All-Inside Endoscopic Broström–Gould Technique
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Abstract: Ankle sprain is the most frequent sports trauma. Surgical treatment is needed in case of chronic instability, after failure of conservative treatment. The technique established today worldwide consists in repairing the ligament (Broström technique) and strengthening the repair by adding extensor retinaculum (Gould technique). An arthroscopic technique recently has been developed; nevertheless, no published technique has proposed a total endoscopic Broström technique associated with a Gould augmentation because of difficulty in visualizing the retinaculum by anterior ankle arthroscopy. Lateral ankle endoscopy can provide a view of this area that is superior to open surgery. In this technique, the procedure is able to be performed safely and reproducible under perfect viewing. The purpose of this study is to describe an all-inside endoscopic Broström–Gould technique.

Surgical Technique
The technique is performed with a 4-mm 30° angle arthroscope because of a better view, and the laxity allows complete exploration of the joint. Irrigation is provided by gravity pressure with a hanging saline bag or 50 to 60 mm Hg pressure using an irrigation system. Arthroscopic dissection is performed using a 4.5-mm bone/soft-tissue shaver blade. Passing the suture is facilitated by the Mini Scorpion (Arthrex, Munich, Germany). It is also necessary to have an arthroscopic grasp, a knot pusher, and knot cutter (Video 1). The patient is placed in the lateral decubitus position with the pelvis slightly rotated 30° posterior. Position 1 is used for anterior arthroscopy. The hip is externally rotated. Position 2 is used for the lateral ankle endoscopy. The hip is internally rotated (Figs 1 and 2).

Landmarks: Identification and Marking of Portals
The patient is placed into position 1 (Fig 1). Three portals usually are created to perform the procedure. The anteromedial portal is the first portal (portal 1). It has to be made in maximum dorsiflexion to have the portal more lateral than a normal anteromedial portal. In this way, the anterior working area is bigger, the cartilage is protected because of the dorsiflexion, and the tibialis anterior tendon is at the most lateral position (Fig 1). It is not necessary to perform an injection of saline before making an incision. To be inside the joint, it is important after the passage of the mosquito clamp with the nick-and-spread technique to catch the contact of the ligament and augmentation with the inferior extensor retinaculum.

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bone with the trocar, then to slide the trocar from medial to lateral by keeping contact with the bone. The second portal is the accessory anterolateral portal (portal 2), which is not marked on the skin, as it is made under transillumination guidance when the arthroscope is positioned in portal 1 and viewing the lateral gutter. The placement of this portal is between the spotlight and malleolus (Fig 1). The sinus tarsi portal (portal 3) creates a complete vision of the lateral ankle endoscopically with a complete vision of the retinaculum. Portal 3 is made 1 cm anteriorly to the mid-distance point between the tip of the fibula and the proximal tip of the fifth metatarsal (Fig 2).

**Step 1: Anterior Arthroscopy, Performing the Broström**

The arthroscope is introduced into portal 1. Once the arthroscope perfectly well centered on the external gutter, portal 2 is positioned between the spotlight and the lateral malleolus. To create this portal, we can use a needle. The position should be anterior to the malleolus in the external gutter above the anterior talofibular ligament (ATFL) (Fig 1). A mosquito clamp is introduced using the nick-and-spread technique. Debridement is then begun with the shaver. The resection starts with the scar tissue in the lateral gutter. The first mark to be found is the attachment on the malleolus of distal end of accessory anterior inferior tibiofibular ligament (Bassett ligament). It is then possible to find the insertion of the ATFL on the malleolus distally to the Bassett ligament. It is important then to move the scope backward to visualize the talar neck and have a general view.

Then, we create with a beaver blade a capsulotomy between the ATFL and the capsule (Fig 3). The dissection is handled by a shaver and has to end with a perfect view of the ATFL, from the malleolus to the talar neck. The ATFL is then peeled off from malleolus footprint. It is necessary to prepare the zone of insertion of the ATFL with a burr. This is made to create good biologic healing. The preparation of the malleolus is raised on the last
fibers of insertion of the Bassett ligament to receive the retinaculum on the malleolus. The inferior part of the final preparation is going to receive the ATFL and the superior part will receive the retinaculum (Fig 3). The first anchor is positioned in the footprint of the ATFL, always with the arthroscope in portal 1 and instruments and the anchor by portal 2. The second and the third anchor will be placed at the time of lateral ankle endoscopy (Figs 4 and 5). The Mini Scorpion (Arthrex) is charged with 1 suture (Fig 6). It is important to make a big loop of this suture. The suture is passed through ATFL and the strand from the ligament is passed into the loop to obtain a lasso around the portion of ligament. This technical pearl is made to reinforce the suture (Tables 1 and 2). The ATFL is drawn into malleolus by pulling the other end suture of the anchor. Then, the ATFL is fixed by using Nicky’s knots with a knot pusher (Fig 6).

Step 2: Lateral Ankle Endoscopy, Performing the Gould Augmentation

The ankle is then positioned in lateral decubitus (position 2) and portal 3 is made (Fig 2). The smooth trocar of the arthroscope is passed between the retinaculum and the skin to create a working space (Fig 4). In this way, the cutaneous nerves are staying with the fatty subcutaneous tissue and, as it is avascular, there is no neurovascular danger. The arthroscope is then positioned in portal 3, looking at portal 2 from inferior to superior (Fig 4). A
Fig 5. Retinaculum fixation with 2 anchors. (A) Passing the suture through the retinaculum with a complete view. (B) Four strands from 2 anchors. The knot is made outside the joint with 2 strands (1, 2). (C) By pulling on the 2 strands (3, 4 orange arrows), the knot is going down (red arrows) via the pulley effect created by the anchors. (D) Final aspect after the other knot was made with the other strands (3, 4). (Ret, retinaculum.)

Fig 6. ATFL fixation. (A) The suture of the anchor is set in the Mini Scorpion to pass the ATFL. (B) The suture passing the ATFL. (C-D) The suture passing the ATFL is passed into the loop to obtain a lasso around the portion of ATFL. (E) ATFL is drawn into the malleolus by pulling the other suture of the anchor. Then, the ATFL is fixed. (ATFL, anterior talofibular ligament.)
**Table 1. Advantages and Disadvantages**

| Advantages                        | Disadvantages                                |
|----------------------------------|----------------------------------------------|
| Restore lateral ankle instability| Need arthroscopic experience                 |
| Minimally invasive               | Not commonly used portal 3 to visualize the retinaculum |
| Safe and reproducible            |                                              |
| Good visualization of the ATFL   |                                              |
| and retinaculum                  |                                              |

ATFL, anterior talofibular ligament.

The window of the shaver must always be under arthroscopic vision. It is important to obtain perfect visualization of the retinaculum as well as the hole of portal 2 created in step 1. We must be able to see perfectly on one side the prepared malleolus and on the other side the retinaculum, ready to be sutured. More deeply, it is possible to have a vision of the Broström repair and more superiorly the lateral side of the talus (Fig 4). The second anchor is then introduced from portal 2 and placed on the anterior part of the malleolus approximately 1 cm superior to the previous anchor in the prepared zone (Fig 3). Once the anchor is inserted, the sutures are passed into the retinaculum using the Mini Scorpion (Arthrex) (Fig 5). Another anchor is then placed inferiorly in the same prepared zone and the sutures are passed in the retinaculum. By passing the 4 strands, it is possible to create a mattress suture from one anchor to the other using the 2-pulley technique. Two strands from each anchor are tied externally to the skin, and, by pulling on the other 2 strands, the knot is pushed downward. The final fixation is made by suturing the strads using a Nicky’s knot (Fig 5).

**Postoperative Care**

Patients are immobilized with a soft ankle orthosis for 15 days. Active and passive dorsi- and plantar flexion range of motion and weight bearing are started at 15 days. Inversion and eversion exercises are started at 6 weeks after surgery and full athletic activity at 12 weeks after surgery.

**Discussion**

Many techniques have been described and generally classified into anatomical or nonanatomical repairs. Nonanatomical repairs provide poor long-term results and are not recommended as the first choice for treatment.2,6 The Broström technique is an anatomic repair technique and has been a standard procedure for chronic lateral ankle instability. However, it soon became clear that this procedure was insufficient, and changes were then described to tighten and strengthen the repair.4 Today, Broström associated with Gould augmentation is proposed as the gold standard worldwide.

Recently, arthroscopic techniques of repairing the ATFL have been described in which some perform only Broström and others add Gould augmentation percutaneously or by a mini open technique.7 Here, we report the technique of Broström with Gould augmentation performed with direct control and visualization by arthroscopy and endoscopy. Endoscopic surgery is the only way to approach all the ligaments and retinaculum; therefore, we should switch from an arthroscopy to an endoscopy, just like in shoulder surgery. This technique is safe and reproducible, even for a young surgeon trained in arthroscopy, as it has been shown in a recent French prospective study.8 The main limitation of this technique is the indication. It is not recommended in the case of a highly degenerative ligament; however, that is not always clear before the operation. Since at the moment it is difficult to distinguish clearly whether the ATFL is attenuated or not, we recommend using arthroscopy with the hook test to evaluate the quality of the ATFL.9 The long-term results of this technique need to be further evaluated.

**Table 2. Surgical Steps and Pearls and Pitfalls**

| Surgical Steps                        | pearls | Pitfalls                                      | Figure |
|---------------------------------------|--------|-----------------------------------------------|--------|
| Arthroscopic portal (portal 1, 2)     | The anteromedial portal is made in a position of dorsiflexion, and the arthroscope is placed to see the lateral gutter. | A lack of dorsiflexion will result in poor visualization of the lateral gutter. | 1      |
| Lateral gutter preparation            | It is important to peel off the ATFL and shave the footprint. | A lack of preparation will decrease the chance of biologic healing. | 3      |
| ATFL fixation                         | The lasso loop will increase the fixation of the ligament. | The quality of the ATFL sometimes is weak due to degeneration. | 6      |
| Endoscopic lateral portal (portal 3)  | The position of portal 3 is 1 cm superior to the mid-distance between tip of the fibula and base of fifth metatarsal. | The sensitive branch of the sural nerve is passed near the mid-distance between the 2 tips. | 2      |
| Endoscopic dissection                 | Preparation starts with the smooth trocar. | The visualization has to be complete just like in open surgery to avoid nerve damage. | 4      |
| Retinaculum fixation                  | Two anchors will bring more contact and stability. |                                              | 5      |

ATFL, anterior talofibular ligament.
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