

Management and Prevention of 5th Metatarsal Stress Fracture in Sportive People

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Abstract

Stress fractures of the 5th metatarsus are common among sportive people, especially in runners. Because of difficulty in diagnosis and evaluation, sometimes these fractures remain without proper treatment. Anyway, after diagnosis, treatment should be properly conducted in order to avoid complications or relapses that may occur when athlete return to sport. The knowledge of risk factors and sportive movements that could be previous to this pathology is the first preventive strategy.

Keywords: 5th Metatarsus; Stress fracture; Sportive people

Introduction

A stress fracture is the result of repetitive micro-lesions that involve the bone. The fifth metatarsal is considered at high risk for this fracture due to the overload which it is subjected, the high level of sportive stress and the poor blood supply [1]. The metatarsal head is more movable than the proximal base, which has strong insertion of capsule, ligaments and tendons, causing a fulcrum effect at the level of the metaphyseal-diaphyseal junction. Biomechanical studies show that the main stress across the bone peaks occur when the load is directed 30-60° from the horizontal plane [1]. Regarding the pathogenesis, athletic movement that involves a greater risk of fractures of the fifth metatarsal stress is “running”, then, in second position there is “the jump” that can be related to awkward landings. Training grounds too, such as hard surfaces, significantly increase the shock of impact [2].

Important elements that have significant effect on this kind of pathologies are the gait pattern and support of the foot mode; in fact the supinated foot, with a greater height of the longitudinal arch and a plant that does not rest on the ground in the inner part, is a risk factor [3]. In 1990 Brunet et al. [4] performed an epidemiologic study on 1,505 runners, including 1130 males and 375 females. This study has shown that women are more susceptible to stress fractures due to hormonal patterns which result in a lower bone mineral density. Then, in girls, the increased risk of stress fractures has been related to a BMI lower than 19, a late menarche over 15 years old and participation to

gymnastics and dance from an extremely young age. In boys it was noted that practice of basketball is a preventive factor for these accidents [5].

Diagnostic Approach

The knowledge of the extrinsic and intrinsic features considered relative risk factors is essential. Those extrinsic include high training loads and the use of uncomfortable shoes that do not help the athlete during exercise. Intrinsic factors include a too high longitudinal arch of the foot, different height of legs and an excessive virus forefoot [6]. About clinical features, at the first stages of pathology, there is pain during the exercise, which relieves with rest. Over time, pain tends to be more continuous and is localized mainly around a precise point. On examination, pain for palpation and percussion, functional limitation and sometimes also swelling with local slight bruising could be observed [7]. X-ray is performed in 3 projections: lateral, oblique and in the anterior-posterior position, but for unclear fractures a CT can be done [8]. In cases of severe doubt, an MRI which detects the bone edema could be useful [8].

Treatments

Treatment of fifth metatarsal stress fractures depends on the type of fracture and sport activity. Conservative treatment consists in immobilization of the foot through a plaster or a brace and use of crutches to avoid load for a period of 6-8 weeks. This type of treatment should be reserved for metaphysical

fractures [9,10]. After these weeks of immobilization it's expected a progressive gait gradually supporting the load on the foot. Thevendran et al. [11] showed that extracorporeal shock-wave therapy (ECSWT) helps healing of fifth metatarsal stress fractures. Electromagnetic stimulation is used for fifth metatarsal stress fractures, but is more successful in case of pseudoarthrosis/non-union [7].

Surgical treatment is used in a small percentage compared to the conservative; it's applied in professional athletes, in patients with pseudoarthrosis, or in case of failure of conservative treatment. It's used by athletes because it has shorter times of healing so they can return faster to sport activity. Probably the most widely used is intramedullary fixation with a 4.5 mm cannulated screw [12], but in spite of positive results, many surgeons still use non-cannulated intramedullary screws. Sometimes, it is useful for preoperative planning because you may need a bone graft in order to reduce fractures with obliterated channel.

Surgical treatment can present several complications: the most common is a chronic pain at the level of the screw after healing, and patients often require its removal. Other types of post-operative problems are the breakage of the screw or its incorrect positioning [13]. An important value is represented by the athlete's psychological sphere, in order to overcome in a positive way the injury and resume faster the optimal physical condition, assisted by the medical staff [14].

Rehabilitation

protection of the foot with a splint and a bandage after surgery and until the wound healing appears necessary. Two weeks after surgery the patients should begin a progressive increase in load weight, in relation with patient's pain tolerance. Thevendran et al. [11], in 2013 have proposed a thesis about post-injury recovery which provides an increase in load on the foot 6 weeks after surgery or immobilization; during this period this protocol needs the patient to perform an X-ray to follow the fracture healing. Subsequently they focus on gradual joint recovery, muscle recovery and finally sporting gesture, which occurs at about 12-20 weeks from trauma [13]. Premature return to activity may result in complications for the athlete that can cause recurrences, which are very difficult to treat [15]. A good postoperative follow up must include a careful reassessment of the extrinsic and intrinsic factors which are the risks for these stress fractures. Consequently, the athlete will return optimally to sport practice [16].

Prevention

The knowledge of the causes and risk factors has been proved to be vital during the follow up, for a more appropriate and detailed study regarding stress fractures. Among preventive options, the most important are training programs: during training it is important to increase slowly and gradually two fundamental factors: the intensity and the duration of the

sport practice. Consequently, even the recovery and rest time must increase progressively in order to not overload the fifth metatarsal [7]. To prevent impacts, good quality footwear and the use of custom-made orthotics can be very useful. Using amortized footwear [17] reduces the percentage of stress fractures. In relation with nutritional factors, a healthy diet is the basis of athlete's correct lifestyle. The correct intake of calcium and vitamin D provides greater bone homeostasis [18]. The recommended daily dose is 1000 mg of calcium and 800-1000 IU of vitamin D. Nieves and other authors in 2010[19] published a study about 125 cross-country athletes, between 18 and 26 years. They observed that the incidence of fractures of the fifth metatarsal stress is reduced by 62% with the intake of calcium and dairy products.

Conclusion

Through a close analysis of the various anatomical and biomechanical studies we can see that stress fractures of the 5th metatarsal are undervalued in the modern sports world. The medical staff of teams and trainers must be adequately informed on the proper management of this type of pathology. Run- and gait-analysis, sporting gesture evaluations, the use of proper shoes or foot orthoses, correct nutrition and correct training loads should be considered the most important elements both for prevention and return to sport after this kind of injury.

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