CASE REPORT

Pubic ramus stress fracture in a 25-year-old male professional marathon runner managed at a tertiary hospital in Addis Ababa, Ethiopia

Mamo Deksisa[1], Ananya Kassahun Admasu[2], Moges Zenebe[3]

[1]Sports Unit, Department of Orthopedics and Traumatology, St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia
[2]Department of Orthopedics and Traumatology, University of Gondar, Gondar, Ethiopia
[3]Department of Radiology, Addis Ababa University, Addis Ababa, Ethiopia

Correspondence: Dr Ananya Kassahun Admasu (ananyakassahunmd@gmail.com)

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Abstract

Bone stress fractures are uncommon in the general population, but they are relatively common in athletic settings. Pelvic stress fractures constitute approximately 4% of all bone stress fractures. Athletes are particularly at risk for developing these types of fractures. Stress fractures of the pubic rami typically manifest as severe, progressively worsening pain in the groin area. A high index of suspicion and comprehensive clinical examination are essential for accurate diagnosis. Advanced imaging modalities, such as magnetic resonance imaging, offer high sensitivity and can corroborate clinical findings. This report presents a case of a misdiagnosed pubic ramus stress fracture in an athlete. We also review the relevant literature and discuss diagnostic approaches and treatment recommendations for such patients.

Keywords: bone stress fracture, pelvic stress fracture, pubic ramus, sports injuries, Ethiopia

Introduction

Pelvic stress fractures (PSFs) are relatively rare, accounting for only 4% of all bone stress fractures (BSFs). Stress fractures of the pubic rami are the most common PSFs, largely attributable to the tensile force exerted by the strong adductor muscles at their pubic insertion. These fractures are frequently observed in long-distance runners.[1] The typical clinical presentation of PSFs is groin pain, and such fractures may not be evident on plain radiographs. Even repeated imaging findings may remain falsely negative.[2] More advanced imaging modalities, such as computed tomography, magnetic resonance imaging (MRI), and bone scintigraphy, are often necessary for definitive diagnosis.

Given the relatively small number of reported cases worldwide, this specific case highlights the need for a heightened index of suspicion among treating clinicians for this rare injury; it also highlights the absence of a standardized treatment protocol. We report a case of a pubic ramus stress fracture in a professional Ethiopian marathon runner.

Case presentation

A 25-year-old male professional marathon runner presented with lower abdominal and groin pain, which had been progressing over a span of 3 months by his estimation. He noted a significant increase in pain during the 2 weeks preceding his presentation, which interfered with his training and daily activities. Despite seeking medical treatment, he experienced no improvement in his symptoms. The patient had no history of trauma, comorbid conditions, or chronic illnesses in the family. Additionally, he reported no history of smoking or alcohol consumption and had no other sites of pain. Physical examination revealed diffuse tenderness in the lower abdomen, inguinal area, and pubis, especially upon deep palpation. The only other significant finding was pain on adduction against resistance on the right side.

PSF was the leading differential diagnosis, followed by a femoral neck stress fracture. The patient was subsequently referred for imaging studies. Plain radiographs displayed an indeterminate lesion on the right pubic body and mild widening of the symphysis pubis. Due to the inconclusive nature of the radiograph, further imaging was ordered (Figure 1). Additional MRI revealed a nondisplaced inferomedial fracture of the right pubic body at the insertion of the common aponeurosis of the rectus abdominis and adductor longus muscles, as well as adjacent ill-defined bone marrow oedema on the superior pubic ramus. There was also a partial tear of the rectus abdominis–adductor longus aponeurosis, accom-

Figure 1. Anteroposterior radiograph of the pelvis showing an indeterminate lesion on the right pubic body and mild widening of the symphysis pubis

panied by subchondral bone marrow oedema of the pubic symphysis, consistent with pubic symphysitis (Figure 2).

The patient was treated conservatively through rest, analgesic medication, and supplementation with calcium and vitamin D. After 3 months of this regimen, he returned to training without pain.

Discussion

BSFs arise from physiological, cyclical, repetitive, and continuous muscular forces exerted on normal bones, leading to microtrauma that is inadequately remodelled.[3],[4] These fractures are commonly observed in otherwise healthy people, such as military personnel and athletes. Frequent sites for these fatigue fractures include the tibia, distal fibula, and metatarsals. BSFs can be categorized as high risk or low risk based on their likelihood for progression, delayed union, or nonunion.

PSFs can be attributed to a variety of contributing factors, both extrinsic and intrinsic. Extrinsic factors include nutritional habits, type of terrain, and sports regimens, while intrinsic factors include anatomical variations, age, sex, ethnicity, body mass index, bone mineral density, and physical fitness levels.[3] These factors often intersect in complex ways.[5] For example, a case-control study conducted at an institutional sports injury clinic in South Africa in 1990 found that athletes with BSFs were more likely than those without fractures to experience menstrual irregularities (P<0.005). That study also noted lower levels of dietary calcium intake in the fracture group (P=0.02).[6] Furthermore, a randomized, double-blind study found that vitamin D and calcium supplementation reduced the risk of fractures.[7] Women are more prone to such injuries, as substantiated by multiple studies, due to physiological factors like lower aero-

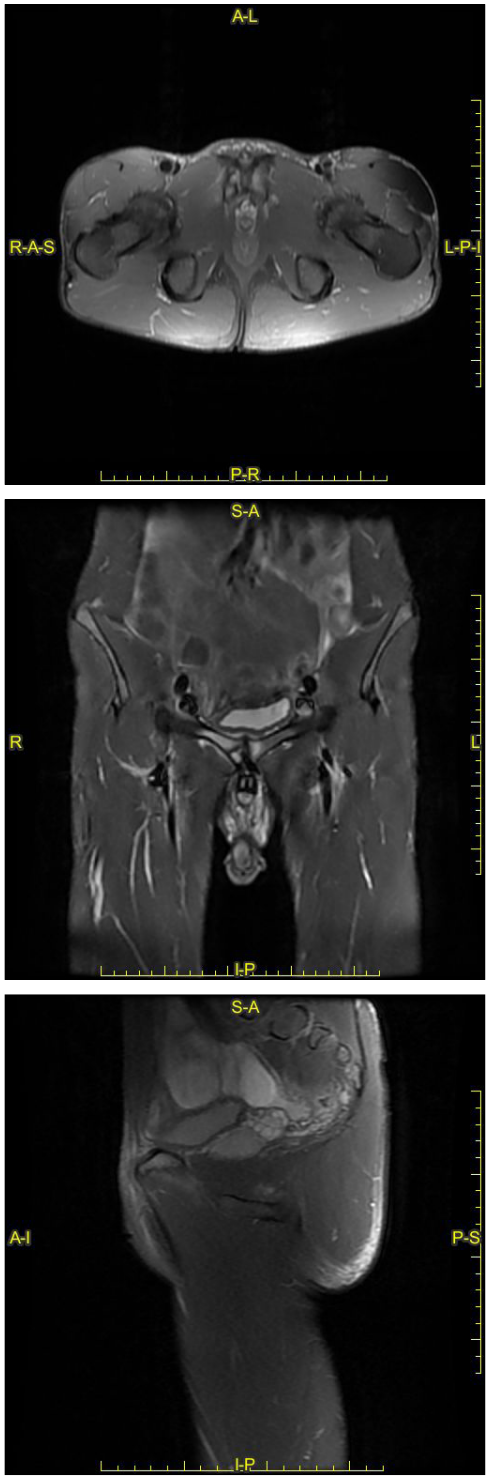

Figure 2. Magnetic resonance imaging of the pelvis, with (A) Axial PD fatsat (proton-density fat saturation), (B) coronal STIR (short TI inversion recovery), and (C) sagittal PD fatsat sequences

These images revealed a nondisplaced fracture of the right inferomedial pubic body at the insertion of the common aponeurosis of the rectus abdominis and adductor longus muscles. Ill-defined bone marrow oedema was also evident at the adjacent superior public ramus. There was also a partial tear of the rectus abdominis–adductor longus aponeurosis, as well as symphysis pubis subchondral bone marrow oedema, consistent with symphysitis pubis.

Table. General treatment protocol for conservative management of sports-related stress fractures

Phase 1	Phase 2 (starts after 2 pain-free weeks)	
Rest	Muscle endurance exercises	
Weight-bearing as tolerated	Core and pelvic girdle stability	
Minimal-impact aerobic exercises (swimming, pool running, cycling)	Balance/proprioception training	Running progression initiated (over 3-6 weeks) Start with 30%-50% of preinjury capacity and progress by 10% per week
Physical therapy	Flexibility	
Oral analgesics other than nonsteroidal anti-inflammatory drugs	Gait training	

bic capacity and smaller muscle mass.[8],[9] Additionally, the incidence of BSFs increases with age.[10],[11]

Among athletes, stress fractures of the pubic rami near the symphysis are the most common type of PSFs.[12] These fractures are typically not displaced, signifying a low likelihood of nonunion and fracture line progression. Common symptoms include pain in the groin or thigh, as well as lower back and buttock discomfort.[5] Differential diagnoses for groin pain include inguinal hernia, adductor muscle injury, osteitis pubis, pubic symphysitis, stress fractures of the pubic ramus or femoral neck, femoral acetabular impingement, and hamstring injury.[8] It is crucial to differentiate these from femoral neck stress fractures, which may present similarly but are categorized as high-risk fractures.[4] In the context of a pubic ramus fracture, physical examination commonly reveals tenderness over the affected ramus upon deep palpation.[13] Pain may also be elicited when the patient stands on a single leg on the affected side.[14]

In terms of diagnostic imaging, advanced modalities are preferable for identifying pubic ramus stress fractures, as is the case for other PSFs. Plain radiographs, although readily available, have low sensitivity—about 10% within the first 2 to 3 weeks.[15] Computed tomography is not recommended as the first line of imaging because of its low sensitivity and associated higher levels of radiation exposure. Bone scintigraphy has high sensitivity but may yield false-positive results in the presence of a tumour or infection. MRI is the preferred modality; despite limitations related to cost and accessibility, it offers the advantage of high sensitivity without the risk of radiation exposure.[14],[16]

MRI is also employed for classifying BSFs. The Frederich classification, originally developed for tibial stress fractures, has been extended to categorize other types of BSFs. This system consists of 4 grades and is useful for distinguishing fractures as either high risk or low risk.[15]

Our patient's plain radiograph yielded inconclusive findings, which was consistent with existing literature. The definitive diagnosis was established using MRI. It should be noted that MRI for such injuries can reveal associated muscle contusions or injuries.[17] Our patient had sustained a tear in the common aponeurosis of the rectus abdominis and adductor longus muscles.

The treatment regimen for PSFs, generally considered low-risk fractures, is usually relatively simple. The time frame for return to activity ranges from 7 to 12 weeks. Although conservative treatment is most commonly employed, surgical management may be considered based on the patient's extrinsic and intrinsic risk factors. Addressing these risk factors can enhance the rehabilitation plan and diminish the likelihood of recurrence.[1],[13]

A 2-phase rehabilitation protocol for conservative BSF management in athletes has been proposed (Table).[18],[19] While these guidelines serve as a general framework, the treating clinician should tailor the regimen based on the patient's specific symptoms.[20] There is a knowledge gap concerning such treatment regimens in our context, making the timeline for return to activity somewhat arbitrary.

Moreover, it is crucial to adjust contributing intrinsic and extrinsic factors, which are patient dependent. Recommendations exist for the administration of 1500 to 2000 mg of calcium and 800 to 1000 IU of vitamin D as preventive measures against stress fractures, although the supporting literature is limited.[13],[21] Our patient received supplementation with both calcium and vitamin D.

Summary and conclusions

PSFs are uncommon but are more likely to be experienced by populations exposed to high levels of physical activity, such as athletes and military personnel. Our patient is a professional marathon runner who had been experiencing pain for 3 months before presenting to our clinic. Despite previous evaluations and the administration of analgesics for pain management, his condition was undiagnosed. This case underscores the need for orthopaedic surgeons to maintain a high index of suspicion for PSFs in specific patient populations. MRI is the preferred diagnostic modality for confirming the clinical suspicion of PSFs. We acknowledge that access to MRI may be limited in certain situations; in such cases, a thorough physical examination, coupled with a detailed history and consideration of both extrinsic and intrinsic risk factors, may offer the best diagnostic approach. Additionally, it is advisable to first rule out other more common conditions and high-risk BSFs in the peripelvic region.

In conclusion, evaluating the prevalence and understanding of the associated extrinsic and intrinsic factors of PSFs and BSFs among athletes in our region would facilitate the development of evidence-based treatment protocols. These protocols would incorporate risk factor modification

and outline a sequence for rehabilitation. Moreover, such an effort would raise awareness within the athletic community about this type of injury, which can result in significant time lost from participation.

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