Technical Note

Anatomic Arthroscopic Graft Reconstruction of the Interosseous Talocalcaneal Ligament for Subtalar Instability

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Abstract: Instabilities of the subtalar joint are commonly overlooked or mismanaged, and chronic instability is a debilitating condition leading to premature joint degeneration. Several methods of treatment have been described, mainly screw fixation, arthrodesis, or ligament reconstruction. Most studies describe open methods for ligament reconstruction. We describe an original technique for "all-inside" arthroscopic graft reconstruction of the interosseous talocalcaneal ligament for subtalar instability.

Chronic lateral ankle instability (CLAI) is a recognized problem after an acute ankle sprain. Anatomically, 2 forms of CLAI can be distinguished, namely tibiotalar instability (TTI) and subtalar joint instability (STI). STI can occur in conjunction with TTI, but can also occur in an isolated form. Unrecognized STI has been described as a cause of failure of surgical treatment in patients with mechanical ankle instability, and has also been suggested as one of the causes of persisting functional instability.[1]

Subtalar joint stability is provided by the cervical ligament (CL) and interosseous talocalcaneal ligament (ITCL). These structures maintain subtalar congruency while allowing the calcaneus to accommodate the talar rotation and the broader anterior portion of the talar dome during ankle dorsiflexion and plantarflexion.[2]

The ITCL is the main subtalar stabilizer. Its structure is composed of a dense connective tissue of parallel

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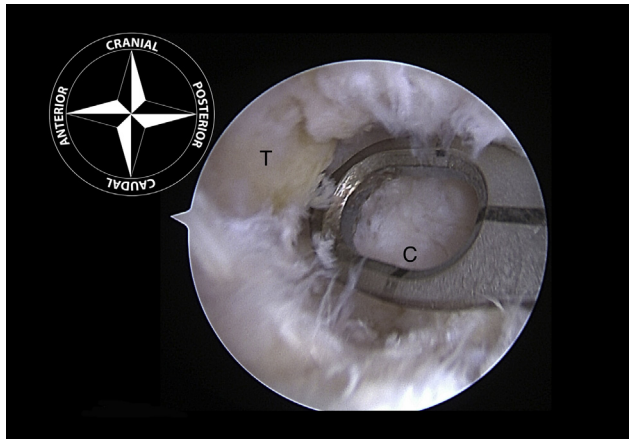

Fig 1. Surgical technique in a patient with chronic subtalar instability in the left ankle. Lateral subtalar portals are used. The patient is placed in right lateral decubitus with a support under the ankle. A complete rupture of the interosseous talocalcaneal ligament (ITCL) can be seen through the sinus tarsi portals. An anterior cruciate ligament (ACL) guide is used to identify the ICTL calcaneal insertion. C, calcaneus; T, talus.

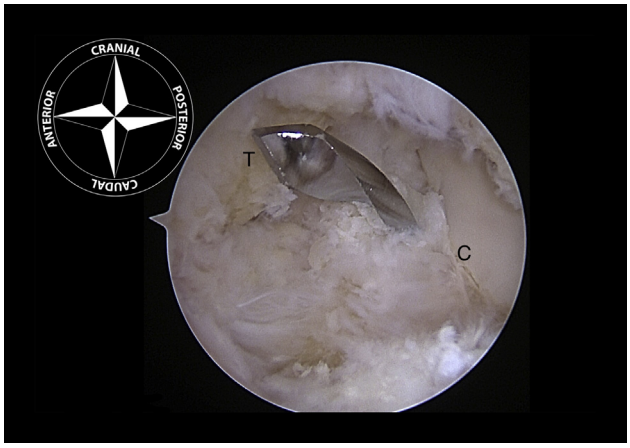

Fig 2. Surgical technique in a patient with chronic subtalar instability in the left ankle. Lateral subtalar portals are used. A Kirschner wire is used for the calcaneal tunnel. C, calcaneus; T, talus.

collagen fibers with a limited proprioceptive role. Experimental studies suggest that ITCL lesions lead to increased rotatory talus instability, probably through a mitered hinge mechanism during varus ankle stress.[3] Ankle sprains with an ITCL lesion documented by magnetic resonance imaging have a poor prognosis regarding pain, stiffness, and instability, which supports the impact of subtalar stability on the tibiotalar stability.[2]

The goal of this paper is to describe the surgical technique for an "all-inside" arthroscopic anatomic reconstruction of the ITCL for chronic subtalar instability using an allograft.

Surgical Technique

Patient Selection

This technique is indicated in patients presenting with isolated subtalar joint chronic instability.

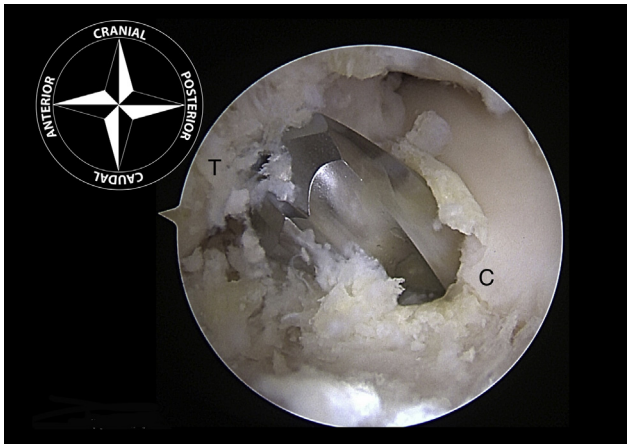

Fig 3. Surgical technique in a patient with chronic subtalar instability in the left ankle. Lateral subtalar portals are used. A 5- or 5.5-mm drill is used for the calcaneal tunnel depending on graft width. C, calcaneus; T, talus.

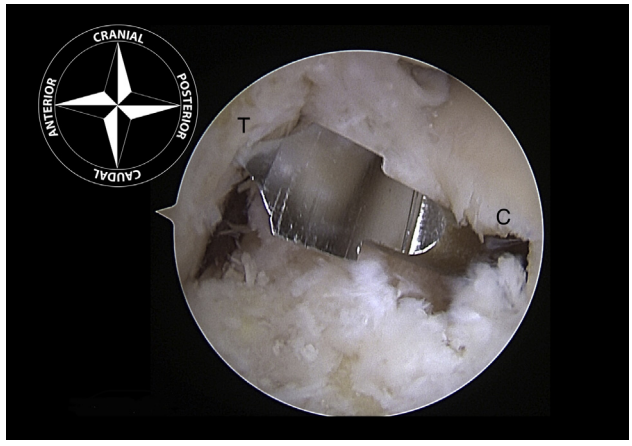

Fig 4. Surgical technique in a patient with chronic subtalar instability in the left ankle. Lateral subtalar portals are used. The Kirschner wire for the TightRope ACL RT device is pass through the calcaneal tunnel. C, calcaneus; T, talus.

Patient Positioning and Arthroscopic Portals

The patient is operated under regional anesthesia. The patient is placed in a lateral decubitus position, with the affected ankle on top, allowing free movement of the ankle. A thigh tourniquet is applied. We do not routinely use distraction devices. A 4-mm 30° scope (Stryker, Kalamazoo, MI) for ankle arthroscopy is used, as well as 3.5- or 4.0-mm synoviotomes (Stryker).

Access to the subtalar joint is obtained through standard anterolateral and anterolateral accessory portals to the sinus tarsi. The intermediate cutaneous branch of the superficial peroneal nerve is identified through flexion and inversion of the ankle or by plantarflexion of the fourth toe.

Reconstruction of the AITFL

Ligamentoplasty is performed using gracilis or extensor/flexor hallucis longus allograft, depending on

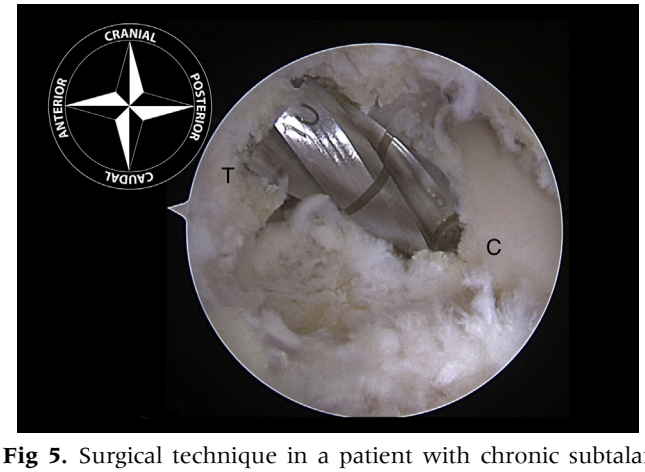

Fig 5. Surgical technique in a patient with chronic subtalar instability in the left ankle. Lateral subtalar portals are used. A talar tunnel of 10-mm length is made. C, calcaneus; T, talus.

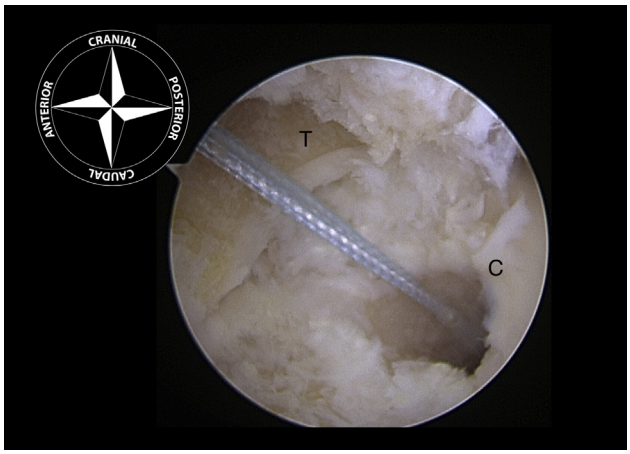

Fig 6. Surgical technique in a patient with chronic subtalar instability in the left ankle. Lateral subtalar portals are used. The final aspect of the tunnel has a blue suture to introduce the graft. C, calcaneus; T, talus.

availability. The graft ends are carefully prepared with Krackow sutures to a diameter of 4.5 to 5.5 mm.

Once the extensor retinaculum, CL, and ITCL are debrided, the exact insertion footprint of the ITCL is located in the calcaneus. Using an anterior cruciate ligament (ACL) guide (Fig 1) (Arthrex, Naples, FL) a 3.2-mm ACL guidewire is inserted from this point (Fig 2), and a 5.5-mm drill is used for the calcaneal tunnel (Fig 3). Then the Kirschner wire is inserted into the talus; when it is about to come out on the anterior talar neck side, a small incision is made to protect the neurovascular bundle. The location of the exit of the guidewire (Fig 4) will be between the tendons of tibialis anterior and extensor hallucis longus.

A 5.5-mm drill is used to a depth of 15 mm in the talus (Fig 5). Once the calcaneus and talar tunnels are drilled (Fig 6), the graft is passed through the tunnels and fixed to the talus using a cortical fixation suture

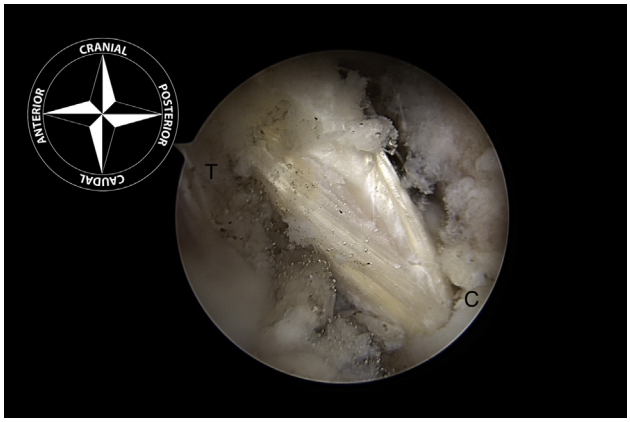

Fig 7. Surgical technique in a patient with chronic subtalar instability in the left ankle. Lateral subtalar portals are used. Final aspect of the graft after talar and calcaneal fixation. C, calcaneus; T, talus.

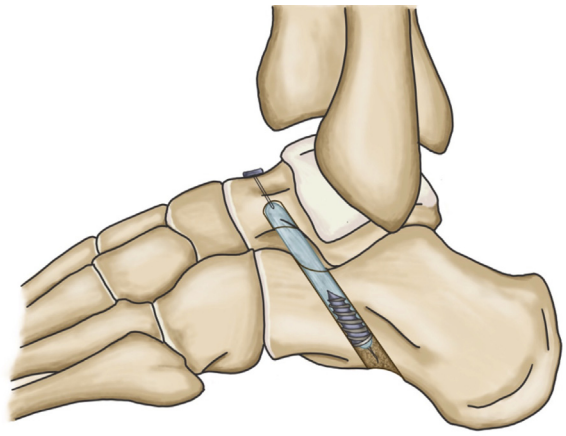

Fig 8. Drawing of the surgical technique. Lateral view of the left ankle. Note the arrangement of the allograft, the calcaneus tunnel, and the blind tunnel with the cortical button device in the talar neck.

button such as the ACL TightRope ACL RT (Arthrex, Naples, FL). By tensioning the white sutures, the graft is advanced, ensuring complete graft fill of the talar tunnel (Video 1). The graft is then fixed to the calcaneus using a flexible guide pin and a 5.5- or 6.25-mm biocomposite tenodesis screw (Arthrex), placing the subtalar in eversion (Figs 7 and 8; Video 1; Tables 1 and 2).

Postoperative Care

Postoperatively, the patient is immobilized in a posterior ankle splint for 3 weeks. The surgical incisions are reviewed 24 hours postoperatively (at the time of discharge from hospital) and after 10 days, during the first postoperative follow-up visit. Only isometric exercises are allowed in the early postoperative period. The ankle splint is replaced by a walker-type ankle-foot orthosis (DonJoy, Surrey, UK) after 3 weeks, and

Table 1. Key Points

- Patient positioning in lateral decubitus
- Create the anterolateral portal first, and after that the accessory anterolateral portal in the sinus tarsi
- Carefully prepare the graft with a Krackow suture, being sure that it will pass through the 5-mm tunnel
- Identify the calcaneal insertion of the interosseous talocalcaneal ligament (ITCL) using an anterior cruciate ligament (ACL) guide
- Create the calcaneal tunnel with a guide wire and cannulated 5- or 5.5-mm drill, from distal to proximal
- Create the blind talar tunnel with a 3.2-mm ACL guidewire and drill to a depth of 10 to 15 mm using a 5- to 5.5-mm drill
- Fix the graft in the talar tunnel with a cortical suture button fixation device for ACL grafts (TightRope ACL RT)
- Fix the graft in the calcaneal tunnel with a 5.5 biocomposite tenodesis screw (Arthrex) in subtalar eversion
- Immobilize the ankle in a posterior splint for 3 weeks and then with a walker-type ankle-foot orthosis; allow for progressive weightbearing starting in week 5, with complete weightbearing at 8 to 12 weeks

Table 2. Pearls and Pitfalls

Pearls	Pitfalls
Draw the main ankle landmarks with the ankle and foot in a neutral position; identify the superficial peroneal nerve	Failure to correctly identify foot print of ligament insertion
Identify the insertion of the interosseous talocalcaneal ligament (ITCL)	Not preparing the graft correctly
Mini open approach in the talar neck is needed to avoid neurovascular injuries	Injury to the neurovascular bundle
Avoid subtalar joint inversion during calcaneal fixation	
Improve varus stability	

progressive partial weightbearing is allowed in the fifth postoperative week. At this time, physiotherapy is commenced, including mobility exercises, electrotherapy, and muscle strengthening and proprioception exercises. The orthosis is generally worn for 9 weeks, after which gradual return to sports participation is allowed.

Discussion

The purpose of this paper is to share an all-inside original technique of arthroscopic reconstruction of the interosseous talocalcaneal ligament to address subtalar instability. Heilman et al.[4] reported experimental findings in sequential subtalar ligaments. The section of the calcaneofibular ligament (CFL) caused a 5-mm laxity during supination stress. The ITCL section caused additional 7-mm laxity during the same stress. During ankle dorsiflexion, the ITCL section causes a significant increase in laxity.

The dominant role of the ITCL in subtalar instability has been the topic of several publications. Most literature regarding surgical treatment for subtalar instability focuses on combined ATFL and CFL retensioning or reconstruction, but some open reconstruction techniques have also been described. With the ever-growing search for minimally invasive and arthroscopic techniques in treating chronic tibiotalar instability, there is the need for a direct technique for reconstruction of the most relevant subtalar ligament: the ITCL.

To the best of our knowledge, this is the first report of an arthroscopic anatomic autologous graft reconstruction of the ITCL for chronic ankle instability. It might be used as an isolated technique, in rare cases of pure subtalar instability, or in combination with other arthroscopic techniques of repair or reconstruction for ankle lateral instability.[5-7]

In conclusion, we describe an arthroscopic technique for reconstruction of the ITCL for cases of chronic subtalar joint inversion. The technique is reproducible and has fewer steps than other previously described methods, reducing the risk of technical errors. We believe the described technique can be performed by most ankle arthroscopists, although we admit that clinical and anatomic studies are necessary to determine the expected results and complication rates.

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