Resection, ORIF or Both? Chronic Navicular Stress Fracture in the Setting of a Calcaneonavicular Coalition

Jose Galvan, Jacob Ivey, Sahil Handa
PMS – III, Midwestern University, Arizona School of Podiatric Medicine

Abstract

Tarsal coalitions are characterized as a fusion between bones of the midfoot and hindfoot. A surgical technique utilized is resection, however, few studies have evaluated outcomes of coalition resections, and there are fewer studies addressing secondary tarsal fractures. This case reports the procedure and outcome of a resection of a CN coalition and how the navicular stress fracture was addressed.

Literature Review

Tarsal coalitions are congenital abnormalities characterized as a fusion between bones of the midfoot and hindfoot due to failure of mesenchymal segmentation during fetal life.[2,3,4,7] The 2 most common are calcaneonavicular (CN) and talocalcaneal (TC) coalitions, and can be categorized based on the ossification which include osseous, fibrous, and cartilaginous.[2,3,5,6]

Coalitions are commonly found in children and adolescents. Patients are often asymptomatic in early childhood, while preadolescents most commonly present with activity-related hindfoot and/or midfoot pain.[5] The most common symptoms include lateral foot pain, repeated ankle sprains, and limited range of motion.[2,3,5]

CN coalitions are identified through various imaging modalities. Radiographic imaging is generally the first test performed; however MRI imaging is gold standard for a definitive diagnosis.[3] MR Imaging for an osseous coalition will show bone marrow signal continuing across the fused articulation, seen as a high intensity signal on a T1, and a low intensity signal on a T2.

Once conservative treatment fails, surgery is required. It's been reported patients who've undergone operative resection compared to nonoperative treatment enjoy a greater level of activity and higher percentage of return to sports.[6] There is still no clear consensus on the operative criteria leading to favorable outcomes.[6] Furthermore, there is even less consensus on how to treat a stress fracture secondary to a coalition.

Figure 1.

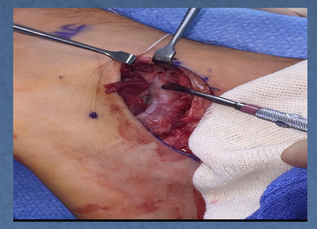

Figure 2.

Figure 3.

Case Study

A 15-year-old competitive basketball player male with no PMH presented with a left foot injury. He reported notable pain to the left foot for at least two weeks. He described a potential "injury" to the left ankle while playing basketball but wasn't bad enough to require cease of activity. He denied swelling or bruising to the area yet reported soreness over the past 2+ weeks. He reported no form of treatment and had no other pedal complaints.

During the musculoskeletal evaluation, the patient had notable tenderness upon palpation to the left navicular. There was no tenderness to palpation of the lateral collateral ligaments or peroneal tendons. The external rotation stress test, anterior drawer, and talar tilt tests were all negative. After analyzing radiographs, MRI, and physical exam findings the patient was diagnosed with a left navicular bone contusion and stress fracture secondary to an underlying fibro-osseous CN coalition.

Two months after full clinical healing, he presented again with pain to the left rearfoot and ankle. An MRI revealed a type II stress fracture of the left mid-navicular originating at the dorsal cortex and extending through 50% of the navicular body (figure 1). Due to the coalition, the patient was at high risk for recurrent stress fractures and advised he needed surgery. Resection of the coalition with avoidance of ORIF was the treatment plan the patient and his family wanted to pursue.

Surgical resection of the CN coalition was performed without complications. After locating and marking the distal fibula, a s-shaped incision was made dorsolateral to the navicular (figure 2). Complete dissection showed the CN bar. Once identified, the coalition was resected, and an inter-positional dermal graft was placed in the new joint space (figure 3).

After 15 weeks of post-operative care with no incidents, an MRI showed a persistent navicular fracture. However, the patient was granted full athletic clearance due to no presenting symptoms. After 20 months of follow-up to date, he had no recurring symptoms, the navicular stress fracture showed complete clinical healing and he is currently playing Division 1 NCAA basketball on scholarship.

Figure 4. Pre-Ops/Post-Ops

First two images from right to left are pre-ops indicating the presence of a CN bar and the third image is a post-op revealing the successful removal of the coalition and showing no signs of reossification to the area.

Discussion

Our case study sought to evaluate the procedure and outcome of a high-level athlete with chronic stress fractures secondary to a coalition. To our knowledge, this is the first reported case study to acknowledge and explain an appropriate treatment plan for stress fractures secondary to a coalition in an elite athlete. Being an elite athlete with professional basketball potential, the patient stated that scouts look negatively upon draft prospects with surgical hardware. Because of this, resection with the avoidance of ORIF was chosen. This unique situation influenced us to investigate reported case studies to evaluate the type of surgery, if any, was recommended for coalitions with secondary stress fractures.

Current literature shows that ORIF is the recommended surgical choice for healing chronic stress fractures. As shown here, coalitions with secondary stress fractures may be healed through resection alone. To avoid coalition reoccurrence, studies indicate a fat dermal graft and bone wax provided better pain relief, higher AOFAS (American-Orthopedic-Foot and Ankle Society) score, and had lower recurrence rates than the EDB technique.[11] It was also noted that dermal grafts have lower rates of reossification than EDB grafts.[4] The advantages of the aforementioned studies show resection of a coalition and placement of a dermal graft is a safe and effective treatment when used on a high-level athlete.

In conclusion, coalition resection, dermal graft placement without ORIF is an effective way to alleviate symptoms and lower the risk of recurrence. However, a larger retrospective analysis on elite athletes must be done to further establish resection without ORIF as a viable treatment option for a patient with chronic navicular stress fractures.

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