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A Ligament Reattachment Technique for High-Demand Athletes With Chronic Ankle Instability

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ABSTRACT

The present prospective study was conducted to evaluate the clinical outcomes of the new ligament reattachment procedure for chronic lateral ankle instability in high-demand athletes. A total of 24 athletes <30 years old were followed for >2 years after undergoing the modified Brostrom procedure using the suture bridge technique. The clinical evaluation included the Karlsson score, the Sefton grading system, and the period to return to exercise. As an evaluation of mechanical stability, the talar tilt angle and anterior talar translation were measured on stress radiographs. The Karlsson score had improved significantly from a preoperative average of 43.5 points to 92.2 points. Using the Sefton grading system, 22 (91.7%) patients achieved satisfactory results. The period to return to exercise was as follows: a mean of 8.4 weeks for jogging, 12.5 weeks for spurt running, 10.5 weeks for jumping, 9.2 weeks for 1 leg standing for >1 minute, 10.6 weeks for walking on uneven ground, and 11.2 weeks for going downstairs. The talar tilt angle and anterior talar translation had improved significantly from the preoperative average of 15.4° and 13.3 mm to 3.8° and 4.2 mm at 2 months postoperatively and 4.9° and 4.8 mm at the final follow-up visit, respectively. The modified Brostrom procedure using the suture bridge technique resulted in satisfactory clinical outcomes comparable to those with conventional ligament reattachment techniques. The suture bridge technique appears to be an effective treatment option for chronic ankle instability in high-demand athletes.

Of the surgical techniques for chronic lateral ankle instability, the modified Brostrom procedure is currently used most frequently, with excellent treatment outcomes reported. However, this procedure will not always be the best surgical technique, overall, for patients with chronic lateral ankle instability (1). High-demand athletes have a high risk of ankle injury and instability recurrence and, thus, the modified Brostrom procedure has sometimes been considered contraindicated for such athletes. Mechanical laxity of the ankle can result in considerable functional instability and a potential reduction of function, proprioception, and strength. The ankle stability necessary to the daily living of ordinary people and sports activity of athletes seems to be obviously different (2,3). Because athletes primarily need sturdy stability, the ideal operation techniques for high-demand athletes are reconstruction using an allo-tendon graft or nonanatomic tenodesis despite restricted joint motion (4–8). However, some investigators have suggested that anatomic reconstruction should be the primary choice for surgical treatment of chronic ankle instability in athletes (2,9). Recently, the modified Brostrom procedure using a suture anchor as 1 of ligament reattachment techniques has been frequently performed, and various reports have been published about the advantages of this technique (10–15). If greater mechanical stability and a wider bone–ligament interface can be obtained through the new ligament reattachment procedure using the suture bridge technique in the shoulder joint (Fig. 1), the modified Brostrom procedure using a suture anchor (Fig. 2) might improve the clinical outcomes in high-demand athletes with chronic lateral ankle instability.

Given this background, we prospectively evaluated the clinical outcomes of a new, modified Brostrom procedure using the suture bridge technique for chronic lateral ankle instability in high-demand athletes.

Materials and Methods

Study Subjects

From July 2008 to May 2010, 24 athletes were consecutively enrolled in the present study. All patients were <30 years old and were followed up for >2 years after undergoing a modified Brostrom procedure for chronic lateral ankle instability. The present study included patients who had complained of unilateral ankle joint instability.

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Conflict of Interest: None reported.

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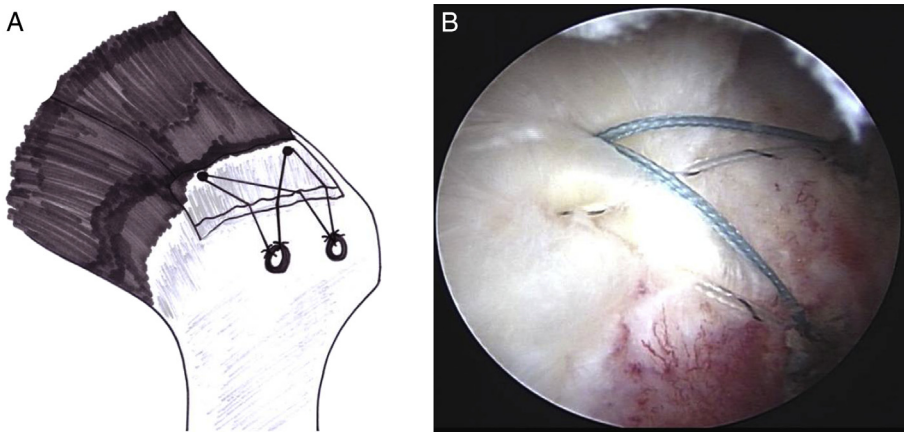

Fig. 1. (*A*) The illustration shows the suture bridge technique for rotator cuff repair in the shoulder joint. (*B*) Arthroscopic view of the suture bridge.

The patients included 10 track, 6 basketball, 5 soccer, and 3 taekwondo athletes. With respect to the treatment history after injury onset, 12 patients in whom cast immobilization had been performed, 6 who had used self-treatments such as ice massage or patches, 4 patients who had received Oriental medicine treatment (acupuncture or moxa cautery), and 2 patients who had not received any specific treatment. At surgery, the mean age of the patients was 23.1 (range 17 to 28) years. The patients included 17 males and 7 females, and the mean length of follow-up was 31.8 (range 24 to 41) months. The institutional review board approved the present investigation.

Surgical Technique and Postoperative Rehabilitation Method

Along the anterior and inferior borders of the lateral malleolus of the ankle joint, a curved incision was made. The location of the inferior extensor retinaculum was identified. On the anterior margin of the talus, an incision was made to open the articular capsule. Thus, the anterior talofibular ligament which underwent scar formation was divided into two parts 2 mm from the fibular margin. The calcaneofibular ligament was evaluated but not divided. From the anterior and distal margins of the lateral malleolus, the periosteum was carefully dissected and retracted to the proximal area. At the origin of anterior talofibular and calcaneofibular ligaments on the anteroinferior part of the lateral malleolus, 2 Corkscrew™ suture anchors (3.5 mm in diameter; Arthrex) were inserted. Parallel with the sagittal plane of the fibula, the suture anchor was inserted from anteriorly to posteriorly. The insertion angle of the 2 suture anchors was 45° in the coronal plane, with the different sagittal plane of the fibula. Special attention was given to avoid entering the retromalleolar groove on the posterior or inside of the ankle joint and to avoid impingement between the suture anchors. Maintaining the ankle joint in neutral flexion and a 5° valgus position, the articular capsule and anterior talofibular ligament were strongly fixed to the fibula using no. 2 FiberWire® suture (Arthrex). After making 2 knots, 4 strands of no. 2 FiberWire® suture (Arthrex) connected to the suture anchor were reserved without cutting. Two drill holes with a 1-cm interval were made proximally and laterally off the insertion site of the suture anchors. The 4 strands of suture material were crossed, and 1 strand from each suture anchor was gathered. Next, fixation using 2 PushLock™ knotless anchors (2.9 mm in diameter; Arthrex) was done, keeping adequate tissue tension by pulling on each suture strand independently. The residual tissue in the proximal part and fibular periosteum were then overlapped using horizontal mattress sutures (2-0 Ethibond, Ethicon Endo-Surgery, Cincinnati, OH) with the articular capsule of the distal part. Imbrication was then performed, and the inferior extensor retinaculum was sutured to the fibular periosteum (Fig. 3).

For 3 weeks postoperatively, a short leg cast and non-weightbearing ambulation with crutches were maintained. Thereafter, an elastic ankle bandage was used, and range of motion (ROM) exercises and partial weightbearing were encouraged. From postoperative week 4, full weightbearing was permitted, and peroneal muscle strengthening exercises and proprioception training were initiated. From approximately postoperative week 6, simple running was initiated. Rehabilitation was consistently performed with the assistance of sports physical therapists. After confirming the recovery of ankle stability by physical examination and stress radiography at 2 months postoperatively, the return to exercise at the preinjury level was permitted. Thereafter, we recommended follow-up visits at 3, 6, 12, and 24 months postoperatively.

About 95% of patients were followed up using the appointed schedule (24 months postoperatively). The remaining patients were called back to the hospital and re-evaluated after an interview on the telephone with 1 of us (B.-K.C.).

Clinical Assessment Methods

The clinical evaluation consisted of the Karlsson score, Sefton grading system, ROM of the ankle, and period required to return to exercise. The Karlsson score (16)

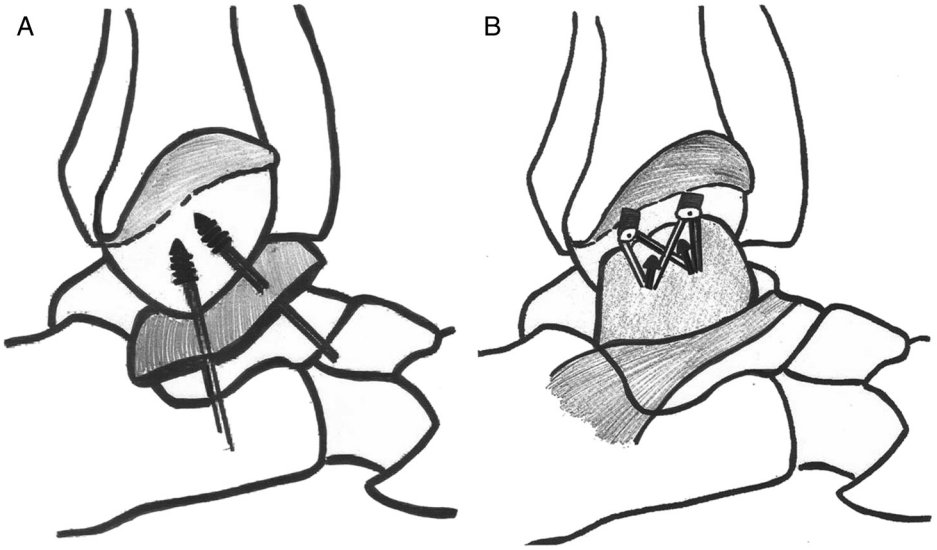

Fig. 2. (*A* and *B*) Schematic drawing of the suture bridge technique using 2 suture anchors and 2 knotless anchors (*arrow* indicates the suture anchor).