

Bilateral medial tibial plateau stress fracture on a treadmill in a healthy man immediately after COVID-19 lockdown

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Abstract

Stress fractures are usually caused by overuse of the weight-bearing extremities. The tibia is a frequently involved site and most stress fractures occur when sedentary lifestyle is suddenly changed to active training regimen. Thus clinicians and radiologists should always be aware of this entity even in healthy, young individuals. We describe the case of a 42-year-old man presenting with bilateral medial tibial plateau stress fractures after running on a treadmill immediately after 69 days of inactive COVID-19 lockdown in Italy.

Keywords

Stress fracture; medial tibial plateau; treadmill; lockdown; MRI

Introduction

Stress fractures are overuse injuries and can be divided into fatigue fractures and insufficiency fractures according to their pathogenesis. Fatigue fractures occur on an otherwise healthy bone after repetitive strain [1,2,3], often resulting as a consequence of a sudden change of frequency, duration or intensity of physical activity. They have been reported mainly in military recruits and athletes. Conversely, insufficiency fractures present when repetitive stress is applied on abnormally weakened bone [1,2,4]. Moreover, in case of lesions involving an osteoporotic bone after a single mechanical stressful event, the term fragility fracture is generally used [5,6]. However, the terms fragility and insufficiency are sometimes used interchangeably in clinical practice in case of fractures of osteoporotic bones. The etiology of stress fractures is thought to be multifactorial, involving both intrinsic (sex, gender, muscle strength, bone quality, hormones) and extrinsic factors (training regimen, type of activity, footwear, running surfaces) [7]. Besides athletes and military recruits, a high clinical suspicion should be kept also in individuals changing the regimen of usual physical activities or engaging in new sports. In addition, we outline the hypothesis that an exceptio-

nal situation such as COVID-19 lockdown might cause, with an extended inactivity, a higher risk of stress fractures if exercise is not resumed gradually.

Case Presentation

An otherwise healthy 42-year-old man came to our attention for bilateral knee pain, more severe on the left side, since after a long run (1h 15 minutes) on a treadmill 15 days before. The patient was not under any medication and his medical history was unremarkable, with the exception of a minor car accident 4 years earlier. Moderately physically active until the COVID-19 pandemic, the patient reported that amid the lockdown his habits had changed considerably to a sedentary lifestyle, with a consequent 4 kilograms weight gain. Body mass index (BMI) at presentation was 25.8. Before restrictive measures were adopted by the Italian Government, he used to run 2 to 3 times a week, although his training frequency had gradually decreased over the last 6 months. Two weeks after the event, due to the persistence of pain, the patient presented to the emergency department. No redness, swelling, bruising or skin abnormality was noted on clinical examination. A complete metabolic panel, including serum calcium, phosphate, vitamin D, alkaline phosphatase, parathyroid hormone, thyroid hormones, albumin, along with complete blood count, creatinine and liver panel, was normal. An orthopedic consultation was requested and physical examination revealed bilateral medial and anterior knee pain, more severe on the left side, elicited by high degrees of knee flexion, without limitation of the range of motion or neurovascular deficits. The localization of pain along the medial joint line lead the physician to consider soft tissue pathology as medial meniscus tear or pes anserine bursitis as primary differential diagnoses and stress fracture as a secondary hypothesis.

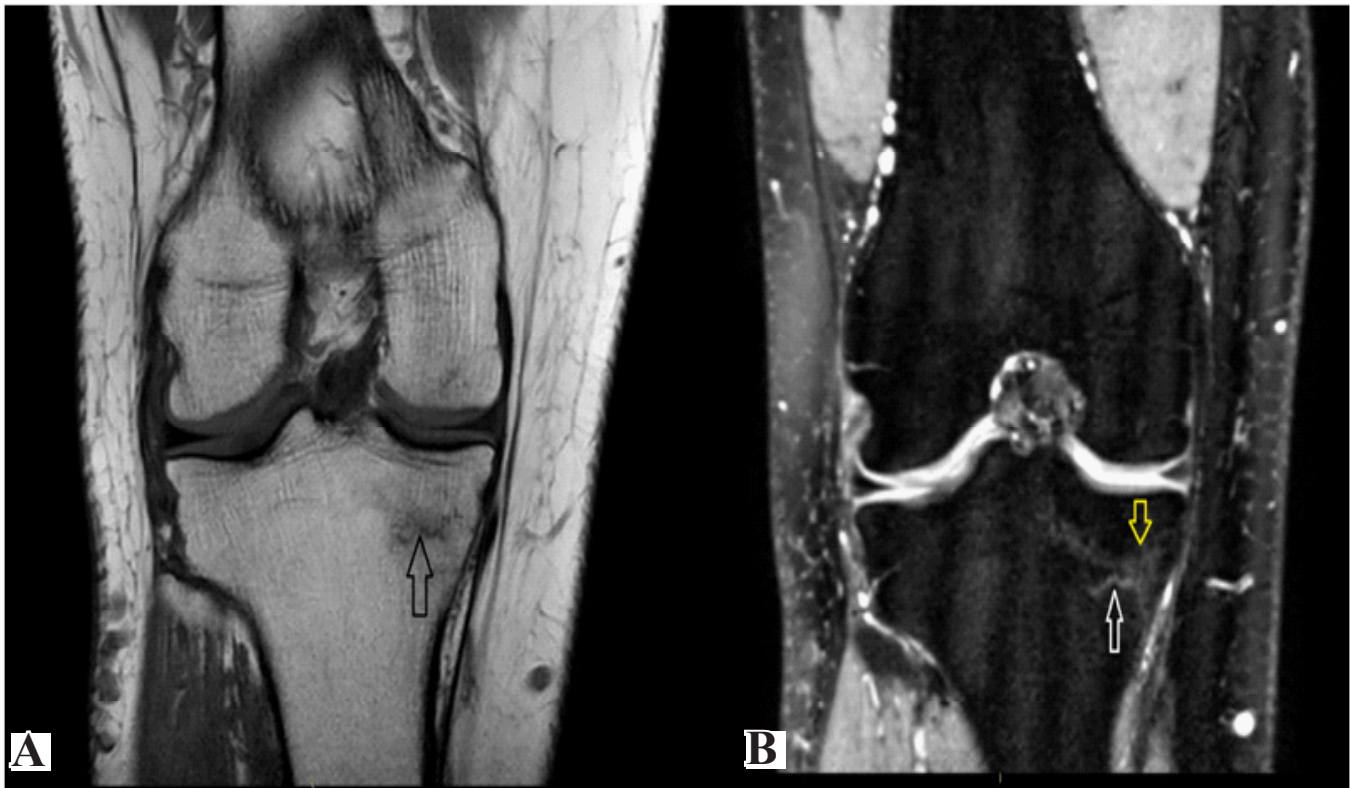


Figure 1: Right Knee. Note the hypointense serpiginous line on the T1 weighted image on the left (black arrow) consistent with a spongiotic stress fracture. The same finding is hyperintense on the proton density weighted image on the right (white arrow) and surrounded by mild spongiotic edema (yellow arrow).

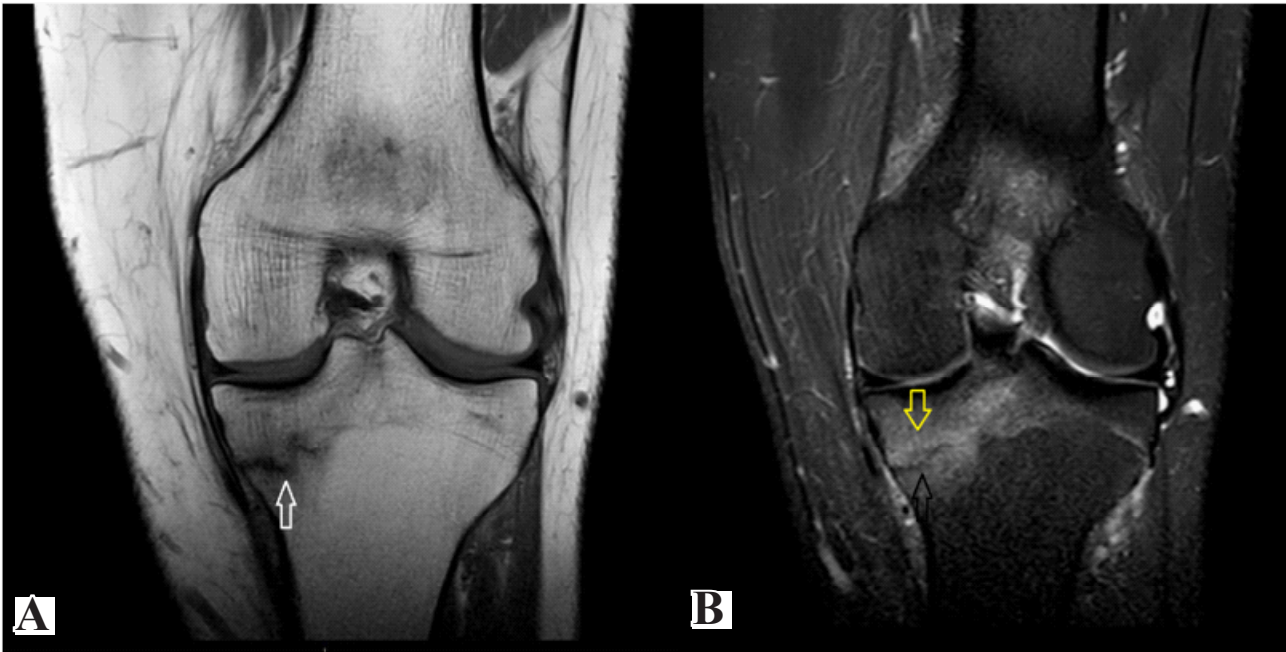


Figure 2: Left knee. Spongiotic stress fracture, a hypointense finding in T1 weighted images on the left (white arrow) and in the STIR sequence on the right (black arrow), where spongiotic edema is better represented (yellow arrow).

Musculoskeletal ultrasound and x-rays were unremarkable. The patient then underwent bilateral knee MRI, revealing on both sides a transverse hypo-intense line on T1-weighted sequences in the postero-medial metaphyseal region (Figure 1A - 2A). The signal alteration was placed near the physeal scar and associated bone marrow edema, more extensive on the left side where tibial spine and contralateral plate were involved, was evident on proton density weighted sequences and in Short tau inversion recovery sequence (STIR) (Figure 1B - 2B). The exam was for the rest unremarkable and a diagnosis of bilateral stress fracture of medial tibial plateau was made.

The patient was referred to the orthopedic surgery department for treatment evaluation and he was asked to refrain from running and to avoid weight-bearing for 3 weeks. Analgesia with paracetamol and non-steroidal anti-inflammatory drugs was also suggested. Due to the ongoing restrictive measures in hospitals an adequate rehabilitation program was postponed.

Discussion

Stress fractures usually occur after repetitive microtrauma and are reported mainly in athletes [8,9] and soldiers [10,11], but are unusual in healthy non-athlete people. Moreover, our patient developed bilateral proximal tibial stress fracture short after a single, isolated, stressful event. His medical history was unremarkable, with low-to-moderate-intensity physical activity which was at first gradually reduced and then discontinued due to restrictive measures during the COVID-19 outbreak. Sedentarity and weight gain might have facilitated regional osteoporosis contributing to the occurrence of a stress or fragility fracture in a weakened bone. Another interesting finding is the presentation of bilateral tibial plateau stress fractures, less common than fractures of the tibial shaft [9,12]. Literature about tibial plateau stress fractures is fairly limited. Engber et al [13] presented a series of 36 patients (57 fractures) including 21 bilateral, while

Harolds et al [14] described 105 fractures in 71 soldiers, observing medial and posterior location as the most frequent involvement, postulating a correlation with weight-bearing stress. Yukata et al. [12] also reported a series of 14 recreational runners (14 medial tibial plateau fractures) and found a postero-medial predominance, consistently with what we noted in our patient. Curiously, although overground runners were described at higher risk than treadmill ones of developing stress fractures in literature [15], our case recommends to keep a high level of suspicion also in treadmill runners presenting with knee pain, even more so after a period of inactivity.

As a differential we considered the possibility of fractures occurring over persistent physis [16] but imaging findings were not suggestive and there was no indication to collect bioptic specimens.

When a stress fracture is diagnosed, a period of rest and offloading of the affected limb are almost invariably needed. Moreover, the use of a supportive splintage may be advised in some patients, especially when immobilization is not possible and to optimize pain control [17]. Meanwhile, pain relief with paracetamol or non-steroidal anti-inflammatory drugs can be considered. Rehabilitative programs may be helpful, especially in athletes, and gradual re-introduction of usual activities is useful also to prevent loss of muscle mass and strength. In our case surgery was not indicated, but it can be an option when high-risk or recalcitrant fractures occur [18]. Moreover, stratification of stress fractures in low and high risk can help to guide a correct therapy. In particular low risk stress fractures can be treated with activity modification without stopping weight bearing, while high risk fractures usually require stopping of hurting activity, weight bearing reduction and sometimes surgery [19].

Conclusion

In conclusion, our case highlights the risk of stress fractures occurring after a change in physical activity habits in otherwise healthy individuals as experienced for instance during a lockdown. We thus emphasize the need for high clinical suspicion and accurate diagnostic work-up also in cases presenting with atypical characteristics.

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Manuscript Information: Received: October 19, 2020; Accepted: November 25, 2020; Published: November 30, 2020

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Citation: Borlandelli E, Marzocchi G, Monteduro F. Bilateral medial tibial plateau stress fracture on a treadmill in a healthy man immediately after COVID-19 lockdown. *Open J Clin Med Case Rep*. 2020; 1711.

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