

# MEDIAL TIBIAL STRESS SYNDROME

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## INTRODUCTION

We will examine the current literature on medial tibial stress syndrome (MTSS). There is not a general consensus on the etiologic factors contributing to MTSS making treatment challenging and thus stressing the importance of preventative measures. We will discuss who is at risk, symptoms, conservative treatment and surgical options to combat this common overuse injury.

MTSS is an exercise related over-use injury. The term shin splints was defined by the American Medical Association in the “Standard Definition of Athletic Injuries” in 1966. Originally, the definition was “pain and discomfort in the leg from repetitive running on hard surfaces or forcible extensive use of flexors.” In the early 1980s, Drez coined the term medial tibial stress syndrome (Figure 1).

The exact mechanism of injury is unknown, but it is associated with overuse (1-3). Schulze et al found the incidence of MTSS to be 7.9% in physically active soldiers, and in athletes it varies between 4% and 35% (4). In a prospective study of 124 military recruits, 35% developed MTSS during basic training. In two separate prospective studies of high school cross-country runners, 12% of 125 runners and 15.2% of 130 runners developed MTSS (5,6). A prospective study by Hubbard et al showed that of the 146 collegiate athletes who participated in running and jumping sports, 19.9% developed MTSS during their

competitive seasons (7). Previous theories indicated an inflammatory response of the periosteum or periosteal traction reaction. However, more recent evidence denotes a painful stress bone reaction (8). Causes have been thought to include acute inflammation of the calf structures, chronic compartment syndrome, and chronic trauma to structures in the calf (1-3).

## RISK FACTORS

MTSS is one of the most common injuries that can occur among active individuals where there is repetitive motion and stress, including weekend warriors and professional athletes. In fact, repetitive high impact sports, such as running, gymnastics, basketball, and racquet sports have been associated with increased risk of developing MTSS (1-3). Military recruits, female runners with amenorrhea and osteoporosis, pronation, equinus, poor or hard running surfaces, inadequate footwear, and overtraining or recent increase in workout intensity or mileage are also related (9). A previous history of MTSS, less running experience, orthotic use, increased body mass index, smoking, and increased hip external rotation in males are all significantly associated with an increased risk of developing MTSS. Risk factors vary by sex (10). Sabeti et al examined the relationship between shin splints, anthropometric characteristics and indicators of body composition. The study found no significant difference in anthropometric parameters, including thigh length, leg length, foot size, and leg circumference and body composition, which included mineral amount and body fat percentage. The study concluded that these factors might not be regarded as risk factors for shin splint development (11).

## SYMPTOMS

A good history and physical examination is critical to diagnosing this injury. MTSS presents as pain along the medial border of the tibia, which may or may not be associated with edema. The pain is often described as sharp and razor-like, but has also been referred to as a dull and throbbing sensation. There is increased pain on palpation to the tibia.

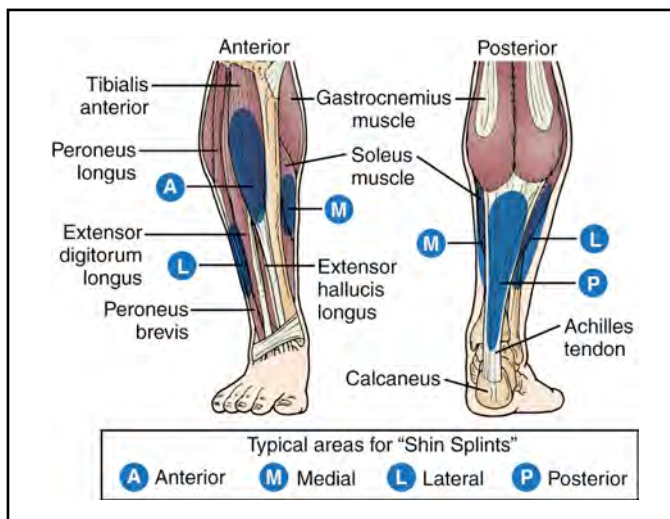


Figure 1. Typical area for shin splints.

## DIFFERENTIAL DIAGNOSIS AND CLASSIFICATION

MTSS can present as generalized tibial pain, so it is important to have a high index of suspicion. Stress fracture, tendonitis, and chronic exertional compartment syndrome should all be ruled out. Stress fractures are also caused by overuse. Plain film radiographs, bone scans and magnetic resonance images (MRIs) can diagnosis tibial stress fractures. Tendonitis occurs when tendons become inflamed. The pain associated with tendonitis can be painful like MTSS, especially if there is a partial tendon tear. An MRI can also be used to aid in diagnosing tendonitis. Chronic exertional compartment syndrome is uncommon and causes symptoms similar to MTSS. Compartment syndrome is a painful condition in which the pressures within the muscles build to dangerous levels. In chronic exertional compartment syndrome, pain typically resolves after the activity is stopped because it is caused by exercise. Measuring compartment pressures within the leg prior to and following exercise is used to diagnosis this syndrome.

Fredericson et al established a grading system in 1995, utilizing MRI and three-phase bone scintigraphy results to categorize tibial stress injuries into MTSS, tibial stress reactions, and tibial stress fractures. The study recommended MRI over bone scan when grading tibial stress lesions in runners. MRI was shown to be more accurate in correlating the clinical symptoms with the degree of bone involvement, which allowed for more accurate recommendations on rehabilitation and a return to impact activity. There is a lack of ionizing radiation exposure and significantly less imaging time with MRI compared to a bone scan (12) (Figure 2).

## TREATMENT

MTSS is typically caused by overuse, so first line treatment is rest for several weeks from the activity that elicited the pain. Nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen, aspirin, and naproxen can help reduce pain and swelling. Compression, ice, changing shoe gear, arch supports and shock absorbing insoles, as well as braces and walking boots can aid in the recovery process. Other treatment options include cast immobilization with crutches, stretching exercises, ultrasound, extracorporeal shockwave therapy, and steroid injections. Schulze et al looked at various treatment options ranging from rest, local cooling, and application of local and systemic anti-inflammatory medicaments to physiotherapy with ultrasound, phonophoresis, and local friction. However, they concluded none of these methods has proven to be superior to the others (1, 2, 4, 13).

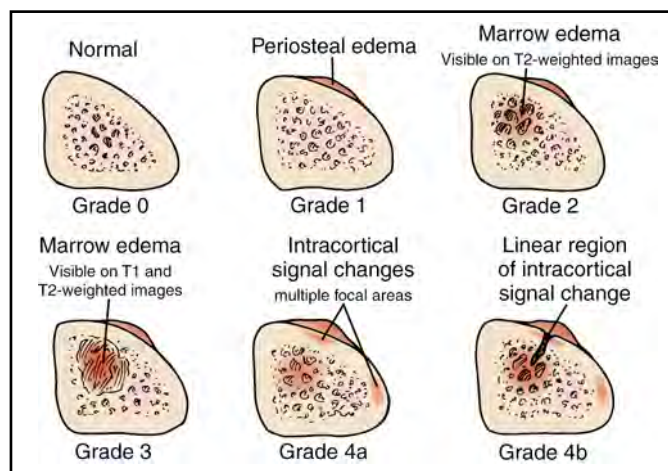


Figure 2. Fredericson classification for medial tibial stress syndrome on magnetic resonance imaging.

## SURGERY

Surgery is reserved for severe cases of MTSS that do not respond to conservative treatment. It is rarely indicated but has shown some promising results (8). A study by Yates et al showed that at 30 months postoperative, surgery significantly reduced pain levels by 72% ( $P < 0.001$ ). An excellent result was reported in 35% of the limbs, good results in 34%, a fair result in 22%, and a poor result in 9%. Despite the success with pain reduction, only 41% of athletes returned fully to their pre-injury sports activity level (14). Surgical treatment includes a deep fasciotomy of the posterior compartment of the leg. The fascia is divided at the fascia-bone interface. The most distal part of the fascia is thicker and stronger as it passes distally to form the flexor retinaculum and is called the soleus bridge. The release of this fascia is considered paramount in achieving a successful outcome (13, 14).

Postoperatively the patients are allowed to ambulate 2 weeks after surgery with a CAM walking boot and crutch assistance. There is a restriction on sports activity for 4-6 weeks. However, patients can swim and ride a stationary bike as tolerated. The return to normal activity may take up to 6-12 months (13, 14).

## PREVENTION

To reduce the chance of developing MTSS, it is recommended to stretch prior to and after exercising. It may also be prudent to wear shock-absorbing insoles with proper fitting shoes during a run or high impact activity. Gradual build up is encouraged when increasing a workout or starting a new sport or exercise regime. Cross training will also allow specific muscles to relax and recover (15). Barefoot running has gained popularity on and off over the

last few years, some claim it helps eliminate shin splints. In theory, the barefoot running spreads the impact stresses among muscles, so no particular area is over loaded. However, there is no clear research supporting the idea that there is a risk reduction with barefoot running (7, 15). Hamstra-Wright et al suggest that interventions should focus on decreasing the BMI, addressing pronation, and encouraging ankle plantar flexion and hip external rotation range of motion exercises (9).

In summary, MTSS can be a challenging injury to treat because the exact cause is unknown. It is critical to make an accurate diagnosis based on clinical examination. The focus for any active person should be preventative measures. The syndrome is typically treated effectively with conservative management, including NSAIDs, rest, and ice. If pain continues, only then should surgical intervention be considered.

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