CASE STUDY

CONTENTS

Intense start, painful consequences: a case report of fatigue fractures

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ABSTRACT

The aim of this study is to present a case of a patient with stress fractures. Stress fractures, otherwise known as fatigue fractures, result from abnormal and repetitive strain of healthy bone. This leads to micro damages and subsequent fractures. They are most commonly encountered after a sudden and excessive increase in physical activity and most frequently located in the metatarsal, heel, tibia, fibula and femur. This case presents a twenty-nine year old patient, diagnosed with obesity, not involved in sport ever before. Since the end of the spring, he started to exercise intensively at the gym, particularly lifting weights. Since the end of summer, he developed increasingly frequent feet pain, so he reported to an orthopedist. An ultrasound examination of the ankle joints was performed and it did not show any soft tissue damage. Subsequent MR imaging of both ankle joints showed a fatigue fracture: the talus bone of both feet and in the left cuboid bone. Excessive physical effort, especially in patients who have not previously participated in sport, can cause fatigue fractures. The diagnostic procedure should include patient's history, X-ray and ultrasound. Fractures at an early stage may not be visible on X- rays, however an MR examination can reveal bone lesions or a fracture line. In the treatment of stress fractures, modification of activity, use of orthosis, direct cooling, short term use of pain drugs and rehabilitation are usually recommended.

KEY WORDS: stress fractures, physical activity, obesity, MR examination

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INTRODUCTION

Fatigue (stress) fractures belong to the group of overload injuries and involve a full cortical fracture of the bone. They occur relatively frequently and are associated with overexertion both in people who suddenly undertake intense exercise and in athletes. The cause of this type of injury is repeated submaximal loading of the bone over time. They most often occur in the lower limbs and are specific to the activities performed. Overload injuries to the upper extremities are much less common than injuries to the lower extremities [1].

In healthy bone, osteoblastic activity repairs sites of damage, including that resulting from physical activity. However, if the regeneration period is not sufficient for osteoblasts to produce new structure, the rate of resorption by osteoclasts exceeds the formation of new bone, and thus bone weakens, becoming more porous and less rigid. Long-term imbalance of these processes leads to the accumulation of microdamage and the formation of a stress fracture [1, 2].

The most common locations for fatigue fractures are the tibia (23.6%), tarsal bones (17.6%), metatarsal (16.2%), fibula (15.5%), femur (6.6%), pelvis (1.6%) and spine (0.6%) [3]. Risk factors for stress fractures include insufficient caloric supply relative to exercise intensity, D hypovitaminosis, obesity, metabolic bone disorders, and high blood cortisol levels. In addition, the absence or oligosymptomatic menstruations and late onset of menstruation can be mentioned among females. Among the people who engage in physical activity, rapid changes in training programs, including increased distance, pace or strength training without

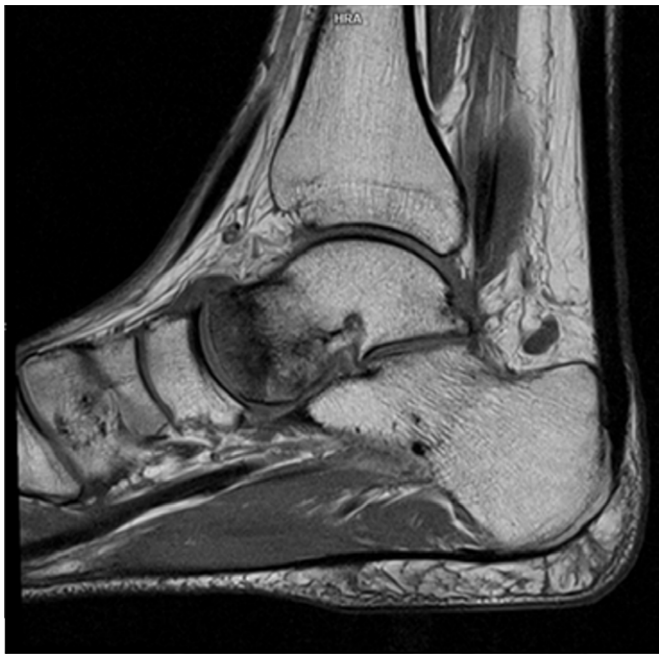

Fig. 1. MR examination of the left ankle joint in the sagittal plane; T-1 weighted image – fatigue fracture in the talus.

Fig. 3. MR examination of the right ankle joint in the sagittal plane; T-1 weighted image – fatigue fracture in the talus.

Fig. 2. MR examination of the left ankle joint in the sagittal semi-plane; T2-weighted fat-sat image – fatigue fracture of the talus with extensive swelling.

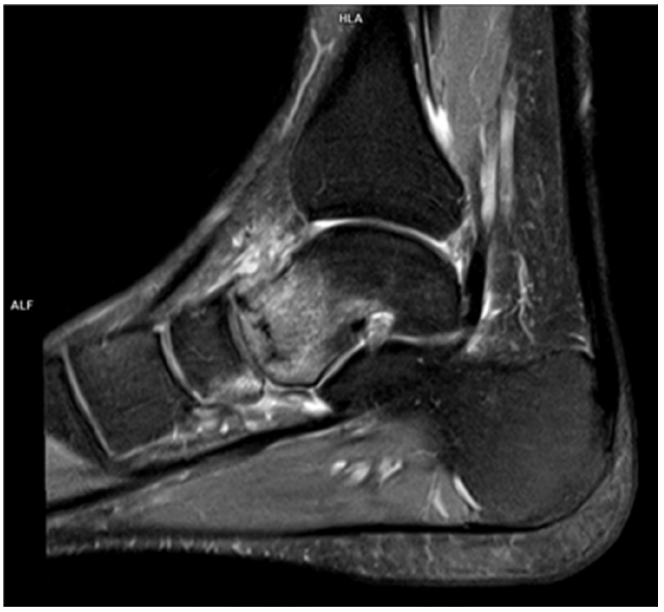

Fig. 4. MR examination of the right ankle joint in the sagittal plane; T2-weighted fat-sat image – fatigue fracture in the talus with extensive swelling.

adequate preparation can also contribute to fractures [1,4]. Overload fractures of the upper extremities are not as common, and can occur in people who practice in sports that require throwing or other overhead movements [3].

Characteristic symptoms for fatigue fractures include sudden or increasing pain over time, the presence of swelling, redness and tenderness depending on the location. Medical imaging is crucial for diagnosis. X-rays are not sensitive and 70% are negative

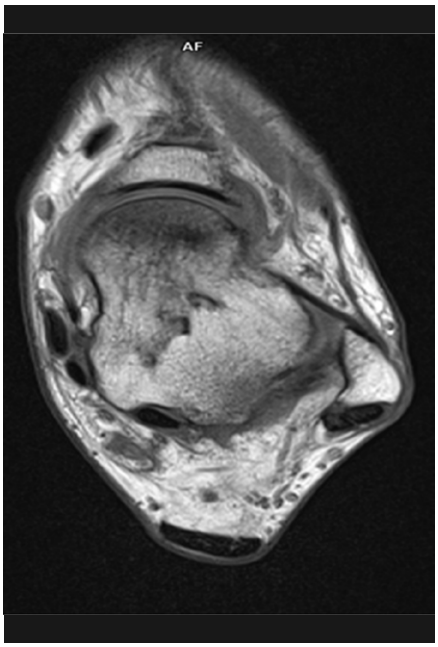

Fig. 5. MR examination of the left ankle joint in the transverse plane; T-1 weighted image – fatigue fracture of the talus.

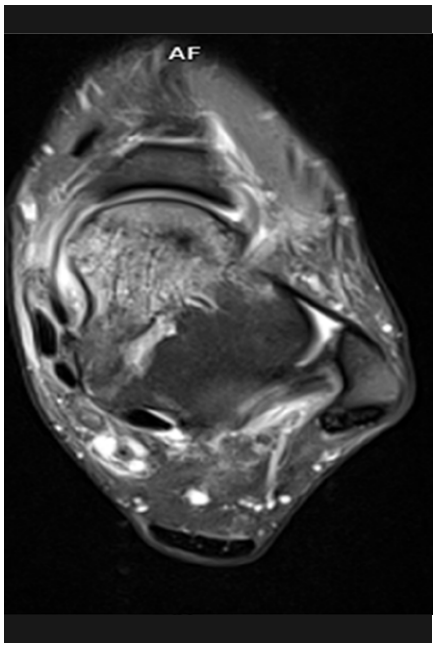

Fig. 6. MR examination of the left ankle joint in the transverse plane; T-2 weighted image fat-sat

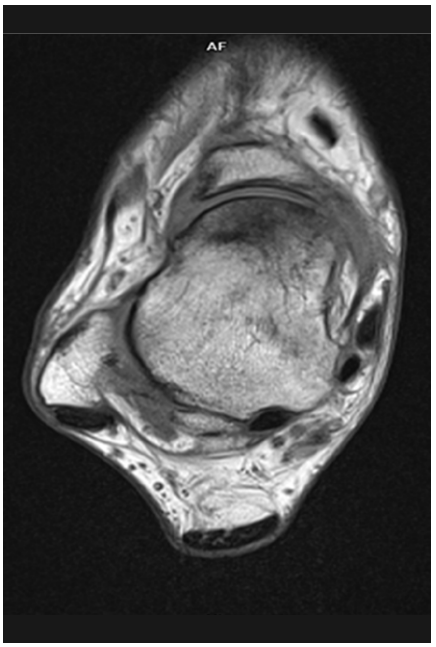

Fig. 7. MR examination of the right ankle joint in the transverse plane; T-1 weighted image – fatigue fracture of the talus.

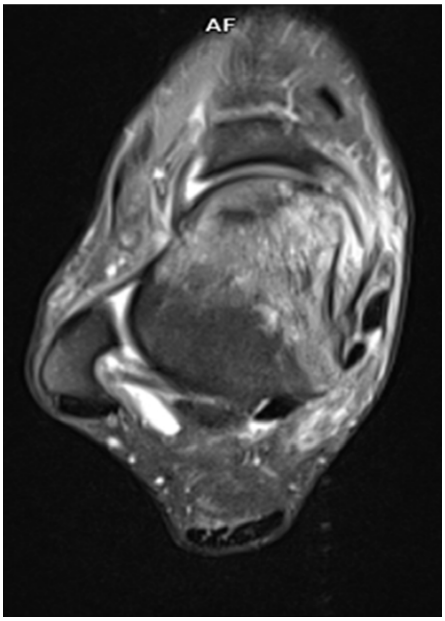

Fig. 8. MR examination of the right ankle joint in the transverse plane; T-2 weighted.

Fig. 9. MR examination of the left ankle joint in the transverse plane; T-1 weighted image.

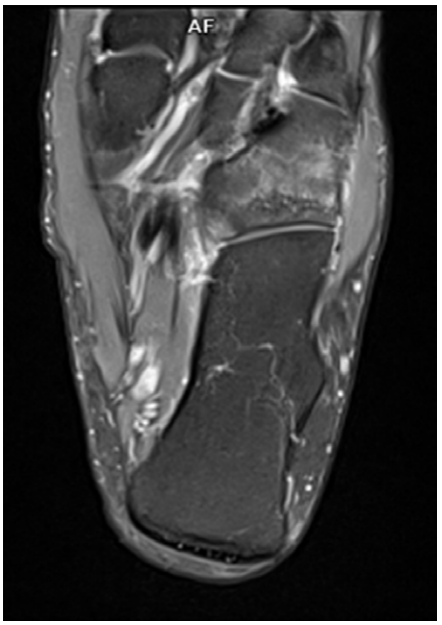

Fig. 10. MR examination of the left ankle joint in the transverse plane; T2-weighted image fat-sat fracture of the cuboid bone.

in the early stages of stress fractures. However, it is a first-round examination because of its availability and low cost. Magnetic resonance imaging (MRI) is now the gold standard and provides a reliable diagnosis of a fatigue fracture [5]. CT scanning although is less sensitive can also be useful in diagnosing a fracture [6, 7].

The primary treatment for fatigue fractures is conservative treatment with immobilization and weight-bearing of the affected limb (about 6 weeks), depending on

the location of the fracture. Initial recovery is followed by initial improvement management and a gradual return to activity [6].

CASE REPORT

A 29-year-old patient presented to the orthopedic clinic because of ongoing pain of both feet that had persisted since the beginning of summer. He described the pain as dull, worsening when walking and preventing daily function. The man was characterized by significant obesity, as evidenced by his BMI of 32. He worked from home with overall daily low physical activity. His lifestyle also included regular consumption of low-percentage alcohol and smoking, which could negatively affect his health. The patient denied the presence of chronic diseases.

Due to his physical condition, reduced capableness and the negative impact of obesity on his mental well-being, he made the decision to reduce excessive weight and improve his health. At the end of spring, without consulting a doctor or personal trainer beforehand, he began intensive workouts that mainly included weightlifting, running and crossfit exercises. As the intensity of exercise increased, pain in the feet increased, especially in the ankle area with accompanying swelling. Symptoms usually appeared only at the end of exercise or after. The patient denied experiencing a torsional injury to his feet during exercise, which could have contributed to the pain. After some time, the symptoms became increasingly frequent and caused difficulties with activities of daily living.

For diagnostic purposes, an ultrasound was first performed, which showed no damage to the ligament-tendon structures. The man was further referred for magnetic resonance imaging of both ankle joints. SE and TSE sequences were performed in T1, T2-weighted images in the transverse and sagittal planes. Sagittal and transverse projections showed swelling of the head and neck of the left talus bone (Fig. 1, 2, 5, 6). In addition, showed a horizontal fracture gap in the left cuboid bone with associated swelling (Fig. 9, 10). On the right side, fatigue changes were observed in the head and neck of the talus – the changes were more severe than on the opposite side with partial erosion of the articular surface and a visible bone fracture gap. Minor fatigue edematous changes were also visible in the navicular bone. The bone changes were also accompanied by edematous and inflammatory changes in the soft tissues of the ankle-navicular joint area (Fig. 3, 4, 7, 8). No pathological changes were found in the remaining bone structures of both feet.

As part of the treatment, the patient was recommended to stabilize both limbs with an orthosis for six weeks, relieve them, limit training for a minimum of 10 weeks, as well as apply cooling packs and take pain medication. The patient was also referred for a consultation with a nutritionist to discuss an appropriate diet and to determine caloric intake in case of returning to exercising. The man was also given recommendations on reducing alcohol consumption and quitting smoking.

DISCUSSION

Stress fractures often occur among patients who suddenly undertake intense training without prior consultation with a doctor. Note that they can also affect professional athletes with regular exercise.

The initial symptoms of a fracture may seem insignificant and nonspecific, and thus become overly belittled [8]. This results in the accumulation of microdamages, increased pain symptoms and prolonged treatment time.

The medical history is important in the diagnosis, where attention should be paid not only to the pain itself, but also to reported recent changes in physical activity, diet, and co-occurring diseases that could suggest a stress fracture [9]. The condition our patient reported to the doctor was a consequence of a long-term unhealthy lifestyle, caused by an improper diet rich in highly processed food and low physical activity, which contributed to excessive weight gain and the development of obesity. Continuing to train despite symptoms can aggravate the injury and prolong recovery time.

Medical imaging, such as X-ray, MRI, CT or ultrasound, are also the basis of diagnosis. At an early stadium of the diagnosis of a fatigue fracture, an X-ray may not show changes in bone structures. CT provides extremely accurate bone detail in multiple planes, often showing periosteal remodeling or fracture lines that are not visible on conventional radiographs. The sensitivity of nuclear scintigraphy images areas of even subtle bone turnover and stress remodeling. Ultrasound, which is more frequently used in the evaluation of the musculoskeletal system, can provide limited evaluation of superficial bony structures and gives a good picture of soft tissues, providing an alternative imaging option. However, MRI provides the most comprehensive assessment of stress injuries, revealing both functional and morphological information about the bone [10-12].

Temporary stabilization of the fracture with an appropriate rigid, semi-flexible or elastic orthosis or plaster

dressing, lifestyle modification and daytime activities are sometimes important elements in the therapeutic process. However, it may be sufficient to modify physical activity under the guidance of specialists, so that the patient can gradually increase the intensity of training without pain.

Prevention of stress fractures involves a variety of training, proper breaks, strengthening the muscles that stabilize the skeleton, proper footwear and a balanced diet.

CONCLUSIONS

Excessive physical exertion, especially in obese people who have not previously been active in sports, can lead to fatigue fractures. Early diagnosis is crucial, and ultrasound or X-ray often do not show early changes, so an MRI is necessary if a fracture is suspected. It allows the detection of microtrauma that is invisible in other examinations. In some cases, a scintigraphic examination or CT scan may also be helpful. Treatment includes activity modification under the supervision of a doctor or physiotherapist, cooling of the injury, use of pain medications and rehabilitation under the supervision of a specialist. A conscious approach to physical activity reduces the risk of fatigue fractures and their complications.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest.

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