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PLATELET-RICH PLASMA INJECTION IN SINUS TARSI SYNDROME: A PROSPECTIVE CASE SERIES

Physical Medicine & Rehabilitation

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ABSTRACT

Background: Sinus tarsi syndrome is a cause of chronic anterolateral ankle pain often associated with subtalar instability following trauma. Conventional treatments may provide limited relief. Platelet-rich plasma (PRP) has emerged as a potential regenerative therapy. **Objective:** To evaluate the effectiveness of PRP injection in reducing pain and improving function in patients with sinus tarsi syndrome. **Methods:** A descriptive case series of four patients with clinically and MRI-confirmed sinus tarsi syndrome refractory to conservative management was conducted between September 2024 and September 2025 in the Department of PMR, RIMS, Imphal. Outcomes were assessed using the Visual Analogue Scale (VAS) and American Orthopaedic Foot and Ankle Society (AOFAS) score at baseline, 1 month, 3 months, and 6 months. **Results:** Mean VAS scores improved from 8 to 2, while mean AOFAS scores increased from 51.25 to 91 at 6 months. All patients showed sustained pain relief and functional improvement without adverse events. **Conclusion:** PRP injection may be a safe and effective treatment for sinus tarsi syndrome. Larger controlled studies are needed to validate these findings.

KEYWORDS

Sinus Tarsi Syndrome, Platelet-rich Plasma, Case Series

INTRODUCTION:

The sinus tarsi is a small, cone-shaped cavity located on the lateral side of the hindfoot, between the neck of the talus and anterosuperior calcaneus[1]. It contains structures that contributes to the stability of the ankle and proprioception[1]. These structures are extrinsic ligaments (calcaneofibular and deltoid) and intrinsic ligaments (interosseus, talocalcaneal, cervical), and the medial, lateral and intermediate roots of the inferior extensor retinaculum[1]. Injury or rupture of the intrinsic ligaments caused increase movement of the subtalar joint resulting in instability.[2] Excessive subtalar joint movement increases stress on the synovium and sinus tarsi, leading to subtalar synovitis with chronic inflammation and fibrosis, presenting as anterolateral ankle pain in sinus tarsi syndrome.[2]Associated ligament injuries may cause increased mobility and instability of hindfoot and midfoot, with athletes at higher risk of post-injury instability.[2]

It typically develops secondary to traumatic lateral sprains or chronic ankle instability[1]. Ankle sprains represent a significant portion of athletic injuries, accounting for 10% to 30% of general sports-related trauma and up to 56% in specific high-impact disciplines.[1] The incidence of inversion sprains is estimated at 2 to 7 per 10,000 person-days, contributing to over one million annual clinical presentation for acute ankle trauma.[1]

The hallmark of sinus tarsi syndrome is persistent pain localized to the anterolateral aspect of the ankle.[1]Symptoms are typically exacerbated by weight-bearing (standing or walking), ambulation on uneven terrain, foot supination and adduction.[1]Dynamic impingement test is considered a useful clinical indicator.[3] This involves everting the hindfoot while palpating the sinus tarsi region.[3] Additionally, significant pain relief following injection of a local anaesthetic or steroid or corticosteroid into the sinus tarsi strongly supports the diagnosis.[3] Such injections may serve as therapeutic purpose.[3]

MRI is the most commonly used imaging method, identifying 4 key abnormalities in symptomatic individuals: low T1signal with high T2 signal intensity suggestive of high T2 signal intensity suggestive of synovitis, reduced signal intensity on both T1-and T2- weighted images indicating fibrosis, ligament thickening with indistinct margins consistent with partial tears, and non-visualization of ligaments indicating complete rupture.[4]

Treatment includes rest, NSAIDs, physiotherapy, orthosis to correct the underlying biochemical abnormalities[4]. Non conservative treatment includes steroid or local anaesthetic injection and surgery.[4] Physiotherapy focuses on improving balance and proprioception, strengthening the supporting musculature (especially the peroneal, tibial and calf muscles) and restoring normal musculature control of the ankle and foot.[5]

Platelet-rich plasma (PRP) is one of the emerging treatment modalities. There are few studies of observing effectiveness of PRP in sinus tarsi syndrome. PRP has anti-inflammatory and regenerative properties. PRP contains a high concentration of platelets that release growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), and vascular endothelial growth factor (VEGF), which play a key role in tissue healing[6]. It also includes tumor necrosis factor-α (TNF-α) and hepatocyte growth factor (HGF), which modulate inflammatory pathways by inhibiting the activation of nuclear factor kappa B (NF-kB), a key regulator of inflammation. Additionally, PRP exerts anti-inflammatory effects by reducing the production of inflammatory enzymes cyclooxygenase-2 and cyclooxygenase-4[7].

There is limited evidence regarding PRP in sinus tarsi syndrome and conventional treatments may be insufficient. This study was conducted to evaluate the effectiveness of platelet-rich plasma (PRP) injection in reducing pain and improving function in patients with sinus tarsi syndrome.

MATERIALS AND METHODS

Study design: Descriptive case series
Study period: September 2024 - September 2025
Study setting: Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal
Participants: 4 patients diagnosed with Sinus Tarsi Syndrome

Inclusion criteria:
1. Patients diagnosed with sinus tarsi syndrome based on clinical findings and MRI
2. Age 18-50 years
3. Duration of symptoms more than 3 months
4. Failed conservative treatment

Exclusion criteria:
1. Local or systemic infections
2. Platelet count less than 180×10^3/microliter
3. Coagulopathy and Bleeding disorders
4. Acute fractures or recent trauma around the ankle
5. Previous ankle surgery
6. Recent corticosteroid injection at the same site (within last 3 months)
7. Malignancy

Written informed consent was obtained from all patients before intervention and for publication of this case series.

Preparation of PRP:
PRP was prepared using Double spin method: 10ml of whole blood was obtained by venipuncture in acid citrate dextrose (ACD) tubes. Centrifugation was done using a soft spin at 2400 rpm for 10 minutes. The lowest layer is RBC precipitate, the middle layer is white blood cell and the upper layer is plasma; the supernatant plasma containing platelets was collected and centrifuged again at hard spin i.e., 3600 rpm for 15 minutes to obtain a platelet concentrate. The lower 1/3rd is PRP and upper 2/3rd is platelet-poor plasma (PRP). One ml of PRP was procured.

Procedure: Patient was placed in the supine position with knee flexed and foot in inverted position. Preparation of the skin with antiseptic solution was done. Injection site was marked on the soft point of the anterolateral ankle, 1cm in front and 1cm below lateral malleolus. Needle was inserted into the sinus tarsi canal, pointing towards the medial malleolus. One ml of PRP was injected.

Post procedure care: Ice application for 10 mins every 2hrly for 24 hrs following intervention.

No major complications were observed in any of the patients.

Figure 1: Preparation of platelet-rich plasma

Figure 2: Platelet-rich plasma injection into the sinus tarsi canal

OUTCOME MEASURES
Outcome measures were assessed by using Visual Analogue Scale (VAS) for pain intensity and American Orthopaedic Foot and Ankle Society (AOFAS) for functional disability. The visual analogue scale is a validated scale for the subjective measure of pain. It consists of a 10cm horizontal with the endpoints defining extreme limits such as 'no pain at all' and 'worst pain ever'. Patient mark a point on the line that corresponds to the intensity of pain perceived. AOFAS is an outcome measures for ankle and hindfoot conditions. It evaluates 3 components- pain, function and alignment. Pain component has 40 points, function component has 50 points and alignment component has 10 points. Function component covers activity limitation, walking distance, walking surfaces, gait and motion. Alignment measures ankle-hindfoot alignment. Total score ranges from 0 to 100. Score 0 indicates worst possible condition. Score of 90-100 indicates excellent outcome, 80-90 indicates good outcome, 70-80 indicates fair outcome and less than 70 indicates poor outcome.

CASE DESCRIPTIONS:
Case1: A 35year old male presented with chronic lateral ankle pain for 6 months following a history of inversion ankle sprain, aggravated by prolonged walking. It was associated with feeling of instability while walking on uneven surface. Pain was localized to sinus tarsi region and tenderness on palpation, pain on inversion ankle movement. MRI of ankle shows increased signal intensity in sinus tarsi region with synovitis and interosseus ligament inflammation. VAS score was 8/10 and AOFAS score was 52/100.

Case 2: A 29year old female presented with persistent ankle pain for 8 months after a sports- related inversion injury. She complaint of deep ankle pain, worse during running and stair climbing along with occasional instability. Localized pain was present over sinus tarsi region and pain on subtalar joint movement. MRI shows edema in sinus tarsi fat with partial tear of interosseus talocalcaneal ligament. VAS score was 7/10 and AOFAS score was 55/100.

Case 3: A 42year old male presented with chronic lateral ankle pain for 1 year with a history of repeated ankle sprain. Pain was dull aching and aggravated by walking on uneven surface and prolonged walking. Tenderness was present over sinus tarsi region and pain on inversion ankle movement. MRI shows fibrous and inflammatory changes within the sinus tarsi with ligament degeneration. VAS score was 9/10 and AOFAS score was 48/100.

Case 4: A 30year old male presented with lateral ankle pain and instability for 4 months after a road traffic accident with ankle twisting injury. Pain was localized to lateral hindfoot and worsened with weight bearing and walking on uneven terrain. Tenderness was present over sinus tarsi region and pain on subtalar joint movement. MRI shows sinus tarsi inflammation with fluid collection and degenerative changes. VAS score was 8/10 and AOFAS score was 50/100.

RESULTS:
All four patients demonstrated significant improvement in pain intensity and functional improvement. No major adverse events were reported.

Visual Analogue Scale score: All patients showed a significant and sustained reduction in pain scores from baseline to 6 months, as shown in table 1 and figure 3.

Table 1: Comparison of pre-procedure and post procedure Visual analogue scale of 4 cases.

VAS score	Case1	Case 2	Case 3	Case 4
Baseline	8	7	9	8
1st month	6	5	7	6
3rd month	3	3	5	4
6th month	2	2	3	2

Table 1 illustrates the improvement of pain intensity, measured using VAS in four patients with sinus tarsi syndrome before and after intervention. Baseline scores indicate severe pain in all cases. It shows a progressive reduction in pain scores in all cases from baseline to 6 months indicating gradual and sustained improvement after intervention.

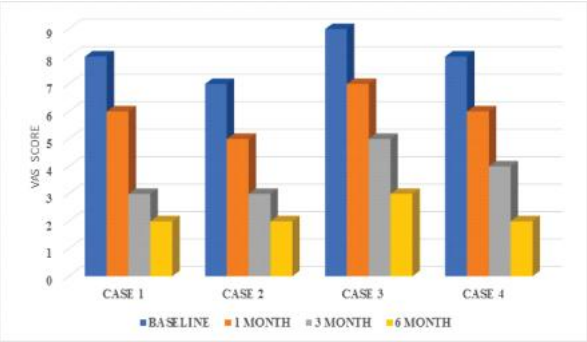

Figure 3 shows bar diagram demonstrating a progressive decline in VAS scores from baseline to 6 months in all 4 cases, indicating gradual and sustained pain reduction following intervention.

American Orthopaedic Foot and Ankle society (AOFAS): All cases demonstrated notable improvement in functional outcome from baseline to 6 months, as shown in Table 2 and Figure 4.

Table 2: Comparison of pre- procedure and post-procedure AOFAS score of 4 cases.

AOFAS score	Case 1	Case 2	Case 3	Case 4
Baseline	52	55	48	50
1st month	65	68	60	63
3rd month	78	82	75	80
6th month	90	94	88	92

Table 2 shows functional outcomes measured by AOFAS score in four patients with sinus tarsi syndrome before and after intervention. It shows progressive improvement of AOFAS score in all 4 cases from baseline to 6 months following intervention. Baseline scores indicated poor function, which improved consistently at 1 month and 3 months, with marked improvement observed by 6 months. All patients achieved good to excellent functional outcomes at final follow-up, reflecting the effectiveness of the intervention.

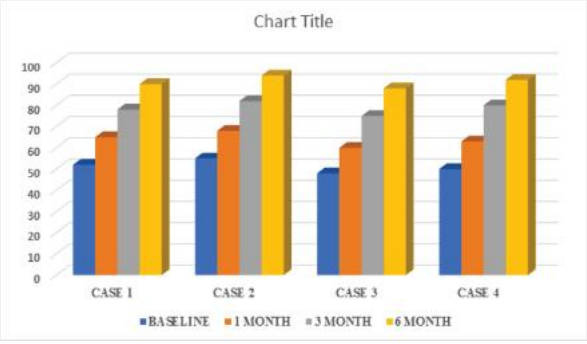

Figure 4 shows bar diagram demonstrating a progressive increase in AOFAS scores at 1 month, 3 months and 6 months compared to baseline in all 4 cases reflecting gradual and sustained functional recovery following intervention.

DISCUSSION

The present case series demonstrated a consistent and sustained improvement in both pain and functional outcomes in patients with sinus tarsi syndrome following platelet-rich plasma (PRP) injection. Pain intensity measured by using Visual Analogue Scale (VAS), showed a progressive decline from baseline to 6 months in all cases. Similarly, functional outcomes measured by the American Orthopaedic Foot and Ankle Society (AOFAS) score revealed a steady increase over the same period, indicating significant clinical recovery.

The early reduction in VAS scores observed at 1 month suggests a prompt therapeutic response to PRP. This effect continued to improve at 3 months and was sustained at 6 months. The beneficial effects of PRP can be attributed to its high concentration of growth factors, such as platelet-derived growth factor (PDGF) and transforming growth factor-beta (TGF-β), which promote healing of injured ligaments (especially interosseous talocalcaneal ligament) and synovial tissues, reduce inflammation, and enhance regeneration of damaged soft tissues within the sinus tarsi region.

The improvement in AOFAS scores reflects not only pain relief but also restoration of functional capacity, including improved gait, stability, and daily activities. By 6 months, all patients achieved good to excellent functional outcomes, suggesting that PRP may play a significant role in both symptomatic relief and functional restoration.

The progressive nature of improvement observed in this study aligns with the known biological mechanism of PRP, where tissue healing and remodeling occur gradually over time. These findings are consistent with previous literature reporting the efficacy of PRP in various musculoskeletal conditions, including tendinopathies and ligament injuries, where it has been shown to reduce pain and improve function.

The result of this study has similar findings with the study conducted by Serdar Toy et al[1] that PRP injection provided clinically significant pain relief and functional improvement for 6 months in sinus tarsi syndrome. However, this study has several limitations. The small sample size (n=4) limits the generalizability of the results. Additionally, the absence of a control or comparison group makes it difficult to definitively attribute the observed improvements solely to PRP. Variability in patient characteristics and lack of imaging follow-up may also influence the outcomes. Further studies with larger sample sizes, randomized controlled designs, and longer follow-up periods are needed to establish the efficacy of PRP in sinus tarsi syndrome.

Despite these limitations, this case series provides preliminary evidence supporting the use of PRP as a safe and potentially effective treatment option for reducing pain and improving functional outcomes in patients with sinus tarsi syndrome.

CONCLUSION

This case series demonstrates that platelet-rich plasma (PRP) injection is a safe and potentially effective treatment modality for patients with sinus tarsi syndrome. All four cases showed a consistent reduction in pain, as evidenced by declining VAS scores, along with progressive improvement in functional outcomes measured by AOFAS scores over a 6-month follow-up period.

The sustained and gradual improvement observed suggests that PRP facilitates tissue healing and functional recovery in the sinus tarsi region. These findings support the role of PRP as a promising minimally invasive therapeutic option, particularly in patients who do not respond adequately to conservative management. However, given the small sample size and lack of a control group, larger randomized controlled studies are necessary to further validate these results and establish standardized treatment protocols.

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