

Original Article

Frequency of Unilateral Versus Bilateral Medial Tibial Stress Syndrome in Novice Footballers

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ABSTRACT

Background: Medial tibial stress syndrome (MTSS) is a common overuse injury characterized by pain along the distal two-thirds of the medial tibial border. It predominantly affects athletes engaged in weight-bearing activities, including football players. Despite its prevalence, there is limited research focusing on MTSS specifically within the context of football, particularly in relation to unilateral versus bilateral occurrences and the implications of limb dominance.

Objective: The study aimed to measure the frequency of unilateral versus bilateral MTSS in footballers and to provide insights into the relationship between MTSS and limb dominance.

Methods: This comparative cross-sectional study was conducted over six months from July 2021 to December 2021 across various football clubs in Lahore, Pakistan. Ethical approval was obtained from the Lahore College of Physical Therapy, and permissions were secured from club administrations. The sample comprised 140 recreational footballers aged 20-29 years, selected using non-probability convenience sampling. Participants were diagnosed using the MTSS criteria established by Marinus Winters in 2017, which included history taking and physical examination. Data collection involved a detailed questionnaire covering demographics, medical history, and sporting history. The study excluded individuals with previous surgical history, systemic diseases, or tumors. Data analysis was performed using SPSS version 25, employing descriptive and inferential statistics to examine relationships between variables.

Results: The mean age of participants was 21.3 years (SD = 2.97), with a mean weight of 62.2 kg (SD = 8.1) and mean height of 5.5 feet (SD = 0.39). The sample included 97 males (69.3%) and 43 females (30.7%). MTSS was reported unilaterally in 82.2% of participants, with 67.9% (n = 95) experiencing symptoms in the right leg and 14.3% (n = 20) in the left leg. Bilateral MTSS was observed in 17.9% (n = 25) of participants.

Conclusion: The majority of athletes reported unilateral MTSS, with the right leg being more commonly affected than the left. These findings suggest the need for comprehensive bilateral assessment in the diagnosis and treatment of MTSS in footballers to optimize performance and prevent recurrence.

Keywords: Medial tibial stress syndrome, MTSS, football injuries, unilateral MTSS, bilateral MTSS.

INTRODUCTION

Medial tibial stress syndrome (MTSS) is described as exercise-induced pain along the posteromedial distal two-thirds of the tibia, occurring during or after activity and diagnosable by palpation of the affected area along a length of less than 5 cm (1). Distinct from compartment syndrome, stress fractures, and other neuropathies affecting the lower leg (2), MTSS is a prevalent overuse condition impacting both novice and experienced athletes, particularly those involved in weight-bearing activities (3). The incidence of MTSS ranges between 13.6% and 20% in athletes and 4% to 35% in military personnel, significantly limiting participation in sports and recreational activities. This condition has a high recurrence rate and is notoriously challenging to treat, underscoring the importance of prevention (2). Gender differences have been observed, with female recruits being more susceptible to MTSS than their male counterparts (53% vs. 28%) (2). In a 2002 review, Couture and Karlson concluded that MTSS accounts for 60% of lower leg injuries

among runners, with a prevalence of 13.6% to 20% among this population (4, 5). Lower leg injuries are also common among contact sports athletes, such as football players (6).

The lower limb is subjected to significant biomechanical stresses during athletic activities, making it particularly prone to injuries, especially in contact sports. Despite the well-documented characteristics of MTSS, its etiology remains debated. Two predominant pathophysiological theories exist: the tibial fascia-traction theory (TFTT), which posits that excessive traction forces exerted by muscles on the tibia and its periosteum are responsible (7), and the bone stress reaction theory (BSRT), which suggests that inadequate bone remodeling in response to repetitive stress leads to MTSS (8). Lower leg muscles are critical in controlling foot flexibility and rigidity during foot rollover, essential for absorbing forces and protecting the bones of the lower limb from excessive shock during weight-bearing activities (9). Foot pronation, a known risk factor for MTSS, causes a medial shift of the center of pressure under the foot during the stance phase of running, potentially increasing the activity of the tibialis anterior (TA) and soleus (SO) muscles to mitigate excessive pronation (10, 11, 12).

Research continues to identify intrinsic and extrinsic risk factors associated with the development of MTSS. Intrinsic factors include higher pelvic tilt in the frontal plane, peak internal rotation of the hip, navicular drop, and foot pronation. Extrinsic factors encompass training errors, inappropriate shoe designs, sudden increases in training volume and intensity, and rough running surfaces (13). In a 2017 cross-sectional study, Winters et al. aimed to assess the reliability and validity of history and physical examination for diagnosing MTSS. He concluded that MTSS could be reliably diagnosed based on clinical history and physical examination in both clinical and research settings. His study showed high inter-rater reliability, with a prevalence of 74%, a percentage of agreement of 96%, positive predictive value of 97%, negative predictive value of 92%, a prevalence bias of 0.48, a bias index of -0.04, and a kappa value of 0.89 (14).

Naderi et al. found that high soleus activity, but not tibialis anterior activity, during the propulsion phase of running is a contributing risk factor for MTSS. Participants with MTSS tended to have a greater body mass, higher dynamic foot pronation, a history of MTSS, and lower previous vigorous physical activity levels. A model incorporating BMI, peak EMG amplitude, previous history of MTSS, dynamic alignment index (DAI), and physical activity demonstrated an 88.6% accuracy in classifying participants who eventually developed MTSS (15).

Our study focuses on measuring the frequency of unilateral versus bilateral MTSS in footballers, as lower leg injuries are more prevalent in contact sports. Dominant limb kicking, which produces higher ball velocity and is used more frequently than the non-dominant leg, may contribute to these injuries. Leg dominance, defined as the preferred kicking limb, plays a crucial role in football competition (16). Haglung et al. observed an increased rate of muscle strains in the kicking leg (17), while Serner et al. reported a higher incidence of dominant limb adductor injuries, with kicking being a frequent mechanism (18). Future investigations into football-related injuries should consider limb dominance using consistent methods for assigning and tracking dominant versus non-dominant limb use (19). Understanding the impact of limb dominance on injury rates in soccer players may illuminate injury mechanisms and risk factors, as highlighted in a systematic review examining the relationship between leg dominance and injury prevalence in soccer players.

MATERIAL AND METHODS

The study employed a comparative cross-sectional design, conducted in various football clubs in Lahore, Pakistan, over a six-month period from July 2021 to December 2021. Ethical approval was granted by the Lahore College of Physical Therapy, Lahore, Pakistan, and permissions to recruit athletes were obtained from the respective club administrations. The sample size was calculated using the census method, and a non-probability convenience sampling technique was adopted for participant selection.

The MTSS diagnosis criteria proposed by Marimus Winters in 2017 were employed to diagnose athletes. These criteria involved two main components: history taking and physical examination. During history taking, the presence of exercise-induced pain along the distal two-thirds of the medial tibial border, pain provoked during or after physical activity and alleviated with relative rest were assessed. Physical examination included recognizing pain along the posteromedial tibial border greater than 5 cm.

Participants aged 20-29 years who were recreational footballers were included in the study. Exclusion criteria comprised a previous surgical history, any systemic disease, or tumor. Participants were asked to fill out a data form that collected information regarding age, gender, weight, height, BMI, side involved, medical history, and sporting history, including the number of games played in a week, training sessions, and position in the game field. Informed consent was obtained from all athletes prior to their inclusion in the study. Anonymity and confidentiality of participants were preserved by not revealing their names or identities during data collection, analysis, and reporting of study findings. Data were collected from several football clubs, including LUMS Football Club, LMDC Football Club, Fame Football Club, and Model Town Football Club.

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize the data, and inferential statistics were employed to assess the relationships between variables. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring that all procedures involving human participants were conducted ethically and responsibly (Declaration of Helsinki). Overall, this study aimed to measure the frequency of unilateral versus bilateral medial tibial stress syndrome in footballers, considering the prevalence of lower leg injuries in contact sports. The findings are intended to contribute to the understanding of injury mechanisms and risk factors associated with MTSS, potentially guiding future preventive and therapeutic strategies.

RESULTS

Table 1: Descriptive Statistics of Participants

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Age (years)	140	18	29	21.3	2.97
Weight (kg)	140	50	77	62.2	8.1
Height (feet/inches)	140	5	6.2	5.5	0.39

Table 2: Frequency Distribution of Gender

Gender	Frequency	Percent
Male	97	69.3%
Female	43	30.7%
Total	140	100%

Table 3: Frequency of Unilateral vs. Bilateral MTSS

MTSS Location	Frequency	Percent
MTSS in right leg	95	67.9%
MTSS in left leg	20	14.3%
MTSS in both legs	25	17.9%
Total	140	100%

The study's results reveal detailed insights into the demographic and clinical characteristics of the participants. The mean age of the 140 participants was 21.3 years, with an age range from 18 to 29 years and a standard deviation of 2.97 (Table 1). This age distribution indicates that the study predominantly involved young adults, a demographic commonly engaged in athletic activities. Regarding gender distribution, the majority of participants were male, comprising 69.3% (n=97) of the sample, while females accounted for 30.7% (n=43). This significant gender disparity aligns with the general trend of higher male participation in recreational football activities (Table 2).

Weight and height statistics further characterized the sample. The mean weight of the participants was 62.2 kg, with values ranging from 50 kg to 77 kg and a standard deviation of 8.1, reflecting a relatively homogenous group in terms of body mass (Table 1). Height measurements ranged from 5 feet to 6.2 feet, with a mean height of 5.5 feet and a standard deviation of 0.39, indicating minimal variation in stature among the participants (Table 1).

The frequency distribution of medial tibial stress syndrome (MTSS) showed a notable pattern. MTSS was predominantly unilateral, with 67.9% (n=95) of participants experiencing symptoms in the right leg, compared to 14.3% (n=20) in the left leg. Bilateral MTSS was reported by 17.9% (n=25) of the participants (Table 3). This distribution suggests a higher propensity for MTSS to affect the dominant leg, which is often subjected to greater stress during athletic activities. The detailed demographic and clinical data underscore the relevance of considering both intrinsic and extrinsic factors in the management and prevention of MTSS. The predominant occurrence of MTSS in the right leg among football players highlights the need for targeted preventive strategies focusing on limb dominance and specific training regimens. These results contribute valuable information for developing comprehensive approaches to mitigate the risk of MTSS in young, active populations.

DISCUSSION

The findings of this study contribute to the understanding and diagnosis of medial tibial stress syndrome (MTSS) in athletes, particularly novice footballers. In 2017, Winters et al. conducted a cross-sectional study to evaluate the reliability and validity of history and physical examination for diagnosing MTSS. Their study underscored the importance of clinical assessment, demonstrating high inter-rater reliability with a prevalence of 74%, a percentage of agreement of 96%, positive predictive value of

97%, and negative predictive value of 92%, with a kappa value of 0.89 (Winters et al., 2017). Utilizing the diagnostic criteria established by Marinus Winters, our study similarly found that MTSS could be reliably diagnosed through history and physical examination.

A 2015 study by Winters et al. aimed to validate items for patient-reported MTSS scores, including participants from diverse sports categories such as military personnel, runners, and hockey players. Previous studies often featured heterogeneous populations, lacking specificity in sports categories. In contrast, our study focused exclusively on novice footballers, thereby providing more specific and relevant data for this population. This specificity enhances the applicability of our findings to footballers, highlighting the unique demands and injury risks associated with this sport.

Various studies have explored management protocols for MTSS, including extracorporeal shock wave therapy, foot orthoses, neuromuscular training, and myokines therapy. Winters et al. (2017) suggested that the most effective treatment for MTSS involves the gradual progression of training programs, proper training techniques, and biomechanical assessment. Our study aimed to identify the frequency of unilateral versus bilateral MTSS among footballers to inform better assessment and treatment regimens. The results indicated a higher prevalence of unilateral MTSS, particularly in the right leg, suggesting that both legs should be thoroughly assessed to optimize treatment outcomes.

The strengths of our study include its focus on a specific athletic population and the use of validated diagnostic criteria, which enhance the reliability and relevance of the findings. However, limitations exist, such as the non-probability convenience sampling technique and the potential for selection bias. Additionally, the study's cross-sectional design precludes causal inferences, and the relatively small sample size may limit the generalizability of the results.

Future research should consider longitudinal designs to explore the causative factors and long-term outcomes of MTSS in footballers. Furthermore, studies should investigate the effectiveness of different treatment protocols tailored to the specific needs of football players, incorporating both preventive and therapeutic strategies. Understanding the role of limb dominance in MTSS development and recurrence could also provide valuable insights for targeted interventions.

CONCLUSION

In conclusion, the majority of athletes in this study reported unilateral MTSS, with the right side being more commonly affected than the left. These findings emphasize the need for comprehensive bilateral assessment in developing effective treatment regimens for footballers with MTSS, aiming to enhance performance and prevent recurrence.

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