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Sinus Tarsi Syndrome In A Recreational Athlete: The Role Of Proprioceptive Rehabilitation In Conservative Management

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Abstract

Background: Sinus tarsi syndrome (STS) is an uncommon cause of chronic lateral ankle pain and instability, often developing after ankle sprains due to subtalar joint ligament injuries. The resulting subtalar instability leads to synovitis and fibrotic tissue infiltration in the sinus tarsi space. Optimal management is not well established, but conservative therapy is generally first-line. Case Presentation: A 27-year-old male recreational athlete presented with persistent right anterolateral ankle pain for 7 months following a severe inversion injury. He reported deep ankle pain (VAS 7/10) aggravated by weight-bearing and uneven ground, with a sensation of hindfoot instability and "giving way." Physical exam showed tenderness over the sinus tarsi (lateral opening of the subtalar joint) and pain at end-range inversion and plantarflexion. Notably, he had bilateral pes planus (flat arches), which can increase subtalar stress. The talar tilt (inversion stress) test was positive, suggesting lateral ankle ligament laxity. Investigations: Blood tests (including rheumatoid factor and uric acid) were normal, reducing suspicion of inflammatory arthritis or gout. Ankle radiographs were unremarkable. Magnetic resonance imaging (MRI) of the ankle revealed fluid and oedema in the sinus tarsi with T2 hyperintense signal replacing the normal fat, and injuries to the interosseous talocalcaneal and cervical ligaments – findings characteristic of sinus tarsi syndrome. These imaging results confirmed the clinical diagnosis. A diagnostic sinus tarsi injection was considered but not performed (the patient declined this procedure), so we proceeded directly with conservative management. Intervention: The patient underwent a 6-week conservative rehabilitation program. Initial measures included rest from aggravating activities, oral nonsteroidal anti-inflammatory drugs (NSAIDs) for pain relief, and footwear modification (arch-support insoles to correct pes planus). A structured physiotherapy regimen was implemented focusing on proprioceptive and balance training, ankle strengthening exercises, and range-of-motion maintenance. Balance exercises (e.g. single-leg stands on unstable surfaces, wobble board training) were emphasized to improve subtalar joint proprioception and postural control. Theraband resistive exercises targeting the peroneal and tibialis muscles were used to enhance dynamic support of the subtalar joint. Kinesiology taping was applied around the ankle (including a subtalar sling taping technique) to provide external support and feedback during activities. These interventions align with recommended conservative treatments for STS, which include balance/proprioceptive training, muscle strengthening, bracing or taping, and foot orthoses. The goal was to restore neuromuscular control and compensate for the loss of ligamentous stability. Outcomes: By the end of the rehabilitation program, the patient's symptoms had improved substantially. Ankle pain decreased to VAS 1–2/10 with only occasional mild twinges on uneven ground. Instability feelings resolved; he could jog and cut laterally without the previous "giving way." On examination, sinus tarsi tenderness markedly diminished and the subtalar range was pain free. He returned to recreational sports (cricket) at 3 months post-injury with an ankle brace for additional support. At 6-month follow-up, he remained asymptomatic in daily activities and sports, with no recurrence of instability. This functional recovery without invasive intervention highlights the effectiveness of the conservative, proprioception-focused management. Conclusion: This case demonstrates that sinus tarsi syndrome in an athlete can be successfully managed with non-operative treatment centred on proprioceptive and strengthening rehabilitation. Restoration of subtalar stability through targeted neuromuscular training addressed the underlying ligamentous injury and instability, leading to resolution of chronic pain. Proprioceptive rehabilitation may be a critical component in conservative management of STS, potentially obviating the need for injections or surgery in similar cases. Sports medicine clinicians should maintain a high index of suspicion for STS in patients with chronic ankle pain post-sprain and consider comprehensive rehabilitation to target subtalar joint instability.

INTRODUCTION

Sinus tarsi syndrome (STS) is a painful clinical condition of the hindfoot characterized by chronic anterolateral ankle pain and a feeling of instability, typically following a traumatic ankle injury (1). Initially described by O'Connor in 1958 as a distinct entity, STS remained poorly understood for decades (2). Recent insights clarify that STS is primarily caused by instability of the subtalar joint due to ligamentous injuries (often the interosseous talocalcaneal and cervical ligaments) incurred during ankle sprains. The excessive subtalar motion leads to synovitis of the subtalar joint and infiltration of fibrotic tissue into the sinus tarsi space, which in turn produce the characteristic deep lateral ankle pain (1). The true incidence of STS is unknown, but it is frequently associated with lateral ankle sprains and chronic ankle instability. It has been estimated that up to 10–25% of patients with chronic lateral ankle instability also have subtalar joint instability (i.e. sinus tarsi syndrome) (3). Patients with STS often report pain localized to the sinus tarsi (just anteroinferior to the lateral malleolus) and a sensation of hindfoot instability or "giving way," especially when walking on uneven ground or during sudden changes in direction (1). On examination, there is tenderness on deep palpation of the sinus tarsi, and pain is often elicited at the end range of passive ankle plantarflexion with foot supination (4). Subtalar instability may not always be obvious on routine exams, but special tests can help; for example, a positive talar tilt/inversion stress test or subtalar medial lateral glide test suggests laxity in the subtalar ligaments. Notably, individuals with predisposing anatomical factors such as pes planus (flat feet) may develop STS even without a discrete trauma, due to chronic impingement in the sinus tarsi from excessive pronation. The diagnosis of sinus tarsi syndrome is largely clinical but can be supported by specific investigations. Plain radiographs are usually normal or may show only nonspecific findings. A useful diagnostic manoeuvre is an injection of local anaesthetic into the sinus tarsi – relief of pain after injection is considered confirmatory for STS (1). In this patient, a sinus tarsi injection was not performed; however, imaging provided clear evidence. Magnetic resonance imaging (MRI) is the preferred imaging modality for STS, as it visualizes the soft tissue structures of the sinus tarsi and subtalar joint with high resolution (5). Typical MRI findings include fluid or scar tissue filling the sinus tarsi space and oedema within, indicating replacement of the normal adipose tissue by inflammatory/fibrotic material. MRI often also shows partial tears or attenuation of the interosseous and cervical ligaments, and can reveal any subtalar arthritic changes (5). In our case, the MRI findings of sinus tarsi fluid and ligamentous injury corroborated the STS diagnosis (6). Management of sinus tarsi syndrome can be challenging due to the complex nature of subtalar instability. Conservative treatment is generally the first-line approach and can lead to symptom resolution in many cases (4). Standard non-operative management includes rest and activity modification, anti-inflammatory medications, stabilization of the rearfoot (through bracing or orthotics), and targeted physiotherapy (1). The physiotherapy component is crucial: rehabilitation focuses on improving balance and proprioception, strengthening the supporting musculature (especially the peroneal, tibial, and calf muscles), and restoring normal neuromuscular control of the ankle and foot (4). These measures address the functional instability that characterizes STS. Notably, while there are no randomized controlled trials specifically for STS rehabilitation, numerous studies on chronic lateral ankle instability (a related condition) have demonstrated that balance and proprioceptive training can significantly improve joint stability, sensorimotor function, and reduce recurrence of instability (4). In refractory cases of STS, interventional options such as corticosteroid injections into the sinus tarsi to reduce synovitis or surgical management may be considered.

Subtalar arthroscopy can be performed to debride inflamed synovial tissue and fibrotic scar from the sinus tarsi, which can alleviate pain and instability by essentially "denervating" the sinus tarsi region (2). In severe or persistent cases with gross subtalar instability, surgical stabilization or subtalar arthrodesis is a last resort . Fortunately, the majority of patients improve without needing surgery: in a large series of 273 STS patients, only 89 (32%) ultimately required surgical intervention after failing conservative therapy. This report presents a case of sinus tarsi syndrome in a recreational athlete managed successfully with an individualized conservative program, highlighting the pivotal role of proprioceptive rehabilitation. The case underlines important diagnostic considerations and demonstrates that a nonoperative approach can restore function in STS, thereby providing a useful reference for sports medicine practitioners.

CASE PRESENTATION

Patient History: A 27-year-old male recreational cricket athlete presented to our sports medicine clinic with chronic right ankle pain and instability. Seven months prior, he sustained a significant ankle injury when he

landed awkwardly after a jump during a basketball game, forcing his foot into inversion. He recalled immediate pain and swelling on the lateral aspect of the ankle and was initially unable to bear weight. Though radiographs at that time showed no fracture, he was diagnosed with a severe lateral ankle sprain and managed with Protection, Optimal Loading, Ice, Compression, and Elevation (POLICE) (7), and a short period of immobilization in a brace. The acute swelling and bruising gradually resolved over a few weeks, but the patient noted that deep ankle pain persisted. Over the ensuing months, he experienced continuous anterolateral ankle pain rated about 7/10 on the visual analogue scale (VAS). The pain was exacerbated by weight-bearing, especially on uneven surfaces or during sports that required cutting or pivoting movements. He described a sensation of the ankle "giving way" or feeling unstable, particularly when walking on rocky ground or ascending stairs. The pain would lessen with rest and activity avoidance, but never fully resolved. He denied any significant pain radiation beyond the lateral hindfoot. There were no mechanical locking or clicking symptoms in the ankle. He had no history of inflammatory joint disease, gout, or other foot problems prior to this injury. The patient's medical history was unremarkable, and he was otherwise healthy with no chronic illnesses. He had tried over-the counter NSAIDs and an ankle brace on his own, which provided only partial, temporary relief, prompting him to seek further evaluation. **Examination:** On presentation to our clinic, the patient was a healthy young man with normal gait on level ground, though he expressed apprehension with single-leg stance on the affected side. Inspection of the right ankle showed no visible swelling, deformity, or skin changes. Interestingly, he was noted to have bilateral pes planus (flatfoot posture) on standing, with collapsed medial longitudinal arches Figure $_1$. Pes planus can predispose individuals to subtalar joint irritation by increasing pronation and compression in the sinus tarsi. There was no tenderness at the lateral malleolus or distal fibula, and no peroneal tendon subluxation was evident. Palpation, however, elicited marked tenderness over the sinus tarsi region – specifically just anterior and below the lateral malleolus, in the area of the talocalcaneal sulcus. The tenderness in this region is a hallmark finding in STS. The patient had no tenderness over the anterior talofibular ligament (ATFL) or calcaneofibular ligament (CFL) insertions specifically, and the medial ankle structures were non-tender. Active range of motion of the ankle was full in dorsiflexion and plantarflexion. Subtalar joint motion (inversion and eversion of the hindfoot) was present; however, at the extreme of inversion combined with plantarflexion, the patient reported reproduction of his deep pain, and the end range felt somewhat uncomfortable. Passive motion revealed a similar pain at the end range of foot supination (inversion + plantarflexion), consistent with impingement in the sinus tarsi area. Stability testing of the ankles found no gross laxity of the tibiotalar joint: the anterior drawer test of the ankle was negative.

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Figure 1 Showing Bilateral Pes Planus – Too Many Toes Sign

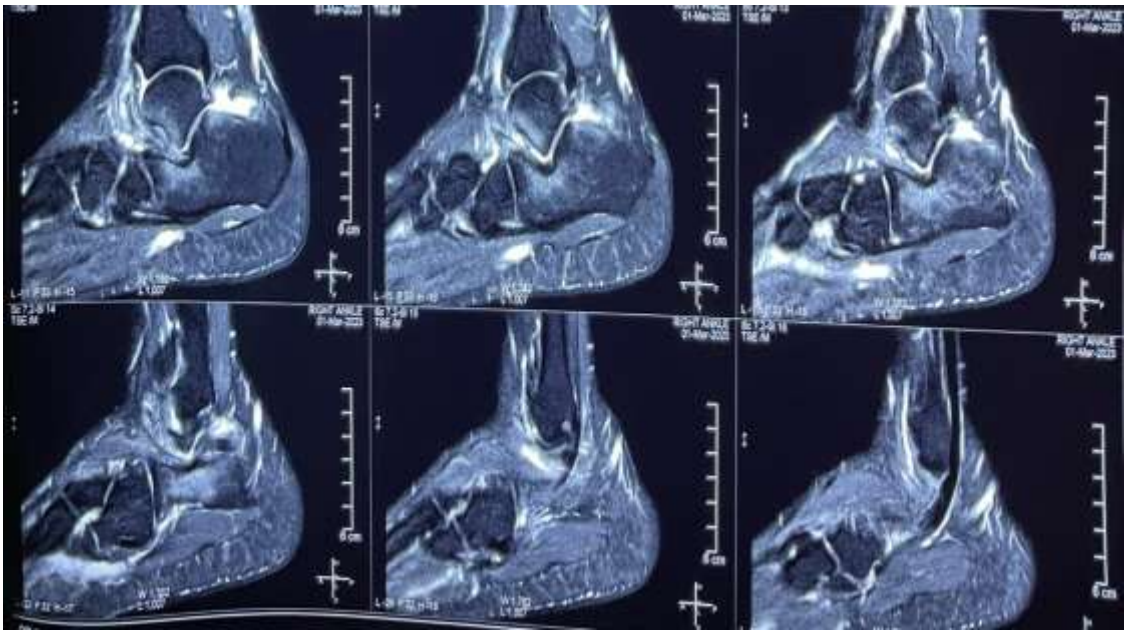

Figure 2

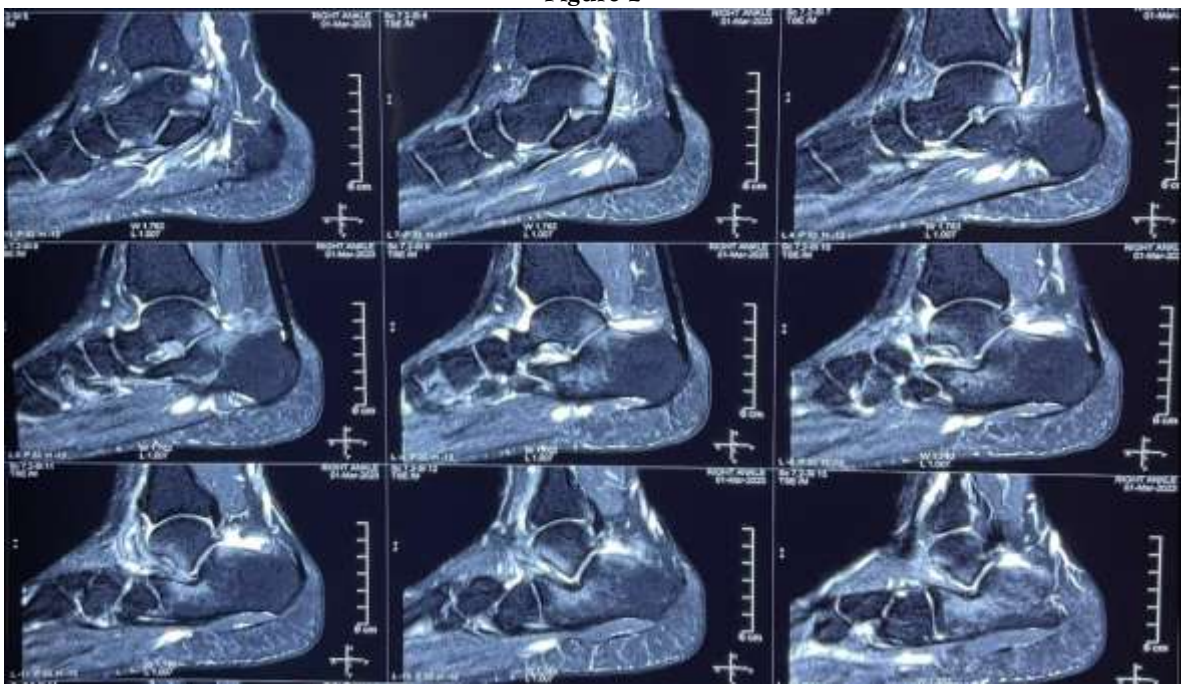

Figure 3 Hyperintensities noted on Fat Suppressed Sagittal View of Right Ankle at Sinus Tarsi region

However, the inversion stress (talar tilt) test was mildly positive on the right side – suggesting some lateral ligamentous laxity. A subtalar joint stability test was performed by grasping the calcaneus and translating it medially/laterally under the talus; this elicited some increased translation on the right side compared to the left, though it was a subtle finding. Additionally, a single-leg balance test was done: the patient could balance on his left (uninjured) leg with eyes closed for 30 seconds without issue, but on the right leg he was notably unsteady and had to open his eyes or tap down within 10 seconds, indicating impaired balance/proprioception in the injured ankle. Neurologic exam of the lower limbs was normal (sensation intact and symmetric, muscle strength 5/5 in all groups including peroneal and tibialis posterior, reflexes normal). There were no signs of complex regional pain (skin was of normal temperature and colour). Overall, the clinical picture (persistent sinus tarsi

pain, instability after an inversion injury, and subtle subtalar laxity) strongly suggested sinus tarsi syndrome, likely related to subtalar joint instability secondary to the prior severe sprain. **Investigations:** To confirm the diagnosis and rule out other pathology, further investigations were undertaken. Laboratory tests including complete blood count, inflammatory markers, rheumatoid factor, and serum uric acid were all within normal limits, effectively excluding systemic inflammatory arthritis or gout as causes of the ankle pain.

Imaging was crucial in this case. Plain weight-bearing radiographs of the right ankle (anteroposterior, lateral, and mortise views) showed well-maintained joint spaces and no fractures or bony abnormalities. There were no signs of osteochondral lesions or arthritis in the ankle or subtalar joint on X-ray. Given the clinical suspicion of sinus tarsi syndrome, an MRI of the right ankle and hindfoot was obtained for further evaluation.

The MRI (performed with standard T2-weighted & Fat supressed sequences) was remarkable for changes in the sinus tarsi region. There was evidence of fluid and oedema filling the sinus tarsi space on T2weighted images, with a bright signal replacing the normal fat signal in that canal. This MRI finding – T2 hyperintensity in the sinus tarsi – corresponds to infiltration of the sinus tarsal adipose tissue by inflammatory cells or scar tissue and is a distinctive hallmark of sinus tarsi syndrome (1). Additionally, the MRI demonstrated partial tears or strain of the interosseous talocalcaneal ligament and the cervical ligament (intrinsic subtalar ligaments that lie within the sinus tarsi). The affected ligaments showed thickening and high signal on T2, consistent with injury. There was no osteochondral lesion of the talus. Mild fluid was noted in the posterior subtalar joint as well. The inferior extensor retinaculum also appeared oedematous. These findings confirmed that the patient had subtalar joint soft tissue injury with resultant sinus tarsi inflammation – in other words, sinus tarsi syndrome due to subtalar instability.

No other pathology was identified on MRI (the tendons and other ankle ligaments were intact). A diagnostic sinus tarsi injection (with local anaesthetic and steroid) can be used to both confirm the diagnosis and provide relief. In this case, due to the patient's financial constraints and his preference to avoid injections, we did not perform an image-guided sinus tarsi injection. Nevertheless, the clinical and MRI findings were sufficiently conclusive for STS. Given the absence of any "red flag" findings and the patient's willingness to pursue conservative care, we proceeded with a non-operative management plan focusing on rehabilitation.

INTERVENTION AND REHABILITATION:

The treatment goals for this patient were to reduce pain and inflammation in the sinus tarsi, restore subtalar joint stability, and improve proprioception to prevent further episodes of instability. A comprehensive conservative management program was initiated, incorporating multiple modalities:

1. **Relative Rest and Activity Modification:** The patient was advised to temporarily discontinue high-impact sports and running to allow the inflamed sinus tarsi tissues to calm down. Weight-bearing was allowed as tolerated in daily life, but he was cautioned to avoid uneven terrain and sudden pivoting movements during the initial healing phase.
2. **Anti-inflammatory Medication:** A two-week course of NSAIDs (oral celecoxib 100 mg twice daily) was prescribed to help reduce the chronic synovitis in the sinus tarsi and relieve pain. The patient reported a moderate decrease in pain after the NSAID course. Ice massage over the anterolateral ankle was also recommended after exercises, as cryotherapy can assist in diminishing local inflammation and pain (7).
3. **Footwear Modification and Orthotics:** Given the patient's bilateral pes planus, we implemented supportive footwear changes. He was advised to wear stable athletic shoes with a good rearfoot control. In addition, custom semi-rigid orthotic insoles with medial arch support were provided to correct over-pronation of his feet. The aim was to limit excessive subtalar joint motion during gait – an orthotic can help restrict the pronation-supination range and thus reduce stress on the healing sinus tarsi (1). A well-constructed shoe combined with an orthotic can improve hindfoot stability and was deemed an important adjunct to therapy.
4. **Bracing/Taping:** For additional external support, especially during weight-bearing exercises, the patient was fitted with an ankle stabilizing orthosis (ASO brace) that provides a figure-of-eight strap support to limit inversion. Alternatively, ankle taping techniques were employed during therapy sessions. We used a taping method akin to a subtalar sling: a strip of athletic tape applied from the midfoot around the calcaneus to support the subtalar joint, in conjunction with a standard lateral ankle strapping. Taping and bracing were intended to protect the subtalar joint from extreme motions and to provide enhanced proprioceptive feedback during the

rehab period (1). Kinesiology taping (elastic therapeutic tape) was also applied along the peroneal muscle group and lateral ankle to facilitate muscle activation and proprioception. The patient wore the brace or tape during all sporting activities in the rehabilitation phase.

5. Exercise therapy – Proprioceptive and Balance Training: The cornerstone of the intervention was a structured exercise therapy program emphasizing proprioceptive rehabilitation. Since STS involves injury to the ligamentous stabilizers of the subtalar joint (with consequent loss of their mechanoreceptor input), enhancing the neuromuscular control of the ankle is critical (1). The patient worked with monitored exercise 3 times per week for 6 weeks, focusing on progressive balance and stability exercises. Initially, simple weight shifting and single-leg stand exercises were done (Phase 1: "Attain" stability in static positions). He practiced single-leg stance on the affected side, first on a firm surface, then on a foam pad, and eventually with eyes closed to challenge his proprioception. As he improved, dynamic balance tasks were introduced (Phase 2: "Maintain" stability during movement) – for example, single-leg mini-squats, lunges, and reaching exercises while balancing on the right leg. He was also incorporated proprioception exercises of a wobble board and Bosu® balance trainer: the patient performed drills such as tilting the board in controlled motions, and later doing gentle bouncing and catching a ball while on the board, to simulate sport-like perturbations. These exercises stimulate the remaining mechanoreceptors and retrain the muscles and tendons around the ankle to react quickly to maintain stability. Over the weeks, his balance times and confidence on the right leg significantly improved.

6. Muscle Strengthening and Coordination: In parallel, targeted strengthening exercises were prescribed for key muscle groups that support the ankle and subtalar joint. The peroneal muscles
(longus and brevis) are especially important for lateral stability, so we focused on peroneal strengthening using resistance bands (eversion exercises) and ankle weights. In addition, the tibialis posterior and calf muscles (gastrocnemius-soleus) were strengthened through resisted inversion exercises and heel raise exercises, respectively. The aim was not only to improve muscle strength but also the reaction time and coordination of these muscles during movements. Plyometric drills (such as lateral hops and agility ladder drills) were eventually added in Phase 3 ("Sustain" phase) of rehab to train the ankle for quick reactive stability in sports-like scenarios. Throughout, emphasis was placed on proper lower extremity alignment and avoiding any uncontrolled inversion of the foot.

7. Joint Mobilization and Flexibility: While the patient's ankle joint range was largely normal, gentle joint mobilizations were performed by the therapist to ensure the talocrural and subtalar joints maintained normal mobility (since tightness could alter mechanics). Care was taken to not stress the subtalar joint excessively during mobilization. The patient was also instructed in stretching exercises for the Achilles tendon and calf muscles to prevent tightness, which can otherwise affect ankle mechanics. All stretches were done in a controlled manner to avoid any undue subtalar strain. The rehabilitation progression was individualized based on the patient's tolerance and improvements. After approximately 4–6 weeks of this comprehensive program, the patient achieved significant improvements, as detailed below.

OUTCOME AND FOLLOW-UP

The patient's response to conservative treatment was excellent. After two weeks of NSAIDs and relative rest, he reported a reduction in baseline pain and improved comfort during daily activities. As the proprioceptive training and strengthening program progressed, he noticed substantial gains in ankle stability. By the end of the 6-week structured rehabilitation period, the patient's right ankle pain had diminished from an initial VAS 7/10 to about 1/10 at rest and only 2/10 with strenuous activity Graph $_1$. He no longer experienced the feeling that his ankle would give way on uneven surfaces; in fact, he was able to perform single-leg balance on the right leg for over 30 seconds eyes closed, which was a marked improvement and nearly equal to his uninvolved side.

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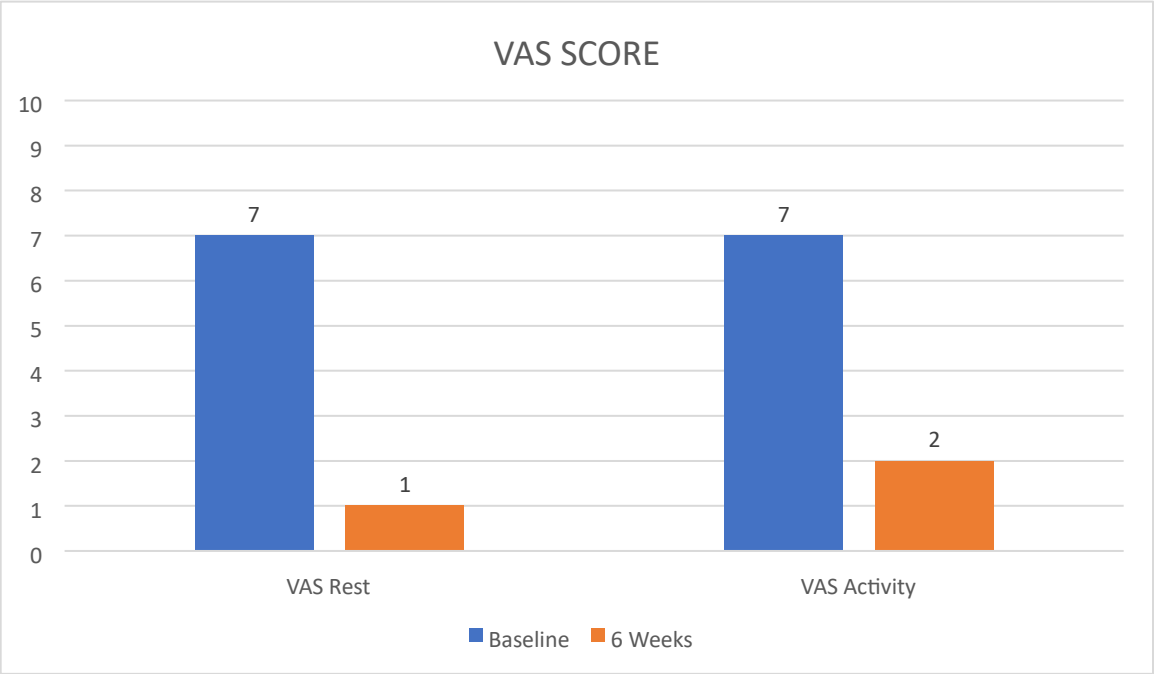

Graph 1 VAS

On re-examination, tenderness of the sinus tarsi had virtually resolved – palpation of the lateral sinus tarsi region elicited only minimal discomfort. The provocative manoeuvre of forced inversion and plantarflexion of the foot was now pain-free, indicating that the subtalar synovitis and impingement had been alleviated. Ligamentous stability tests remained the same (mild laxity on inversion stress), but with the dramatically improved neuromuscular control, the patient no longer had functional instability. He demonstrated good eccentric control of inversion (e.g., he could hop and land on the right foot without the ankle rolling). Functionally, the patient was able to resume light jogging at around the 5-week mark of rehab, initially on a treadmill and then outdoors on flat terrain. By 8 weeks post-intervention, he had returned to playing non-competitive cricket and soccer with an ankle brace for precaution. He reported playing at nearly full intensity without pain. We advised him to continue a maintenance exercise program (especially balance drills and strengthening) at least 2–3 times weekly to ensure lasting stability.

A follow-up at 3 months after completing rehab showed that the patient remained very satisfied with the outcome. He had no significant pain complaints and had not experienced any episodes of ankle sprain or instability despite regular sports participation. At 6 months post-rehab, he continued to do well – he could run 5 kilometres and play recreational sports without limitation. On a validated ankle outcome scoring system (American Orthopaedic Foot & Ankle Society Ankle Hindfoot Score), he improved from an initial 42/100 to 77/100 at final follow-up, reflecting near-normal function Graph $_2$. There were no adverse effects of the treatment. The patient did not undergo any injection or surgical procedure. This successful outcome highlights that a dedicated conservative management approach, centred on proprioceptive and strengthening exercises, can effectively resolve sinus tarsi syndrome in an active individual. The patient's case reinforces the importance of addressing subtalar joint stability and sensorimotor deficits in chronic post-sprain ankle pain. He was counselled to continue using supportive footwear and occasional bracing during high-risk activities to reduce re-injury risk. Periodic check-ins were scheduled to ensure he maintained his rehabilitation gains.

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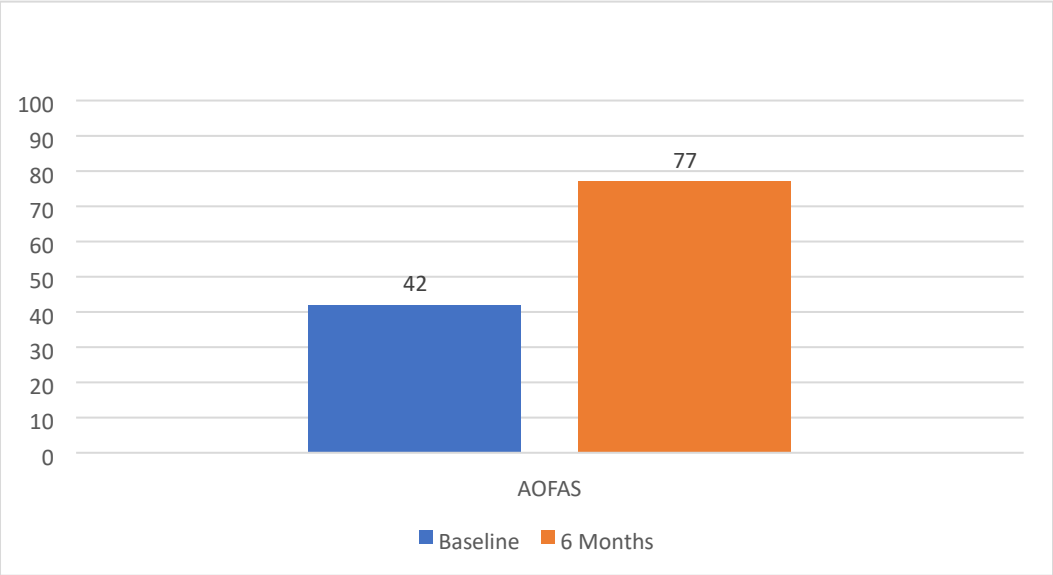

Graph 2 – AOFAS – Hindfoot

AOFAS - Hindfoot

DISCUSSION

This case illustrates several key points in the recognition and management of sinus tarsi syndrome, particularly emphasizing the role of proprioceptive rehabilitation in conservative treatment. STS is often an underdiagnosed cause of chronic ankle pain and functional instability in athletes. In our patient, a history of a significant inversion ankle sprain led to persistent anterolateral ankle pain and instability – a pattern consistent with STS as described in the literature (1). The sinus tarsi region contains important structures for subtalar joint stability (the interosseous and cervical ligaments) and is richly innervated with sensory nerve endings. Histological studies have demonstrated abundant free nerve endings and mechanoreceptors (Pacinian, Golgi, and Ruffini corpuscles) in the sinus tarsi's synovial tissues (5). Akiyama et al. noted that the sinus tarsi is not merely an anatomical space but also a source of proprioceptive input for foot and ankle motion. Therefore, when the ligaments in this area are injured, patients not only develop pain from synovitis but also a loss of proprioceptive feedback contributing to the feeling of instability. The pathophysiology of STS in this context is essentially one of subtalar joint instability following trauma. The inversion sprain that our patient sustained likely injured both the lateral ankle ligaments (ATFL/CFL) and the subtalar ligaments (interosseous talocalcaneal and cervical ligaments). While lateral ankle sprains are common, concurrent subtalar instability is less obvious but not uncommon – studies estimate a significant subset of chronic "ankle sprain" patients actually have subtalar ligament injury contributing to ongoing symptoms. The excessive subtalar motion allows repetitive trauma to the synovium and fat within the sinus tarsi, causing chronic inflammation and fibrosis in that space.

Clinically, this manifests as deep hindfoot pain and a sense of joint instability, especially on uneven ground as the subtalar joint is stressed. Our patient's examination and MRI reflected this classic mechanism, and it was crucial to identify STS rather than attribute his pain solely to an ankle sprain or peroneal tendon issue. One diagnostic clue is the tenderness localized to the sinus tarsi and pain relief with a sinus tarsi injection (if performed), which helps distinguish STS from other lateral ankle pain causes.

Conservative management is widely advocated as the initial approach for STS (4). The rationale is that reducing inflammation and enhancing dynamic support can often break the cycle of pain and instability without invasive procedures. In our case, we employed a combination of rest, NSAIDs, orthotics, bracing, and physiotherapy – all of which are supported by existing recommendations (1,4). Foot orthoses and proper footwear addressed the patient's pes planus and likely helped unload the sinus tarsi by limiting excessive pronation/supination range (1). Bracing and taping stabilized the joint externally and gave the patient confidence to engage in exercises early on without fear of reinjury.

The centrepiece of treatment, however, was the proprioceptive and balance training. Given that STS entails a loss of passive stability from torn ligaments, the body must compensate with active (muscular) and reflexive

stability. Rehabilitation aimed to "re-educate" the neuromuscular system of the ankle. Balance and proprioceptive exercises have been shown to improve postural control, joint position sense, and functional outcomes in patients with chronic ankle instability (1). By extrapolation, the same principles apply to subtalar instability in STS. In the literature, Hertel et. al. have documented that balance training can significantly reduce giving-way episodes and improve stability scores in unstable ankles . In our patient, progressive balance drills and strengthening led to objective improvements in stability (as evidenced by better single-leg balance time and return to sport without instability). This underscores that proprioceptive deficits can be rehabilitated to a large extent, restoring functional stability even if ligamentous laxity remains (1).

Muscle strengthening, particularly of the peroneal, was another critical component. The peroneal muscles act as dynamic stabilizers resisting inversion – their timely contraction can prevent subtalar joint excessive motion. We prioritized peroneal strengthening and found the patient's eversion strength and reaction improved, contributing to his subjective stability. Additionally, coordination exercises trained the muscles to respond quickly to perturbations, which is vital because ligament injuries in STS mean the normal ligamentous mechanoreceptor input is diminished. Our approach corresponds well with concepts in the literature that highlight enhancing dynamic muscle control when static restraints (ligaments) are compromised (1,5).

It is noteworthy that our patient's sinus tarsi syndrome was managed without any injections or surgical intervention. In many cases of STS, a corticosteroid injection into the sinus tarsi is used to reduce inflammation and can provide significant, though sometimes temporary, relief (8). Some studies have explored injections of substances like platelet-rich plasma or ozone as well, with reports of a few months of symptom improvement (8). However, avoiding injections spared our patient potential side effects and, importantly, allowed us to use pain as a guide during rehab (rather than masking it). The success of purely conservative treatment in this case aligns with the outcome of some case series where a majority of patients respond to non-operative measures. For example, in a long-term study by Yang et al., about two-thirds of STS patients improved with conservative therapy and did not require surgical intervention (4). Our case reinforces that a well-designed rehab program can indeed be sufficient for many individuals with STS. Of course, not all cases of sinus tarsi syndrome will resolve conservatively. Particularly in elite athletes or in cases with severe subtalar instability or intra-articular pathology (like subtalar arthritis or coalition), surgical options may be needed. Subtalar arthroscopy is a minimally invasive procedure that can directly address STS pathology – by arthroscopically debriding the inflamed synovium and fibrotic tissue from the sinus tarsi, surgeons effectively remove the source of pain (nociceptors) and may improve joint mobility (2). Reports have shown that arthroscopic management of STS leads to pain reduction and a high rate of return to sport (one review noted about 60– 80% of athletes returning to pre-injury sports after subtalar arthroscopic debridement) (9). In addition, if gross instability persists, a surgical stabilization (such as subtalar ligament reconstruction or even subtalar fusion in extreme cases) can be performed, as documented in refractory cases (10,11). These interventions are typically reserved for when conservative measures fail. In our patient, they were thankfully unnecessary. It is interesting to consider that aggressive arthroscopic debridement essentially works by removing mechanoreceptive and nociceptive tissue in the sinus tarsi, whereas our conservative approach worked by retraining and compensating for those mechanoreceptive losses. Both paths address the pain and instability but through very different means – one by removal and the other by adaptation.

From a sports medicine perspective, this case highlights the importance of including subtalar instability (sinus tarsi syndrome) in the differential diagnosis of chronic lateral ankle pain. Athletes with recurrent ankle sprains who report persistent deep ankle pain and instability should be evaluated for STS, as missing this diagnosis could lead to prolonged disability. A thorough clinical exam and appropriate imaging (MRI) will usually reveal the condition. Early institution of a proprioception-focused rehabilitation program can lead to excellent outcomes, as seen here, and may reduce the need for more invasive treatments. The role of the pes planus in our patient's case is also worth noting. Flatfoot biomechanics can cause a chronic impingement-type STS even without a discrete injury. In our case, the acute injury was the main trigger, but his bilateral flatfoot likely exacerbated the stress on the subtalar joint during recovery. This was managed with orthotics and taping, demonstrating how addressing biomechanical contributors (like arch support for flatfoot) is an integral part of treating STS.

In summary, the conservative management of sinus tarsi syndrome requires a multimodal approach: controlling inflammation, supporting the joint, and—most uniquely—restoring proprioception and dynamic stability. Our patient's successful recovery exemplifies this approach. The case adds to the growing evidence that many cases

of STS can be managed non-operatively. It underscores that proprioceptive rehabilitation is not just an adjunct, but rather a cornerstone of treatment, given the proprioceptive role of the sinus tarsi's contents. Clinicians should ensure that rehabilitation protocols for post-ankle injury patients include subtalar-focused exercises when appropriate. Doing so can facilitate a full return to sport and reduce the risk of recurrence, as demonstrated in this case.

CONCLUSION

Sinus tarsi syndrome is a relatively infrequent but important cause of chronic ankle pain and instability in athletes, often arising after ankle sprains that injure the subtalar ligaments. This case report shows that with accurate diagnosis and a carefully structured conservative management plan, patients with STS can achieve full recovery. A key lesson from this case is the pivotal role of proprioceptive and balance rehabilitation in addressing the underlying subtalar instability. By improving neuromuscular control and dynamic support of the hindfoot, conservative therapy can effectively compensate for ligamentous damage, leading to pain resolution and restoration of function. In the presented case of a recreational athlete, a combination of rest, anti-inflammatories, orthotic support, and an intensive physiotherapy regimen focusing on proprioception and strengthening resulted in excellent outcomes without the need for injections or surgery. The patient returned to sports symptom-free and remained stable at follow-up. This reinforces that proprioceptive rehabilitation should be emphasized in the conservative treatment of STS. Sports medicine practitioners should maintain a high index of suspicion for sinus tarsi syndrome in patients with persistent lateral ankle pain post-injury, and consider comprehensive non-operative management as a first-line strategy. Further studies, including controlled trials, would be valuable to optimize rehabilitation protocols for STS, but this case demonstrates that even in the absence of such data, adherence to established principles of ankle instability rehab can yield successful results. In conclusion, conservative management, particularly proprioceptive and functional training can play a transformative role in the recovery from sinus tarsi syndrome, offering athletes a safe return to activity and potentially obviating more invasive interventions.

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