

Case Report

Bilateral talocalcaneal tarsal coalition with flatfeet treated with single-stage coalition resection and calcaneal lengthening osteotomy: A case report

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ABSTRACT

A coalition is a bridge connecting osseous structures. Tarsal coalitions typically involve talocalcaneal and calcaneonavicular joints. As a result, patients might present with pain and/or rigid flatfoot deformity. We outline a case of bilateral middle facets talocalcaneal tarsal coalition with rigid flatfeet who was treated with resection combined with flatfoot reconstruction. The patient was an 11-year-old Saudi girl who had progressive bilateral flatfoot for which non-operative treatment failed. A single-stage middle facet talocalcaneal coalition resection with concomitant Evans calcaneal lengthening osteotomy and gastrocnemius recession was performed. Postoperatively, the American Orthopaedic Foot and Ankle Society (AOFAS) ankle midfoot score was measured, and the patient had a score of 90/100. The outcome was satisfactory, and the other foot was operated on 6 months later, with the same procedure and outcome (AOFAS: 90/100). Six years of follow-up showed no recurrence and a satisfactory lifestyle with no activity limitation. We aimed to highlight the AOFAS score 6 years after resecting the coalitions while reconstructing the foot in a single-staged procedure.

Keywords: Flatfoot, Peroneal muscle spasm, Pes planovalgus, Rigid flatfoot, Subtalar joint, Talocalcaneal joint, Tarsal coalition

INTRODUCTION

Osseous coalition is a congenital segmentation failure of the bones in the fetal foot. The reported incidence of tarsal coalitions is up to 13%.^[1-3] Talocalcaneal and calcaneonavicular joints are the most commonly involved joints in the foot, whereas the talocalcaneal joint accounts for around 48% of all cases.^[1-4] Foot and ankle pain can be the presenting complaints of a child with a congenital tarsal coalition; therefore, the diagnosis can be missed.^[5] Hence, a thorough clinical assessment and proper radiological evaluation are required to diagnose the condition. The presenting symptoms can be secondary to degenerative changes, foot deformity, or the coalition itself. Tarsal coalition is associated with a rigid flatfoot and peroneal muscle spasm features; a painful non-flexible valgus deformity, and markedly restricted subtalar motion.^[6,7] Routine radiographs can help diagnose osseous coalitions (88% specificity). Furthermore, computed tomography (CT) and magnetic

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resonance imaging (MRI) are required to diagnose and guide pre-operative surgical plans.^[8-10] CT scan is a valuable tool in diagnosing osseous coalitions and assessing the extent of the disease and its involvement, which will dictate the surgical plan. MRI is also used to assess non-osseous coalitions, where the fibrous type will have low-to-moderate signal intensity, while the intensity is similar to fluid in cartilaginous coalitions.^[11] Simple resection of coalitions is generally acceptable and often results in symptom relief. However, it does not address the mechanical malalignment of the foot, nor the muscular imbalance associated with tarsal coalitions.^[12] The treatment of talocalcaneal coalition with flatfoot correction in the pediatric population continues to be controversial. Other series, however, have shown that combining coalition excision with flatfoot correction in a single-stage surgery was associated with more valuable outcomes and better long-term results.^[13] Here, we outline a case of a patient with bilateral rigid flatfoot deformity treated with tarsal coalition excision and concomitant flatfoot reconstruction and soft-tissue release. The procedure was described by Kernbach *et al.* who reported excellent outcomes of his three cases (American Orthopaedic Foot and Ankle Society [AOFAS] score was 94.33 ± 2.81). The aim was to shed light on the positive results of performing tarsal coalition resection and reconstructing the foot and its associated deformities in a single procedure in our population by measuring the AOFAS score 6 months from the surgery.

CASE REPORT

An 11-year-old Saudi girl presented to the pediatric orthopedic outpatient clinic with progressive bilateral flatfoot deformity for years. The patient is not known to have any medical or surgical history and had undergone an initial course of conservative treatment consisting of non-steroidal anti-inflammatory medication, shoe wear modification, and orthotics. Clinical examination revealed that she has a bilateral flatfoot deformity with a tight Achilles tendon. She had a painless ankle and talonavicular joints range of motion, but a painful subtalar joint with eversion and inversion manipulations. Standing films were obtained and showed evidence of middle facet talocalcaneal coalitions [Figure 1]. In addition, CT [Figure 2] and MRI [Figure 3] were also used to delineate the coalition further and assess the presence of significant arthritis. Surgical intervention was planned in the form of a single operation to resect the talocalcaneal coalition of the middle facet and perform concomitant flatfoot reconstruction involving Evans calcaneal lengthening osteotomy and gastrocnemius recession. A classic medial incision was made for resection of the middle facet coalition and bone wax was applied to the bleeding bony surfaces. After that, an Evans calcaneal osteotomy was completed using a tricortical iliac crest allograft through a lateral incision. Finally, a gastrocnemius recession was performed. Following the operation, the foot was immobilized in a below-knee non-



Figure 1: AP (a and b), oblique (c and d), and lateral (e and f) standing radiographs of the bilateral flat feet deformity.



Figure 2: Coronal (a), sagittal (b), and axial (c and d) CT images confirming the evidence of coalition.



Figure 3: Sagittal (a and b) and axial (c and d) MR images confirming the evidence of coalition in right and left foot, respectively.



Figure 4: Lateral (a) immediate post-operative radiograph of the right foot showing the redemonstration of the medial foot arch. Lateral (b), AP (c), and oblique (d) views after the final union of the osteotomy.



Figure 5: Lateral (a) immediate post-operative radiograph of the left foot showing the redemonstration of the medial foot arch. Lateral (b), AP (c), and oblique (d) views after the final union of the osteotomy.

Table 1: Radiographic measures of tarsal coalition resection with flatfoot reconstruction

	Preoperative angle (°)		Postoperative angle (°)	
	Calcaneal inclination	Meary's angle	Calcaneal inclination	Meary's angle
Right	0	10	22	2
Left	0	6	19	3

weight-bearing cast for 6 weeks. Full-weight-bearing was permitted after signs of complete union, which was about 10 weeks from surgery [Figure 4]. The AOFAS ankle midfoot score was measured and showed a score of 90/100. The patient was satisfied with the outcome and the other foot was operated on after 6 months with the same principles, techniques and AOFAS score during follow-up [Figure 5]. Six years of follow-up showed no recurrence and a satisfactory lifestyle with no activity limitation. Pre-operative and post-operative radiographic parameters are summarized in [Table 1].

DISCUSSION

In our report, single-stage coalition resection and flatfoot reconstruction showed good outcomes and patient satisfaction. Mild pain was elicited only with strenuous activities and walking for long distances. The AOFAS score was 90/100, whereas 100 indicate a normal and healthy foot. It is intuitive to address all pathologies in such cases and simple resection will not correct the associated deformities in tarsal coalitions. However, we found that single-staged procedure is feasible and results in faster rehabilitation compared to a staged procedure and it worked for us on both feet.

Coalitions of the foot are commonly associated with non-flexible pes planovalgus in the pediatric population.^[1,2] In an extensive review of the literature, Stormont and Peterson (1981) reported 314 cases of tarsal coalitions.^[3] The talocalcaneal complex was involved in 37% of those reported cases, and the middle facet was involved in the majority of those cases. Moreover, other series have demonstrated that such coalitions may occur bilaterally in up to 50% of the cases.^[15] Tarsal coalitions are frequently diagnosed in mid to late adolescence because symptoms do not typically appear until that age.^[1] Thus, peroneal spasticity and rear foot secondary arthritis typically develop in these cases.^[1]

Surgeons tend to simply excise the coalition when early diagnosis is established and there is no concurrent arthritis or deformity.^[7] It is acceptable to excise the coalition for severe pain in an otherwise aligned foot. Therefore, early diagnosis utilizing appropriate standard radiographs and CT is crucial.^[5] Kernbach *et al.* reported three cases who underwent resection of coalition with flatfoot reconstruction

in one procedure.^[13] The mean post-operative score of AOFAS ankle-hind foot was 94.33 ± 2.81 . Similarly, our case had excellent outcomes in terms of AOFAS score and the mean follow-up in their series was 30 months, whereas our patient had 6-year follow-up.

Isolated resection of the coalitions, especially with associated flatfoot, has been associated with poorer outcomes. Simple resection does not address the concomitant hind foot valgus and pes planovalgus that happens secondary to soft-tissue contracture.^[13] Westberry *et al.* performed complete sustentaculum tali excision in 12 tarsal coalitions.^[16] Eleven out of 12 coalitions had a mean of post-operative AOFAS score of 90. During their follow-up, no recurrence was reported. The one coalition that had a poor outcome was due to the presence of pes planus deformity, which was not corrected from the index procedure. After correction of the deformity in a subsequent surgery, symptoms improved. The rising concerns of such negative outcomes have urged some orthopedic surgeons to perform staged reconstruction of flatfoot in combination with coalition resection.^[5] Such reports of the approach mentioned above are few. Yen *et al.*^[14] reported a case of excision of a middle facet coalition with calcaneal lateral opening-wedge osteotomy without internal fixation.

CONCLUSION

Our patient underwent talocalcaneal coalition excision with concomitant Evans calcaneal lengthening osteotomy and gastrocnemius recession in a single operation. At 6-year follow-up, the patient reported a satisfactory lifestyle with no activity limitation. Mild pain was only elicited with strenuous activities, prolonged walking or standing. In addition, the AOFAS ankle midfoot score was 90/100 on both feet. The future research is needed to assess the cost-effectiveness of such an approach.

AUTHORS' CONTRIBUTIONS

SA was the primary surgeon; he conceived the idea for the case report. YA and AB wrote the case and reviewed the final manuscript. AA, AS, WA, and FA did the literature review, collected the data, and formulated the manuscript. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient's parent has given his consent for the patient's images and other clinical information to be reported in the journal. The parent understands that the patient's name and initials will not be published, and due efforts will be made to conceal her identity, but anonymity cannot be guaranteed.

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CONFLICTS OF INTEREST

There are no conflicting relationships or activities.

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