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Diagnostic Insights into Multiple Unilateral Tarsal Coalitions in a Nonsyndromic Patient: A Case Report

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Background: Tarsal coalition is an abnormal union between 2 or more tarsal bones that can potentially cause pain, stiffness, and altered foot biomechanics.

Case Report: A 49-year-old man presented to the clinic with chronic dorsal pain in the left foot. Magnetic resonance imaging (MRI) revealed multiple unilateral nonosseous calcaneonavicular and talocalcaneal coalitions, with associated bone marrow edema. Conservative treatment of the condition, including range-of-motion and strengthening exercises, resulted in gradual improvement.

Conclusion: This case underscores the importance of MRI in detecting nonosseous coalitions and associated edema. Notably, the presence of multiple coalitions in a nonsyndromic patient is rare, as such findings are typically associated with syndromic conditions. Awareness of this possibility aids accurate diagnosis and management.

Key words: Bone, union, magnetic resonance imaging, midfoot, case report

BACKGROUND

Tarsal coalition is defined as an abnormal congenital or acquired union between 2 or more tarsal bones, leading to restricted joint motion and altered biomechanics of the foot. The reported prevalence of the condition in the general population is approximately one-2%, although it is likely underdiagnosed due to asymptomatic or subtle presentations (1). The condition often becomes symptomatic during late childhood or adolescence, when the coalition ossifies, causing stiffness or pain related to increased joint stress.

Tarsal coalitions can be classified based on the nature of the tissue that connects the bones. These classifications are known as the bony, cartilaginous, and fibrous types (synostosis, synchondrosis, and syndesmosis, respectively). The calcaneonavicular and talocalcaneal joints are involved most frequently, accounting for nearly 90% of all coalitions (2). Although most cases are bilateral, the presence of multiple unilateral coalitions in the absence of syndromic features is exceedingly rare.

Clinically, patients may present with dorsal foot or ankle pain, recurrent ankle sprains, rigidity, or muscle spasms due to compensatory peroneal overactivity (2). Some may exhibit rigid flatfoot deformity, while others remain relatively asymptomatic.

The diagnosis of a coalition relies heavily on imaging, as clinical findings can be nonspecific. Plain radiographs may demonstrate characteristic findings such as the talar beak sign, C-sign, or anteater nose sign, depending on the type and location of the coalition (3). However,

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computed tomography (CT) offers superior delineation of osseous bridges, whereas magnetic resonance imaging (MRI) is the modality of choice for nonosseous coalitions, allowing simultaneous assessment of bone marrow edema, cartilaginous interfaces, and periarticular inflammation (3).

Recognition of these variants is critical. Misinterpreting a fibrous or cartilaginous coalition as early osteoarthritis may delay correct diagnosis and lead to inappropriate management. Moreover, identifying multiple coalitions, even when unilateral, is essential for surgical planning and anticipating biomechanical repercussions in adjacent joints (4).

CASE

A 49-year-old man presented with chronic pain over the dorsal aspect of his left foot. This pain, which had persisted for 2 years, was described as mechanical, exacerbated by walking or sports activities, and relieved by rest and nonsteroidal anti-inflammatory drugs. He denied any history of trauma, inflammatory disease, or previous foot surgery. His family history was unremarkable.

On physical examination, mild tenderness was noted over the patient's sinus tarsi and dorsolateral midfoot. Inversion and eversion of the subtalar joint were minimally limited and painful, whereas plantarflexion and dorsiflexion of the ankle were preserved. There was no visible deformity or leg length discrepancy, and neurovascular findings were normal.

Routine radiographs of the foot were inconclusive. Magnetic resonance imaging (MRI) was subsequently performed to evaluate persistent pain. MRI demonstrated nonosseous coalitions involving both the calcaneonavicular and talocalcaneal joints on the left side. These coalitions were characterized by narrowed joint spaces with irregular cortical margins and low-to-intermediate signal intensity on T1-weighted images, with corresponding high signal on short TI inversion recovery (STIR) sequences, consistent with edematous changes in the adjacent talus and calcaneus (Fig. 1A-D). The right foot was unremarkable.

A diagnosis of multiple unilateral nonosseous tarsal coalitions was made. The patient's condition was managed conservatively with a supervised physical therapy program focusing on range-of-motion, proprioceptive, and strengthening exercises targeting peritalar musculature. Footwear modification and activity adaptation were also recommended. Over the subsequent months, the patient's pain gradually improved, and no recurrence of symptoms was observed at the sixth-month follow-up. Surgical intervention was therefore deemed unnecessary. Consent was obtained verbally from the patient, in accordance with our institution's policy.

DISCUSSION

Although tarsal coalitions are frequently bilateral—occurring in up to 50% of cases—multiple unilateral coalitions may also rarely occur. Multiple tarsal coalitions have been frequently reported in association with several syndromes such as tarsal–carpal coalition syndrome, fibular hemimelia, Nievergelt-Pearlman syndrome, and Apert syndrome (4). However, multiple unilateral coalitions can also rarely occur in nonsyndromic individuals, as illustrated by our case. Such a presentation may easily be overlooked, particularly in adults for whom degenerative or mechanical causes of foot pain are often prioritized in the differential diagnosis.

The pathogenesis of tarsal coalitions is generally considered congenital, resulting from a failure of mesenchymal segmentation during embryologic development. Nonetheless, acquired forms may occur after trauma, infection, or inflammatory processes. Over time, altered biomechanics at the subtalar and midtarsal joints may induce microtrauma, leading to bone marrow edema and secondary pain—even in the absence of a complete osseous bridge (3).

The clinical spectrum varies widely depending on the type, size, and biomechanical relevance of the coalition. Osseous coalitions typically restrict motion and cause rigid deformities, whereas fibrous or cartilaginous coalitions may present with intermittent pain, often exacerbated by activity. Pain in such cases is largely mechanical, reflecting abnormal stress distribution across the adjacent joints rather than overt inflammation. In our patient, the mechanical nature of the pain, absence of deformity, and MRI findings of bone marrow edema were consistent with a symptomatic nonosseous coalition rather than degenerative arthropathy.

Imaging plays a pivotal role in diagnosing tarsal coalitions. While plain radiographs may reveal indirect signs such as the talar beak, C-sign, or anteater nose, the sensitivity of such images is limited, particularly in cases of nonosseous types. MRI remains the modality of choice, offering superior soft-tissue contrast and enabling the detection of fibrous or cartilaginous connections, periarticular edema, and reactive changes (3). In the present case, MRI not only confirmed the

presence of both calcaneonavicular and talocalcaneal coalitions but also revealed associated edematous signal changes—findings that clarified the etiology of the patient's chronic dorsal foot pain.

Management of tarsal coalitions depends on symptom severity, patient activity level, and coalition type. Conservative treatment—consisting of activity modification, orthotic support, and physical therapy aimed at improving range of motion and muscular control—can be initiated. In refractory cases, targeted corticosteroid injections or surgical excision may be considered (1). In our patient, nonoperative treatment led to sustained symptomatic improvement. This result underscores that not all coalitions necessitate surgical intervention—particularly when symptoms are mild and biomechanical alignment is preserved.

From a broader perspective, this case emphasizes the importance of maintaining a high index of suspicion

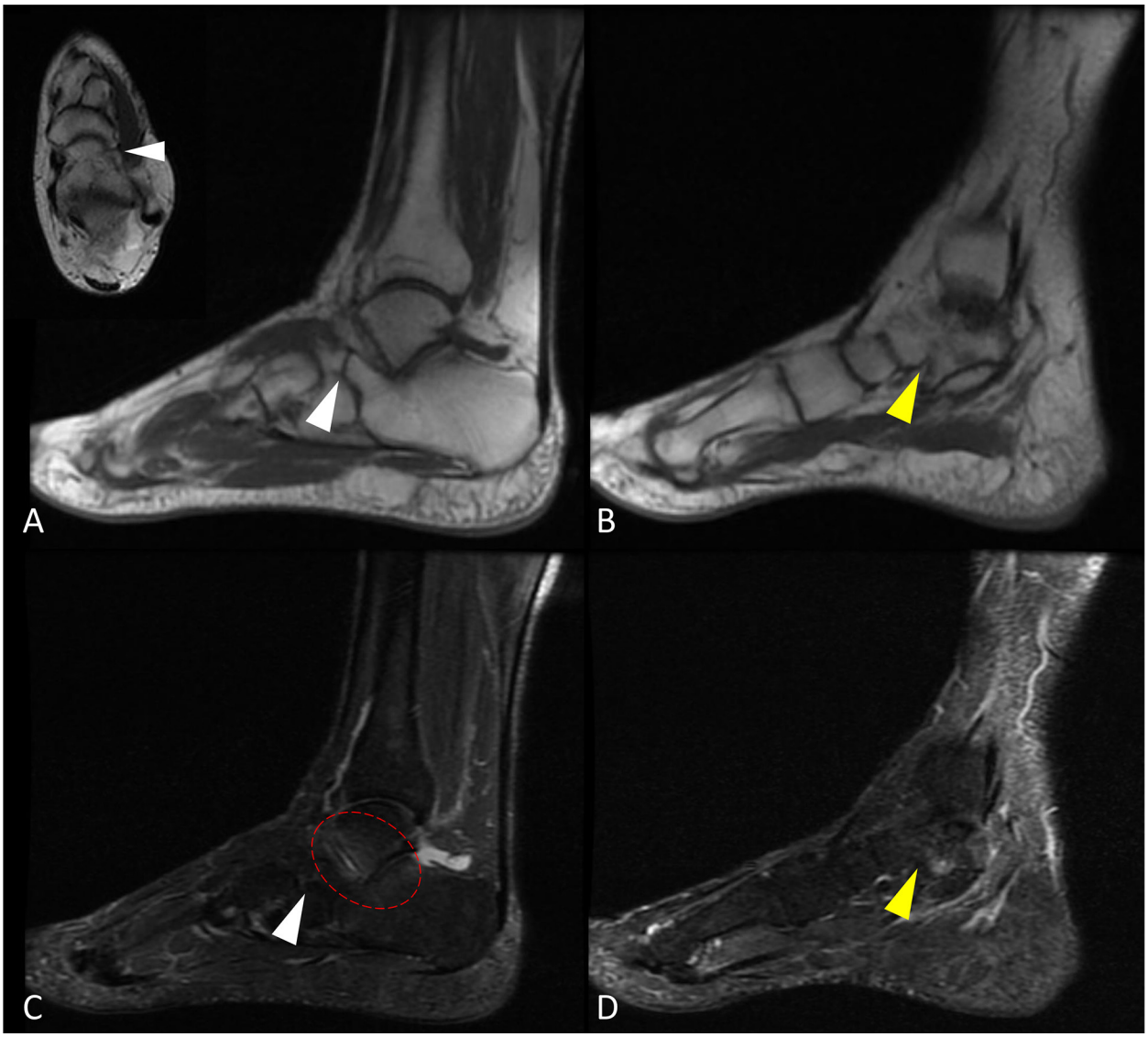

Fig. 1. Magnetic resonance imaging. (A,B) T1-weighted sagittal and (C,D) short TI inversion recovery (STIR) sagittal sequences demonstrate a calcaneonavicular coalition (white arrowheads), a talocalcaneal coaltion (yellow arrowheads), and edematous changes in the periarticular regions (red dotted circle). Notably, the inset in Fig. A (proton density-weighted axial sequence) confirms the presence and morphological characteristics of the calcaneonavicular coalition.

for multiple coalitions in patients with unexplained unilateral foot pain, even in the absence of syndromic features. Failure to identify additional or coexisting coalitions may result in suboptimal treatment outcomes, especially when planning injections or surgical approaches. Routine use of advanced imaging modalities, particularly MRI, can prevent such oversights and ensure comprehensive assessment.

CONCLUSIONS

In conclusion, multiple unilateral nonosseous tarsal coalitions represent a rare but clinically significant cause of chronic foot pain in adults. Accurate recognition through detailed imaging and individualized conservative management can yield favorable outcomes while avoiding unnecessary or incomplete interventions. Clinicians should remain vigilant for these subtle anomalies, as early identification facilitates the use of targeted, noninvasive, and effective treatment strategies.

Contributions

Hilal Yalçınkaya: investigation, writing (original draft)
Berkay Yalçınkaya: investigation, writing (original draft)
Çağatay Çakır: investigation, writing (original draft)
Semra Duran: conceptualization, writing (reviewing and editing), supervision

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