

# Tibial Stress Fractures Treated with Shockwave Surgery: Five Years After.

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Tibial stress fractures represent 49% to 73% of all overuse bone injuries due to biomechanical fatigue or overload. The natural history of this fracture shows that it is symptomatic for several years without treatment. However, therapeutic protocols for this fracture are still controversial. Many options have been described ranging from conservative treatment to intramedullary nailing. Few cases are available in the literature, so there is not enough evidence to accept any of them as the standard choice, and the treatment will need individual decision making. Compression tibial fractures may become chronic because of a lag in vascular supply to the fracture. Chronicity is a response to hypovascularity, and hypovascularity leads to delayed union or no union. The current gold-standard treatment includes a progressive retraining that will place the athlete out of active competition for at least four months, and if there are persistent symptoms, it could be over a year. This same challenging situation has been seen in military recruits. Limitation of the activity causing the symptoms is the keystone to any treatment regimen. Either on athletes or military recruits, cardiovascular conditioning and flexibility should be maintained by non-weight-bearing alternative exercises. We have explored the benefits of ESWT in tibial stress fractures, based upon the known effects of shockwaves in bone. We believe that osteoinduction, due to the micro lesions on the trabeculae and the vascular effects on both periosteum and cancellous bone may accelerate the recovery process in athletes with this condition. All experimental reports suggest that top pressing of the marrow from the medullary canal, marrow hypoxia and subperiosteal haemorrhages, may cause and stimulate new bone growth. Hypovascularity in stress fractures leads to chronicity. Thus, there could be two theoretical advantages of shockwaves in the treatment of stress fractures: one, shockwave therapy promotes vascularity at fracture site, and two, shockwave therapy enhances bone remodelling. ESWT produces micro-cracks in cortical bone that may lead to an enhanced remodelling process in bone. This enhanced remodelling process actually increases the surface area over which the load is applied. Thus, the intrinsic strength of bone as a material is increased at the end of the remodelling process, decreasing the risk for new stress fractures. To determine if Extracorporeal Shock Wave Therapy enhances osseous remodelling and decreases the time of recovery in stress fractures, we performed a case series study in fourteen patients. We presented our first report in the 6th ISMST international congress in Winterthur 2002, showing the faster recovery in our study group. Now we want to present the follow up after five years follow up of the same group, as well as the results of our protocol in new subjects. In this series there were seven women and seven men, all of them 18 years old, first year cadets, with identical bilateral stress fractures located at the union of the middle and distal thirds of the tibia. The onset of the symptoms was 8 weeks before they were included in the study, and the diagnosis was made over clinical history, Tc-99 Bone scans, ultrasound tests and X-Ray positive to stress fractures. Two thousand 0.7 milli-Joule Shockwaves were applied to the more symptomatic Tibia and eight days later the shock wave dose was repeated. All patients went into a progressive retraining program. We controlled nutrition intake, activity, and the progressive retraining standard program for the management of stress fractures. The rate of success was measured by the presence of pain before, through, or after the training practice. All patients were free of pain during the retraining program on their shockwave treated tibia. All of them presented persistent pain during the progressive retraining program on the untreated Tibia. Treated tibias were pain free after the retraining program. Untreated tibias were painful after that time, and were the cause of incapacities. All patients were satisfied with the treatment, and are prone to repeat it in the untreated tibias. Treated tibias were significantly faster to recover than untreated tibias after three weeks of retraining and physical therapy. Results after five years showed that all of our patients recovered with no recurrence of the symptoms, and finished their military career without any

athletic limitation. Our protocol is currently used in athletes in Venezuela and Cuba, and our results have been reproduced with similar results. We believe this is a safe procedure that can be recommended for athletes with tibial stress fractures in order to recover their physical activity in a shorter period of time.