Technical Note

Lateral Arthroscopic Subtalar Arthrodesis for Talocalcaneal Coalition: Surgical Technique

Teodor Negru, M.D., and Ronny Lopes, M.D.

Abstract: Resection of symptomatic talocalcaneal coalitions (TCCs) has been performed for patients with normal tarsal joints and <50% involvement of the subtalar joint. For those with TCCs >50% of subtalar articulation or/and subtalar arthritis, a subtalar arthrodesis is done. The purpose of this Technical Note is to describe the arthroscopic resection of TCC and talocalcaneal arthrodesis during the same procedure by using a 2 lateral portal technique. With the patient in lateral decubitus under general or locoregional anaesthesia, the foot and ankle are extended beyond the edge of the surgical table. A lateral portal is created 1 cm anterior to the tip of the lateral malleolus in which the arthroscope is introduced. The anterolateral portal is created 1 cm inferior and 2 cm anterior to the tip of the lateral malleolus. The posterior subtalar surface is prepared progressively. The TCC resection is completed. The fixation is obtained with 2 cannulated screws. The arthroscopic resection of TCC and subtalar arthrodesis during the same procedure by using 2 lateral portals can be done for correctly selected patients.

The documented incidence of tarsal coalition is approximately 1% or less of the population.1,2 The joints most commonly affected are the talocalcaneal coalition (TCC) and calcaneonavicular coalition, which account for approximately 90% of cases.3 The talocalcaneal coalition rate is between 12.7 and 48.1%.3,4 Asymptomatic TCCs do not need treatment, whereas the management of painful coalitions remains disputable.5 Conservative treatment is the first-line recommendation for symptomatic talocalcaneal coalitions, but if it fails, surgical treatment may be indicated.2,5 Many techniques have been described for the treatment of TCCs. Resection of symptomatic TCCs has been performed for patients with normal tarsal joints and <50% involvement of the subtalar joint. For patients who have degenerative lesions of the tarsal joints, a triple arthrodesis is indicated. Those with TCCs >50% of subtalar articulation and/or subtalar arthritis a subtalar arthrodesis is done.5-7 The purpose of this Technical Note is to describe the arthroscopic resection of TCC and talocalcaneal arthrodesis during the same procedure by using 2 lateral portals technique.

Surgical Technique (With Video Illustration)
A demonstration of the lateral arthroscopic talocalcaneal coalition resection and subtalar arthrodesis is available in Video 1.

Surgical Equipment
A standard 4-mm arthroscope is required. Shavers (3.5 or 5 mm in diameter) and spherical or oval burrs (5 mm in diameter) are used. A tourniquet and an arthroscopy pump may or not be added.8,9 Coalition and cartilage resection and subchondral bone preparation are achieved with burrs, curettes, chisels, and awls. The arthrodesis is fixed with cannulated screws under fluoroscopy to assess the contact and position of the bone surfaces.

Installation
Preoperative antibiotics prophylaxis is done. With the patient in lateral decubitus under general or locoregional anaesthesia, the foot and ankle are extended beyond the edge of the surgical table. Therefore, the foot can be forced in varus to open up the sinus tarsi...
and the lateral part of the subtalar joint, making the access easier for arthroscopic procedures (Fig 1).10

**Portals**
A lateral portal is created 1 cm anterior to the tip of the lateral malleolus11,12 in which the arthroscope is introduced. The anterolateral portal is created 1 cm inferior and 2 cm anterior to the tip of the lateral malleolus under arthroscopic guidance (Fig 2).13 The working area is created progressively with the shaver in contact with bone, from distal to proximal. The lack of movements in the subtalar articulation is observed.

**Bone Surface Preparation and Coalition Resection**
The posterior subtalar surface is prepared progressively preserving its shape and ensuring that compression will not cause malalignment in the coronal and sagittal plane during the arthrodesis fixation. The preparation is done until the tibialis posterior tendon (Fig 3) and TCC is identified. As middle facet coalitions are oblique rather than horizontal, the TCC resection is done from dorsal to caudal, lateral to medial, and distal to proximal so as not to miss any extension into the posterior facet on the medial side.14 The TCC is resected with an arthroscopic burr until the movements of the subtalar articulation can be clinically and arthroscopically confirmed. After the cartilage is completely removed and coalition is completely resected, a square-tipped awl is used to make holes down to the cancellous bone on the articular surfaces to promote bone fusion (Fig 4).

**Fixation**
The fixation is obtained with 2 cannulated screws inserted from the posterior aspect of the heel to the talus.8,15-17 Two pins are inserted perpendicular to the posterior subtalar surface from the calcaneal tuberosity to the talus maintaining the hindfoot in its final position. The pins and arthrodesis final position are radiologically assessed. Then, 2 cannulated of 6.5-mm diameter screws (FAST of SERF Extremity Society, Decines France) are inserted to apply compression at the arthrodesis site (Fig 5).

**Postoperative Management**
This technique can be performed as a 1-day surgery procedure. A walking boot is required to be used immediately after the procedure for 4 to 6 weeks with full weight-bearing as tolerated. Analgesics and nonsteroidal anti-inflammatory drugs are prescribed for the early postoperative period. Thromboprophylaxis for 4 weeks is prescribed. Clinical and radiologic evaluation can be performed at 6 weeks and 3, 6, and 12 months postoperatively.

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**Table 1. Advantages, Disadvantages, and Limitations of Lateral Arthroscopic Subtalar Arthrodesis for Talocalcaneal Coalition (TCC)**

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<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Limitations</th>
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<tbody>
<tr>
<td>Good exposure of subtalar joint</td>
<td>Long surgery</td>
<td>Limited number of patients suitable for this procedure</td>
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<td>Hindfoot malalignment because of TCC can be corrected</td>
<td>Lesser saphenous vein is at risk with anterolateral portal placement</td>
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<td>The technique can be done with usual arthroscopic instruments</td>
<td>Clinical studies are needed to validate this technique</td>
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<td>Low rates of complications</td>
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<td>Reduced risk of skin complication (necrosis, infection, delayed healing) compared with open procedures</td>
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<td>Shorter time to fusion compared with open procedures</td>
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<td>One-day surgery</td>
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<td>Full weight-bearing immediately after the procedure and quicker recovery compared with open procedures</td>
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<td>Minimal invasive surgery</td>
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**Table 2. Pearls and Pitfalls of Lateral Arthroscopic Subtalar Arthrodesis for Talocalcaneal Coalition (TCC)**

<table>
<thead>
<tr>
<th>Pearls</th>
<th>Pitfalls</th>
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<td>Forcing the foot in varus with the patient in lateral decubitus opens the sinus tarsi, the lateral part of the subtalar joint, and can reduce the pes planus that is often associated with TCCs</td>
<td>If the articular shape is not preserved, the compression can cause malalignment during fusion fixation (medial over-resection leads to varus malalignment; lateral over-resection leads to valgus malalignment)</td>
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<tr>
<td>Posterior tibialis tendon is an anatomical landmark for medial resection of the TCC</td>
<td>Resecting medially to flexor hallucis longus tendons can damage the medial neurovascular bundle</td>
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<tr>
<td>Flexor hallucis longus is a medial anatomical landmark for articular preparation</td>
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<tr>
<td>TCC is resected when movements in subtalar articulation can be confirmed</td>
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<tr>
<td>Using a square-tipped awl to make holes in the cancellous bone promote bone fusion</td>
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Discussion

Many case series describing the treatment of TCCs and its results are available in the literature but, to our knowledge, at the time of writing this paper, this is the first Technical Note reporting a resection of TCC followed by arthrodesis by lateral subtalar arthroscopy.

However, the optimal surgical treatment for symptomatic TCCs after failed conservative management has yet to be determined. Postoperative pain after resection of symptomatic tarsal coalitions remains an issue and is usually associated with pre-existing secondary arthritic changes and synovitis. Preoperative assessment of the size and extent of particularly posterior facet articular surface involvement can help to select which patients would be expected to benefit from tarsal coalition resection only or in combination with arthrodesis as treatment. In cases in which resection is not possible or desired, the fusion of the subtalar joint only can be performed, instead of the traditional triple arthrodesis, reasoning that any motion saved in the midtarsal joints would maintain force transfer during motion, decreasing or slowing degenerative changes in adjacent joints.

Lateral subtalar arthroscopy is a technique with good results and low iatrogenic complication rates that allows good visualization of the entire subtalar articulation. The safety of the portals was proved in the
No structures are at risk with the lateral portal placement.\textsuperscript{11-13,24} The structures at risk for the anterolateral portal are dorsal intermediate cutaneous branch of the superficial peroneal nerve, the dorsal lateral cutaneous branch of the sural nerve, the peroneus tertius tendon, and a small branch of the lesser saphenous vein. Frey et al.\textsuperscript{11} demonstrated that only the branch of the lesser saphenous vein is at risk to be lacerated, but the rest of the structures are at a safe distance of the placement of anterolateral portal.

Arthroscopic tarsal coalition resection is a feasible and effective surgery,\textsuperscript{26} and the TCCs can be resected using lateral portals arthroscopic technique.\textsuperscript{14} The medial open approach to the TCC does not provide adequate exposure of the posterior and posterolateral extent of the coalition without excessive retraction on the tibial nerve and vessels.\textsuperscript{14} Moreover, conventional open surgery for symptomatic TCCs can lead to complications that are independent of the used technique, including incisional neuroma formation (10\%), superficial wound infection (4\%), and delayed wound healing (4\%).\textsuperscript{5,21,27,28}

The posterior subtalar surface can be prepared under lateral arthroscopic guidance and subtalar arthrodesis can be done.\textsuperscript{8,25,29} Studies of arthroscopic subtalar arthrodesis showed good results with low rates of complications,\textsuperscript{30} a bone rate fusion greater than 90\% with a shorter time to fusion (average of 8 weeks), and a quicker recovery.\textsuperscript{16,17,30-33}

In conclusion, the arthroscopic resection of TCC and subtalar arthrodesis during the same procedure by using 2 lateral portals can be done for correctly selected patients.

References


