et al. showed that stress fracture can be observed in patients not involved in sport activities (6), as in the current case, she denied any violent activity.

The primary diagnostic method is a plane radiograph in two phases. However, in the early stage, the sensitivity is as low as 10%, rising to 30% - 70% at follow-up (13). Later, localized periosteal reactions is the common sign for stress fractures (1).

Occasionally, bizarre patterns of periosteal reaction may mystify the radiographic diagnosis of stress fractures (14). In the current case, periosteal reaction and new bone formation were too extensive for diagnosis of stress fracture.

Nuclear medicine scintigraphy is highly sensitive to detect stress fractures; however, findings are nonspecific (15). In the current case, there was a fusiform increased uptake that can be misdiagnosed as infection or neoplasm.

MRI is the best choice of imaging modality in stress fractures, since it has the highest combined specificity and sensitivity (16).

A fracture line is diagnostic and reveals in the fluid-sensitive sequences as a linear hypointense signal with surrounding ill-defined area of edema. Marrow edema in acute phase, surrounding soft-tissue edema, and periosteal reaction should not be mistaken as a neoplastic

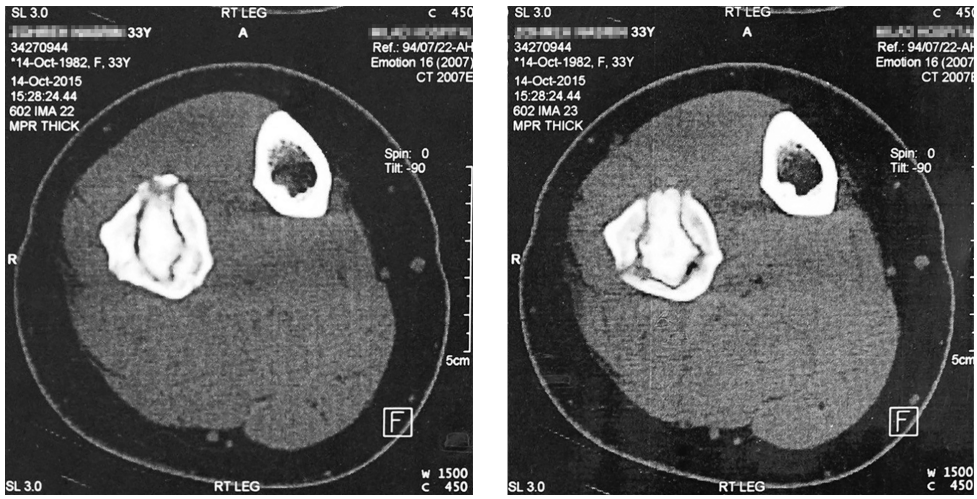

Figure 2. Axial CT scan shows diffused sclerosis of the lesion

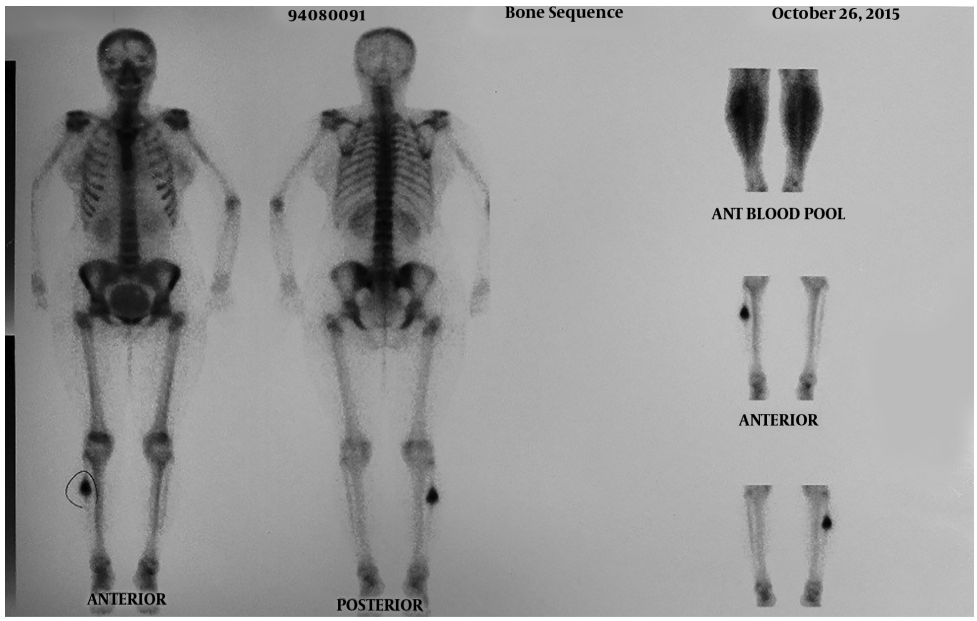

Figure 3. Fusiform increased uptake in Tc99 bone scan

process. Lack of an associated soft-tissue extension, and proper clinical follow-up lead to a correct diagnosis (17-19).

To increase the diagnostic value of T1- and T2-weighted images, the examination can be supported by short inversion time, inversion recovery (STIR), and fat-suppressed T2-weighted images (17, 20). Although MRI is the best imaging modality to evaluate stress fractures, in some cases, it is impossible to distinguish stress fracture from infections, or neoplastic lesions based on MRI.

A retrospective study of 22 stress fractures referred to an oncology clinic to evaluate tumors found that the key to diagnosis was a CT scan in 15 cases (68.2%), cite on the MRI in five cases (22.7%), and a combination of studies in two cases (9.1%); when MRI failed to catch the proper diagnosis, CT was established as the best diagnostic tool (21). According to the literature, the sensitivity of CT scan concerning all stress fractures is lower than that of MRI, and its role is mainly limited to excluding other diagnosis (22).

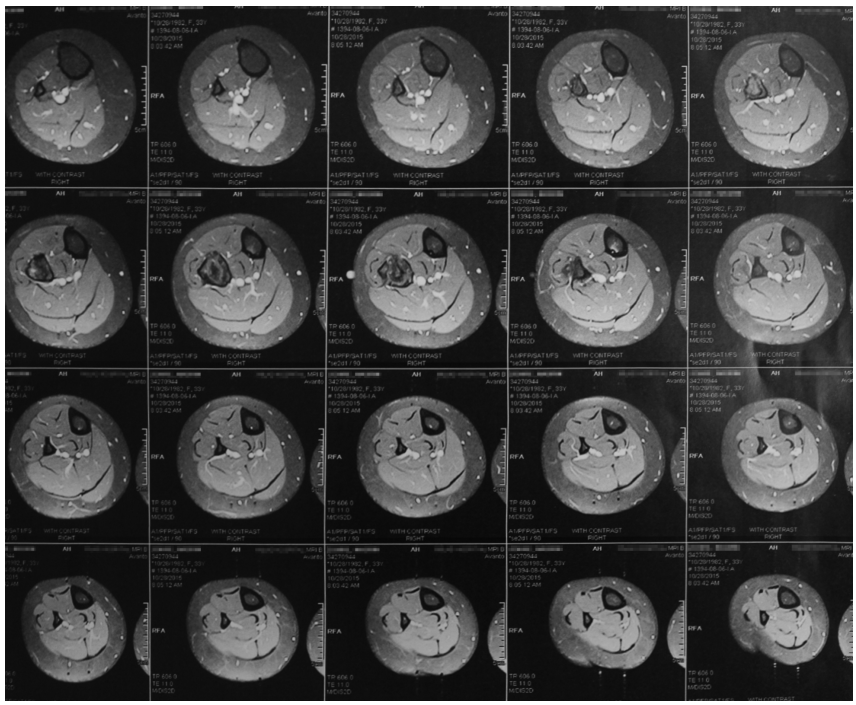

Figure 4. Heterogeneous hyposignal mass in T2-weighted MRI without contrast enhancement

Figure 5. Three months post-operative radiograph of patient after fibulectomy

In the current case, MRI was not specific for stress fracture and malignancy could not be ruled out based on MRI, but CT scan was more helpful to abandon an aggressive lesion.

On the other hand, the most common area of the fibula affected by tumors is the proximal third (23). Although, most proximal fibular tumors are benign, diagnosis of malignant tumors is hampered by delays in presentation.

Sun et al. reported that in proximal fibular lesions palpable pain, high temperature, and peroneal nerve compression were predictive for malignancy (24).

It is necessary, in some cases, to perform biopsy on proximal fibular lesions when suspecting malignancy (24), but the differential diagnosis may be more complicated in the early reactive and proliferative phase of callus since mitoses and atypical fibroblasts may deface the cytological picture (25).

In the current case, biopsy was the key point for correct diagnosis and roll out bone malignancies.

There is a subset of high-risk stress fractures that have a tendency toward progression to complete fracture, delayed union, nonunion, and chronic pain, but fibula stress fracture is in the low-risk group and in the literature, no cases were found with hypertrophic nonunion of fibula diaphysis following stress fracture.

Questions regarding prognosis and optimal treatment of a stress fracture cannot be determined without knowing its location, the extent of the structural damage, and

the presence or absence of nonunion (26). In the current case, fibulectomy seemed the best treatment of choice due to low morbidity and early recovery.

3.1. Conclusions

The chronic state of stress fracture may clinically and radiographically mimic a neoplasm and require a biopsy to rule out a malignant process.

In difficult cases, CT scan may be helpful to denounce other diagnoses.

Footnotes

Conflict of Interests: The authors declared no conflict of interest.

Ethical Consideration: The study was in accordance with current ethical considerations. Informed consent was obtained from all participants and the study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the Institutional Human Research Committee.

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