Bilateral Lateral Cuneiform–Third Metatarsal and Unilateral Right Navicular–Medial Cuneiform Coalitions: A Rare Case Report

Ibraheem AlQurashi[1], Mohammed Kifah Alkhars[2], Tagelasfya Elkhair Abdelwahab[3], Mohammed Jassim Alhassan[4]*, Rawan Salem Alkhammas[4]

[1]*Musculoskeletal Radiology Consultant, Taif Health Cluster, King Abdulaziz Specialist Hospital- Taif, Saudi Arabia*

[2]*Radiology Senior Registrar, Al-Ahsa Health Cluster, King Fahad Hospital, Al-Ahsa, Saudi Arabia*

[3]*Radiology Senior Registrar, Taif Health Cluster, King Abdulaziz Specialist Hospital- Taif, Saudi Arabia*

[4]*Medical Student, College of Medicine, King Faisal University, Al Ahsa, Saudi Arabia*

***Correspondence:** Mohammed Jassim Alhassan, Medical Student, College of Medicine, King Faisal University, Al Ahsa, Saudi Arabia,

Mohd9jassim@gmail.com

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Written informed consent was obtained from the patient for the publication of this case report.

AVAILABILITY OF SUPPORTING DATA
The data supporting the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CONFLICT OF INTERESTS
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

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The data supporting the conclusions of this case report are derived from the clinical records of the patient involved. Due to the personal and sensitive nature of these medical records, and to protect patient confidentiality, the data are not publicly available. Access to the data may be granted by the corresponding author upon reasonable request, subject to institutional and ethical approval.

ABSTRACT

Introduction: Tarsal coalition—an abnormal fusion of tarsal bones—typically has a congenital etiology, but it can occasionally be an acquired condition. Calcaneonavicular and talocalcaneal coalitions account for the vast majority of tarsal coalitions, while midfoot coalitions are exceptionally rare.

Case presentation: We report a case of a 27-year-old man with chronic bilateral foot pain exacerbated by physical activity. Non-contrast-enhanced multiplanar CT demonstrated non-osseous coalitions bilaterally between the lateral cuneiform and the base of the third metatarsal, as well as the right navicular – medial cuneiform (NC-MC) joint. Subsequent MRI confirmed pseudoarthrosis interfaces with mild subcortical irregularity and bone marrow edema at the lateral cuneiform–third metatarsal (LC-MT3) joint and the right NC-MC articulation.

Conclusion: To our knowledge, this is the first documented case of simultaneous bilateral lateral cuneiform–third metatarsal coalition combined with a right navicular–medial cuneiform coalition.

CASE REPORT

BACKGROUND

Tarsal coalition is an uncommon condition involving abnormal fusion between tarsal bones, most often congenital and affecting the calcaneonavicular or talocalcaneal joints. Midfoot coalitions, such as those involving the LC–MT3 and NC–MC joints, are extremely rare and often underdiagnosed due to subtle symptoms. Advances in CT and MRI have improved detection of these atypical, non-osseous coalitions. Reporting this rare combination of bilateral LC–MT3 and unilateral NC–MC coalitions expands current knowledge of midfoot anomalies and emphasizes the importance of imaging for accurate diagnosis and effective management.

INTRODUCTION

Tarsal coalition is an uncommon condition characterized by abnormal osseous, cartilaginous, or fibrous union between two or more tarsal bones. Tarsal coalition often results from a failure in embryonic mesenchymal segmentation, but it may also be acquired secondary to trauma, infection, or inflammatory conditions. Calcaneonavicular and talocalcaneal coalitions account for approximately 85% –90% of the reported cases of tarsal coalitions [1]. In an anthropological study of 486 individuals aged 12–97 years, twelve forms of tarsal coalition and three types of bipartition were assessed. Tarsal coalitions were identified in 4.7% of the sample, occurring more frequently unilaterally than bilaterally and predominantly affecting the left foot. No significant differences in age at death were observed between individuals with and without coalitions, and no cases of multiple concurrent coalitions were detected. The calcaneonavicular coalition was the most common subtype, whereas calcaneocuboid coalitions were rare, observed in only one individual. These findings highlight the importance of documenting both the frequency and anatomical distribution of foot coalitions and bipartitions in anthropological and clinical contexts [11].

Midfoot coalitions are notably rare. Among them, lateral cuneiform–third metatarsal (LC–MT3) and navicular–medial cuneiform (NC–MC) coalitions are particularly uncommon, with most reports limited to isolated, unilateral cases. Occasionally reported in athletes , naviculocuneiform coalitions often require surgery when conservative measures fail [2]. LC–MT3 coalitions, whether osseous or fibrocartilaginous, are even less frequently encountered [3].

Owing to technological advances, the diagnostic sensitivity of high-resolution imaging, especially multiplanar computed tomography (CT), for atypical coalition sites has markedly improved compared with conventional radiography [4].

Here, we present the first documented case of simultaneous bilateral LC–MT3 coalition with a right NC–MC coalition diagnosed through magnetic resonance imaging (MRI) and CT. This report is the first to describe this unique coalition pattern, offering valuable insight into the spectrum of midfoot anomalies.

CASE PRESENTATION

A 27-year-old male football player presented with a 5-year history of progressive bilateral midfoot pain, exacerbated by physical activity, with no preceding traumatic event, systemic illness, or prior foot surgery. Clinical examination revealed localized tenderness over the midfoot bilaterally, more pronounced on the right, with mild restriction of dorsiflexion and plantarflexion but preserved neurovascular status.

Non-contrast-enhanced multiplanar CT demonstrated non-osseous coalitions between the lateral cuneiform and the base of the third metatarsal bilaterally, as well as the right NC-MC joint.

Subsequent MRI confirmed pseudoarthrosis interfaces with mild subcortical irregularity and bone marrow edema at the LC–MT3 joint and the right NC-MC articulation (Figures 2, 3).

On the basis of these findings, a diagnosis of simultaneous bilateral LC–MT3 coalition and unilateral right NC–MC coalition was established. The patient was managed conservatively with activity modification, custom orthotics, and nonsteroidal anti-inflammatory medications, resulting in symptom improvement at follow-up.

DISCUSSION

Tarsal coalitions, although relatively uncommon in the general population, demonstrate consistent anatomical patterns and laterality. Previous anthropological studies have reported that tarsal coalitions occur in approximately 4–5% of skeletal samples, more frequently unilaterally and with a predominance in the left foot. Calcaneonavicular coalitions are the most commonly documented subtype, whereas other types, such as calcaneocuboid coalitions, are rare. Most coalitions are asymptomatic, and their presence does not appear to influence age at death or overall health outcomes. These observations underscore the importance of documenting both the frequency and anatomical distribution of coalitions, providing a reference framework for understanding atypical or multi-site presentations, such as those seen in the present case [11].

To our knowledge, this is the first reported case of simultaneous bilateral LC–MT3 coalition with a unilateral NC–MC coalition. The multiplicity and bilaterality of the patient's condition underscore the importance of imaging both feet, even in patients with unilateral symptoms. The absence of trauma, systemic disease, or inflammatory conditions and the morphological appearance on imaging support a congenital etiology.

A limited number of LC–MT3 coalitions have been described since 2018. A symptomatic non-osseous LC–MT3 coalition was reported in 2018, demonstrating that this articulation can form fibrocartilaginous bridges and become painful in adults [3]. Midfoot coalescences can also appear in atypical pairings (e.g., lateral cuneiform–cuboid) and multi-coalition constellations, reinforcing that segmentation errors may involve more than one joint axis [5]. Regarding the naviculocuneiform complex,

contemporary case series and case reports have shown that the medial cuneiform is the dominant NC partner and that NC coalitions, while rare overall, have recognizable imaging phenotypes and variable symptomatology [5]. Recent single-patient reports have specifically documented NC–MC coalitions confirmed on CT, with symptom relief after arthrodesis when conservative therapy failed [6].

Contemporary reviews regard congenital failure of mesenchymal segmentation as the primary mechanism underlying tarsal coalition, with some patients expressing multiple coalitions or combined midfoot–hindfoot patterns (e.g., NC with subtalar), suggesting a broader developmental field defect rather than an isolated joint anomaly [7].

Regarding the imaging strategy for suspected non-osseous or atypical midfoot coalitions, MRI has now been well-validated for both detecting and mapping reactive changes (edema, synovitis). However, CT better depicts contouring and subtle bridging, an approach endorsed by recent reviews and studies on diagnostic accuracy. In a previous diagnostic study, MRI showed high accuracy for detecting coalition and associated pathologies, supporting routine inclusion when clinical suspicion is present; CT remains complementary for multiplanar osseous detail [8]. Our sequential MRI and CT workflow, therefore, aligns with the current best practice for rare or multi-site midfoot coalitions [9].

The first-line therapy for symptomatic fibrocartilaginous coalitions, especially in adults, comprises conservative management approaches, such as activity modification, orthoses, and nonsteroidal anti-inflammatory drugs; surgery is reserved for cases featuring recalcitrant pain or mechanical restriction. Previous studies have reported that when indicated, operative management (resection ± interposition; arthrodesis for selected joints) yields an overall clinical success rate of 79%–81% across common coalition types; however, evidence specific to midfoot coalitions is limited and heterogeneous, so individualized decision-making is recommended [10].

For NC–MC coalitions that remain symptomatic, recent evidence supports arthrodesis as a reliable option with durable pain relief at follow-up, whereas resection has also been recommended as an option in older literature; these choices hinge on cartilage status, coalition morphology, and adjacent joint mechanics [6].

Our patient's improvement with non-operative care is consistent with reports that fibrocartilaginous midfoot coalitions can settle under load-modifying strategies.

This study is limited by its single-case design and absence of surgical/pathological correlation. Nonetheless, the unique pattern of coalition and detailed imaging assessment support its educational value.

CONCLUSION

This is the first report of a bilateral LC–MT3 coalition with a right unilateral NC–MC coalition. Accurate diagnosis relies on high-resolution imaging, with CT identifying non-osseous features and MRI confirming morphological details. Awareness of such atypical patterns can aid early detection and appropriate management, potentially preventing prolonged disability.

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FIGURES

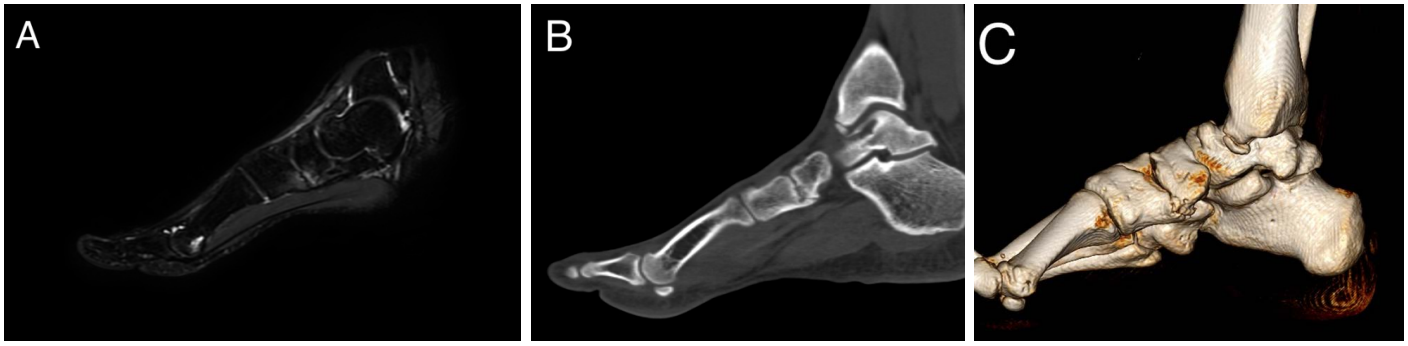

Figure 1: Right navicular–medial cuneiform coalition in a 27-year-old man with chronic foot pain. A. Sagittal PD fat-sat of the right foot shows navicular–medial cuneiform articulation with cortical irregularity, sclerosis, and bone marrow edema. B, C. Sagittal CT (B) and 3D reconstructed image (C) of the same foot further illustrates the coalition.

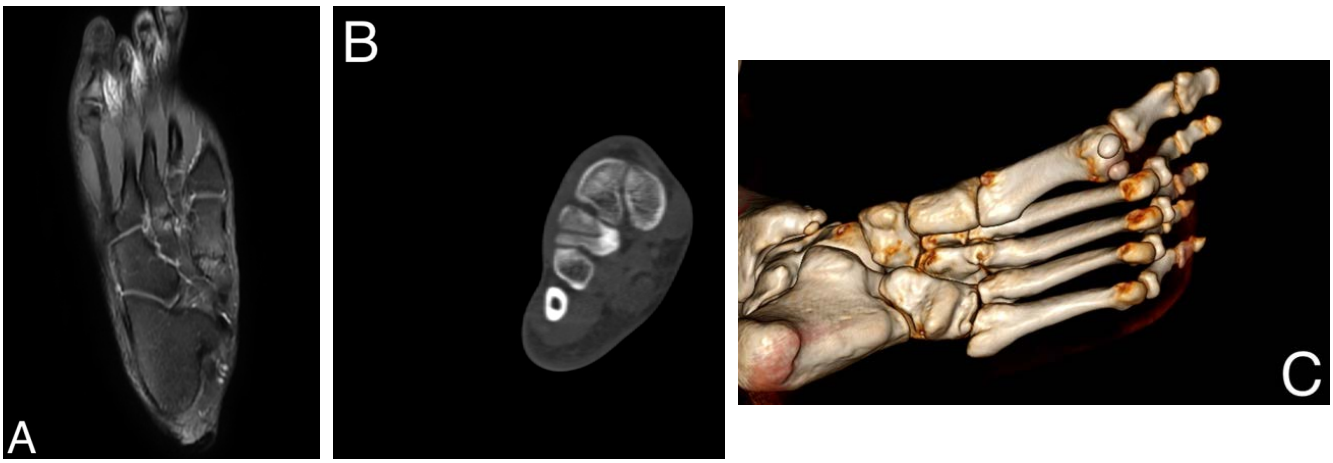

Figure 2: Right third metatarsal–lateral cuneiform coalition in the same patient. A. Long-axis PD fat-sat of right foot shows narrowing of joint space, cortical irregularity, and edema of the third metatarsal and the lateral cuneiform. B, C Coronal CT (B) and 3D reconstructed image (C) of the same foot further illustrates the coalition.

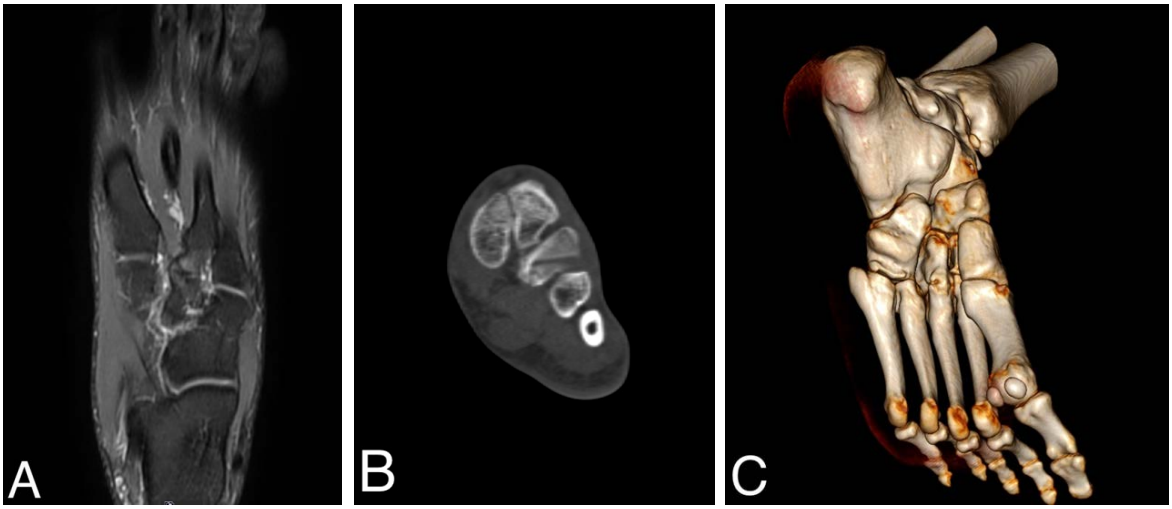

Figure 3: Long-axis PD fat-sat of the left foot in the same patient. A. Long-axis PD fat-sat of the left foot shows narrowing of joint space, cortical irregularity, and edema of the third metatarsal and the lateral cuneiform. B, C Coronal CT (B) and 3D reconstructed image (C) of the same foot further illustrates the coalition.

KEYWORDS

Non-osseous tarsal coalition, midfoot, distal foot