Technical Note

Arthroscopic Extracapsular Plication to Treat Multidirectional Instability of the Shoulder

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Abstract: Successful arthroscopic treatment of multidirectional shoulder instability requires that the surgeon reduce the volume of the capsule. This goal can be achieved by using the extracapsular plication technique. There are several advantages to using pancapsular plication and an intra-articular knot. Much better potential for capsular healing exists when the outer layer of the capsule, which is composed of fibrous tissue, is tied extra-articularly. With the intra-articular plication technique, the inner layer of the capsule is synovia, which has less healing capacity. The amount of capsule plication that can be achieved with the extra-articular plication technique exceeds what is possible with the intra-articular plication technique. This is very important in patients who have a large degree of instability in the anterior, the posterior, and, particularly, the inferior direction. Thermal capsulorrhaphy enhances other arthroscopic stabilization procedures. Thermal striping helps to reduce capsular redundancy if laxity persists. However, with arthroscopic extracapsular plication, the capsular tissue can be shortened without using thermal energy. **Key Words:** Shoulder—Instability—Multidirectional—Extracapsular.

Treatment of the multidirectional instability (MDI) of the shoulder is a challenge for the orthopaedic surgeon. The treatment of MDI usually does not involve surgery.[1] Burkhead and Rockwood reported excellent results using an exercise program.[2] In patients who failed conservative treatment, successful results can be achieved with open surgery. The first open inferior capsular shift of MDI was performed by Neer and Foster.[3] Other researchers have reported good or excellent results using open capsular shift or its modifications.[4,5]

The first arthroscopic treatment of MDI using the transglenoid technique was described by Duncan and Savoie in 1993.[6] In 1997, Wichman and Snyder[7] described the arthroscopic plication technique, in which the capsule is excoriated with a rasp or motorized shaver for better healing. A suture hook is used to plicate the capsule, creating a 1-cm fold between the capsule and the labrum. Nonabsorbable suture is used to create a horizontal mattress suture and an arthroscopic knot is tied intra-articularly. We have developed what we believe is a new arthroscopic technique: extracapsular plication of the posterior and anterior capsule. Extracapsular plication enables the surgeon to correct the degree and direction of laxity in a patient with MDI of the shoulder. Furthermore, this type of technique offers better healing potential for the capsule because the outer part of the capsule (its fibrous layer) is plicated and tied.

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Cite this article as: Cicak N, Klobucar H, Bicanic G, Trsek D. Arthroscopic extracapsular plication to treat multidirectional instability of the shoulder. Arthroscopy 2005;21:1280.e1-1280.e6 [doi:10.1016/j.arthro.2005.07.014].

0749-8063/05/2110-4406$30.00/0

doi:10.1016/j.arthro.2005.07.014

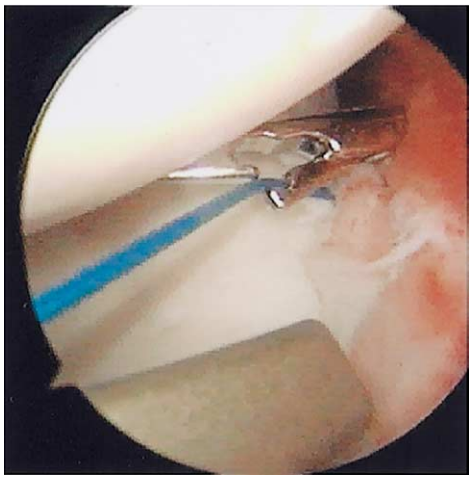

FIGURE 1. View from the anterior superior portal. The penetrating grasper used to retrieve the Ethibond suture through the posterior capsule out of the joint.

SURGICAL TECHNIQUE

After undergoing general anesthesia, the patient is placed in the lateral decubitus position with 30° of posterior tilt. The arm is placed in an arm holder with 10 lb of traction. The glenohumeral joint is entered, using a standard posterior portal. An anterosuperior portal is established with an outside-in technique to assure proper portal positioning (the anterosuperior portal is 1 cm away from the anterior lateral corner of the acromion). Positioning with a spinal needle before placement of the cannula ensures adequate placement. The cannula (length, 55 mm; diameter, 6 mm) enters the superior aspect of the rotator interval, just below the biceps tendon.

An anteroinferior portal is also created using an outside-in technique with a spinal needle to assure proper positioning of the cannula. This portal lies 2 cm distal to the anterosuperior portal, just inferior and lateral to the coracoid tip. The cannula (length, 75 mm; di-

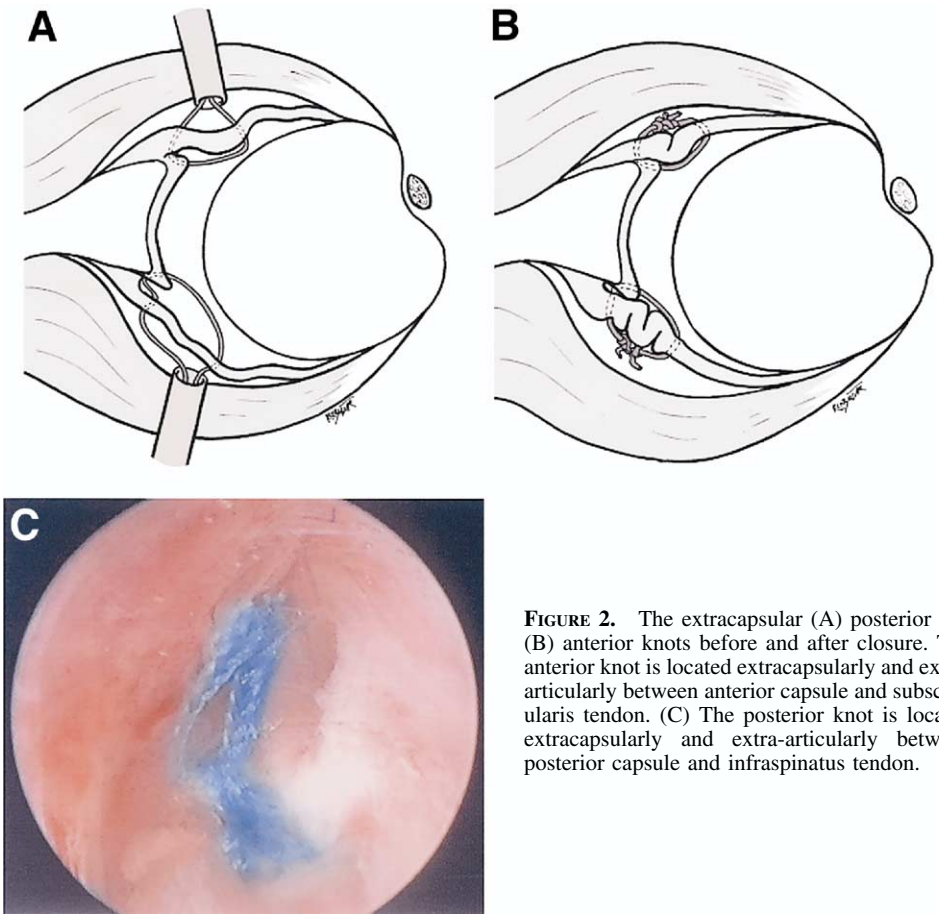

FIGURE 2. The extracapsular (A) posterior and (B) anterior knots before and after closure. The anterior knot is located extracapsularly and extra-articularly between anterior capsule and subscapularis tendon. (C) The posterior knot is located extracapsularly and extra-articularly between posterior capsule and infraspinatus tendon.

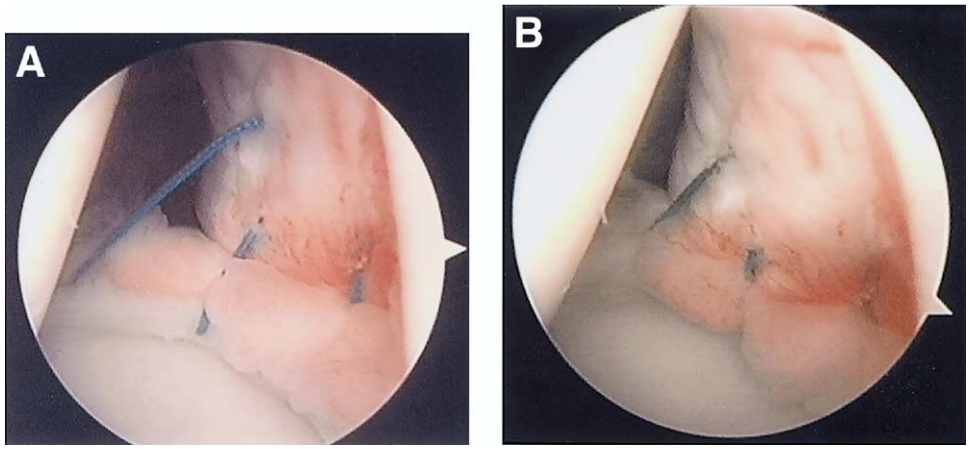

Figure 3. An extracapsular knot is tied through the posterior portal, eliminating posterior capsular redundancy. Note the appearance of posterior plication of the capsule (A) before and (B) after closure.

ameter, 6 mm) enters the inferior aspect of the rotator interval, just above the subscapularis tendon.

Through diagnostic arthroscopy, a diagnosis of capsular laxity is confirmed. Then, with the arthroscope in the anterosuperior portal, the cannula enters the joint through the posterior portal.

Capsular plication usually begins in the center of posterior capsule. The cannula is drawn out from the joint just behind the posterior capsule. A penetrating grasper with 35° curves (DePuy Mitek, Norwood, MA) and Ethibond suture (Ethicon, Somerville, NJ) perforates the posterior capsule at approximately the 8 o'clock position (right shoulder) just above the posterior labrum. The grasper is then passed near the junction of the labrum and articular cartilage. The Ethibond suture is withdrawn from the joint through the anteroinferior portal.

The straight penetrating grasper perforates the posterior capsule 1 to 2 cm superior and posterior to the first perforation of the capsule. The penetrating grasper catches the Ethibond suture from the anteroinferior portal and withdraws it through the posterior cannula (Fig 1). An arthroscopic sliding knot is tied outside the cannula and pushed through the posterior cannula with a knot pusher.[8] The knot is reinforced by 2 half hitches, reversing their direction and posts. The sutures are cut with a sliding suture cutter (DePuy Mitek). The sliding knot is placed extra-articularly and extracapsularly between the posterior capsule and infraspinatus tendon (Fig 2). Each step is then repeated as second, third, and fourth sutures are made in similar fashion at 7 o'clock, 9 o'clock and 10 o'clock (Fig 3).

During all posterior capsular plication, the cannula is placed extracapsularly, between the capsule and the infraspinatus tendon. Usually we place 4 posterior extracapsular plication sutures. However, additional plication sutures may be placed if necessary. The most difficult aspect of this type of surgery is deciding how much to imbricate the tissue. The number of sutures depends on clinical history, examination under general anesthesia, and the arthroscopic appearance. This

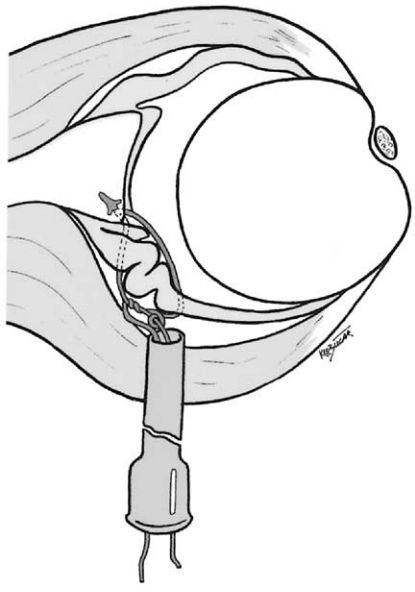

Figure 4. The extracapsular posterior plication with anchor suture.

FIGURE 5. The anterior inferior cannula is placed extracapsularly and extra-articularly between upper edge of the subscapularis tendon and middle glenohumeral ligament.

technique can be combined with suture anchors for patients with capsulolabral defects (Fig 4).

Anterior laxity of the capsule can be reduced with 2 extra-articular sutures. The arthroscope is placed in the posterior portal. The anteroinferior cannula is pushed extracapsularly between the upper edge of the subscapularis tendon and the upper edge of the middle glenohumeral ligament (Fig 5).[9] A penetrating grasper with a 35° curve and Ethibond suture is introduced through the anteroinferior cannula to perforate the anterior capsule at approximately 5 o'clock near the junction of the labrum and articular cartilage. The Ethibond suture is withdrawn from the joint through the anterosuperior portal. The straight penetrating grasper is introduced through the anteroinferior cannula to perforate the anterior capsule 1 to 2 cm superior and anterior to the initial perforation of the capsule. The penetrating grasper catches the Ethibond suture from the anterosuperior portal and withdraws it through the anteroinferior cannula. An arthroscopic sliding knot is tied and pushed through the anteroinferior cannula with a knot pusher. The knot is reinforced by 2 half hitches, reversing their direction and posts. The sutures are cut with a sliding suture cutter. The sliding knot is placed extra-articularly and extracapsularly, between the anterior capsule and subscapularis tendon (Fig 2B). A second suture is tied in a similar fashion at the approximately 3 o'clock position.

Inferior instability is treated with rotator interval closure. Through the anteroinferior cannula, a penetrating grasper with Ethibond suture perforates the upper edge of the middle glenohumeral ligament (Fig 6). The suture is withdrawn through the anterior

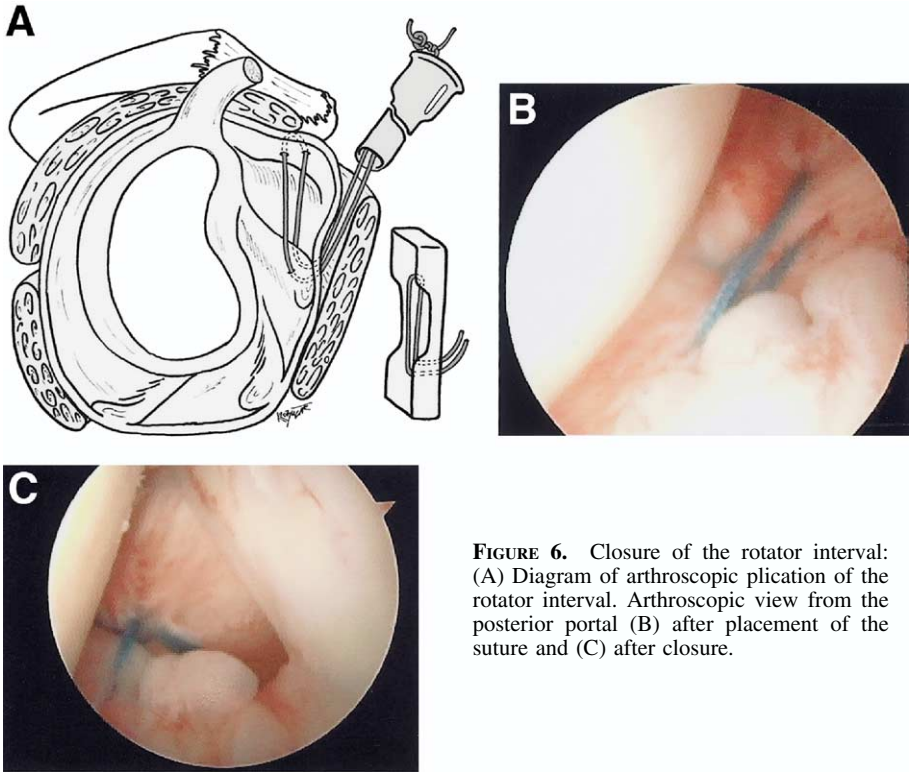

FIGURE 6. Closure of the rotator interval: (A) Diagram of arthroscopic plication of the rotator interval. Arthroscopic view from the posterior portal (B) after placement of the suture and (C) after closure.

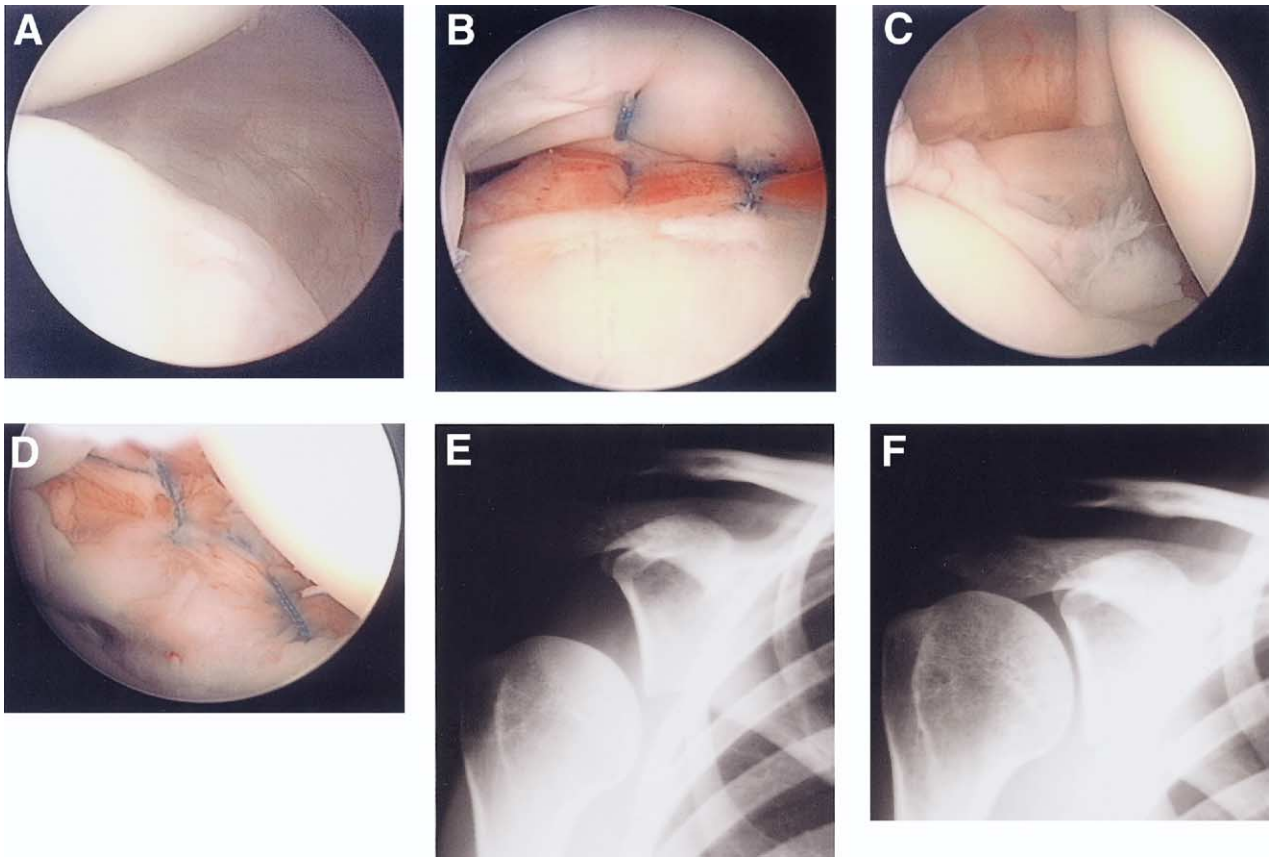

FIGURE 7. Extracapsular plication enables the surgeon to correct a large degree of capsular laxity of the shoulder, particularly in the posteroinferior direction (view is from the anterior superior portal). A marked capsular laxity of the posteroinferior part of the right shoulder (A) before and (B) after suture tying. Note the complete closure and reduction of the capsular volume. Appearance of the rotator interval (C) before and (D) after closure with the extra-articular knot of the anterior capsule (view is from the posterior portal). Radiographs of the shoulder (E) before and (F) after extracapsular plication. Note the inferior subluxation of the shoulder.

superior cannula. The anterior superior cannula is withdrawn just external to the superior capsule. The end of the Ethibond suture is placed in the mouth of the straight grasper, which pierces the superior capsule. We use the penetrating grasper to advance the suture into the joint and to withdraw the suture through the anteroinferior cannula. Again, the middle glenohumeral ligament is penetrated and the suture is retrieved from the joint. The knot is then tied and the second suture is placed in similar fashion.

DISCUSSION

Arthroscopic treatment for multidirectional shoulder instability was begun in 1993.[6] Several groups of researchers have reported good to excellent results after arthroscopic stabilization.[10-12] Successful arthroscopic treatment requires that the surgeon identify the direction and degree of clinical instability during preoperative evaluation, identify the areas responsible for excessive translation during arthroscopic evaluation, and then correct all necessary areas of the glenohumeral joint.[13] We believe that all of this can be achieved with the extracapsular plication technique.

There are several advantages to the intra-articular knot technique. With the use of this technique, there is a much better potential for capsular healing because the outer layer of the capsule, which is composed of fibrous tissue, is tied extra-articularly. With the intra-articular plication technique, the inner layer of the capsule, which is synovia, has less capacity for healing. The amount of capsular plication that can be achieved with the extra-articular plication technique exceeds what is possible with the intra-articular plication technique. This is very important in patients who have a large degree of instability in the anterior,

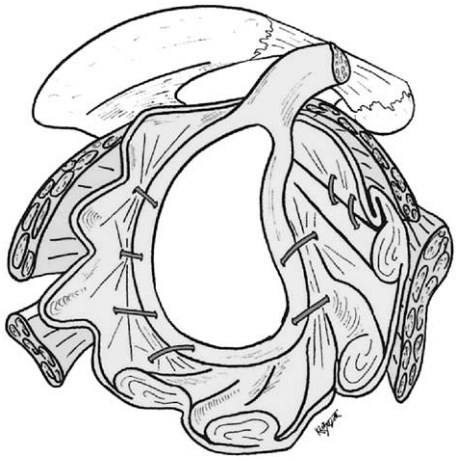

FIGURE 8. The final results of extracapsular and extra-articular plication of the posterior and anterior capsule with rotator interval closure.

the posterior and, particularly, the inferior direction (Fig 7). Thermal capsulorrhaphy enhances and augments other arthroscopically performed stabilization procedures, improving the results that can be obtained when either procedure is used alone.[14] Thermal striping helps reduce capsular redundancy if laxity persists.[15] However, with arthroscopic extracapsular plication, the capsular tissue can be shortened without using thermal energy (Fig 8).

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