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12 ASA, an Arthroscopic Technique for Recurrent Anterior Dislocations Using Partial Subscapularis Tenodesis in Association with Bankart Repair

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12.1 Introduction

Over the past decades, arthroscopic treatment of recurrent anterior dislocations has become the most popular method to repair the atraumatic or post-traumatic capsulo-labral defect [1]. In fact, these techniques achieved good results in terms of restoration of joint function and a relapse rate comparable with open surgery, especially if the glenoid and humeral head bone morphology are quite normal [2–4]. In case of glenohumeral bone defects, such as anterior glenoid bone loss and engaging Hill Sachs lesions, the percentage of re-dislocation grows up to a higher percentage until 67% [5–7]. Other techniques such as Bankart repair plus Remplissage [8, 9] to the open or all-arthroscopic Bristow-Latarjet [10–13] and bone graft procedures [14–16] are used as an effective alternative to treat shoulder instability, with gleno-humeral defects.

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No study demonstrates actually which arthroscopic technique should be used in young and sportive patients with subsidence of capsulo-labral structures or hyperlaxity without severe anterior glenoid bone loss.

In 1986, Johnson described an arthroscopic technique for recurrent shoulder dislocation in patients with 'virtually nonexistent glenohumeral ligaments' using the articular portion of the subscapularis tendon [17]. Despite the numerous advantages of the arthroscopic approach, Johnson's technique was abandoned because of potential complications related to the placement of metal staples for tendon fixation adjacent to the level of the glenoid edge.

Starting from Johnson' idea, Maiotti and Massoni in 2010 developed a new surgical technique that was a combination of a Bankart repair and an arthroscopic subscapularis augmentation (ASA) (Fig. 12.1) consisting of a tenodesis of the upper third of the tendon [18]. The number of patients treated with this technique is increasing over time, with more than 600 cases in different hospitals. The surgical skills have been implemented in a biomechanical study to attest the stability, and have been perfomed [19] using ASA in association with Bankart with relative glenoid bone loss inferior to 20%, and a series of 72 patients have been studied to attest arthropathy at mid-term follow-up.

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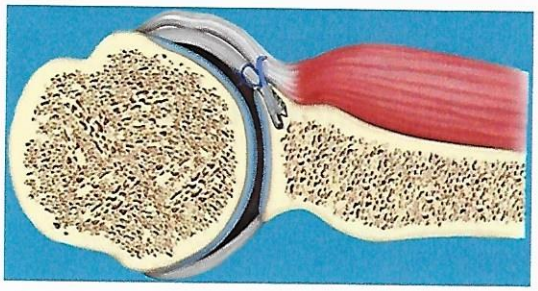

Fig. 12.1 Tenodesis of the upper third of the subscapularis

Table 12.1 Indication and contraindication for ASA technique

Indication	Contraindication
Hyperlaxity or capsular insufficiency associated with glenoid bone defect of less than 10% in patients practising contact sports	Multi-directional instability
Hyperlaxity or capsular insufficiency associated with glenoid bone defect between 10 and 20% in patients who do not practise contact sport	Gleno-humeral osteoarthritis
	Throwing sports
	Subscapular tendon lesions

12.2 Algorithm of Treatment

Given the several pathomechanical aspects of chronic anterior instabilities, we are working to rationalize the use of the upper part of subscapularis tendon among other treatment techniques. The common parameters to be considered for the most suitable use of the subscapularis tendon in association with a simple Bankart repair are: clinical observation of more than 90° of external rotation position at ER1 in the supine position; pain and positive apprehension test also in ER1 position between 80° and 90° of external rotation; intraoperative observation of inadequate soft tissues anatomy due to the chronic instability or high superior traction mobility of the subscapularis tendon.

The indications for Bankart repair associated with ASA are (Table 12.1):

- Hyperlaxity or capsular insufficiency associated with glenoid bone defect of less than 10% in patients practising contact sports
- Hyperlaxity or capsular insufficiency associated with glenoid bone defect between 10 and 20% in patients who do not practise contact sport

Contraindications to perform this type of procedure are the following: multi-directional instability, gleno-humeral osteoarthritis, throwing sports, subscapular tendon lesions.

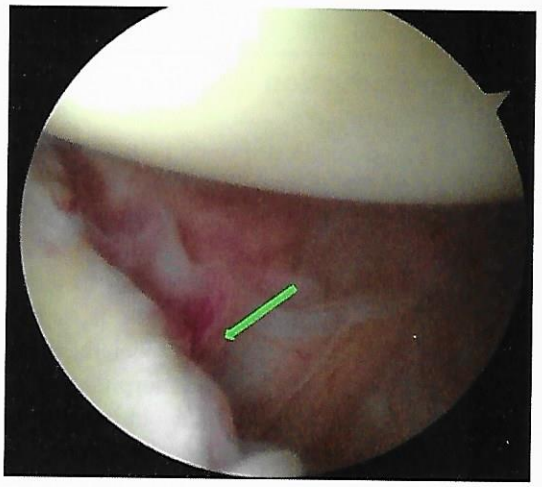

Fig. 12.2 Capsulo-labral lesion

12.3 Bankart Repair and Subscapularis Augmentation: Surgical Technique

The procedure was performed with the patient under an inter-scalene block or under a blended anaesthesia in the lateral decubitus position.

Standard anterior and posterior portals were used. The anterior and posterior gleno-humeral joint structures were inspected to assess any anteroinferior labral insufficiency (Fig. 12.2), superior labrum anterior-posterior (SLAP) lesions, anterior glenoid defects and Hill–Sachs

Fig. 12.3 Hill–Sachs lesion

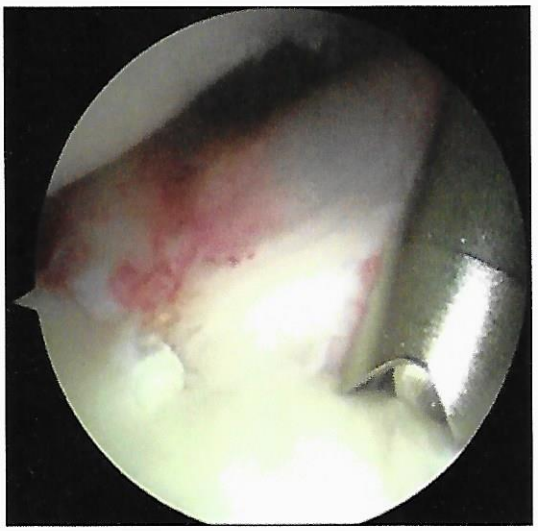

Fig. 12.4 Glenoid hole for subscapularis fixation

lesions (Fig. 12.3) and to confirm the anterior displacement of the humeral head with respect to the glenoid cavity. An additional anterior–superior portal was used.

A lower capsular repair was performed with 2.9 mm non-absorbable knotless suture anchors loaded with multi-strand sutures.

The subscapularis fixation bone hole should be done over the top of the glenoid corner (Fig. 12.4). We systematically performed the superior subscapular is traction test (SSTT) to test with a graduate gripper the elasticity of the subscapularis tubular part of tendon in order to fix and give it the proper tension between 2 and 3 o'clock in a right shoulder or 10 and 11 in the left side (Figs. 12.5 and 12.6).

After testing, the upper third of the subscapularis tendon was penetrated at least 5 mm from its superior border with a penetrator punch loaded with multi-strand tape (Labral tape, Arthrex); the tape is then retrieved from the upper cannula and then passed again in the lower cannula so that the free ends of the tape remain accessible through the same lower cannula (Fig. 12.7).

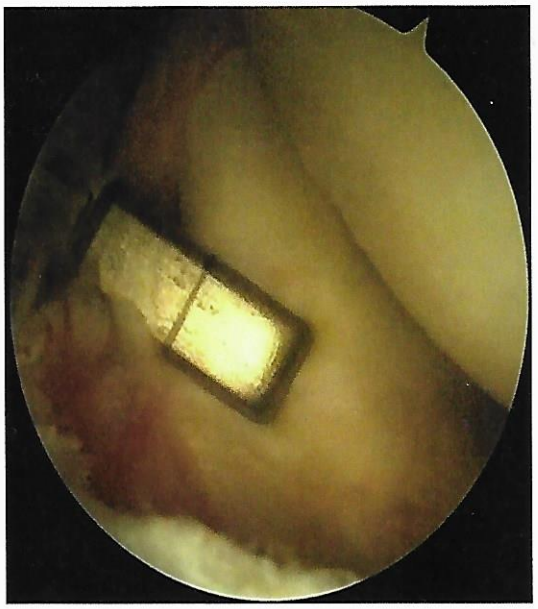

Fig. 12.5 Non-elastic tendon

A loop is created by passing the two ends of the tape through the loop in the middle of the suture (Fig. 12.8).

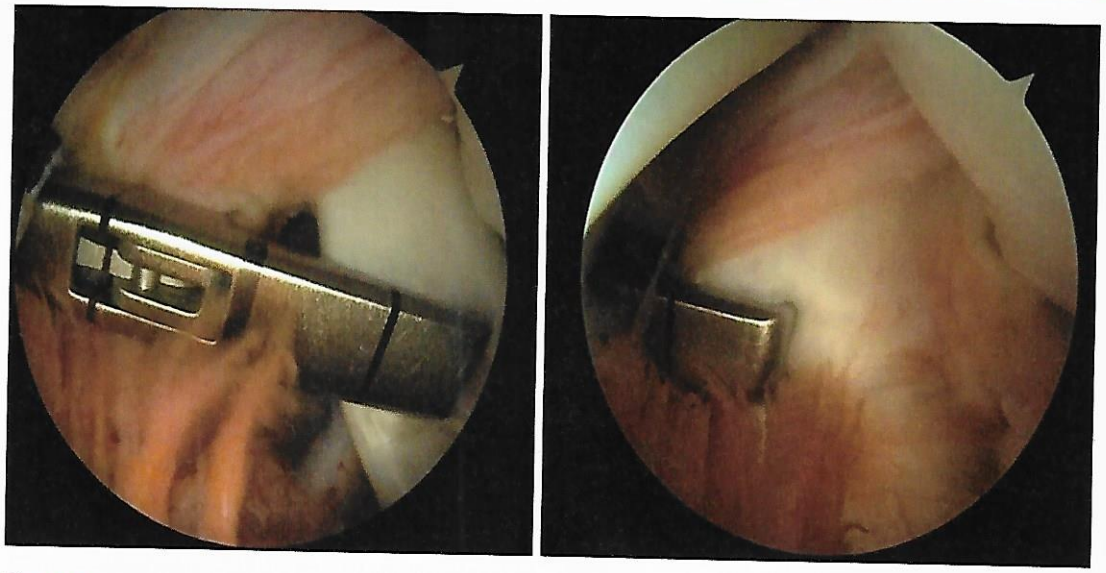

Fig. 12.6 Elastic tendon

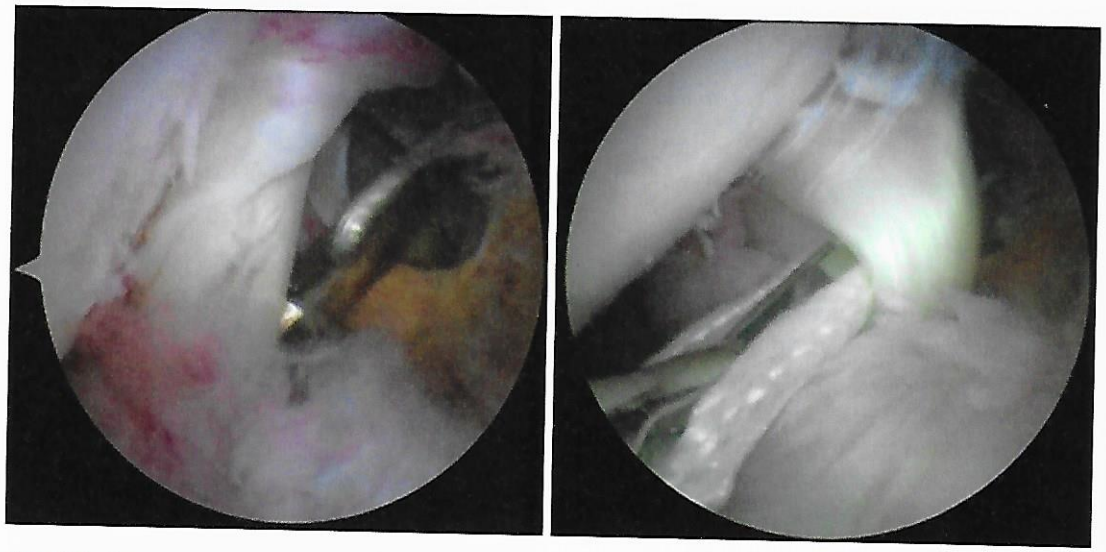

Fig. 12.7 Penetrator punch loaded with multi-strand tape through the subscapularis

At this point, both free ends of the tape are passed through the eyelet's anchor (3.5 mm knotless PEEK suture anchor [PushLock]) that is pushed along the tape towards the bone hole.

While impacting the anchor (Fig. 12.9), care is taken to keep the patient's arm in neutral rotation to avoid excessive tensioning on the tenodesis. The repair, including complete closure of the anterior pouch and centring of the humeral head in the glenoid cavity, was assessed by arthroscopic examination from the antero-superior portal (Figs. 12.10 and 12.11).

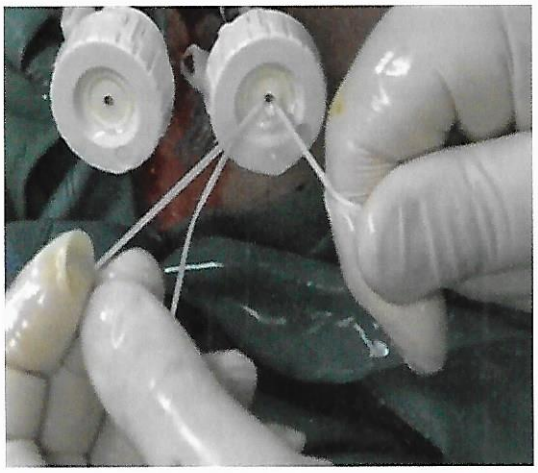

Fig. 12.8 A loop made outside to grab the subscapularis

Fig. 12.9 Anchor insertion-loaded multi-strand tape

Fig. 12.10 Final view from posterior portal

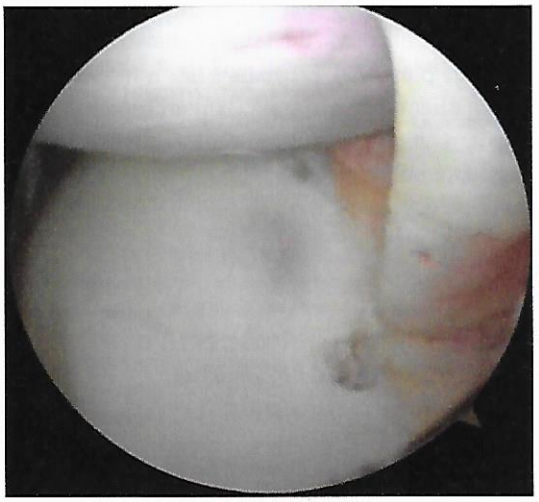

Fig. 12.11 Final view from antero-superior portal

12.4 Biomechanical Study

In order to examine the biomechanical effect of the ASA procedure on gleno-humeral joint motion and stability, a biomechanical study has been performed to investigate the stabilizing effect of the ASA procedure on translation and rotation in the gleno-humeral joint after Bankart lesion with additional bony defect [20].

Eight human cadaver shoulder specimens, without evidence of rotator cuff tear and shoulder injury in their medical history, were investigated and tested using a robot based on a shoulder simulator (Fig. 12.12).

Translational stability and range of motion was tested in each specimen in four different configurations: physiologic, Bankart lesion with bony defect, simple Bankart repair and Bankart repair plus ASA.

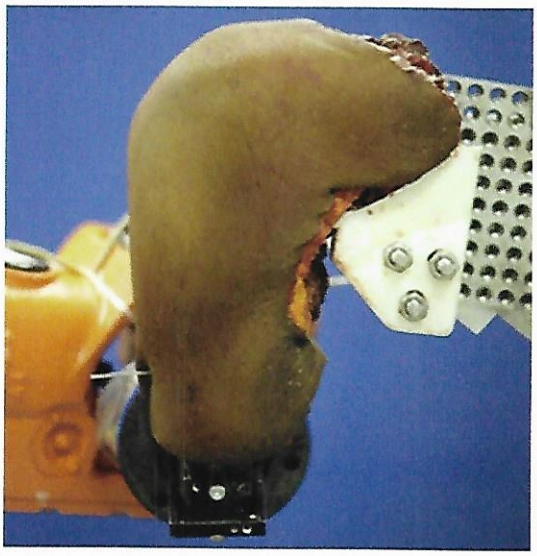

Fig. 12.12 The specimen is mounted on the robot

The results of the study showed that the Bankart plus ASA procedure has a higher stabilizing effect than a simple Bankart repair in anterior and anteroinferior translation, preventing the joint from dislocations; the limitation of external rotation decreased from 0° and 30° of abduction, to 60° abduction.

12.5 Clinical Retrospective Studies of ASA and Bankart Repair

The recently published clinical results at medium term follow-up are encouraging. A retrospective clinical study on 89 patients engaged in sports has been performed at 2–5 years' follow-up [19]. All patients underwent a computed tomography scan to assess the percentage of glenoid bone loss by the Pico method. A prior stabilization procedure had failed in 20 patients. Only 3 of 89 patients had a post-traumatic re-dislocation (3.3%). Clinical scores showed significant improvements: the VAS score decreased from a mean of 3.1 to 0.5 ($P < 0.0157$), the Rowe score increased from 58.9 to 94.1 ($P < 0.0215$) and the ASES score increased from 68.5 to 95.5 ($P < 0.0197$). No limitation in internal rotation as well as in abduction and flexion were found. In contrast, there was a difference of 6° in external rotation with the arm at the side of the trunk and 3° with the arm at 90°of abduction, to the contralateral side.

A multi-centre study has been performed on 110 patients treated for chronic anterior shoulder instability with arthroscopic Bankart repair and ASA at four different European hospitals [21]. Patients selected for this study were involved in contact sports, with a history of traumatic recurrent shoulder dislocations and a minimum of 2-year follow-up. Three patients (2.7%) had a traumatic re-dislocation. At final follow-up, the mean scores were as follows: VAS scale decreased from a mean of 3.5 to 0.5 ($P < 0.015$), Rowe score increased from 57.4 to 95.3 ($P < 0.035$) and ASES score increased from 66.5 to 96.5 ($P < 0.021$). The mean deficit of external rotation was 8° ± 2.5° with the arm at the side of the trunk and 4° ± 1.5° with the arm at 90° of abduction.

Another study has been published to compare the ASA procedure with the open Latarjet in case of glenoid bone loss [22] in two groups of 20 homogeneous but randomly selected patients. At a mean follow-up of 24 months (range, 20–39 months), no statistically significant differences were found between the two groups according to QuickDash, Constant and Rowe shoulder scores.

12.6 Discussion

In the last decades, many studies have reported a variable rate of recurrence from 0 up to 40% when a standard Bankart repair was performed in patients with anterior shoulder instability and quite normal glenoid shape. Based on this consideration, the necessity to program, in patients with a moderate glenoid damage, the 'Bankart plus' [23] procedure with a higher number of anchors in order to achieve a good stabilization and better healing of the capsulo-labral complex was underlined. The other option for decreasing the number of failures was the association of the Bankart plus the Remplissage, which consists of tenodesis of the infraspinatus tendon in the posterior humeral defect. New studies have shown the pathomechanics of the bipolar defect in the shoulder instability and underlined the necessity

to use a graft in cases of on–off track Hill Sachs lesions; moreover, the role of the capsular deficiency and the constitutional hyperelasticity of the anterior soft tissue capsular complex was not considered. Our failure rate of 3%, also in case of mild glenoid defect and Hill Sachs lesions, suggests that the ASA plus Bankart could be considered as a Remplissage plus Bankart addressing the pathology from the front, instead of the back. Furthermore, the arthroscopic test for the Subscapularis elasticity could demonstrate an important role of the tendon in shoulder hyperlaxity. We think that ASA could improve the biological healing of the Bankart repair, reduce the anterior capsular elasticity, strengthen with scar tissue the coraco-humeral ligament acting in the opposite site of the Remplissage. The loss of external rotation (6° with the arm at the side of the trunk and 3° with the arm in 90° of abduction) was significantly lower compared with the ER loss resulting from Bankart repair plus Remplissage, and open or arthroscopic bone-block transfers [9, 24–26]. Another important observation is that with this technique we did not observe any early osteochondral damage, as reported with other procedures [27, 28].

12.7 Conclusions

The ASA technique associated with a Bankart repair represents a new technique for the treatment of recurrent anterior dislocations. It is a reproducible, safe and effective technique for patients with hyperlaxity or capsular insufficiency and low glenoid bone loss where the Latarjet could be considered an overtreatment, going to fill the grey area between Bankart repair and bone-block procedures.

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