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Arthroscopic Repair of Anterior Talofibular Ligament Using the Pull-Out Technique for Chronic Ankle Instability: Case Report

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ABSTRACT

Arthroscopic repair of the lateral ankle ligament using the anchor system has been increasingly reported. We treated a 39-year-old woman who suffered from pain and instability in her left ankle joint. She was diagnosed with chronic ankle instability and an osteochondral lesion of the talar dome. For this patient, arthroscopic repair of the anterior talofibular ligament (ATFL) was performed. Standard anteromedial and anterolateral portals were placed, and excision of the osteochondral fragment and microfracture were performed. Then, an accessory anterolateral (AAL) portal was placed. No. 2 nylon sutures were inserted into the ATFL remnant through the AAL portal. Two bone tunnels were created at the footprint of the fibula attachment toward the posterior edge of the lateral malleolus using a passing pin, and nylon sutures anchored in the ATFL were retrieved toward the posterior fibula. The foot was held in neutral position with eversion, and nylon sutures were tied at the posterior fibula. At 1 year after surgery, the Japanese Society for Surgery of the Foot scale was improved from the preoperative value of 48 points to a postoperative value of 100 points. Stress radiography showed no difference of talar tilt angle between the involved and noninvolved ankles. Joint position sense was also improved at 3 and 6 months after surgery. This arthroscopic repair of the ATFL using the pull-out technique enabled achievement of an improved clinical score and stability of the ankle and proprioception, and there was no concern about complications of the anchor system.

Ankle sprains frequently occur in sports activities, and most cases are successfully treated conservatively (1). However, about 10% of cases require surgical treatment to restore the stability of the ankle joint (2). Since Broström (3) first described the procedure of anatomic repair of the lateral ligament of the ankle, good results of this procedure with some modifications have been reported (4). Since the development of the anchor system and the arthroscopic surgery technique, arthroscopic repair of the ankle lateral ligament has been described, and good results have been reported as well (5–11). The arthroscopic procedure has several advantages, such as small skin incision and minimal subcutaneous dissection, which allows an early recovery after surgery (12). Moreover, a small incision can prevent damage to mechanoreceptors and free nerve endings distributed in the ankle lateral ligament and lateral capsule, and it will induce early improvement of the proprioceptive function after surgery. These arthroscopic repair procedures require several anchors, from large to smaller diameter (range 2.9-5.5 mm) (13). The application of anchors enables the arthroscopic surgery to be easier, but there are some concerns, such as anchor loosening, displacement, and eyelet breakage (14). From the bone stock for revision surgery, it is desirable to avoid using large-diameter anchors. In this case report, we describe arthroscopic repair of the anterior talofibular ligament (ATFL) using the pull-out technique, which obtained good clinical results, including improvement of the proprioceptive function.

Case Report

A 39-year-old woman who had a history of multiple ankle sprains presented in our hospital with complaints of pain and instability with giving-way sensation of her left ankle joint. She has played volleyball at a recreational level. Conservative treatment, such as physiotherapy, orthosis, and administration of pain killers, was performed for about 1 year in another hospital, but the patient's symptoms did not improve. In the physical findings of her left ankle joint, there was no limitation of range of motion, but anterior drawer and varus instability were observed. On plain radiogram and magnetic resonance imaging (MRI), osteochondral lesion of talus (OLT) in the posteromedial area was observed (Fig. 1). On the stress radiogram, the talar tilt angle was 11°. Because the patient's symptoms did not improve despite conservative treatment over 1 year, surgical procedure for OLT and chronic lateral ankle instability was performed to reduce the pain and restore ankle stability.

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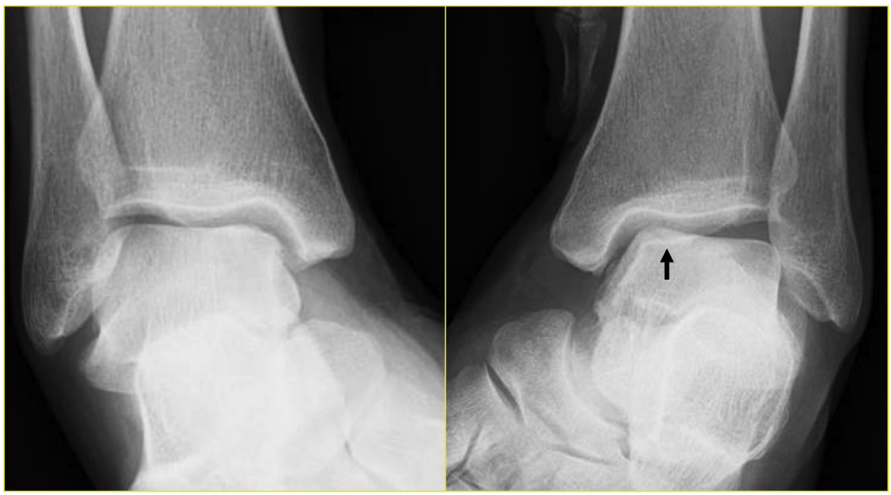

Fig. 1. Stress radiography. Talar tilt angle was 11° on the left ankle. Arrow indicates osteochondral lesion.

The patient was placed in the supine position with tourniquet hemostasis about the thigh. Standard anterolateral (AL) and anteromedial (AM) portals were established under joint distraction using an ankle distractor (Smith & Nephew, Memphis, TN) (Fig. 2*A, B*). A 2.7-mm 30° oblique arthroscope was used. For OLT, the osteochondral fragment was excised, and microfracture was performed arthroscopically. From the AL portal view, the fiber of the ATFL, which was ruptured at the fibula side, was confirmed (Fig. 3*A*). An accessory anterolateral (AAL) portal was placed according to the previous report (9) (Fig. 2*C*). Then, an 18-G hollow needle with a no. 2 nylon thread was placed into the proximal third of the remnant of the ATFL through the AAL portal (Fig. 3*B*). The nylon was retrieved through the AL portal with a mosquito Pean clamp (Fig. 3*C*), and the 18-G needle was withdrawn. These procedures were repeated 4 times, and 4 nylon sutures were penetrated in the ATFL remnant. Two nylon sutures as a set were tied outside the AAL portal (Fig. 4A). Then, 2 sets of nylon sutures were pulled from the AL portal to anchor the ATFL remnant. A small 1-cm incision was made at the posterior border of the lateral malleolus (Fig. 2*D*). Through the AAL portal, a 1.6-mm-diameter passing pin was inserted at the fibula attachment of the ATFL toward the incision at the posterior border of the lateral malleolus (Fig. 3*D*). Two drill tunnels were created at the footprint of the ATFL, and then 2 nylon sutures were retrieved through 1 bone tunnel to the posterior wound and repeated for the other tunnel (Fig. 4*B*). The foot was held in neutral position with eversion, and each of the 2 nylon sutures was tied at the posterior incision to reattach the ATFL at the fibula footprint (Fig. 3*E*).

A compressive bandage and plaster cast fixation were applied for 3 weeks, and then active dorsiflexion-planter flexion and partial weight bearing were allowed with an ankle brace. Full weight bearing was achieved 6 weeks after surgery. An ankle brace was applied for 3 months after surgery. Then, jogging and straight running were started. Physical therapy, including joint motion and muscle-strengthening exercises, were performed under the supervision of a physical therapist.

Six months after surgery, the patient returned to her sports activity. Just before her return to the sports activity, stress radiography and MRI were performed to confirm whether she could safely return. Stress radiography showed stable ankle (Fig. 5*A*), and MRI revealed good contour

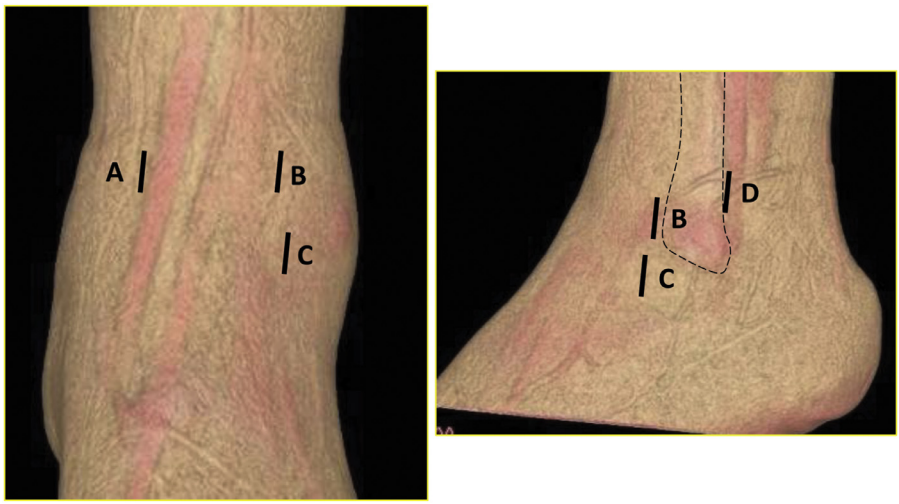

Fig. 2. Skin incision. *(A),* Anteromedial portal. *(B),* Anterolateral portal. *(C),* Accessory anterolateral portal. *(D),* Posterior incision located at the posterior border of the lateral malleolus.

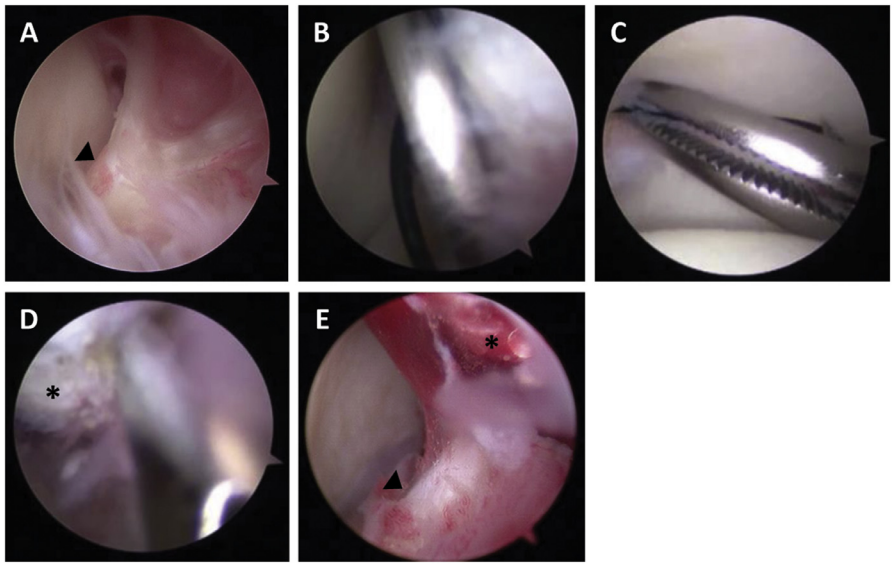

Fig. 3. Arthroscopic findings. *(A),* Anterior talofibular ligament (ATFL) ruptured at the fibula side. *(B),* An 18-G needle with No. 2 nylon was penetrated into the ATFL remnant through the accessory anterolateral (AAL) portal. *(C),* The nylon is retrieved through the anterolateral portal with a mosquito Pean clamp. *(D),* Creating the bone tunnel at the fibula attachment of the ATFL using a 1.6-mm-diameter passing pin through the AAL portal toward the posterior incision. *(E),* After fixation of the ATFL. *; fibula, arrowhead; ATFL.

of the ATFL (Fig. 5). At 1 year after surgery, no instability of the ankle joint was observed on stress radiography (Fig. 6). The Japanese Society for Surgery of the Foot Ankle-Hind foot scale was improved from the preoperative value of 48 points to a postoperative value of 100 points.

The joint position sense was measured as the proprioceptive function, as previously described (15,16). During movement of inversion, the difference between the index angle and replication angle was recorded as the replication error using a goniometer footplate. The index angle was evaluated at 6 positions: 5°, 10°, 15°, 20°, 25°, and 30°. The side-to-side difference of the replication error was improved from the preoperative value of 2.5° ± 1.7° to 3- and 6-month postoperative values of 0.8° ± 0.7° and 1.1° ± 0.7°, respectively.

Discussion

Recently, good clinical results by the arthroscopic Broström procedure using the anchor system for chronic ankle instability have been reported. However, it has also been reported that the complication rates in arthroscopic repair of the ATFL were higher than for open surgery (13). The present procedure obtained stability of the ankle joint and an improved clinical score, although there was a comorbidity of OLT. In this case, because 2 distinct procedures for OLT and ATFL were performed, it may be difficult to determine which was primarily responsible for a significant improvement after surgery. However, in the case of chronic ankle instability with OLT, which is required for the

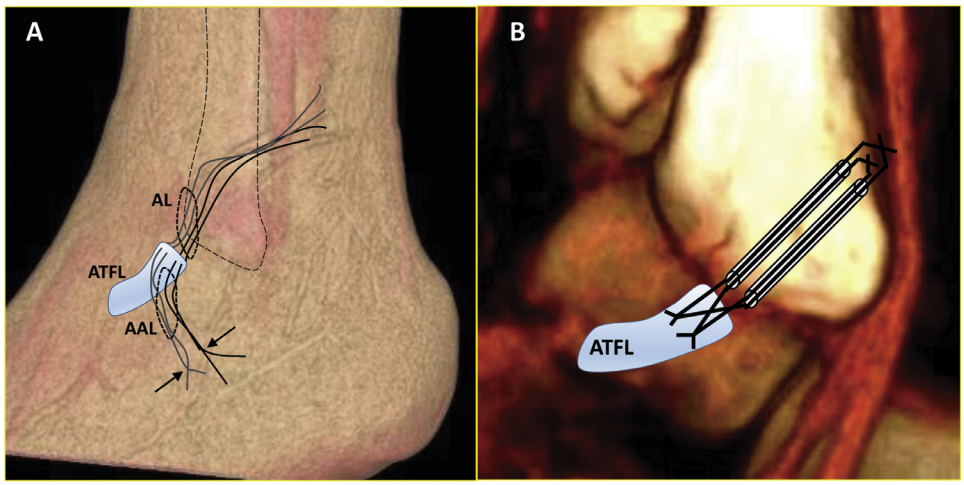

Fig. 4. *(A)* Four No. 2 nylons penetrated the anterior talofibular ligament (ATFL) remnant through the ATFL from the accessory anterolateral (AAL) portal, and 2 nylons as a set were tied outside the AAL portal (arrows). The other side of the nylon is retrieved through the anterolateral portal. *(B)* Two bone tunnels from the fibula attachment of the ATFL to the posterior border of the lateral malleolus. Two nylon sutures were retrieved through 1 bone tunnel to the posterior incision and repeated for the other tunnel, and each of the 2 nylons was tied at the posterior incision.

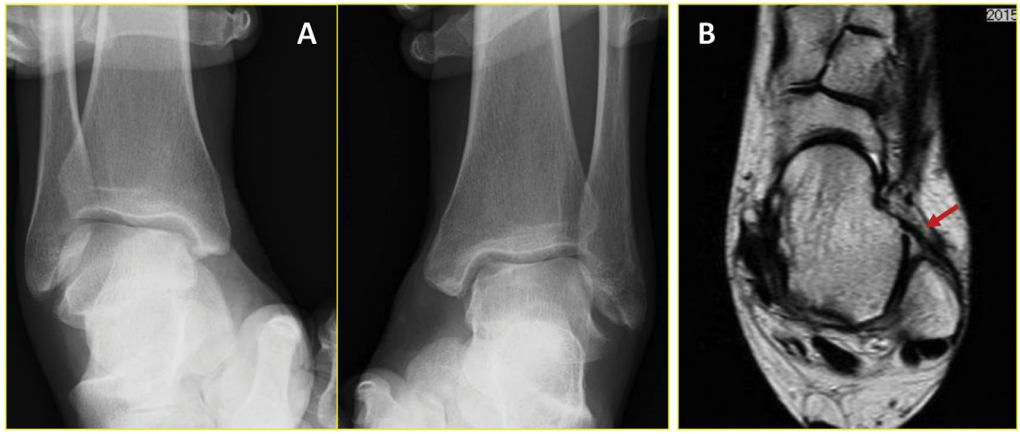

Fig. 5. *(A),* Stress radiography at 6 months after surgery. No difference of the talar tilt angle was observed between the right and left ankles. *(B),* Axial view of magnetic resonance imaging at 6 months after surgery. Good contour of the anterior talofibular ligament (ATFL) was observed. Arrow indicates repaired ATFL.

arthroscopic procedure, all procedures should be performed under arthroscopy to obtain good clinical results, including improvement in proprioceptive function. This procedure has several advantages. Our arthroscopic repair of the ATFL did not require any anchor system, so there was no concern about anchor-related complications. Two bone tunnels within the ATFL fibula footprint enable attachment of the ATFL remnant widely. In many arthroscopic Broström procedures, 1 anchor has been used for the ATFL to attach it at a wide ATFL footprint, which suggests that there is the possibility to not obtain the anatomical function due to the small contact area at the fibula. Moreover, the tension when fixing the ATFL to the fibula can easily regulate by adjusting the pulling force at the posterior incision. However, the calcaneofibular ligament (CFL) is not able to be repaired in the same way as other arthroscopic repair procedures. Lee et al. (17) demonstrated good clinical results of a modified Broström procedure without CFL repair.

Chronic ankle instability is defined in 2 types of instability: mechanical and functional. Freeman (18) described functional instability as a subjective unstable feeling or giving-way sensation of the ankle joint. Mechanoreceptors were observed in lateral ligaments, capsule, and retinaculum, and damage to these structure is a possible cause of proprioception deficit (19,20). Arthroscopic repair results in less damage to the joint capsule than open surgery, which means that arthroscopic surgery is advantageous to improve proprioception. The methods to evaluate proprioception have included the postural balance test, peroneal muscle reaction time to sudden ankle inversion, peroneal nerve conduction velocity, and joint position sense (21). We evaluated joint position sense before and after surgery and confirmed the improvement of it after surgery. Early improvement of joint position sense will contribute to the return to sports activities and decrease the repeated sprain of the ankle. A previous report demonstrated improvement of joint position sense after open modified Broström surgical procedure using the same method for evaluation of joint position sense (22). Further investigation is needed to compare the improvement of joint position sense of arthroscopic surgery versus open surgery.

A potential risk of this arthroscopic procedure might be entrapment of nerve at the AAL portal by tied nylon because the superficial peroneal nerve is close to the AAL portal (4). A prospective study to validate the safety of this procedure is needed.

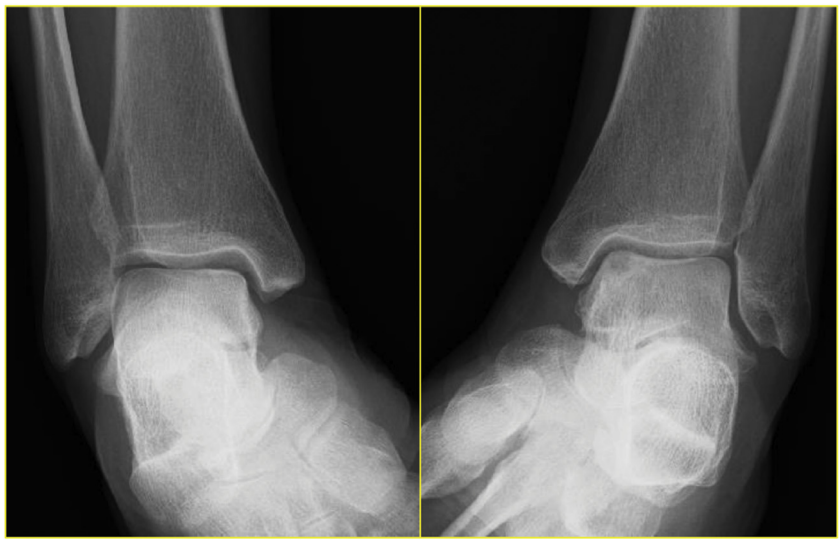

Fig. 6. Stress radiography at 1 year after surgery. No difference of the talar tilt angle was observed between the right and left ankles.

In conclusion, arthroscopic repair of the ATFL using the pull-out technique showed good clinical results at 1 year after surgery. This technique can adjust the tension on the ATFL and improve joint position sense, and there is no concern about complications of the anchor system.

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