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Case Study: Strengthening of Tibialis Anterior in Medial Tibial Stress Syndrome

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Abstract:
Background: Medial Tibial Stress Syndrome (MTSS) is a common overuse condition of the lower limb associated with repetitive tibial loading, muscular fatigue, and pain along the tibial border. Tibialis anterior strengthening may improve dorsiflexor control and reduce symptoms during impact activities.
Objective: To describe the effect of a structured tibialis anterior strengthening programme on pain, dorsiflexor strength, ankle dorsiflexion range of motion, and Zumba-related functional ability in a young female with MTSS.
Case Presentation: A 22-year-old female student presented with left anterior and medial lower-leg pain that increased during Zumba, particularly during jumping and lateral shifting. Symptoms began insidiously after increasing exercise intensity and progressed to pain during walking. Examination revealed tenderness along the medial tibia, mild swelling, reduced ankle dorsiflexion range, dorsiflexor weakness, and pain intensity of 7/10 on the Visual Analogue Scale (VAS).
Physiotherapy Management: The patient received a 4-week tibialis anterior focused programme, 5 sessions per week, including seated tibialis raises, isometric dorsiflexion holds, resisted dorsiflexion with a resistance band/TheraBand, kettlebell toe raises, and front-foot raise walking. Exercise dose was progressed from pain-free activation to resisted and functional dorsiflexion work with monitoring of pain, swelling, and technique.
Results: After 4 weeks, pain reduced from 7/10 to 2/10 on VAS, FAAM-Sports score improved from 6/32 (18.75%) to 19/32 (59.38%), dorsiflexor MMT improved from 3/5 to 4+/5, and ankle dorsiflexion range increased from 8 degrees to 14 degrees.
Conclusion: Tibialis anterior strengthening was associated with reduced pain and improved functional tolerance in this MTSS case. The findings support the inclusion of targeted dorsiflexor strengthening as part of conservative MTSS rehabilitation, while recognising that broader management of calf flexibility, training load, footwear, and biomechanics may be needed for full recovery.
Keywords: Medial Tibial Stress Syndrome; Tibialis Anterior Strengthening; Physiotherapy Management; Visual Analogue Scale; Foot and Ankle Ability Measure; Zumba

BACKGROUND:

A shin injury caused by repetitive stress or overuse is known as Medial Tibial Stress

Syndrome **(MTSS)**. When the body is unable to repair effectively in response to repeated muscular contractions and tibial tension, various stress reactions in the tibia and surrounding musculature take place.

Pathophysiology - It is thought that the underlying periostitis of the tibia caused by tibial strain when under load is the primary cause of MTSS. However, recent research suggests that a variety of tibial stress injuries, such as tendinopathy, periostitis, periosteal remodelling, and tibial stress reaction, are likely involved in MTSS. Commonly involved muscles are the soleus, tibialis anterior, and tibialis posterior. The aberrant strain and bending of the tibia brought on by chronic, repetitive loads appear to be the root of these diverse tibial stress injuries.

MTSS typically manifests as vague, diffuse pain along the middle-distal tibia of the lower extremities that worsens with effort. The discomfort can be mild or acute and excruciating. In the early stages of MTSS, discomfort is worse at the start of exercise and gradually decreases throughout training and minutes after exercise stops. However, when the damage worsens, pain may appear while at rest or with less exercise.

The management of MTSS is usually conservative. Conservative treatment for medial tibial stress syndrome emphasises rest and activity adjustment with less frequent, load-bearing exercise. The length of rest needed for symptom relief is unspecified and probably varies from person to person. Iontophoresis, phonophoresis, ice massage, ultrasound therapy, periosteal pecking, strengthening and extracorporeal shockwave therapy are some treatments that have shown promise with scant data. Low- energy laser therapy, stretching, lower leg braces, and compression stockings are some of the treatments that haven't helped. Prefabricated orthotics decreased MTSS, according to a recent study on naval recruits. Improved calcium and vitamin D status, gait retraining, and stubborn instances with a restricted or slow response to rest and activity moderation may speed recovery.

This case report showed the strengthening of the Tibialis Anterior muscle strategies utilized in the evaluation and management of MTSS. It is more commonly seen in younger groups and is not gender biased. The patient in this case study is a 22-year-old female student who started Zumba in January 2026 to lose weight and get fit. The strengthening of the Tibialis Anterior muscle is a useful adjunct in managing MTSS, reducing pain and improving function.

CASE PRESENTATION:

The patient was assessed on January 20th, 2026. She was a 22-year-old female student, named Smriti Vaishnavi, with a height of 4 feet 11 inches and body weight of 62 kg. Her chief complaint was pain in the front and medial aspect of the left lower leg while performing Zumba, especially during jumping, landing, and lateral shifting movements. The pain had started approximately one week before assessment after she began regular Zumba sessions in January 2026 for weight reduction and general fitness. She was attending five Zumba sessions per week, and with increasing class intensity the pain gradually became more severe. Initially the pain was present mainly during exercise, but by

the time of assessment she had also started experiencing discomfort while walking.

The clinical history suggested an insidious onset overuse injury aggravated by repetitive impact loading. On examination, the patient reported dull aching pain and acute discomfort over the distal medial tibial region. Pain intensity was 7/10 on the Visual Analogue Scale during activity and was described as intolerable during Zumba. Symptoms reduced with rest and icing. Palpation revealed tenderness along the medial tibial border with mild swelling. Active ankle dorsiflexion range of motion was reduced, and dorsiflexor muscle strength was decreased. Pain was reproduced with physical activity, particularly during jumping and lateral movement, indicating functional limitation consistent with Medial Tibial Stress Syndrome.

Uniqueness of Case Study:

This case study focuses on TA strengthening the impact on the MTSS. The patient's symptoms improved significantly with the strengthening of the tibialis anterior muscle, allowing her to return to Zumba.

Physiotherapy Management:

The physiotherapy programme was planned as a 4-week tibialis anterior focused rehabilitation protocol with 5 supervised or guided sessions per week. Each session lasted approximately 35-45 minutes, including a short warm-up, the strengthening component, rest periods between sets, and post-session symptom monitoring. The patient was advised to temporarily avoid high-impact Zumba movements such as full-height jumping, repeated landing, rapid lateral shuffling, and painful plyometric tracks until symptoms reduced. Exercises were performed within a tolerable pain limit of 0-3/10 on VAS, and any increase in sharp pain, swelling, limping, night pain, or pain persisting beyond the session required reduction of intensity or referral for further evaluation.

1. Seated tibialis raises / sitting toe raises: The patient sat on a chair with hips and knees flexed to approximately 90 degrees, feet flat on the floor, and heels maintained in contact with the ground. She lifted the forefoot and toes upward into ankle dorsiflexion, held the end position for 3-5 seconds, and slowly lowered the forefoot to the floor. The initial dosage was 3 sets of 10 repetitions, progressed to 3 sets of 15-20 repetitions as pain allowed. The technique emphasised slow controlled movement, avoidance of toe curling, and prevention of compensatory hip or knee movement.
2. Isometric tibialis anterior holds against the wall: The patient stood with her back supported against a wall, heels placed approximately 10-15 cm away from the wall, and knees slightly flexed. She dorsiflexed both ankles by lifting the toes and forefoot from the floor while keeping the heels down. The contraction was held for 5-10 seconds, followed by 10-15 seconds of rest. Dosage was 10 repetitions per set for 3 sets. This exercise was used in the early phase to initiate pain-free activation and improve endurance of the tibialis anterior without excessive repetitive loading.
3. Dorsiflexion with resistance band in long sitting: The patient was positioned in long sitting with the knee extended and a resistance band looped around the forefoot and anchored securely in front of the foot. She pulled the foot upward toward the body against resistance, held the end range for 2-3 seconds, and returned slowly to the starting

position. The dosage was 3 sets of 12-15 repetitions. Progression was achieved by increasing band resistance, increasing hold time, or adding one extra set when the patient completed the exercise without pain or fatigue-related compensation.

4. Theraband dorsiflexion holds in standing: The patient stood with support available nearby for balance and the Theraband anchored around the forefoot. She performed active dorsiflexion against the band and maintained the position for 5 seconds before slowly relaxing. The dosage was 3 sets of 10 repetitions. This exercise was progressed from bilateral support to reduced hand support to improve functional control while maintaining correct lower-limb alignment.
5. Kettlebell toe raises / loaded dorsiflexion: A light external load was applied over the forefoot only after pain-free active dorsiflexion was achieved. The patient performed controlled toe raises with the heel grounded and the forefoot lifting against the light load. Dosage began with 2 sets of 8-10 repetitions and progressed to 3 sets of 10-12 repetitions. Load was increased gradually and only when the patient maintained proper movement control without increased medial tibial pain.
6. Front-foot raise walking: In the functional phase, the patient walked slowly while maintaining gentle forefoot elevation to encourage tibialis anterior endurance and control during gait. She performed 3 rounds of 10-15 metres with adequate rest between rounds. Progression included increased walking distance, slower eccentric lowering of the forefoot, and controlled return to low-impact Zumba movements. Jumping and cutting drills were reintroduced only after pain reduction, improved dorsiflexion strength, and better landing control.

Progression and precautions: Week 1 focused on pain-free activation, isometric holds, and low- repetition seated movements. Week 2 added resistance-band dorsiflexion and increased repetitions. Week 3 introduced greater resistance and loaded toe raises. Week 4 progressed toward functional dorsiflexion control, front-foot raise walking, and graded return to modified Zumba. Precautions included avoiding sudden training-load increase, maintaining supportive footwear, using proper warm- up and cool-down, monitoring post-session soreness, avoiding exercise during acute swelling, and stopping any activity that caused sharp tibial pain or altered gait.

Short-term Goals:

- Reduce pain
- Initiate pain-free TA activation
- Improve TA strength

Long-term Goals:

- Return to Zumba and other physical activities
- Prevent MTSS recurrence

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Outcome Measures:

- VAS: Visual Analogue Scale for pain
- Foot and Ankle Ability Measure (FAAM) (4-0): Sports Subscale
- Manual Muscle Testing (MMT): For Dorsiflexion
- Ankle range of motion (Dorsiflexion)

RESULTS:

The patient's symptoms improved significantly with the strengthening of the tibialis anterior. Outcome measures showed:

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Visual Analogue Scale:

Pre-treatment	Post-treatment
7/10	2/10

Foot and Ankle Ability Measure (FAAM):

Abilities/Activities	Score Pre-treatment	Reasoning	Score Post-treatment	Reasoning
Running	1	Extreme difficulty due to shin pain on impact	3	Slight difficulty, can run but mild end-range discomfort
Jumping	0	Unable to do plyometric tracks in Zumba	2	Moderate difficulty, avoids full-height jumps but does low-impact jumps
Landing	1	Extreme pain on foot strike	3	Slight difficulty
Starting and stopping quickly	1	Pain with rapid deceleration	3	Much better deceleration control
Cutting/Lateral movement	1	Shuffling while Zumba is reproducing medial tibial pain	2	Moderate difficulty, lateral shuffles are still mildly painful
Ability to perform the activity with your normal technique	1	Modifies all moves, avoids the heel-toe pattern	3	Near-normal, minor compensation on plyometrics
Ability to participate in your desired sport/Zumba as long as you like	1	Stops after 10-15 min, class is 45 min	3	Completes a full 45-min class, slight pain in the last 5 mins
Total	06/32 (18.75%)		19/32 (59.38%)	

Note: According to the Ankle and Foot Ability Measure (FAAM), there is improvement from 18.75% to 59.35%, that is 40.6%. As only the TA strengthening has been done. Tight calves, foot posture, and training errors weren't addressed, so jumping/cutting still scored 2/4. This is actually good for discussion – shows the specific role of TA.

Manual Muscle Testing: (For the Dorsiflexor muscle group)

Pre-treatment	Post-treatment
3/5	4+/5

Ankle Range of Motion: (Dorsiflexion)

Pre-treatment	Post-treatment
8 degrees	14 degrees

DISCUSSION:

The present case showed meaningful improvement in pain, dorsiflexor strength, ankle dorsiflexion range of motion, and sport-related function after a 4-week tibialis anterior strengthening programme. VAS pain reduced from 7/10 to 2/10, while the FAAM-Sports score improved from 18.75% to 59.38%, indicating clinically relevant recovery. Diagnosis was supported by typical MTSS findings such as activity-related tibial pain, medial tibial border tenderness, aggravation during impact activity, and relief with rest, consistent with the clinical approach described by Winters et al.[1]

Improvement may be related to the role of the tibialis anterior in controlling plantarflexion, reducing foot slap, and assisting shock absorption during landing and dance activity. Strength improved from 3/5 to 4+/5 and dorsiflexion range increased from 8° to 14°, which may have enhanced lower-limb control during Zumba movements. This supports literature linking tibialis anterior function with MTSS risk.[4]

The findings agree with conservative management principles, although residual difficulty in jumping and cutting suggests isolated strengthening may not address all contributing factors. Future rehabilitation should include load management, calf flexibility, footwear advice, proximal control, and return-to-sport training. As this is a single case, results should be interpreted cautiously.

Limitations:

- Single-case design limits generalizability
- No imaging to rule out stress fracture or confirm bone involvement
- Only Strengthening of the tibialis anterior muscle
- Short follow-up period; recurrence rate unknown
- No control or comparison with other interventions

CONCLUSION:

A 4-week TA strengthening program reduced pain and improved dance function in Zumba

with MTSS. TAtraining should be considered in MTSS protocols, especially for dance populations. RCTs with larger samples are warranted.

REFERENCE:

1. Winters M, Bakker EWP, Moen MH, et al. (2018). Medial tibial stress syndrome can be diagnosed reliably using history and physical examination. Br J Sports Med, 52(19), 1267-1272.
2. Naderi A, Bagheri S, Ramazanian Ahoor F, et al. (2022). Foot Orthoses Enhance the Effectiveness of Exercise, Shockwave, and Ice Therapy in the Management of Medial Tibial Stress Syndrome. Clin J Sport Med, 32(3), e251-e260.
3. Anderson LM, Bonanno DR, Calnin BJ, et al. (2024). Is the addition of running retraining to best standard care beneficial in runners with medial tibial stress syndrome? J Foot Ankle Res, 17(2), e12029.
4. Madeley LT, et al. (2021). Tibialis anterior muscle activity and MTSS risk. J Sci Med Sport, 24(8), 754-759.
5. Saad MA, Jamal JM, Aldhafiri AT, et al. (2025). Medial Tibial Stress Syndrome: A Scoping Review of Epidemiology, Biomechanics, and Risk Factors. Cureus, 17(3), e81463.