

Medial tibial stress syndrome: A case report and review of the literature

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Abstract

Medial tibial stress syndrome (MTSS) is among the most prevalent disorders of the lower leg. It is prevalent among athletes, particularly runners. Risk variables encompass female gender, elevated body mass index, and training intensity. Magnetic resonance (MR) imaging has become an extremely accurate technique for identifying bone stress injuries. We report a case of a 38-year-old female exhibiting considerable shin pain, with MRI findings indicative of medial tibial stress syndrome.

Keywords: Medial Tibial Stress Syndrome; MRI; Bone Stress Injury; periosteal oedema; bone marrow oedema; shin splints

1. Introduction

Medial tibial stress syndrome (MTSS), often referred to as "shin splints" is a prevalent source of exercise-induced leg pain, especially among runners and athletes participating in repetitive impact activities. This denotes a range of bone stress injuries along the posteromedial border of the tibia, correlated with risk factors including female gender, increased body mass index, training errors, and abrupt escalations in training intensity. Despite its widespread occurrence, the precise pathophysiology of MTSS is not fully elucidated, with suggested explanations including periosteal irritation, bone marrow stress response, and irregularities in adjacent soft tissues. Timely and precise diagnosis is crucial to avert the advancement to more severe stress injuries or total fractures. Although initial plain radiographs may appear normal, magnetic resonance imaging (MRI) has become the preferred method for finding bone stress injuries, assessing their severity, and recognizing related soft tissue alterations. This study presents a case of medial tibial stress syndrome (MTSS) in a recreational athlete, emphasizing the MRI characteristics that substantiate the diagnosis and distinguish MTSS from alternative etiologies of tibial pain.

2. Case report

This case relates to a 38-year-old woman with no notable medical history, who experienced shin pain during sports activities, particularly jogging, without any prior injury history. She had a routine X-ray that showed no abnormalities; nevertheless, due to the ongoing pain, an MRI was conducted, revealing periosteal and bone marrow edema in the central third of the medial tibia.

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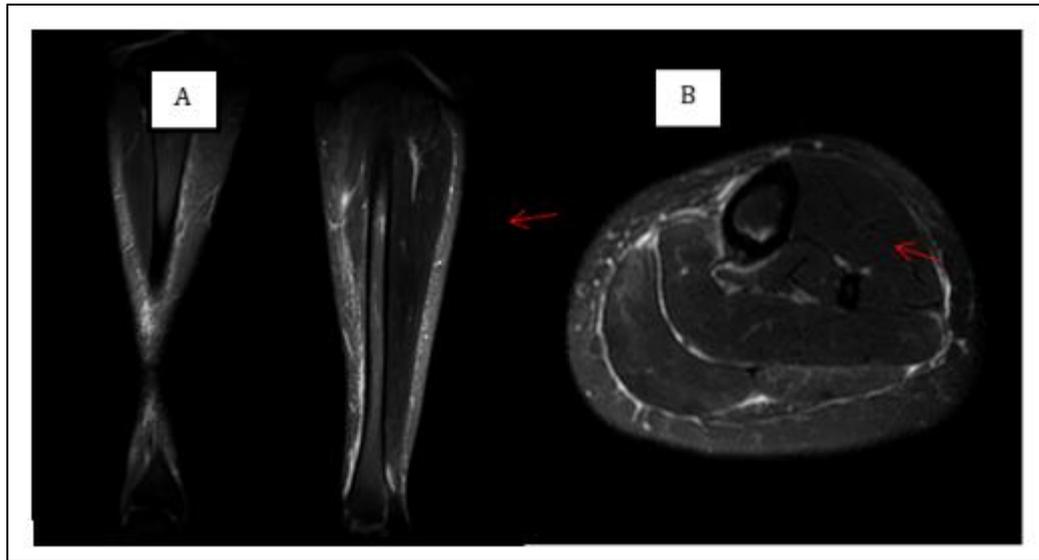


Figure 1 T2 FAT SAT MRI sequence in coronal (A) and axial (B) plans showing periosteal and bone marrow oedema (red arrow)

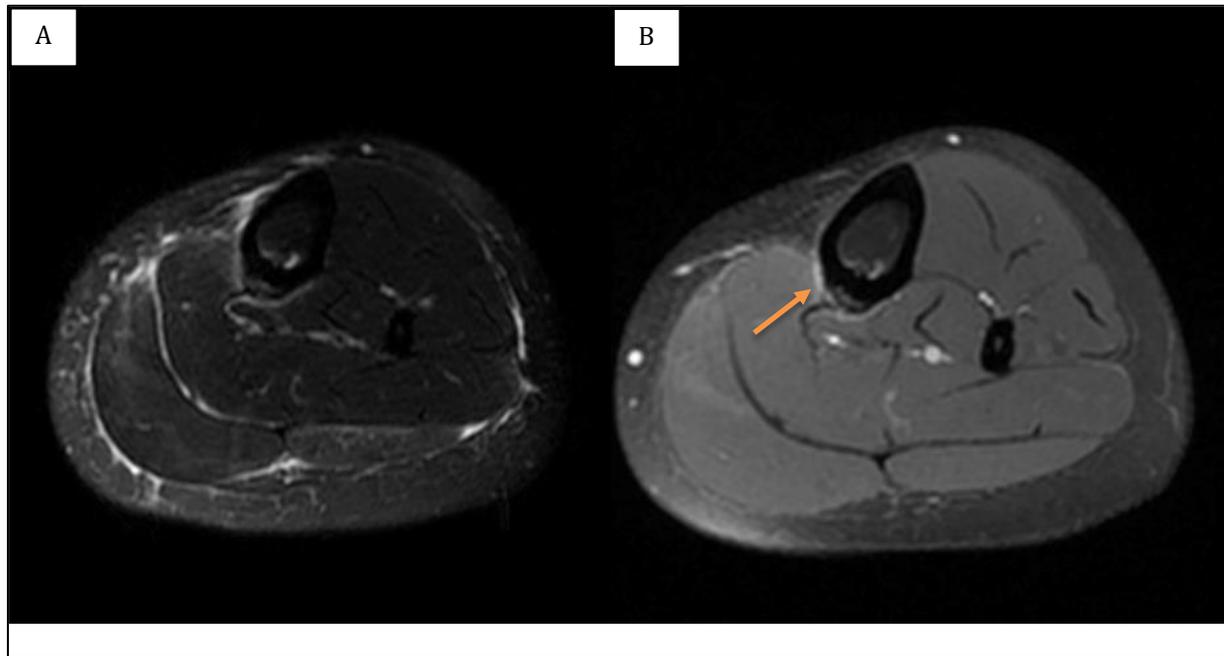


Figure 2 T2 FAT SAT MRI sequence in axial plan (A) and T1 axial sequence after contrast enhancement (B) showing periosteal oedema with enhancement after contrast injection (green arrow)

3. Discussion

Medial tibial stress syndrome (MTSS), also referred to as "shin splints," is characterized by leg pain resulting from recurrent stress. It is prevalent among athletes, particularly runners (1). The suggested injury mechanism involves repetitive pressure that surpasses bone strength, leading to the accumulation of microdamage, which may ultimately result in a complete fracture. Bone Stress Injuries (BSIs) arise when bone resorption surpasses ossification during the normal remodeling process (2). They can be characterized as overuse injuries that induce discomfort in the region spanning the distal to middle third of the posterior medial tibial border, occurring during exercise and resulting from cyclic loading. The differential diagnosis includes ischemia conditions and stress fractures (3). MRI has emerged as the preferred imaging modality for assessing patients with suspected tibial stress injuries. Additionally, MRI can detect injuries to the muscles and tendons of the lower extremity, which are prevalent among athletes and may exhibit clinical manifestations similar to stress injuries. Moreover, MRI can be employed to assess the degree of the stress damage (4).

Fluid-sensitive sequences are often advised for the identification of BSI when utilizing MRI. A primary characteristic of BSI is bone marrow edema, evidenced by elevated signal on fat-saturated T2-weighted and short inversion recovery (STIR) imaging. Fat-saturated T2 sequences and STIR enhance sensitivity by attenuating fat signals that may hide edema in non-fat-saturated T2-weighted sequences. In 1995, FREDERICSON AND COLLEAGUES reviewed the MRI findings of 14 athletes with 18 tibial stress injuries and established a classification system for stress injuries based on the presence of periosteal edema, bone marrow edema, and intracortical signal abnormalities. A grade 1 injury is characterized by periosteal edema, with substantial signal intensity alterations along the cortical surface of the tibia on T2-weighted imaging. Grade 2 is characterized by the presence of both periosteal and bone marrow edema, signifying cancellous microfractures, whereas grade 3 additionally encompasses indistinct low signal on T1-weighted imaging within the medullary canal, indicating more severe microfractures. A grade 4 stress injury features a discernible fracture line, typically most apparent on T1-weighted imaging, indicating a genuine stress fracture.

The study by KIJOWSKI ET AL. involving 138 individuals with 142 tibial stress injuries demonstrates a strong correlation between the Fredericson grade of stress injury and the MRI characteristics of injury severity, as well as the duration required for return to sports activity (4). This study found no significant differences in periosteal and bone marrow edema or the time to return to sports activity between patients with grades 2 and 3 stress injuries. A recent study by T. OKUNUKI ET AL. demonstrated that individuals with MTSS exhibited aberrant findings in adipose tissue and peri-tendon, alongside periosteal edema and bone marrow edema (6).

Radiographs, commonly utilized to rule out alternative causes of tibial pain, typically do not reveal stress fractures until around 2 to 8 weeks post-symptom onset. Two-thirds of the first radiographs of symptomatic individuals were determined to be negative.

CT has diagnostic use in specific instances of BSI or in shin discomfort with a differential diagnosis that extends beyond BSI, especially when a bone tumor is a consideration. In instances with negative MRI results, CT can reveal the initial signs of cortical stress damage that remain hidden in other imaging modalities.

4. Conclusion

MTSS is characterized by pain or discomfort of the leg secondary to repetitive stresses. The exact cause and pathophysiology behind MTSS are still unclear. Various imaging modalities can be utilized to either confirm the diagnosis of MTSS or rule out other causes of similar presentation. MTSS exhibits complex etiology due to abnormalities in the periosteum, bone marrow, adipose tissue, and peritendon. Imaging combined with a thorough history and physical exam can help lead to an early diagnosis

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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