

A Rare Case of Cuboid-Navicular Coalition in a Nine-Year-Old Girl

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INTRODUCTION

Tarsal coalitions are a rare pathology involving 1-2% of the general population with more than 90% involving the talocalcaneal joint or the calcaneal-navicular articulation (1-3). Cuboid-navicular coalitions represent only 1% of all coalitions in the literature (4). The cause of tarsal coalition has been attributed to failure of mesenchymal segmentation during the first trimester of intrauterine development (5) and may exhibit autosomal-dominant inheritance (6). Our presentation provides an alternative successful surgical approach to a cuboid-navicular coalition compared to those previously described.

LITERATURE REVIEW

A literature search was performed in Pubmed-Medline, Cinahl, and Embase with consideration to tarsal coalitions. Cavallaro and Hadden in 1978 described a successful surgical excision with long-term follow-up of a cuboid-navicular synostosis (7). A dorsomedial approach to the coalition with application of bone wax or extensor digitorum brevis (EDB) muscle belly inter-positional spacer between the bones was later described by Downey (8). More recently, several new materials have been developed and used as inter-positional spacers following tarsal resections. Hounshell et al 2011 described the use of a regenerative tissue matrix for use in a cuboid-navicular resection pain free and without recurrence at 3 years postoperative follow-up (9).

CASE STUDY

A healthy 9-year-old female gymnast presented with a chief complaint of mild persistent right dorsal lateral foot pain for the past 5 months. Six months ago, the patient experienced a right ankle sprain, was casted for 2 weeks, and then rested for 3 months before returning to gymnastics full-time. However, she still experienced pain to her right foot. It was recommended that the patient be casted for functional orthotics, which provided mild pain improvement while

standing and walking. However, running and jumping still caused persistent discomfort.

Physical examination revealed an inverted right forefoot relative to the rearfoot. The resting calcaneal stance position was everted bilaterally. There was tenderness to palpation to the dorsal lateral navicular cuboid joint area of the right foot. There was adequate pain-free range of motion to the ankle and subtalar joints bilaterally. However, there was some limitation of motion in the right midtarsal joint. The patient had adequate ankle dorsiflexion with the knee extended and flexed. Gait examination revealed early heel off.

Radiographic examination showed some irregularity with increased density between the navicular and cuboid bones that may be chondral or fibrous in nature. Furthermore, a computed tomography (CT) scan confirmed the presence of a cubonavicular coalition of the right foot. The patient was diagnosed with a cuboid-navicular coalition. Because the patient's symptoms persisted despite conservative treatment, surgical resection of the coalition was performed.

SURGICAL TECHNIQUE

A 6-cm curvilinear incision was made extending from the lateral talar calcaneal area centered over the navicular cuboid bar area and was extended to about the fourth metatarsal base. The deep fascia was incised exposing the extensor digitorum brevis muscle belly, which was bluntly separated over the area of the dorsal proximal cuboid. The periosteum capsular incision was then made over the bar exposing the navicular cuboid bar. The dorsal surface of the bar seemed to be soft tissue. The bar was then fully resected approximately 8-9 mm. The dorsal surface seemed to be a fibrous bar but the deeper surface seemed to be a bony bar. Next, a regenerative tissue matrix was then utilized and placed into the area where the bar had been resected. The two superficial edges were sutured to the periosteum over the navicular and cuboid. The foot was then tested and showed good motion at the midtarsal joint and stability with little motion of the tissue matrix. The shiny side of the

regenerative tissue matrix was placed against the raw bone for incorporation and sutured with 2-0 Ethibond.

POSTOPERATIVE PROTOCOL

The patient was placed in a below-knee short-leg cast with bi-valved fiberglass and kept nonweight-bearing for 2 weeks. The patient was then transitioned to heel weight-bearing as tolerated in a CAM boot and began range of motion exercises for another 2 weeks. At 4 weeks postoperative, the patient was progressed into regular shoes as tolerated and prescribed 4 weeks of physical therapy (Figures 1, 2)

RESULTS

At 2 weeks postoperative, the patient's incisions were well healed and she reported minimal pain and discomfort. At 3 weeks postoperative, the patient reported doing well and was able to start swimming without the CAM boot. During the 4 week postoperative visit, the patient demonstrated good range of motion of the midtarsal and subtalar joint. She had mild tenderness at the navicular cuboid coalition

site with limited range of motion of the right midtarsal joint. In her gait examination, she was guarding while walking on her right foot.

At 8 weeks postoperative, the patient returned to hiking and running and reported less discomfort than before surgery. Long-term follow up of 12 months revealed no postoperative complications and no recurrence of the deformity. The patient no longer reports discomfort at the dorsolateral right foot. Subjectively, the patient was happy with pain relief and was able to return to gymnastics.

DISCUSSION

There are several surgical approaches for managing tarsal coalitions that have been described in the literature. The most common tissue grafts are EDB muscle belly, local adipose tissue, or buttock adipose tissue. However, these grafts have the potential for increased patient morbidity and increased operative time associated with harvesting the graft. Regenerative tissue matrix is a human derived biologic that is relatively strong in comparison to native ligament and fascia, quickly incorporates into tissue and



Figure 1. Coalition identification and resection.



Figure 2. Regenerative tissue matrix application.

has great pliability and durability (9). These qualities make this material ideal for incorporation between bone surfaces. The regenerative tissue matrix has slippery inner surfaces that allow for slight motion between the joints, which is expected to inhibit bone regeneration and retain the tarsal biomechanical unit (8).

Hounshell et al 2011 was the first to describe the interpositional use of a regenerative tissue matrix as a spacer for the treatment of a tarsal coalition. Three years after resection and interposition of the graft, the patient remains pain free and has continued on with her work activities without restriction.

The purpose of this article was to describe the use of a biologic graft material for the treatment of a cuboid-navicular coalition. Postoperative range of motion of the midtarsal and subtalar joints is better than it was preoperatively. At 8 weeks postoperative, the 9-year-old female gymnast was able to return to hiking and running. At 1 year postoperative, the patient continues to do well and has resumed gymnastics. We have found that the use of a biologically engineered spacer, specifically a regenerative tissue matrix, provides an excellent alternative for patients with a symptomatic cuboid-navicular coalition

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