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Tips, Quips and Pearls

Technique Article: Tarsal Coalition Resection Using Kirschner Wires Across the Subtalar Joint in a Two-Incision Approach

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ABSTRACT

Subtalar coalitions are a significant cause of morbidity, especially in the pediatric population. Arthrodesis was considered the standard of care, with coalitions involving >50% of the joint until the mid-1990s. Today, some are recommending resection of the coalition first and to save hindfoot arthrodesis as a salvage procedure. As a result, resection of talocalcaneal coalitions is becoming more common, and optimizing the surgical technique is a necessity in the field of orthopedics. We present a technique to optimize surgical resection of talocalcaneal coalitions by using Kirschner wires inserted from the lateral side, which allows us to demarcate the coalition. This gives us a greater ability to perform a more complete resection and also helps prevent iatrogenic trauma to the articulating surface.

Operative management for tarsal coalitions is reserved for when nonoperative management has proven ineffective (1). In 1960, Hark (2) began to advocate resection versus arthrodesis for talocalcaneal coalitions. Today, more are advocating the surgical excision of the talocalcaneal resection in situations that formerly would have been treated with fusion (3,4). The goal of surgical intervention is to restore normal anatomic motion and to alleviate pain from abnormal hindfoot and midfoot motion. Tarsal coalition surgery and specifically middle facet subtalar coalitions resections are challenging procedures. Anecdotally, we have found that this location in the foot is difficult to access, and demarcation between pathologic and native bone may not be obvious. Proper surgical technique involves safe identification of the coalition and complete takedown to restore a more normal joint range of motion. We set out to provide a technique tip to accomplish this task.

Preoperative evaluation of the patient should include evaluation of the medial and lateral soft tissue envelope and the neurovascular status. The contralateral foot and ankle should be examined for comparison. Plain radiographs should include a weightbearing series with anterior-posterior, lateral, 45° oblique, and calcaneal axial views of the foot. A calcaneal axial view is most helpful in identifying a talocalcaneal coalition. Computed tomography scans are obtained to further evaluate for the presence of a coalition and to evaluate for degenerative changes that could alter surgical planning. Some coalitions are fibrocartilaginous in nature and not bony. Magnetic resonance imaging is a proven technique to evaluate these types of coalitions and is the technique used at our institution (5).

Technique

The patient is placed supine on the table. Regional anesthesia may be used for this technique, but we routinely use general anesthesia. A tourniquet is routinely applied, and a beanbag is used for positioning. The beanbag is a useful tool in this situation because it allows us to easily change positioning of the patient after the medial approach without redraping the patient. The patient is initially positioned in a partial lateral decubitus position that brings the operative foot into about 45° of external rotation relative to the bed. The patient's hips always remain centered on the bed, as opposed to in the lateral decubitus position, where the greater trochanter is centered on the bed. After the medial exposure, the beanbag can be deflated. This causes the patient's hips to become parallel with the bed and brings the operative foot to internally rotate back to neutral and helps with the sinus tarsi approach. We routinely use a miniature C-arm fluoroscopy machine because this is much easier to manipulate in our experience and has a lower radiation burden.

The medial incision and exposure is completed first. A horizontal incision along the medial aspect of the hindfoot is centered over the sustentaculum tali (Fig. 1). The interval between the posterior tibial tendon and the flexor digitorum longus tendon is found while protecting the neurovascular bundle. This initial step has been widely described in the literature (6,7). Based on preoperative computed tomography scanning, the necessary joints are exposed, including the calcaneocuboid, subtalar, and talonavicular joints. Next, the lateral side is exposed using

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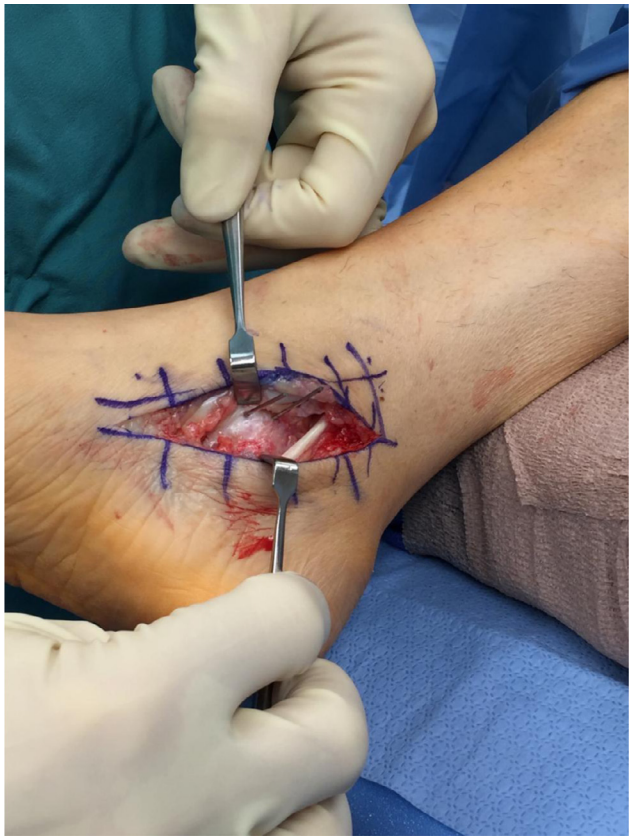

Fig. 1. Medial exposure.

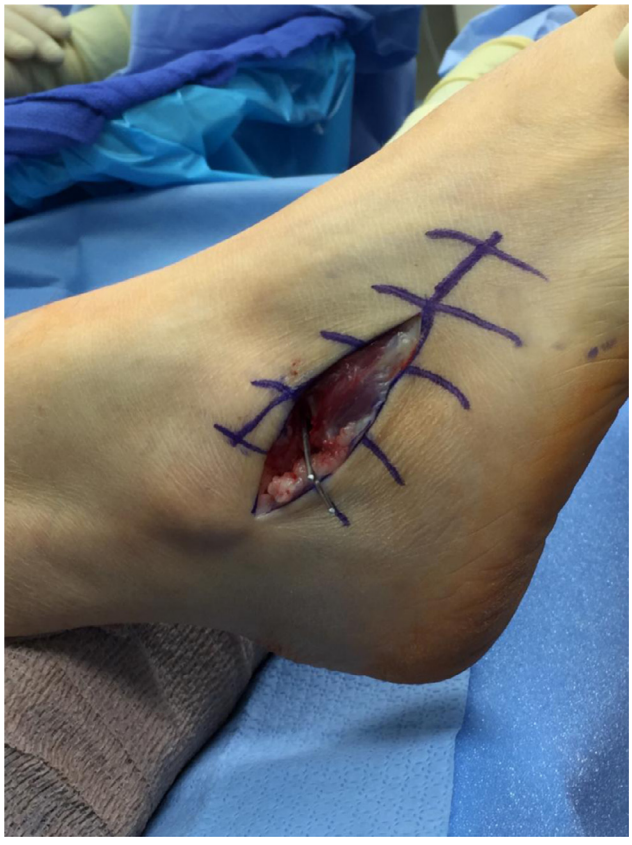

Fig. 2. Lateral approach with Kirschner wire placed.

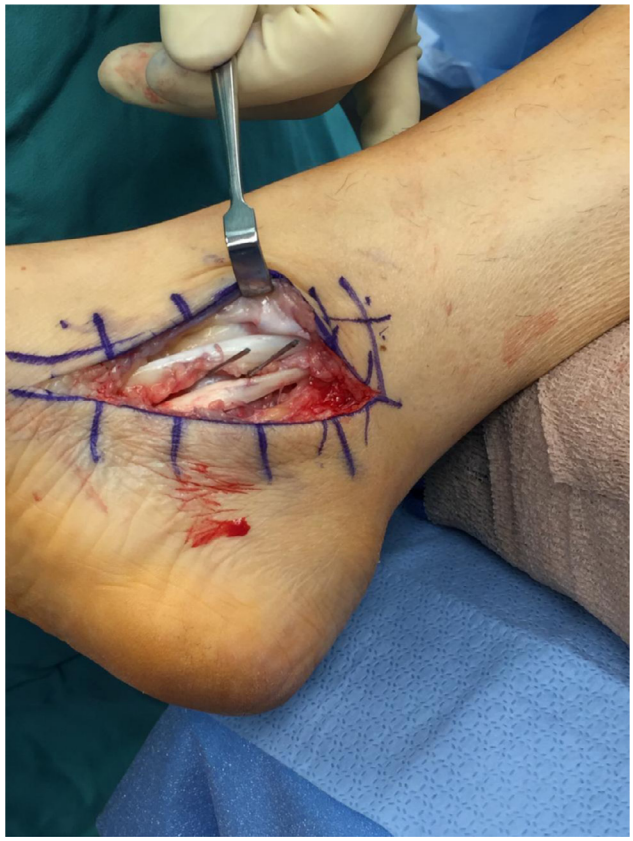

Fig. 3. Medial approach after Kirschner wire placed shows demarcation of coalition.

the sinus tarsi approach (Fig. 2). Our incision is just distal to the fibula toward the base of the fourth metatarsal. The peroneal tendons and sural nerve are protected, and the extensor digitorum brevis is dissected to expose the sinus tarsi. Tools such as smooth laminar retractors can be used as needed to achieve adequate visualization and joint distraction. Then 0.045 Kirschner wires (K-wires) are placed across the joint of interest until they protrude through the coalition starting laterally and heading medially (Figs. 2 and 3). This is done under direct visualization to prevent injury to the articular surfaces. From previous exposure of the coalition from the separate medial approach, the advancement of the K-wires can be identified through the coalition while protecting the medial structures.

Coalition resection is performed around the protruding K-wires with a sagittal saw and rongeurs. Demarcation and resection of the pathologic bone allows us to take the resection back to a level of healthy articular cartilage. Adequate resection of the coalition can be confirmed with fluoroscopy. Figs. 4 and 5 show an example of intraoperative fluoroscopy that aided in the confirmation of adequate coalitions resection. Of note, each surgery should be handled on a case-by-case basis. If the anterior or posterior aspect of the coalition is difficult to visualize directly, being able to freely pass a tool such as a freer elevator to the area demarcated by the K-wire gives us more confidence that adequate resection has occurred.

The wounds are then thoroughly irrigated with sterile saline solution. Bone wax and adipose tissue are then placed to help prevent reformation of the coalition. Deep soft tissue closure is done with 2-0 Vicryl, and buried subcuticular 3-0 Vicryl simple interrupted sutures are placed to approximate the skin. Last, we use 3-0 nylon sutures placed in a horizontal mattress configuration for final skin closure. In children who may not tolerate suture removal in the clinic, 4-0 absorbable suture is placed in a running fashion in the subcuticular tissue for final skin closure. A plaster

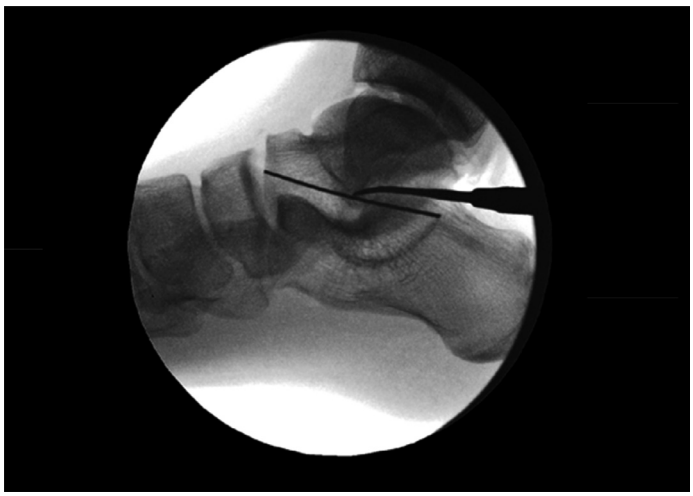

Fig. 4. Intraoperative fluoroscopy film. Notice how the freer-elevator is able to come in contact with the K-wire demarcating the anterior aspect of the coalition.

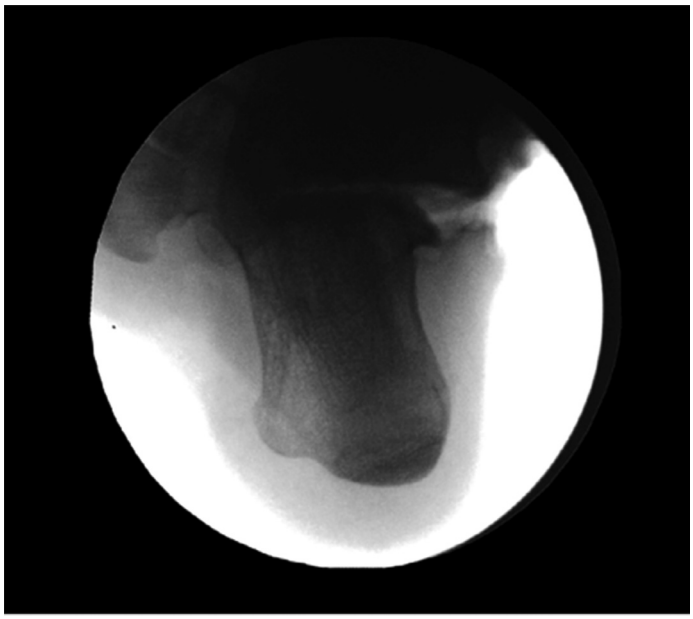

Fig. 5. Intraoperative Harris view helps to confirm adequate resection of the coalition.

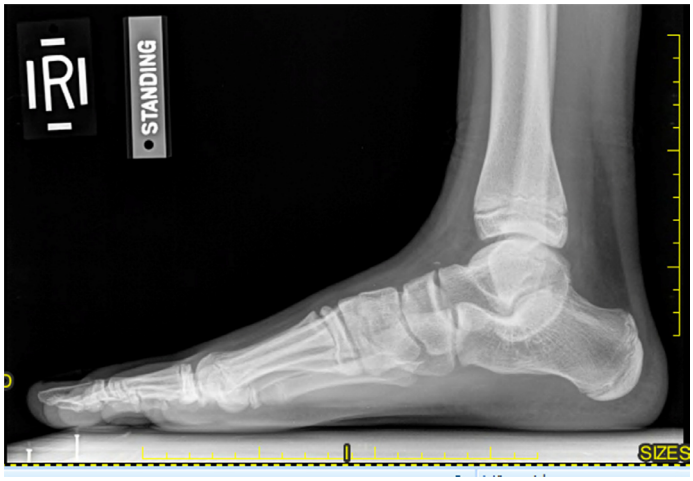

Fig. 6. Preoperative x-ray film shows talocalcaneal coalition and a positive C sign.

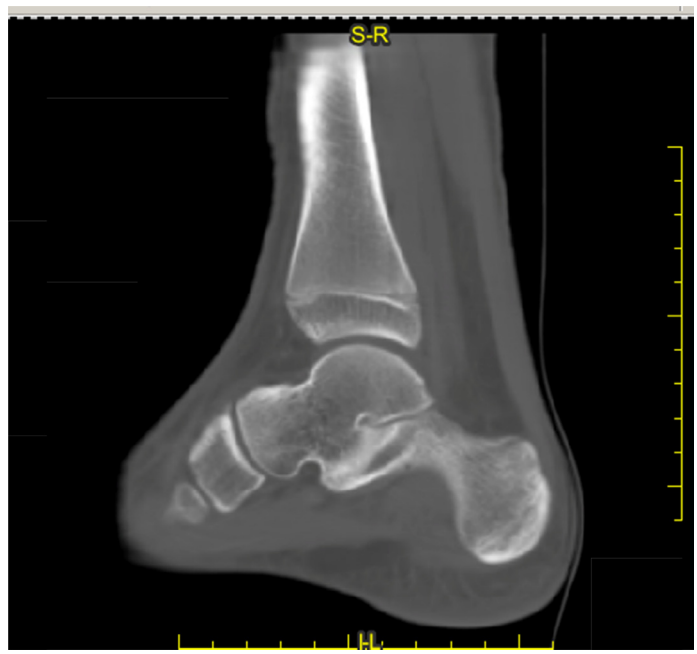

Fig. 7. Representative CT scan cut showing talocalcaneal coalition.

posterior splint with stirrups is placed, and the patient is taken to the recovery room. A preoperative x-ray film and a representative cut through the computed tomography scan (Figs. 6 and 7) and a postoperative x-ray film (Fig. 8) confirm the coalition resection.

Discussion

Talocalcaneal coalition is a serious cause of morbidity in up to 2% of the population, with 50% of talocalcaneal coalitions being bilateral, and 25% of those being symptomatic and requiring some form of nonoperative or operative treatment (7,8). If the nonoperative technique fails, this often leads to operative treatment because pain and poor mobility persist (9). Furthermore, indications for a second operation are often attributed to incomplete resection, leading to recurrence of the collation (6,10,11). The use of a 2-incision technique allows accurate identification of the coalition and ensures complete resection. Olney (10) describes a technique using Keith needles inserted from

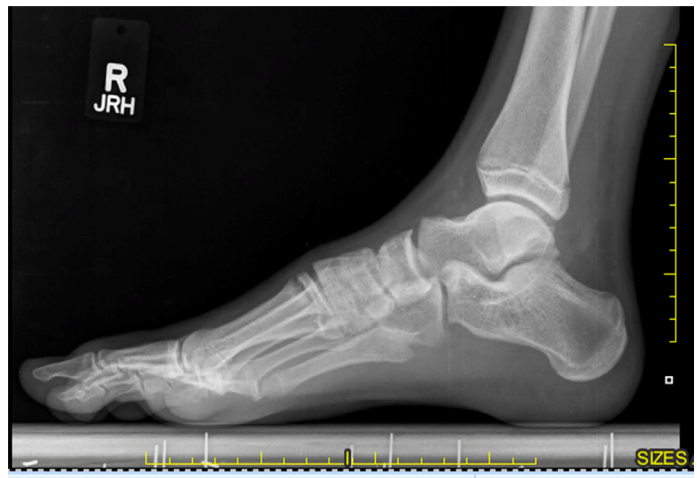

Fig. 8. Postoperative x-ray showing talocalcaneal coalition resection.

the medial side; however, this is done blindly and has the potential to damage the normal articular cartilage beyond the coalesced joint. If excess bone is excised, normal joint motion or tendon excursion could be affected.

There are a few limitations to this procedure. This technique uses a 2-incision approach, which could lead to an increased incidence of postoperative pain and wound complications, especially in patients with diabetes or other vasculature pathology. Placing a K-wire in the subtalar joint can be difficult because of the natural curvature of the joint. If this is done blindly, there can be iatrogenic injury to the cartilage. In addition, this technique may add operative time and a small increase in cost with the use of K-wires. Finally, we do not know whether this technique affects patient outcomes. Further studies are needed.

In conclusion, we believe that this approach gives us an opportunity to optimally resect large amounts of coalition while doing so safely and effectively. Optimal resection would logically lead to better patient outcomes. We plan to continue with this body of work and correlate our technique to clinical outcomes in the future.

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