

CASE REPORTS

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Case report
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MEDIAL TIBIAL STRESS SYNDROME: CASE REPORT

MEDIJALNI TIBIJALNI STRES-SINDROM: PRIKAZ SLUČAJA

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Summary

Introduction. Although it can be difficult to differentiate pain in lower legs, it is important for clinicians to differentiate medial tibial stress syndrome, which is a rather benign condition, from acute compartment syndrome, which is an emergency, as well as from different types of stress fractures described in this region. The aim of this case report was to present medial tibial stress syndrome as a clinical diagnosis, possible dilemmas in differential diagnosis and the efficacy of rehabilitation treatment. **Case report.** A 25-year old male patient sought medical help complaining of the pain along the distal third of tibia. The pain was present on palpation of the distal two-thirds of the lateral and medial tibial border over the length of 9 cm and on muscle manual testing of foot flexors. The patient underwent physical and exercise treatment for three weeks. The recovery was monitored by visual analogue scale, which measured the lower leg pain, pain on palpation and manual muscle testing. In addition, the patient himself assessed his ability to resume sport activities on the 5-point Likert scale. The final evaluation and measurements showed his complete functional recovery. **Conclusion.** The results obtained in this case show the importance of accurate clinical diagnosis and rehabilitation for medial tibial stress syndrome

Key words: Medial Tibial Stress Syndrome; Diagnosis, Differential; Male; Adult; Signs and Symptoms; Pain; Exercise Therapy; Rehabilitation

Introduction

It can be difficult to differentiate the lower leg pain and one of possible diagnosis is medial tibial stress syndrome (MTSS).

In 1966, the American Medical Association defined MTSS as a pain and discomfort in the lower region of the leg resulting from repetitive activity on hard surfaces, or due to forcible, excessive use of the foot flexors, the diagnosis should be limited to musculoskeletal inflammation, excluding stress fractures or ischemic disorders [1].

Sažetak

Uvod. Diferencijalna dijagnoza bola u potkolenici može biti kompleksna. Za kliničara je važno da razlikuje medijalni tibijalni stres-sindrom što je prilično benigno stanje od akutnog kompartment-sindroma kao urgentnog stanja i različitih vrsta stres-fraktura u ovoj regiji. Cilj je da se prezentuje medijalni tibijalni stres-sindrom kao klinička dijagnoza, moguće dileme u dijagnostici i efekti konkretnog rehabilitacionog tretmana. **Prikaz slučaja.** Pacijent, star 25 godina, javio se na pregled zbog bola duž distalne trećine tibije. Bol je prisutan pri palpaciji medijalne ivice tibije, u distalnoj trećini dužinom od 9 cm kao i pri testiranju plantarnih fleksora stopala. Pacijent je uključen u rehabilitacioni tretman tokom tri nedelje koji je podrazumevao fizikalnu i kineziterapiju. Oporavak je praćen uz pomoć vizuelne analogne skale kojom smo merili bol u potkolenicama, pri palpaciji i pri testiranju plantarnih fleksora stopala kao i uz pomoć petostepene Likertove skale kojom je pacijent subjektivno procenjivao spremnost da se vrati u sportske aktivnosti. Završna ispitivanja i merenja pokazala su potpun funkcionalni oporavak. **Zaključak.** Dobijeni rezultati kroz ovaj prikaz slučaja ukazuju na značaj precizne kliničke dijagnoze i rehabilitacije kod medijalnog tibijalnog stres-sindroma.

Glavne reči: Medijalni tibijalni stres sindrom; Diferencijalna dijagnoza; Muško; Odrasli; Znaci i simptomi; Bol; Vežbe; Rehabilitacija

Medial tibial stress syndrome is characterized by the lower leg pain, in the middle or lower third of the medial edge of the shinbone with tenderness of this region over at least 5 cm [2]. MTSS is a common injury affecting runners either separately or associated with different overuse injuries, and it is also common in other running sports. It is described in gymnasts and ballet dancers [3], as well as in military population [4]. The incidence of MTSS in previously mentioned population ranges from 4 to 35% [2, 5].

Abbreviations

MTSS	– medial tibial stress syndrome
ACS	– acute compartment syndrome
BMI	– body mass index
MRI	– magnetic resonance imaging

The biomechanical factors associated with this syndrome include foot over-pronation, excessively tight leg muscles and decreased range of motion in subtalar joints [6-8]. Different studies have documented that female gender is a statistically significant risk factor [2,5]. Additional risk factors for athletes are training mistakes, hard surface and fatigue. It is very important for the clinician to differentiate MTSS, which is a rather benign condition, from different types of stress fractures in this region and acute compartment syndrome (ACS) that are much more serious conditions [8]. In addition, the tibial periostitis is described as the beginning of polyarteritis nodosa [10], and some types of tumors may be localized in this region [11].

The patient with MTSS complains of pain at the junction of the middle and distal third of shinbone, the symptoms are mostly bilateral, and they increase with running and decrease after rest [12]. In more severe cases, the patient complains of pain during normal walking and usual activities of daily living, even when resting. The pathophysiology of MTSS and mechanism of pain are not very clear, although the majority of authors agree and report muscle overuse, separation and traction of muscle fibers at the site of junction to the medial edge of the tibia and periostitis [13]. The tibialis posterior muscle was believed to be responsible for the development of MTSS; however, new investigations have found that the soleus and flexor digitorum longus muscles are very important in symptomatology [14].

The metabolism of bone tissue is also important in MTSS. It was found that athletes with periostitis of tibia had lower bone mineral density compared with the healthy control group [15], and after the symptoms had been relieved, the bone mineral density became normal [16].

The purpose of this paper was to present medial tibial stress syndrome as a clinical diagnosis, to evaluate a possible differential diagnosis and to show the efficacy of rehabilitation treatment.

Case Report

A 25-year old male patient sought medical help due to the pain along anterior side of lower legs which lasted five months. He had no previous history of a similar condition. The patient is a football referee and plays football for recreation. Initially, he felt pain while he was running, but later the pain was present after walking and usual daily activities. The patient's weight and height were 70 kg and 180 cm, respectively, body mass index (BMI) was 21.6 kg/m². The patient reported to have had the left ankle sprain a year before, but denied anything else.

On clinical examination, a sharp pain was provoked by digital palpation of the medial edge of tibia in the distal third as well as by manual muscle testing of foot plantar flexion muscles and walking on toes. Orthopedic and neurological findings were regular. Dorsal pedal and posterior tibial pulses were normal. There was no difference in measurements of lower legs circumferences (40 cm, measured 10 cm below knee joint spot). A decreased hamstrings flexibility and collapse of medial longitudinal arch of feet were noticed. The talocrural ranges of motion were painless, but the range of motion of the left ankle was somewhat decreased compared with the right ankle. The diagnosis was made according to medical history and additional diagnostic test such as plain radiography of distal legs, which was normal.

The rehabilitation (15 therapies during three weeks) consisted of exercises and physical therapy – iontophoresis of anaesthetic (novocain), low level laser therapy (wavelength -780 nm, frequency 2500-HZ, power output-20 mW, spot size-1 cm, energy density-3 J/cm²; duration of treatment-600s, daily energy dose-6 J, total energy dose-90 J, technique-contact application along the painful medial edge of tibia). Since we did not find the



Figures 1 and 2. Calf muscle stretch
 Slike 1 i 2. Vežbe istezanja zadnje lože potkolenice

Table 1. Parameters of recovery monitored during rehabilitation
Tabela 1. Parametri praćenja oporavka tokom rehabilitacije

Parameter	Before therapy <i>Pre terapije</i>		5 therapies <i>5 terapija</i>		10 therapies <i>10 terapija</i>		15 therapies <i>15 terapija</i>	
	right/ <i>desno</i>	left/ <i>levo</i>	right/ <i>desno</i>	left/ <i>levo</i>	right/ <i>desno</i>	left/ <i>levo</i>	right/ <i>desno</i>	left/ <i>levo</i>
Pain when active <i>Bol pri aktivnosti</i>	70 mm	70 mm	30 mm	40 mm	30 mm	30 mm	0 mm	0 mm
Pain when passive <i>Bol u miru</i>	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm
Pain-palpation <i>Bol-palpacija</i>	70 mm	90 mm	40 mm	50 mm	10 mm	20 mm	0 mm	0 mm
Pain-walk on toes <i>Bol-hod na prstima</i>	50 mm	50 mm	30 mm	40 mm	10 mm	10 mm	0 mm	0 mm
PEK	30°	30°	30°	30°	15°	20°	15°	15°
DF	25°	15°	25°	15°	25°	20°	25°	20°
PF	50°	40°	50°	40°	50°	45°	50°	45°
MMT	4	4	5	4	5	5	5	5

PEK – passive extension of knee/*pasivna ekstenzija kolena*; DF – dorsal flexion/*dorzalna fleksija*; PF – plantar flexion/*plantarna fleksija*; MMT – manual muscle test/*manuelni mišićni test*

dose recommendations of laser therapy in the treatment of MTSS, the parameters of laser light were in accordance with clinical trials aimed at investigating the efficacy of low level laser therapy in treatment of painful musculoskeletal conditions [17–20].

Treatment included ankle range of motion exercises, hamstrings and Achilles tendon stretching (**Figures 1 and 2**) and the exercises were performed twice a day. The patient was told about his condition and advised to buy orthopedic insoles. The control examinations were done after 5, 10 and 15 therapy sessions. The recovery was monitored by visual analogue scale (VAS) ranging from 0 to 100 mm (0-without pain; 100-unbearable pain), the pain in lower legs was measured when being passive and active, on palpation, during walking on toes (**Table 1**). The 5-point Likert scale was applied to obtain the patient's subjective assessment of his recovery and he was asked whether he was capable to resume his sports activities (**Table 2**).

The hamstrings flexibility was measured by the passive extension of knee (knee flexion was measured by goniometer when the patient was lying on his back with hip flexion of 90 degrees); the muscle strength of plantar flexion muscles was measured by manual muscle test (grade 4 when the patient did the plantar flexion on one foot once or twice and grade 5 when he did the plantar flexion on one

foot five times), talocrural range of motion was measured by goniometer (degrees) before and after therapy. After one week, a significant alleviation of pain in lower legs was noticed and after three weeks of continual rehabilitation, the symptoms and signs of MTSS disappeared. The complete functional recovery of patient was achieved and he resumed his work and sport activities. No recurring discomforts were reported on the control examination a month later, and the clinical findings of the lower legs were normal.

Discussion

In differential diagnosis, a lower leg pain includes different clinical conditions. Some of them are rather serious and require an urgent surgery, such as ACS, which is characterized by the pain lasting through and after an activity and getting worse by contractions and passive affected muscle stretching and the sensory and motor neurological deficit is a late sign of nerve and muscle ischemia [6]. Stress fracture of tibia causes lower leg pain in sports involving running, and 90 % of patients report pain in medial –posterior part of tibia [21]. In ACS, the clearly localized and sharp pain is felt on palpation, whereas in MTSS the pain is poorly localized and bilateral [13]. In addition, a nocturnal pain and pain on percussion are not characteri-

Table 2. Subjective assessment of recovery
Tabela 2. Subjektivna procena oporavka

Capability to resume sport activities <i>Sposobnost da se vrati sportu</i>	Yes, completely <i>Da, potpuno</i>	Yes, but not completely <i>Da, ali ne potpuno</i>	Yes and no <i>Da i ne</i>	No <i>Ne</i>	No at all <i>Ne, uopšte</i>
5 therapies/ <i>5 terapija</i>				+	
10 therapies/ <i>10 terapija</i>			+		
15 therapies/ <i>15 terapija</i>	+				

stic of MTSS. In MTSS and stress fracture, passive and active talocrural ranges of motion are usually without pain, contrary to the symptomatology of ACS with very painful ranges of motion.

Other clinical conditions include chronic compartment syndrome, tendinitis, muscle distension and/or tear, occlusion of popliteal artery and radiculopathy [21].

In the case report presented hereby, the young man had clinically clear and advanced symptoms of MTSS caused by plantar flexion muscle overuse, and the risk factors included mechanical imbalances of feet-collapse of longitudinal medial arch and over-pronation, which are very well documented in literature, and decreased hamstrings flexibility.

In relation to risk factors of MTSS, investigations show the level of evidence 1 for foot over-pronation and level of evidence 2 for tight calf muscles and higher BMI [21]. A prospective study performed by Plisky et al. has shown that BMI over 20 kg/m² presents a risk for MTSS in elite runners [22]. BMI of our patient was within normal ranges, but close to the mentioned value that might be in correlation with results of the previous study [22]. In this case, playing football indoors on parquet certainly presents extrinsic risk factors for MTSS. The plain radiography of lower legs was normal. Majority of authors reported normal radiography in MTSS [23, 24], but a small percentage of patients had the signs of periosteal reaction [25]. According to these examinations, MTSS is the first clinical diagnosis and magnetic resonance imaging (MRI) and scintigraphy, both having the same sensitivity, are required to solve any dilemmas, if present [25]. An interesting finding was obtained by the authors in the same study, i.e. a great number of abnormal scintigraphies and MRI were found in the asymptomatic control group [25].

A young patient with MTSS is functionally disabled to a great extent in sport activities involving running due to pain, and later, in everyday activities such as walking when the symptoms advance, as it was the case in our patient. The failure to manage MTSS adequately may result in complications such as stress as well as acute, "real" fractures in this region, which would prolong the treatment and abstinence from sport activities [8].

Treatment of MTSS can be difficult and its main goals are alleviation of pain, treatment of the underlying pathophysiological substrate and identification of risk factors in order to eliminate them.

Literature and clinical practice mention and recommend the following treatment methods: stretching of calf muscles, wearing orthopedic insoles to reduce over-pronation [26], massage, electrotherapy [27], acupuncture [28]; however, no clear recommendations are given. Recent research has shown that extracorporeal shock wave therapy (ECSWT) is efficient in treatment of MTSS with promising results [29]. Stretching and strengthening of specific muscles are crucial in correction of muscle imbalances. In addition, education and reduced training schedule are very important in treatment.

Our patient was treated by analgesic and anti-inflammatory procedures of physical therapy and he also started to wear orthopedic insoles to reduce over-pronation. Having received therapy for a week, he reported the reduced pain, so he started with exercises. Three weeks later, he could run without pain and he resumed his sport and work activities.

The complete functional recovery before resuming sport activities is essential in order to prevent recurring discomforts, which may happen if biomechanical imbalances and some training mistakes are not corrected [11].

This paper has some shortcomings that must be considered. Firstly, a great number of different therapy procedures are used in treatment of MTSS [21, 26–30], but there is no precise decision and recommendation in relation to efficacy and advantage of any treatment [30]. In addition, due to differences in definitions and terminology of this syndrome among different authors it is difficult to interpret the results of investigations [21]. Secondly, a single case report cannot suggest a recommendation regarding treatment for the whole population. The main purpose of this case report was to present MTSS as a clinical diagnosis, evaluate possible dilemmas in diagnostic tests and show the efficacy of rehabilitation treatment.

Conclusion

The results of this case report underline the importance of rehabilitation in patients with medial tibial stress syndrome. An accurate and precise diagnosis of lower leg pain provides a more specific rehabilitation and faster recovery. Due to the possibility of recurring discomforts, monitoring and complete functional recovery of patient as well as the elimination of risk factors are crucial before resuming sport activities.

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