

Searching for an Endoscopic All-Inside Classic Broström-Gould Technique



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Abstract: Ankle sprains represent one of the most common injuries sustained by professional and recreational athletes. For those who develop chronic instability requiring surgery, the Broström-Gould procedure has been advocated as the gold standard treatment. Many arthroscopic techniques have been developed in the attempt to replicate this procedure. However, since both calcaneofibular ligament and inferior extensor retinaculum are extra-capsular structures, some of these techniques include a stand-alone repair of the anterior talofibular ligament, while others add a mini-open or a percutaneous modification to perform the Gould augmentation. In our technique, lateral ankle endoscopy provides a clear view and access to these structures, allowing for an all-inside Broström-Gould using three portals. The procedure is safe and reproducible, resulting in a repair that mostly resembles the classical open technique.

Introduction

Surgical treatment of chronic ankle instability (CAI) may require repair of the anterior talofibular ligament (ATFL) and calcaneofibular ligament (CFL), as well as biological augmentation.

The Broström-Gould procedure has shown good to excellent outcomes and has been considered the gold standard treatment of CAI.¹ Despite this, a myriad of different modifications can be found in the literature regarding this procedure, making it difficult to define academically.

In the past two decades, we have seen a shift toward the use of arthroscopic techniques aiming to replicate the classical open Broström-Gould. In this regard, we must

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Fig 1. Position 1 is used for anterior arthroscopy, with the hip externally rotated and the knee extended. Position 2 is used for lateral endoscopy, with the hip in neutral position and the knee extended.

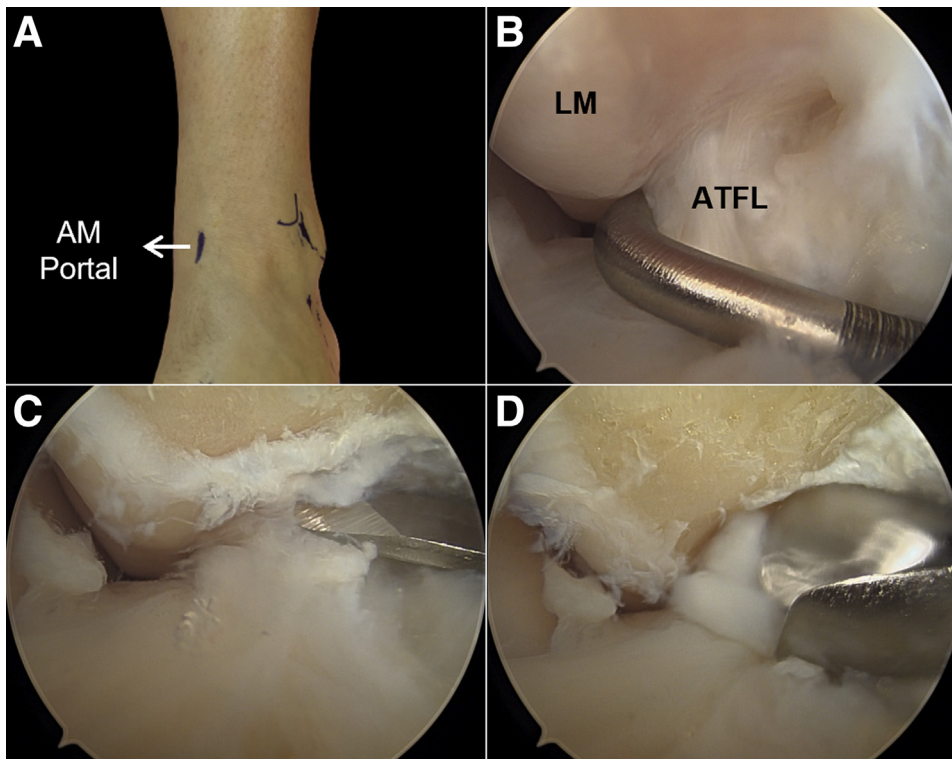


Fig 2. Anterior arthroscopy of a left ankle, with patient in Position 1. (A and B) The anteromedial portal is made just medial to the anterior tibial tendon, with the ankle in dorsiflexion. The arthroscope is introduced and centered in the lateral gutter, and the accessory lateral portal is made just anterior to lateral malleolus and slightly superior to the anterior talofibular ligament. (C and D) The ATFL is peeled off from the malleolus using a beaver blade, and its footprint is burred with a bone shaver to improve biological healing. AM, anteromedial; LM, lateral malleolus; ATFL, anterior talofibular ligament.

Table 1. Pearls and Pitfalls

Surgical Step	Pearls and Pitfalls	Figure
Step 1.AL Portal	Placing the accessory lateral (AL) portal too distal will make it difficult to identify the triangulation of the calcaneofibular ligament (CFL) footprint for anchor placement.A needle can be used to perform the AL portal in the right position.	2
Step 3.Working area	The frondiform ligament represents the stem of the Y-shaped inferior extensor retinaculum. This thickening of the deep fascia is easily felt with a trocar in the AL portal directing anteriorly and inferiorly.Move the trocar in a circular fashion to improve visualization of extensor retinaculum.	3
Step 4.Finding CFL	The CFL is a cord-like structure that can be identified running deep to fibular tendons and superiorly, crossing the subtalar joint, before it inserts in the tip of the fibula.	4

AL, accessory lateral portal; CFL, calcaneofibular ligament; IER, inferior extensor retinaculum.

Table 2. Advantages and Limitations

Advantages	Limitations
Arthroscopic approach allows the treatment of concomitant articular lesions.	The procedure requires good-quality ligament remnants; otherwise, a reconstruction rather than a repair technique may be indicated. The surgeon needs endoscopic experience.
Direct and good visualization is obtained of the extensor retinaculum as compared to percutaneous or mini-open techniques.	
There is less frequent wound-related complications than in open surgery.	
This is a safe and reproducible technique to better understand the lesions and restore lateral ankle stability.	

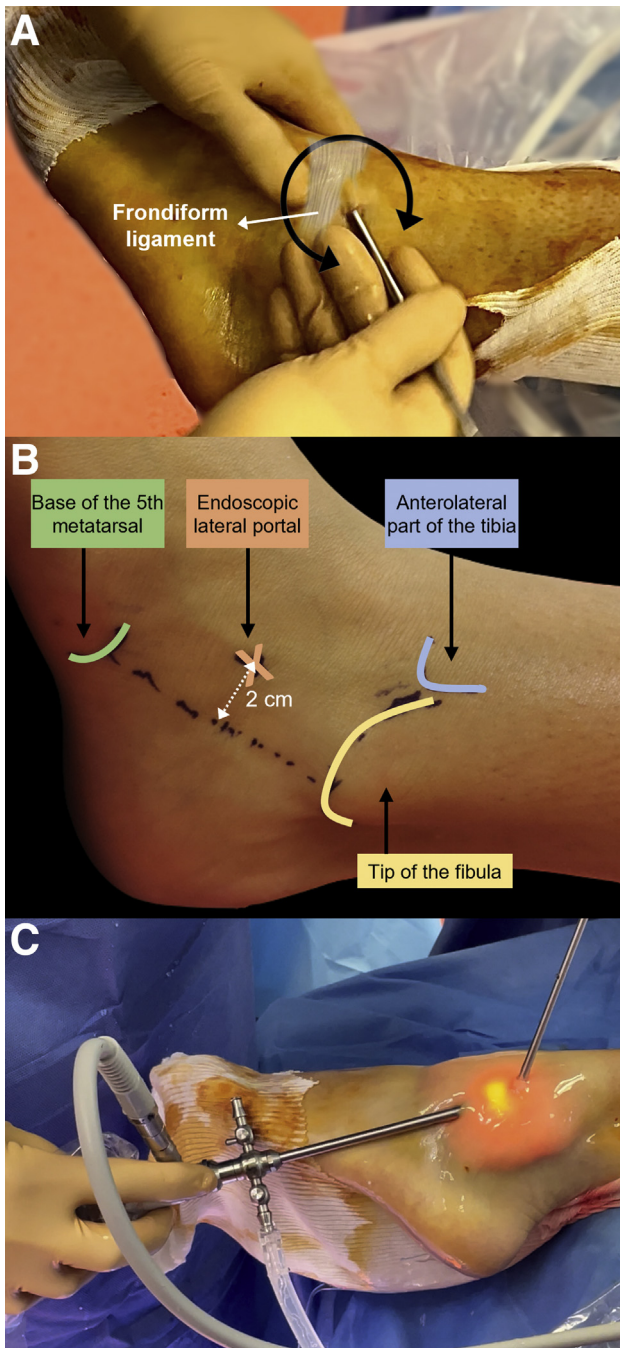


Fig 3. Creating a working area of a left ankle, with the patient in Position 2. (A) Dissection is started with a trocar in the accessory lateral (AL) portal, between the skin and the frondiform ligament (lateral part of the IER). (B) The endoscopic lateral portal is placed 2 cm anterosuperior to the mid-distance point between the tip of the fibula and the base of the fifth metatarsal. (C) Dissection is completed with the arthroscope in EL portal and shaver in AL portal.

consider that while the ATFL is an intracapsular structure, both CFL and inferior extensor retinaculum (IER) are outside the joint, meaning that a purely arthroscopic approach would never really replicate the original procedure.² Although some authors have promoted

techniques with stand-alone repair of the ligaments, others have addressed this issue by adding a mini-open or percutaneous modification to their techniques.^{3,4}

In this work, we describe an all-inside endoscopic technique for the Broström-Gould procedure that aims to be as close as possible to the open described technique.

Surgical Technique

This Technical Note is presented in [Video 1](#). The procedure is divided into two stages: an initial arthroscopic approach followed by an endoscopic approach, which is described below step by step.

Equipment

A 4-mm 30° arthroscope and a 4.5-mm bone/soft tissue shaver are used, with gravity flow irrigation. 1.4-mm soft anchors with nonabsorbable sutures are used for ligaments and retinaculum fixation. A suture passer (Mini Scorpion; Arthrex, Munich, Germany), an arthroscopic grasper, a knot pusher, and knot cutter are also used.

Patient Setup

The procedure is performed under popliteal or sciatic-femoral block, and a tourniquet is used on the thigh.

The patient is placed in lateral decubitus with the pelvis rotated 30° posteriorly to enable the 2 positions required ([Fig 1](#)):

- Position 1 for anterior arthroscopy, with the hip externally rotated and the knee extended
- Position 2 for lateral endoscopy, with the hip in neutral position and the knee extended

Step 1: Anterior arthroscopy, With the Patient in Position 1

The anteromedial (AM) portal is performed just medial to anterior tibialis tendon with the ankle in forced dorsiflexion, ensuring the portal is placed as lateral as possible to provide clear view to the lateral gutter ([Fig 2A](#)).

The arthroscope is introduced and centered on the lateral gutter. Then, transillumination is used to create the accessory lateral (AL) portal, which should be located anterior to the lateral malleolus and slightly superior to the ATFL ([Fig 2B](#)). The location of this portal overlaps the region of the proximal dissection that is performed in open surgery at the end of the distal tibiofibular ligament ([Table 1](#)).

Joint exploration is performed, and any other concomitant lesions requiring treatment may be addressed at this point ([Table 2](#)).

Step 2: ATFL and Fibular Preparation

Using a beaver blade through AL portal, a capsulotomy is performed between ATFL and the capsule.

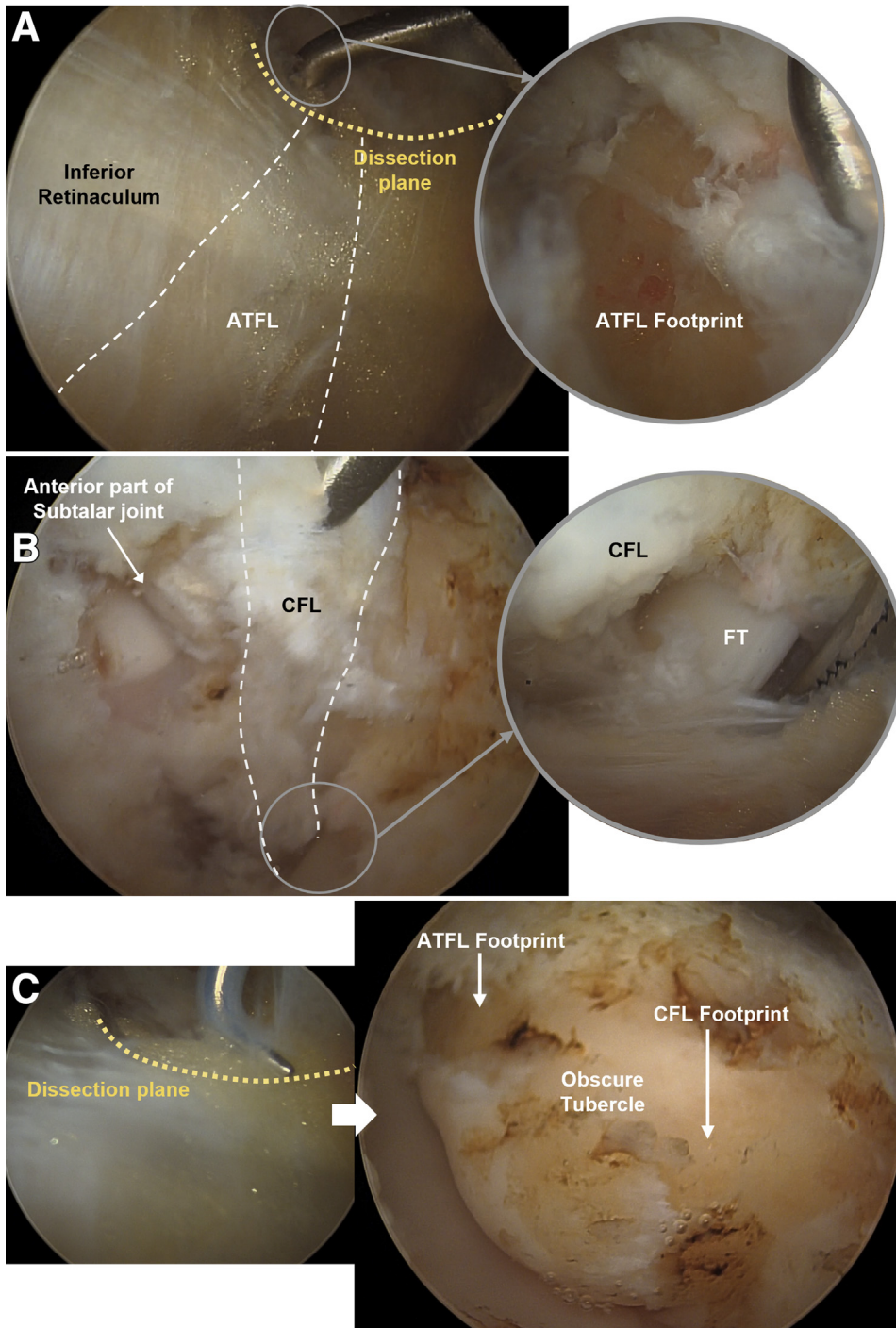


Fig 4. Lateral endoscopy using the endoscopic lateral portal as viewing portal. (A) The inferior retinaculum and the capsulotomy (gray circle) previously made through accessory lateral should be visualized. This point marks the beginning of dissection. (B) The calcaneofibular ligament can be found inferiorly, running deep to fibular tendons. Its fibers can be followed superiorly, passing the subtalar joint, to its insertion on the fibula. (C) After peeling off tissue using electrocautery, both ATFL and CFL footprints can be identified, separated by the obscure tubercle. ATFL, anterior talofibular ligament; CFL, calcaneofibular ligament; FT, fibular tendons.

Scar tissue causing anterolateral impingement is then resected from the lateral gutter using a soft tissue shaver. The dissection of the ATFL is continued to its footprint, located just distal to the insertion of the Basset ligament.

ATFL is detached from its malleolar insertion using a beaver blade, and its footprint is then burred using the bone shaver (Fig 2, C and D). This will provide good

biological environment for the ligaments and IER to heal after reattachment.

Step 3: Working Area and Endoscopic Lateral Portal, With the Patient in Position 2

To create a working space, dissection starts with a smooth trocar between the skin and the inferior extensor retinaculum (Table 1). This structure is easy to

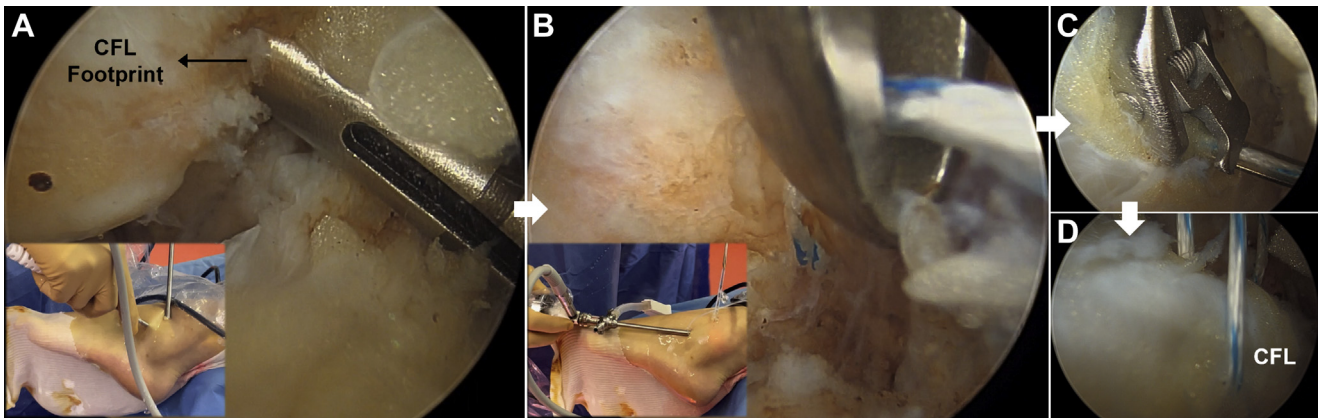


Fig 5. Calcaneofibular anchor. (A) Using the anterolateral portal as a viewing portal, the first anchor is introduced using the endoscopic lateral (EL) portal and is placed in the CFL footprint. (B) The arthroscope is moved to the EL portal and the sutures are retrieved to the accessory lateral portal. (C and D) Sill viewing from the EL portal, a Mini-scorpion is used to pass the sutures through CFL. CFL, calcaneofibular ligament.

feel with the trocar through the AL portal directed inferiorly and anteriorly (Fig 3A). From this point, the trocar will enlarge the working area, keeping the cutaneous nerves away with the subcutaneous fatty tissue to avoid damage. Since this is an avascular plane, there is no vascular danger. The percutaneous preparation of this working area is a key step for the success of the technique.

The endoscopic lateral portal should be placed 2 cm anterosuperior to the mid-distance point between the tip of the fibula and the base of the fifth metatarsal (Fig 3B).

The arthroscope is introduced in the EL portal directing to the AL portal, from which the soft tissue shaver is used to complete dissection (Fig 3C).

Step 4: Endoscopy and Dissection of CFL

The inferior retinaculum should be completely visible now, and the capsulotomy previously performed through the AL portal should be recognized, as this landmark represents the starting point of dissection carried out in open surgery (Fig 4A).

The prominence of the CFL is found distally by palpation (Table 1), following the anterolateral border of the malleolus. Exploration and endoscopic dissection of the anterior part of this prominence will expose the fibular tendons. The CFL can be identified using the fibular tendons as a reference, as its fibers run deep to the tendons (Fig 4B). From this point, CFL fibers can be followed superiorly to its fibular attachment.

Electrocautery is then used through AL portal to peel off tissue from the ATFL to CFL insertions. After this, the obscure tubercle is visible, marking the changing plane between ATFL and CFL footprints (Fig 4C).

Step 5: Anchor Placement

The arthroscope is moved to the AL portal, and the first anchor is placed in the CFL footprint through the EL portal, in the inferior part of the previously prepared fibula (Fig 5A). Then, the arthroscope is moved back to the EL portal, and the sutures are retrieved through the AL portal with a grasping forceps (Fig 5B). One strand is charged in the Mini Scorpion and passed through the



Fig 6. ATFL and IER anchor. (A) Using endoscopic lateral portal as viewing portal, the second anchor is introduced using the accessory lateral portal and is placed in the ATFL footprint. (B and C) Mini-scorpion is used to pass the sutures through the ATFL and IER. ATFL, anterior talofibular ligament; IER, inferior extensor retinaculum.

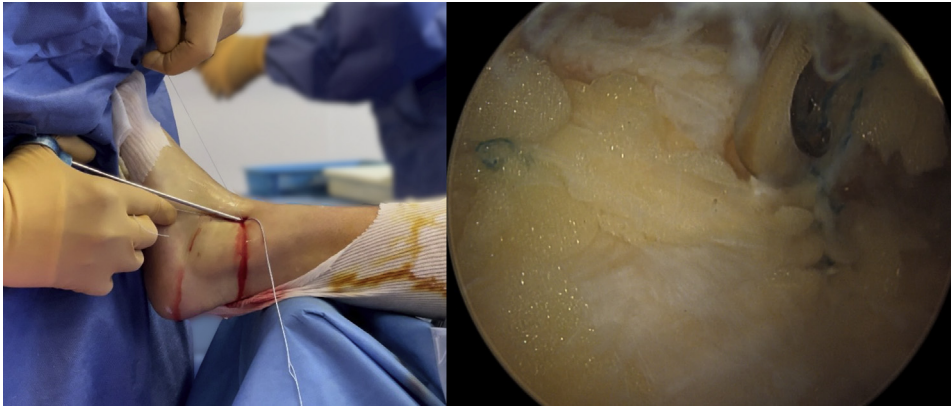


Fig 7. Tying the knots. All sutures should be exiting through accessory lateral (AL) portal. With the ankle dorsiflexed, sutures of both anchors are tied, and the knots are tensioned with a knot pusher in the AL portal. The remaining sutures are then cut under direct visualization from endoscopic lateral portal.

CFL. The other strand is passed inferiorly through the IER, and then both strands are retrieved through the AL portal to achieve a mattress suture (Fig 5, C and D).

The arthroscope is introduced in the EL portal, and the second anchor is placed superiorly, in the ATFL footprint previously prepared, through the AL portal (Fig 6A). One strand is passed through the ATFL, and the other is passed through the IER (Fig 6, B and C). Both strands are retrieved through the AL portal.

Step 6: Tying the Knots and Final View

Holding the foot in dorsiflexion, the two strands from each anchor are tied individually, and the knots are tensioned using a knot pusher (Fig 7). After tightening the knots of both anchors the residual sutures are cut. Final inspection of the repair is performed arthroscopically and endoscopically (Fig 8).

Step 7: Closing, Dressings, an Immobilization

The three portals are closed with staples. The dressing is performed, and a soft ankle orthosis is applied.

Postoperative Care

The surgery is performed on an ambulatory basis, so the patient is usually discharged 6 hours after the procedure.

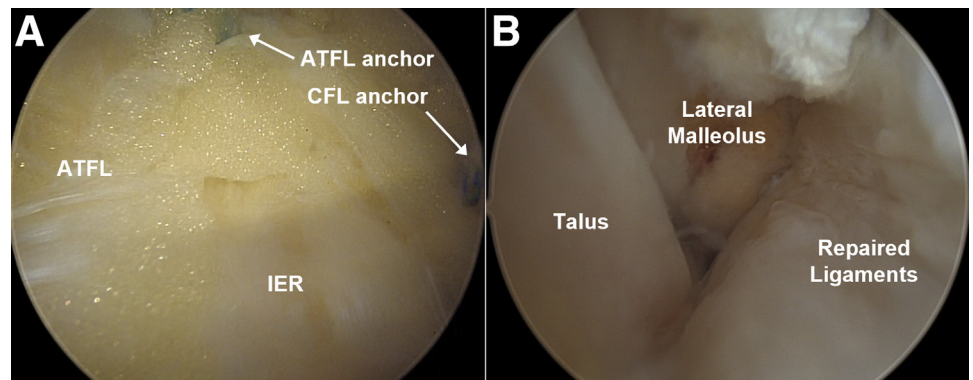
The ankle orthosis is used for 2 weeks, after which active and passive plantar/dorsal flexion range of motion and weight bearing is allowed. Inversion and eversion exercises are started at 6 weeks, and unrestricted activity is allowed at 12 weeks after surgery.

DISCUSSION

The ideal treatment of chronic ankle instability remains in development, as is perceived by the continuous publication of different techniques to address this condition. Nonetheless, the Broström-Gould procedure is the most widely accepted as the gold standard.⁵

Many arthroscopic techniques have been described to the date, most of them partially replicate the classical open Broström-Gould procedure. The fact that both CFL and IER are extra-capsular structures led some authors to perform only partially the Broström procedure, owing to the difficulty of reaching those structures arthroscopically. However, a stand-alone Broström procedure may be insufficient, as the Gould augmentation reinforces the ligament repair and stabilizes the subtalar joint, providing good and lasting results.^{5,6}

Fig 8. Final view. (A) Final endoscopic view using endoscopic lateral portal. (B) Final arthroscopic view using anteromedial portal. ATFL, anterior talofibular ligament; CFL, calcaneofibular ligament; IER, inferior extensor retinaculum.



Our endoscopic technique aims to be as close as possible to the open Broström-Gould procedure, and it is modified after van Dijk open technique.⁷

Direct access to both ligaments and retinaculum is possible using the endoscopic approach. The beginning and the end of the ligament dissection are perfectly seen, and it is possible to achieve a suture of the CFL and the ATFL under direct vision and control, just like in the open technique.

Another advantage is the possibility for addressing concomitant intra-articular pathology, such as cartilage lesions or ankle impingement, since the first part of the procedure includes an arthroscopic approach, prior to ligament repair. Also, wound-related complications seem to be less frequent than in open procedures.⁸

As the main limitation, this technique is not recommended in the presence of highly degenerated ligaments or general laxity, when a reconstruction rather than a repair technique may be indicated.^{9,10}

Well-designed and robust evidence on the outcomes among different techniques is still lacking. The technique described here is safe, reproducible, and, to our knowledge, the one technique that most resembles the classical open Broström-Gould procedure.

Further studies are necessary to evaluate the efficacy and the long-term outcomes of this technique.

References

1. Michels F, Pereira H, Calder J, et al. Searching for consensus in the approach to patients with chronic lateral ankle instability: ask the expert. *Knee Surg Sports Traumatol Arthrosc* 2018;26:2095-2102.
2. Matsui K, Takao M, Tochigi Y, Ozeki S, Glazebrook M. Anatomy of anterior talofibular ligament and calcaneofibular ligament for minimally invasive surgery: A systematic review. *Knee Surg Sports Traumatol Arthrosc* 2017;25:1892-1902.
3. Corte-Real NM, Moreira RM. Arthroscopic repair of chronic lateral ankle instability. *Foot Ankle Int* 2009;30:213-217.
4. Pereira H, Vuurberg G, Gomes N, et al. Arthroscopic repair of ankle instability with all-soft knotless anchors. *Arthrosc Tech* 2016;5:e99-e107.
5. Guillo S, Bauer T, Lee JW, et al. Consensus in chronic ankle instability: Aetiology, assessment, surgical indications and place for arthroscopy. *Orthop Traumatol Surg Res* 2013;99(8 Suppl):S411-S419.
6. Camacho LD, Roward ZT, Deng Y, Latt LD. Surgical management of lateral ankle instability in athletes. *J Athl Train* 2019;54:639-649.
7. VuMedi [Internet]. Amsterdam: Amsterdam Foot & Ankle Platform. Lateral Ligament Reconstruction, 2019. <https://www.vumedi.com/video/lateral-ligament-reconstruction>. Accessed October 14, 2021.
8. Moorthy V, Sayampanathan AA, Yeo NEM, Tay KS. Clinical outcomes of open versus arthroscopic Broström procedure for lateral ankle instability: A meta-analysis. *J Foot Ankle Surg* 2021;60:577-584.
9. Guillo S, Odagiri H. All-inside endoscopic Brostrom-Gould technique. *Arthrosc Tech* 2020;9:e79-e84.
10. Guillo S, Odagiri H, van Rooij F, Bauer T, Hardy A. All-inside endoscopic anatomic reconstruction leads to satisfactory functional outcomes in patients with chronic ankle instability. *Knee Surg Sports Traumatol Arthrosc* 2021;29:1318-1324.

1. Michels F, Pereira H, Calder J, et al. Searching for consensus in the approach to patients with chronic lateral