

Arthroscopic treatment of anterior-inferior shoulder instability

Öne-aşağı omuz instabiliteilerinin artroskopik tedavisi

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Amaç: Travma sonrası gelişen, tekrarlayan öne-aşağı glenohumeral instabilite ve kapsülde bollaşma tanısıyla artroskopik tamir uygulanan hastalar geriye dönük olarak incelendi.

Çalışma planı: Çalışmaya, travma sonrası gelişen, tekrarlayan öne-aşağıya omuz instabilitesi ve kapsülde belirgin bollaşma tanısıyla artroskopik Bankart tamiri ve posterior kapsül plikasyonu yapılan 17 hasta (4 kadın, 13 erkek; ort. yaş 27; dağılım 18-40 yıl) alındı. On bir hastada sağ, altı hastada sol omuz ameliyat edildi. Ameliyat ile ilk çıkık arasındaki süre ortalama 5.2 yıl (dağılım 1-11 yıl) idi. Hastaların hepsine daha önce konservatif tedavi uygulanmıştı. Eklem hareket açıklığı açölçer ile ölçüldü. Kas kuvvetleri elle değerlendirildi. İnstabilitenin değerlendirilmesi amacıyla endişe testi, Jobe endişe-relokasyon testi ve posterior endişe testi uygulandı. Ameliyat öncesinde tüm hastalar ön-arka ve aksiller grafi ve manyetik rezonans görüntüleme ile incelendi. Hastaların ameliyat öncesi ve sonrası fonksiyonel durumları, fizik muayene, radyografik inceleme ve Bankart tamiri için Rowe skorlama tablosuna göre değerlendirildi. Ortalama takip süresi 35.6 ay (dağılım 24-50 ay) idi.

Sonuçlar: Son kontrollerde üç hastada (%17.7) instabilitenin tekrarladığı görüldü. Ameliyat öncesinde ortalama 41 olan (dağılım 15-45) Rowe skoru ameliyat sonrasında 78'e (dağılım 43-100) yükseldi. Sonuçlar 13 hastada (%76.5) iyi-çok iyi, bir hastada (%5.9) orta, üç hastada (%17.7) kötü bulundu. Tekrar çıkık gelişen bir hastaya artroskopik revizyon yapıldı. Hastaların ameliyat öncesi ve sonrası aktif öne fleksiyon, dış rotasyon ve iç rotasyon dereceleri arasında anlamlı fark bulunmadı ($p>0.05$).

Çıkarımlar: Bankart lezyonu ile birlikte kapsülde bollaşma bulunan hastalarda artroskopik tamir ile başarılı sonuçlar alınması mümkündür. Ancak, artroskopik Bankart tamiri ile birlikte kapsül plikasyonu seçilmiş olgularda düşünülmemelidir.

Anahtar sözcükler: Artroskopi/yöntem; eklem instabilitesi/cerrahi; omuz çıkığı/cerrahi; omuz eklemi.

Objectives: We evaluated patients who underwent arthroscopic repair for posttraumatic, recurrent anterior-inferior glenohumeral instability with capsular laxity.

Methods: Seventeen patients (4 females, 13 males; mean age 27 years; range 18 to 40 years) were treated with arthroscopic Bankart repair and posterior capsular plication for posttraumatic, recurrent anterior-inferior glenohumeral instability with capsular laxity. Involvement was on the right side in 11 patients, and on the left in six patients. The mean duration from the first dislocation to surgery was 5.2 years (range 1 to 11 years). All the patients received conservative treatment before surgery. Range of motion was measured with a goniometer and muscle strength was measured manually. Apprehension test, Jobe apprehension-relocation test, and posterior apprehension test were used to assess instability. Preoperatively, all the patients were examined by anteroposterior and axillary radiographs and magnetic resonance imaging. Shoulder functions were assessed with the Rowe rating scale for Bankart repairs. The mean follow-up was 35.6 months (range 24 to 50 months).

Results: Instability recurred in three patients (17.7%). The Rowe score increased from a mean of 41 (range 15-45) to 78 (range 43-100) postoperatively. Functional results were excellent-good in 13 patients (76.5%), fair in one patient (5.9%), and poor in three patients (17.7%). One patient underwent arthroscopic revision following redislocation. Pre- and postoperative values for active forward flexion, external rotation, and internal rotation did not differ significantly ($p>0.05$).

Conclusion: The results of arthroscopic Bankart repair and posterior capsular plication are satisfactory in the treatment of anterior glenohumeral instability with capsular laxity. However, the use of capsular plication with arthroscopic Bankart repair should be considered in selected cases.

Key words: Arthroscopy/methods; joint instability/surgery; shoulder dislocation/surgery; shoulder joint.

Recently, shoulder arthroscopy is continuing its evolution and gradually getting much more used. The use of arthroscopic methods in treatment of anteroinferior shoulder instabilities offers advantages such as recognizing all pathologies causing instability and repairing lesions with less soft tissue damage.

Unappropriate patient choice, insufficient release and repair of capsulolabral tissues without enough tension, and underdiagnosing and repairing all lesions causing instability were blamed for poor early results of arthroscopic instability repair.

It has been seen that one can achieve as good results as open technics by using suture anchors in arthroscopic Bankart repair, in cases where there is a Bankart lesion causing instability without capsular laxity. Open anteroinferior capsular sliding is the method advised for capsular laxity and traumatic instability. However, in instabilities with marked capsular laxity additional methods is being used to get succesful results. Capsular thermal plication is one of these methods advised for treatment of instability caused tension. The advantages of this method is that , it does not change the existing anatomy and it is easy to perform. But, using this method causes early failure especially in cases with pre-existing surgical procedures, and multipl dislocations. Capsular plication is another method advised for repair of shoulder instability. It has been shown that capsular volume can be reduced effectively by using this method.

In this study, results, obtained by using arthroscopic Bankart repair and posterior capsular plication technic in anteroinferior shoulder instablitiy and Bankart lesion with marked capsular laxity, were evaluated retrospectively.

Patients and method

17 patients with at least two years follow-up were included to this study (4 female,13 male; mean age:27, range 18-40 years) who underwent arthroscopic repair, for posttraumatic recurrent anteroinferior instability and capsular laxity that were unresponsive to conservative treatment, between June 1999- December 2003. 11 right and 6 left shoulders were operated and 82% of them were at the dominant side. Patients with multidirectional instability

and pre-existing surgery were excluded from the study.

The anteroinferior instability and capsular laxity were diagnosed by pateints' medical history, physical examination, imaging methods, examination under general anaesthesia and symptoms obtained during surgery.

Detailed medical histories were obtained preoperatively. Complaints, cause and type of instability, type of trauma, number of dislocations, and duration of time to surgery were recorded. During physical examinations range of motions were measured in seated position with a goniometer. Muscle strenghts were measured manually. Shoulder laxity was measured as well as general laxity. For this purpose sulcus sign, and load and shift tests were used. To assess laxity; apprehension, Jobe's apprehension-relocation, and posterior apprehension tests were used. Preoperatively patients were evaluated by anteroposteior and axillary radiographs, and magnetic resonance imaging. Patients, who were unsatisfied after 3 months of conservative treatment and got pain because of anteroinferior instabilty, were operated. During examination under general anaesthesia both shoulders were evaluated for anteroposterior and inferior humeral sliding.

Arthroscopic Bankart repair and posterior capsular plication were done, and if necessary rotator interval was closed. Priorly, under general anaesthesia and beach chair position, diagnostic arthroscopy was performed and shoulder evaluated systematically. Anterior, anterosuperior, and anteroinferior portals were used during surgery. Inferior glenohumeral ligament, and it's attachments to glenoid and humeral head were evaluated for Bankart lesion and humeral separation. Posterolateral portion of humeral head was evaluated for Hill-Sachs lesion. Rotator cuff and biceps tendon were evaluated for additional pathologies.

Capsular laxity was examined visually and with probe, and humeral head translation was evaluated. In addition drive through sign was searched. Patients with Bankart lesion and anterior instability related to this, inferior instability, positive sulcus sign, enlargement in axillary pouch and increased humeral head displacement, and positive drive-through test were diagnosed as anteroinferior instability and cap-

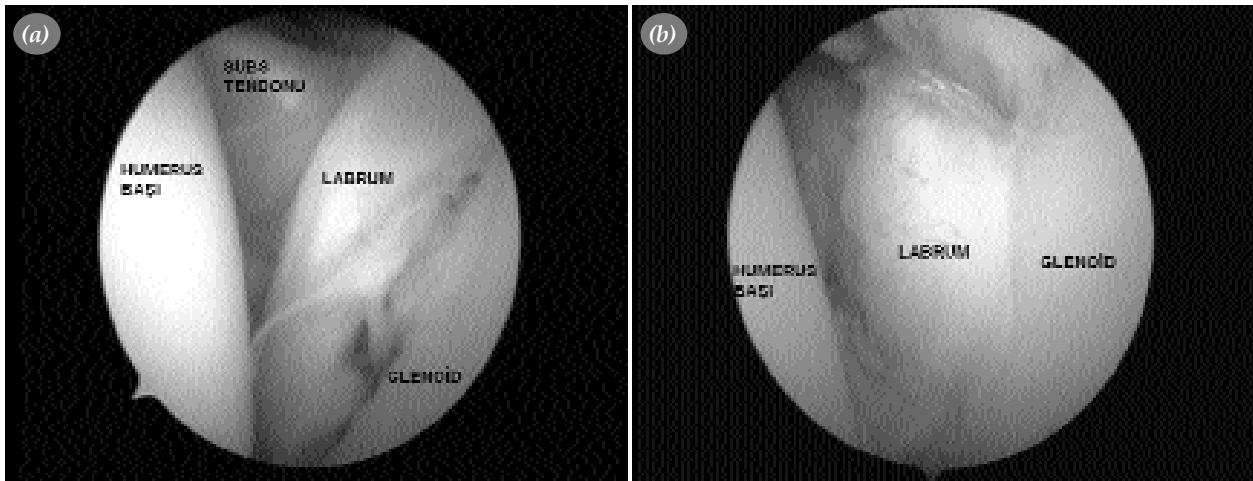


Figure 1. (a) Arthroscopic view of Bankart lesion. (b) After repair.

sular laxity. All patients were operated by the same surgeon, using suture anchors as described in literature. Posterior capsular plication was done for patients with remnant capsular laxity after Bankart repair, with No:1 monofilament absorbable sutures (PDS, Ethicon, Somerville, NJ, USA). By using suture passers. Suture passers (Suture laso, Artrex, Naples, FL, USA) were penetrated through 18.30 o'clock position, 1-1,5 cm far away from labrum and perpendicular to the capsule. After excision of 0,5 cm capsule, suture passer was transferred to 18.00 o'clock position. Second plication suture was performed to 1 cm posterior and superior to the first one in the same style. Additional suture was used if necessary according to clinical story, examination and arthroscopic image. After repair of labrum and ensuring capsular tension, rotator interval was closed if, especially, downwards shoulder displacement was still going on. For this purpose, soft tissues over subscapularis tendon and anterior border of supraspinatus were stitched together with No:1 monofilament absorbable sutures and suture passers (suture laso). During this procedure, arm was positioned in 30° external rotation and abduction in order to avoid external rotation restriction.

Patients used an abduction arm sling for one month after the surgery. During this time pendular and passive assistive exercises were begun. Later range of motion and after third month supporting exercises for shoulder muscles were started. Patients were evaluated according to Rowe scoring table by using pre- and post-operative functions, physical

and radiological assessments, and Bankart repair. Positions of suture anchors were detected x-rays and computerized tomography. The mean follow-up was 35,6 months (range 24-50 months).

Results

There was a significant trauma story in all patients. 14 patient had habitual luxation, 3 had recurrence or subluxation after luxation. Time interval was 5,2 years between initial trauma and surgery (range 1-11 years). The average preoperative relocation was 10,5 (range 5-40) times. There were no bony Bankart lesions diagnosed radiologically. 11 Bankart and Hill-Sachs and two isolated Hill-Sachs lesions were diagnosed by means of magnetic resonance imaging. Four shoulders had no pathologic results.

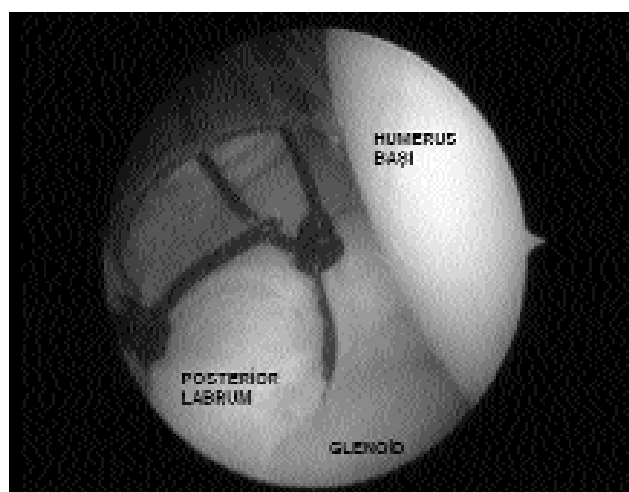


Figure 2. Arthroscopic view after posterior capsular plication

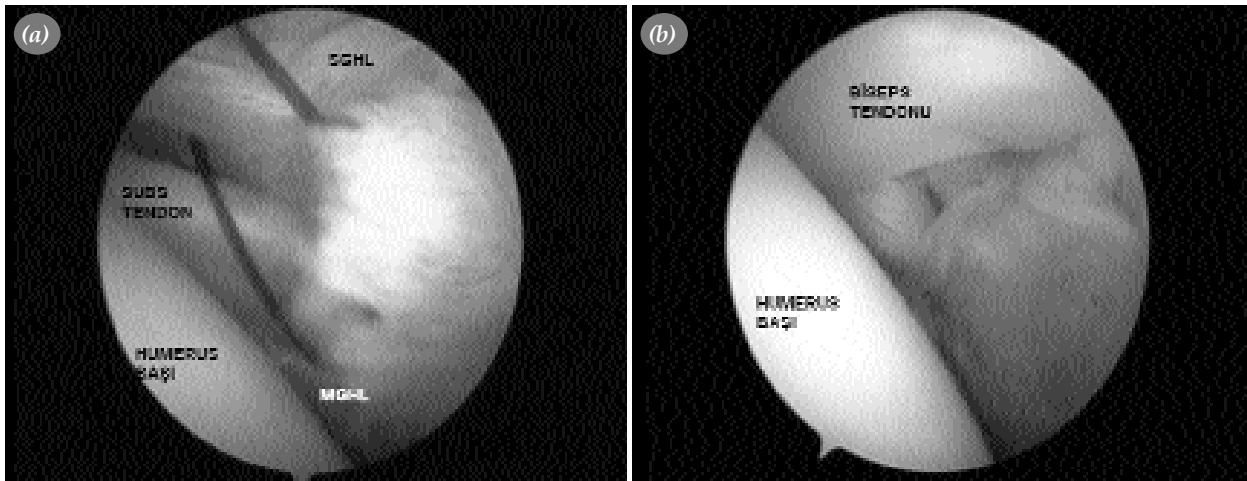


Figure 3. (a) Repair of rotator interval and plication. (b) Rotator interval closed.

SGHL: Superior glenohumeral ligament; MGHL: Middle glenohumeral ligament.

Preoperative 169° of active forward flexion (range 125°-180°), 69,4° of external rotation, and 79,7° of internal rotation (range 45°-90°); postoperatively changed to 170,2° (145°-180°), 66,5° (20°-90°) and 78,5° (40°-90°), respectively.

Preoperatively apprehension and Jobe's apprehension relocation tests were positive in all patients. Sulcus test was performed under general anaesthesia to detect inferior displacement and found as grade 1 in eight patients (distal between acromion distal pole and humeral head is under 1 cm), grade 2 in 9 patients (1-2 cm).

During diagnostic arthroscopy Bankart lesion and marked capsular laxity were detected in all patients, nine of them had capsular interval lesion and 13 of them had Hill-Sachs lesion less than 20% of humeral head.

Bankart lesions were repaired and posterior capsular plications were performed for all patients, and 9 of them had a rotator interval repair. For Bankart repair 4 suture anchors were used in one patient, 5 in two, and 3 in eleven. Fastak (Arthrex, 12 patients) and mini-revo (Linvatec, Largo, FL, USA) were used as suture anchors. In one patient, during surgery one suture got out of its anchor. This anchor was left in its place and surgery was performed with two other anchors. Postoperatively two patient got motion limitations. One of them had full range of motion after physical therapy, but the other had limitations and accepted as bad result. On postop radiologic investigations two patients suture anchors were in wrong positions. One of them had motion limitation and

resolved later, the other one had relaxation and revised.

At latest controls three of 17 patients (17,7%) had recurrence (luxation, subluxation, positive apprehension test). Preoperatively all Rowe scores were poor (mean 41, range 15-45). Postoperative Rowe scores were; excellent and good in 13 (76,5%), moderate in 1 (5,9%), and poor in 3 (17,7%) (mean 78, range 43-100, $p < 0,05$). One patient with moderate Rowe score had positive apprehension test in certain arm positions. One of three poor results got 25% anterior elevation and 50% external rotation limitation. One patient had two subluxations and didn't require reduction. One patient had relaxation and underwent arthroscopic revision. During revision, it has been seen that according to inappropriate anchor location middle glenohumeral ligament complex was medialised and posterior capsular laxity was still going on.

Discussion

Bankart lesion is traditionally the main reason responsible for anteroinferior shoulder instability, hence requires surgical treatment. Bankart lesion has been found in 90% of patients with traumatic anterior shoulder dislocations. Biochemical studies shows that labrum separation can increase shoulder displacement, however there won't be dislocation unless there is capsular injury. Before dislocation there must be capsular tension, that means expansion. Therefore, Bankart lesion is accompanied variably with capsule and ligament elongation. Rotator

interval's relationship with shoulder stability has been shown through clinical and mechanic studies. Therefore glenohumeral instability is a dynamic period involving various degrees of capsulolabral injury.

Surgical repair is indicated in patients with anteroinferior instability in whom conservative treatment is not successful. Bankart repair with capsular sliding is the gold standart for these patients traditionally. By the evolvment of newer modern tecniques, arthroscopic methods are used more frequently in the treatment of anteroinferior shoulder instability. In the studies comparing open and arthroscopic techniques, dislocation recurrence have been shown as 13-70% in the latter and 0-30% in the former group.

The high recurrence dislocation statistics in the early times of arthroscopic repairs, have become comperatively as good as open techniques by newer surgical tecniques and patient selection. In a prospective study by Cole et. al. comparing arthroscopic and open methods, all patients have been examined under general anaesthesia and diagnostic arthroscopy, and treated according to these datas by open or arthroscopic methods. According to this, patients with capsular thinning, tear or capsular laxity with Bankart lesion were operated by open Bankart repair and capsular sliding; patients with obvious glenohumeral ligaments and Bankart lesions were operated by arthroscopic methods. Relaxation rate was 24% in arthroscopic group, and 18% in open group. Authors have shown that there are almost same results for both methods when technical plannig is done according to datas from examination under general anesthesia and diagnostic arthroscopy.

Recently, arthroscopic repair of capsulolabral tissues wih appropriate tension using suture anchors is becoming the standart treatment in suitable anteroinferior shoulder instabilities. But, lack of diagnosing and treating variable capsular laxity accompanying Bankart lesions may cause failure of repair. The decrease of arthroscopic capsular volume can be possible by using capsular plication in patients with marked capsular laxity.

Gartsman et. al., performed arthroscopic Bankart repair, capsular plication, and if necessary thermal

capsuloraphy in 53 patients with anteroinferior shoulder instability. After two years follow-up good and excellent results were 92% and 7,5% of them had relaxation.

Westerheide et. al., stated 85 mean Rowe score and 7% relaxation rate in 71 shoulders of 67 patients, who underwent arthroscopic Bankart repair and posterior capsular plication for anterior shoulder instability, and followed for at least two years.

Arthroscopic Bankart repair and posterior capsular plication were done for all patients for anteroinferior shoulder instability and capsular laxity, and if necessary rotator interval was closed. At a mean follow-up for 35,6 months, 3 of seventeen patients had recurrence (luxation, subluxation, positive apprehension test). The rate of recurrence was found similar with literature. For cases with marked laxity, which frequently causes relaxation after arthroscopic Bankart repair, capsular plication is clinically effective for reducing capsular volume. But, its routine use may cause excessive capsular restriction in some cases.

Functional Rowe scores were good-perfect in 13 cases (76,5%), mean in 1 (8,9%), poor in 3(17,7%). The variable recurrence of instabilty in mean and poor cases were due to insufficient capsular tension. In mean group apprehension test was positive. Subluxations were continuing in one patient of poor group. The other one had a relaxation. Arthroscopic revision was done for his one. During revision it has been seen that posterior capsular laxity was still going on. Postoperatively, probably because of excessive capsular plication, two patient had motion limitation. In one of them range of motion was ensured by physical therapy. But, the other one stil had limitation and bad result.

A part of laxity is necessary for shoulder motions. But, increase of it causes instability. Range of motion must be protected while treating shoulder instability. When our poor results are analysed, it can be seen that major problem is getting unappropriate capsular tension.

For a perfect shoulder instability repair result, all the facts causing instability must be understood and treated appropriately. All lesions causing glenohumeral instability can be treated arthroscopicly. But, it can not be always possible to maintain the

sensitive balance between laxity and instability when reforming capsulolabral tension. There are cadaveric studies determining that capsular plication is an effective method to reduce glenohumeral intraarticular volume. But, the exact amount of capsular volume reduction, in shoulder instabilities because of capsular laxity, is unknown. Further more, because of possible variabilities of capsule regeneration in patients, tissue response against plication can not be foreseen. Besides, ensuring appropriate tissue tension needs a long learning curve and objective criterias are still not described. More studies must be done about these issues.

Arthroscopic shoulder instability repair has lots of difficulties. Suture anchors must be put in appropriate angles and places. On postop x-rays two patients' anchors were in wrong places. One of them had a recovering limitation, the other one had a relaxation and arthroscopic revision. When you bear in mind the articular defects of wrong positioned metal anchors, the use of absorbable anchors in arthroscopic shoulder instability repair can be advised.

It is possible to get successful results with the arthroscopic repair method we use in Bankart lesion and capsular laxity. But there is still need to determine new objective criterias and/or experience to decide the amount of capsular plication to get successful results.

As a result, by using capsular plication, indications for arthroscopic repair are enlarged. In this way, while suggesting open capsular sliding method for anteroinferior instability with marked capsular laxity in past, now it can be possible by arthroscopic methods. Clinically it can be seen that capsular plication reduces capsular volume and relaxation risk. But, getting successful results depends on the answer of question; in which patient how much capsular plication must be done. We advice to perform capsular plication with arthroscopic Bankart repair in selected patients.

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