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ORIGINAL ARTICLE

Arthroscopic Bankart repair associated with subscapularis augmentation (ASA) versus open Latarjet to treat recurrent anterior shoulder instability with moderate glenoid bone loss: clinical comparison of two series

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Abstract

Purpose The treatment of chronic anterior shoulder instability with glenoid bone loss is still debated. The purpose of this study is to compare short-term results of two techniques treating chronic shoulder instability with moderate glenoid bone loss: bone block according to open Latarjet–Patte procedure and arthroscopic Bankart repair in association with subscapularis augmentation.

Methods Ninety-one patients with moderate anterior glenoid bone loss underwent from 2011 to 2015. From these patients, two groups of 20 individuals each have been selected. The groups were homogeneous in terms of age, gender, dominance and glenoid bone loss. In group A, an open Latarjet procedure has been performed, and in group B, an arthroscopic Bankart repair associated with subscapularis augmentation has been performed. The mean follow-up in group A was 21 months (20–39 months), while in group B was 20 months (15–36 months). QuickDash score, Constant and Rowe shoulder scores, were used for evaluations of results.

Results The mean preoperative rate of QuickDash score was 3.6 for group A and 4.0 for group B; Rowe Score was 50.0 for group A and 50.0 for group B. Preoperative mean Constant score was 56.2 for Latarjet–Patte and 55.2 for Bankart plus ASA. Postoperative mean QuickDash score was in group A 1.8 and 1.7 in group B; Rowe Score was 89.8 and 91.6; Constant Score was 93.3 and 93.8. No complications related to surgery have been observed for both procedures. Not statistically significant difference was reported between the two groups ($p > .05$). Postoperatively, the mean deficit of external rotation in ER1 was $-9°$ in group A and -8 in group B; In ER2, the mean deficit was $-5°$ in both groups ($p = .0942$).

Conclusions Arthroscopic subscapularis augmentation of Bankart repair is an effective procedure for the treatment of recurrent anterior shoulder instability with glenoid bone loss without any significant difference in comparison with the well-known open Latarjet procedure.

Keywords Anterior shoulder instability · Open Latarjet–Patte procedure · Arthroscopic Bankart repair · Arthroscopic subscapularis augmentation · Glenoid bone loss

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Introduction

The treatment of recurrent anterior shoulder instability associated with bone loss is still controversial. In 2000, Burkhart [1] highlighted the role of bone defects in his failed arthroscopic cases. He noted that the high failure rate of 67% was mainly due to significant bone defects in the form of anterior inferior glenoid bone loss (GBL) or large engaging Hill-Sachs. Currently, the glenoid bone loss percentage [2–4], which is considered critical for recurrences, is approximately 25%, and in such cases, a glenoid bone augmentation is mandatory [5, 6]. Open Latarjet [7–10] is considered to be one of the most accurate

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techniques for managing recurrent instability with glenoid deficiency because of its low recurrence rate (from 1 to 4%). The senior author (RR) has used this technique since 1986 with very satisfactory results, although he still considers the evolution of coracoid healing on the glenoid to be unpredictable [10, 11, 13]. Furthermore, the arthroscopic version of Latarjet represents a highly demanding technique, with a significant number of intra- and postoperative complications [11, 12]. The current literature provides numerous different techniques for the treatment of GBL, but to date, none have yielded better results than the Latarjet technique [13, 14]. We can conclude that the application of the Latarjet technique in non-active patients with moderate GBL should be considered an "overtreatment." Over the past few decades, arthroscopic Bankart repair was the gold standard for the treatment of anterior instability, especially in patients without significant GBL, but the re-dislocation rate can exceed 13% [15–18]. Since 2000, the main criterion for selecting the surgical option in our Shoulder Unit was glenoid morphology [6, 19] and we have chosen arthroscopic Bankart repair in patients without GBL with a recurrence rate of 7.2% at the medium term [20]. Furthermore, due to the high variability in bone loss amounts and the high frequency (80%) of moderate glenoid defects (H Sugaya) [21], we still experience difficulties in selecting the appropriate procedure, especially in active young people and in active people [20, 22, 23]. In 2013, we started using a new arthroscopic treatment that defined arthroscopic subscapularis augmentation (ASA) consisting of a tenodesis of the upper third of the subscapularis tendon associated with Bankart repair in patients with shoulder instability associated with moderate bone loss [5]. The aim of this study is to compare the clinical results of 40 patients, 20 of whom were treated with an open Latarjet procedure and 20 with ASA and Bankart repair in the same Unit.

Methods

Study population

From December 2011 to October 2015, 51 patients with anterior gleno-humeral instability underwent an open Latarjet procedure, and 40 to an ASA plus Bankart repair. The patients were selected based on the following inclusion criteria: clinical history of traumatic or atraumatic anterior shoulder instability, glenoid bone loss (GBL) from 5 to 23% as assessed by CT scan according to the "Pico area method" [2] and humeral bone loss (Hill-Sachs) wider than one-third of the humeral head, participation in sports, capsulolabral insufficiency, failure of arthroscopic stabilization, or dislocation with glenoid fracture (bony Bankart) [22, 23]. The exclusion criteria were a multidirectional instability, GBL <5 or >23% and radiological and MRI humeral head or glenoid rim modifications. A group of 20 patients (Group A) was selected from 51 patients treated with the Latarjet–Patte procedure with a minimum and maximum follow-up of 20 and 30 months, respectively. For the second group (Group B), we selected the first 20 cases out of 40, treated with the Bankart plus ASA procedure, with a minimum follow-up of 12 months; the follow-up in this group was shorter, ranging from 15 to 36 months (mean 20 months). The right shoulder was involved in 19/40 patients (47.5%), males represented 28/40 patients (70%), and the average age of the patients was 23.4 years (18/39) (Table 1). The average number of shoulder dislocations before surgery was 12 (minimum 5; maximum 50). All patients participated in sports, two of whom were involved in contact sports. One patient in each group presented a failed arthroscopic Bankart repair. Three shoulders in group A and 12 in group B had a grade II "sulcus sign" and an average of 90° of extrarotation in the RE1 position. The biceps load test was positive in 8 shoulders in Group A and 10 in B group.

A type II SLAP lesion was treated in four cases, and a posterior labrum repair was performed in three cases, with two anchors in one case and two in two cases due to a posterior capsular deficiency in two patients. Regarding the coracoid screwing for the Latarjet procedure, we used two screws only when the length of the coracoid bone graft was more than 25 mm. This length was encountered in four cases; in the other cases, we used one screw with a washer. In 18 cases in which the GBL was approximately 20%, preparation of the glenoid side for adaptation to the coracoid was not difficult. In the other cases exhibiting a modest defect ranging from 5 to 15%, we had to increase the glenoid defect to adapt it to the flattened coracoid surface.

Functional and radiological assessments

Preoperative functional assessments of all patients were conducted at the main operative unit by three surgeons with the Constant Score and QuickDash and Rowe scores. The rating of functional results was evaluated postoperatively by two independent shoulder surgeons according to the same methods. The preoperative imaging assessment for all

Table 1 Group B (Bankart + ASA)

Patients	20/40
FU	15–30 months (mean 20 months)
Side	Right 19/40 (47.5%) Left 21 (52.5%)
Gender	Male 28/40 (70%) Female 12 (30%)
Age	18–39 years (mean 23.4 years)

patients included MRI and CT scan. Magnetic resonance imaging was effective in demonstrating Bankart and/or ALPSA lesion, SLAP II and Hill-Sachs lesions in all cases. The Pico surface area method [2] was used to quantify the percentage of GBL. The average bone loss was 18.5 (5–23%). A postoperative assessment of glenoid augmentation with coracoid in group A patients was performed with a CT scan according to the Pico area method to control the correct position and the healing of the coracoid process after 1 and 4 years. All patients in group B underwent a postoperative MRI at 6 months and 1 year to assess the position of the anchors, the scar tissue evolution, particularly at the upper part of the subscapularis tendon, and the chondral aspect of the glenoid and humeral head cartilage.

Surgical techniques open Latarjet procedure

The patient is placed in the Beach Chair position. The skin is incised at the tip of the coracoid, extending inferiorly typically for 5–6 cm. The coracoacromial ligament is detached 1 cm from the coracoid insertion. The coracoid graft is prepared by removing the soft tissues from their deep surface and performing an accurate decortication to generate a wide view of the bone surface. Two n° 2 absorbable sutures were used to identify the coracoacromial ligament attached to the coracoid graft. We used two holes for two screws only if the graft length was larger than 2.5 cm. With an arm at the side and in an external rotation position, we opened the subscapularis muscle along its fibers at the intersection of the middle with the inferior third, where it is safe to divide the muscle by capsule [24]. The capsulotomy is generally performed vertically parallel to the anterior glenoid rim, and if the patient is hyperlaxed, then we can perform an L capsulotomy to reduce the anterior pouch. Once the anterior glenoid half is well exposed, the placement of the coracoid graft is prepared. The anterior labrum is incised, and the periosteum and Bankart lesion are removed. Using a 2.8-mm k-wire, the anterior glenoid neck was drilled at the same distance measured on the coracoid graft. The coracoid graft was stabilized with a partial threaded screw (diameter 4.0) with a washer in 16 cases and with two screws in four cases. The sutures of the ligament attached onto the coracoid graft were used to perform the "Bankart procedure," by passage through the capsule and the inferior gleno-humeral ligament [9].

Arthroscopic ASA and Bankart procedure

The arthroscopic procedure was performed with the patient under an interscalene block associated with general anesthesia in a lateral decubitus position; standard anterior and posterior portals were used. The anterior and posterior gleno-humeral joint structures were inspected to assess any antero-inferior labral insufficiency, SLAP lesions, anterior glenoid defects (Fig. 1) and Hill-Sachs lesions. The damaged anterior labrum was debrided and completely mobilized from the glenoid neck; abrasion of the anterior border of the glenoid neck was performed from the anterior and superior portals. A lower capsular repair and ASA procedure was performed according to the technique described by Maiotti [5] using knotless 2.9-mm anchors in the first ten cases (Mitek-DePuy, J&J). In the other ten cases, a 2.9-mm anchor for the capsular repair and a 3.5-mm knotless PEEK suture anchor (PushLock; Arthrex) were used for the subscapular tenodesis. The anchors were loaded with multi-strand tapes (FiberTape or Labral tape; Arthrex), (Fig. 2a–c). Coexistent SLAP lesions were repaired with 2.9 knotless PEEK suture anchors (PushLock; Arthrex). The anterior capsulolabral tissue could be successfully restored after the procedure (Fig. 3a, b).

Coexistent lesions

The open technique provides limited possibilities to assess associated injuries. The anterior capsule and the anterior glenoid labrum were easily explored. In 5 cases, a bony Bankart lesion was observed.

In the arthroscopic procedures, associated lesions were found in 18 patients. These lesions consisted of 1 (5.5%) partial thickness rotator cuff tear, 3 (16.6%) type II SLAP lesions and 15 (83.3%) engaging Hill-Sachs. In 3 patients, an insufficiency of the anterior glenoid capsulolabral tissue was reported; a loose body was found in 1 patient, and HAGL was observed in 1 patient. Patients with partial-thickness rotator cuff tears required a debridement procedure; in three subjects with type II SLAP lesions, a concomitant labral repair was always performed through the use of a third suture anchor. The operative findings in one patient with a previous Bankart

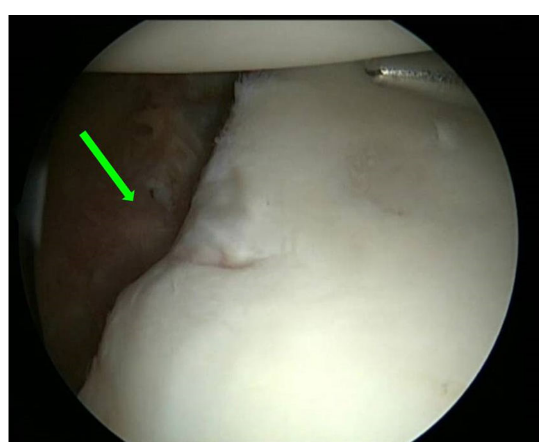

Fig. 1 Anterior bone glenoid defect

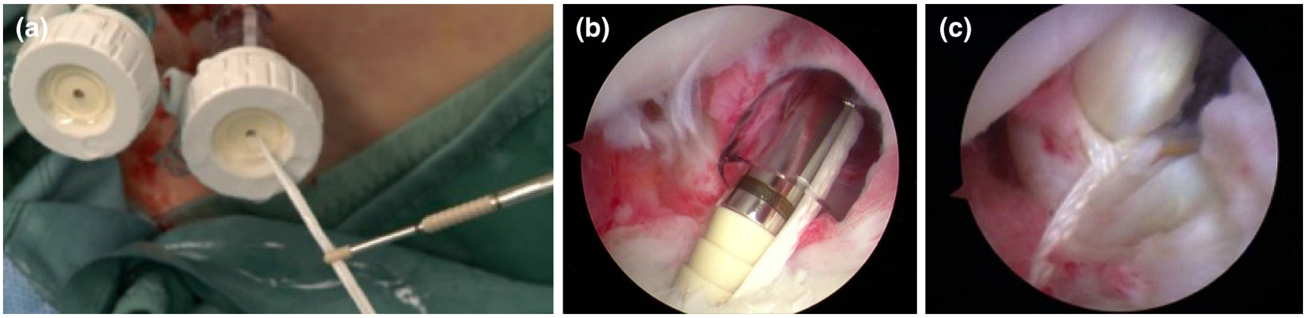

Fig. 2 **a** Labral tape and pushlock anchor. **b** Labral tape and pushlock in side at gleno-humeral joint. **c** Final images ASA

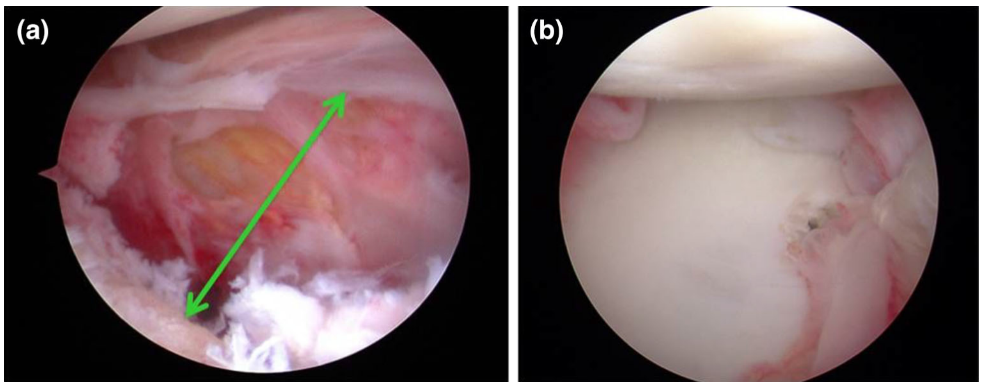

Fig. 3 **a** Anterior capsulolabral insufficiency. **b** The anterior tissue after the ASA procedure view from antero-superior portal

repair failure were as follows: capsulolabral insufficiency and engaging Hill-Sachs lesion.

Postoperative care

After surgical repair, the shoulder was immobilized in a brace with the arm adducted for 3 weeks in the patients in group A treated with Latarjet and for 4 weeks in the patients in group B. The rehabilitation program consisted of four phases applied in hot weather (34 °C degree) according to the Lionese protocol. The first phase was conducted at the 5th week, in which the patients performed exercises to increase their range of motion. The second phase occurred at 6–8 weeks, with recovery of the full range of motion. The third phase occurred at 8–9 weeks, with recovery of strength and proprioceptive abilities. The fourth phase occurred at 10 weeks, with recovery of athletic gestures. Return to sports was allowed at 5 months. The same protocol was used for all patients.

Statistical analysis

To analyze the results, the SPSS statistical software was used. The Chi-square test of association was used to investigate the relationship of shoulder osteoarthritis with other variables such as sex, age at time of first dislocation, number of dislocation, age at time of operation, mean postoperative Rowe score, mean ASES external rotation with arm at side (RE1), external rotation with 90° abduction (RE2) and internal rotation with 90° abduction. Data were presented as the mean ± standard deviation. The level of significance was set at $p < .05$.

Results

Forty patients were available at a mean follow-up of 21 months (20–39 months) for group A and 20 months (15–36 months) for group B. Functional outcomes were rated using the QuickDash score, Rowe and Constant scores. There was not a significant difference between the QuickDash, Rowe and Constant preoperative scores of patients belonging to the two groups of surgical treatment (respectively, $p = .262$, $p = 971$, and $p = .384$); no differences was found even after the surgical treatment (respectively, $p = .833$, $p = 411$ and $p = .662$).

Clinical and radiological results of the open Latarjet–Patte procedure

Clinical and radiological assessments were performed by one radiologist and two different shoulder surgeons. A recurrence due to coracoid nonunion and bone graft reabsorption occurred in one patient. In this case, an Eden-Hybinette technique was performed one year after the operation. Shoulder stiffness occurred in one female patient with restoration of ROM after 14 months, and in one patient a posterior instability was reported at two years of follow-up, but no further treatment was required. In this group, as it is shown in Table 2, there is a significant decrease in the QuickDash mean score (1.9) and a significant increase in Rowe and Constant mean scores (respectively, 39.8 and 36.5). In 12 patients, a limitation of ROM was found, with a mean deficit of −9° in ER1 and −5° in ER2. A CT scan was performed immediately after surgery and after an average of 18 (12–48) months to assess the coracoid healing process. Multi-Slice Computed Tomography (GE Lightspeed 16 slice—General Electric Medical Systems, Milwaukee, Wisconsin, USA) was used. The CT assessment was conducted using the following parameters: 0.65 mm thickness, 120 kV, 0.9 Pitch, 250 mA, 0 mm Gap. Data analysis was performed using Osirix software. In 17 patients, a complete fusion of the graft was found. In two patients, the fusion was incomplete. Two complete fragment nonunion (one spontaneously fractured after one year from the operation at a high sport level of activity) of two coracoids were reabsorbed. In 8 patients, we found asymptomatic subchondral cists on the graft side (3–16 mm). In 5 patients, we found signs of structural alteration of the articular surface of the glenoid: Two patients showed subtle subchondral sclerosis (grade 1) osteoarthritis, and two patients showed glenoid subchondral microgeodes (grade 2). On the axial plane, the screw was less than 1 mm lateral to the glenoid surface in two patients (grade 1 according to our grading), between 1 and 2 mm lateral in one patient (grade 2), and more than 2 mm lateral in one patient (grade 3).

Clinical and Radiological results of Bankart plus ASA

Twenty patients were available for the short-term follow-up, which ranged from 15 to 36 months (average of 20 months). In this group, as it is shown in Table 3, there is a significant decrease in the QuickDash mean score (2.3) and a significant increase in Rowe and Constant mean scores (respectively, 41.6 and 38.6). Three months postoperatively, one patient had a shoulder subluxation, but at 22 months of follow-up, all parameters were normal (Dash score 1.5, Rowe 93, Constant 96). One patient (4.5%) who was affected by bi-directional instability suffered from a capsulitis and underwent a second arthroscopic assessment at 5 months after the surgical treatment due to complaints of discomfort while placing the arm in an external rotation and touching the back of the head. However, none of these patients had recurrent dislocation or instability at the final follow-up. At 18 months of follow-up, the same patients had no discomfort and 180° of active elevation. At the final follow-up, there were no significant differences in forward elevation, backward motion or internal rotation of the shoulder. There was a significant difference during external rotation of the shoulder at the side and during abduction: When compared with the normal contralateral side, the mean deficit in external rotation was −8° ± 5° with the arm at the side of the trunk and 5° ± 3° with the arm in abduction. These satisfactory functional and subjective results allowed all patients able to return to all work activities. MRI controls at 12 months post-op revealed good positioning of the anchors and no signs of glenoid chondral damage (Fig. 4). Two patients showed humeral osteochondral modification of the head cartilage configuring a second degree of Samilson [25] osteoarthritis; in another patient, the same osteochondral damage was more evident on MRI than before the surgical treatment.

Discussion

The main purpose of this study was to compare the clinical results of open bone block techniques, according to Latarjet–Patte and Arthroscopic Bankart repair associated with Subscapularis Augmentation (ASA), to treat anterior shoulder instability with glenoid bone loss (GBL) below 25%. It is well known that this pathology represents one of the most important risk factors for recurrence [46], particularly if an arthroscopic Bankart procedure is performed in active people and in contact sportsmen [20, 23, 24, 26]. In 2000, Burkhart reported a recurrence rate of 67% after

Table 2 Functional outcome in group A patients ($n = 20$)

Type of score	Preoperative		Postoperative		Difference	
	Mean	95% CI	Mean	95% CI	Mean	95% CI
QuickDash	3.6	3.1–4.2	1.8	0.9–2.8	1.9	1.0–2.7
Rowe	50.0	48.3–51.8	89.8	86.0–93.6	39.8	34.9–44.6
Constant	56.2	54.1–57.9	93.3	88.0–97.4	36.5	31.2–41.8

CI Confidence interval of the mean

Table 3 Functional outcome in group B patients ($n = 20$)

Type of score	Preoperative		Postoperative		Difference	
	Mean	95% CI	Mean	95% CI	Mean	95% CI
QuickDash	4.0	3.7–4.3	1.7	1.3–2.1	2.3	1.9–2.7
Rowe	50.0	47.7–52.3	91.6	89.0–94.3	41.6	38.7–44.6
Constant	55.2	53.5–56.9	93.8	91.4–96.2	38.6	36.3–40.9

CI Confidence interval of the mean

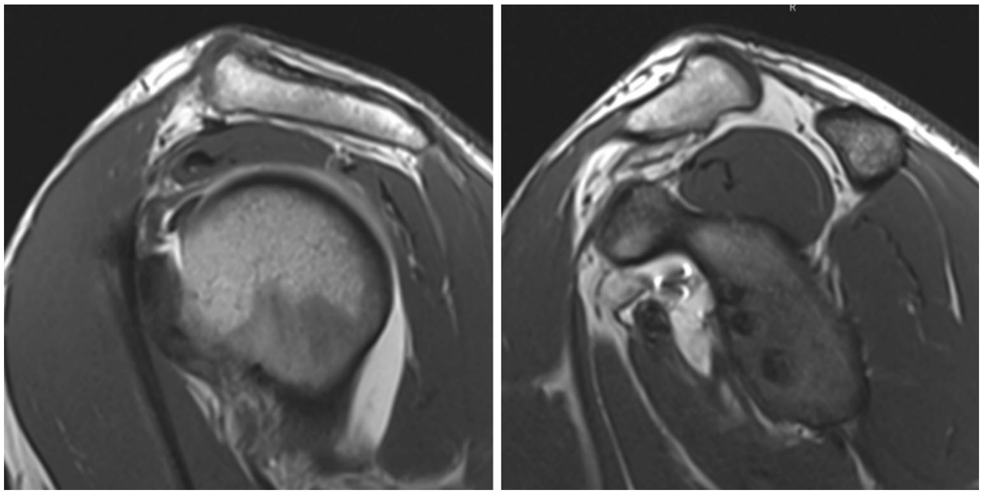

Fig. 4 Arthro-MRI after surgery. A lifted subscapularis and a close capsular camera

arthroscopic repair in patients with significant bone loss [1]. Itoi further confirmed such an effect in terms of humeral and glenoid bone loss in a biomechanical study [6]. In 2007, Mologne [27] presented the outcomes of a series of low-activity patients treated arthroscopically who were affected by GBL or chronic bony Bankart lesion. He reported the effectiveness of suturing the anterior capsule on the inverted glenoid pear, especially if the bony fragment was fixed together with the capsule and ligaments, and a 14.5% rate of re-dislocation, which represents a significant improvement from his results compared with Burkhart's experience. In contrast, these results are not comparable with those reported using the open Bankart procedure or the Latarjet–Patte technique, which yielded a re-dislocation rate ranging from 1 to 5%. In the first decade of 2000, there were many controversies concerning the results of open and arthroscopic techniques. Several comparative studies showed better results with open surgery, whereas superior or equivalent results of arthroscopic procedures were reported by others [28–32]. However, very few studies investigated the relationship between GBL and patient outcomes [1, 22, 33]. Furthermore, in the last fifteen years, this problem has been emphasized. The literature on this subject seems to be regional: In the USA, many surgeons who treat shoulder instability with glenoid bone loss underscored the need for a large number of anchors to fix gleno-humeral ligaments on the glenoid as well as a Remplissage procedure [33–35]. In contrast, in Europe, the glenoid bone augmentation procedure with the Latarjet technique is generally considered the "Gold Standard" for the treatment of anterior shoulder instability in the presence of GBL and engaging Hill-Sachs. The open or arthroscopic Latarjet procedures are considered effective techniques to treat shoulder instability, especially in contact sports. These procedures are considered extremely valid for overcoming bone loss and capsular insufficiency, providing very good results, especially in terms of the failure rate [36–38]. The importance of restoring the glenoid surface and the role of coracoid process healing on the glenoid neck has been emphasized in many studies of the Latarjet procedure [39]. Recently, in a cadaveric study, Yamamoto [40] showed that the subscapularis sling effect was more important than the bone blocking effect. The lower rate of failure reported in the literature with the use of the open Latarjet procedure has contributed to the dissemination of this technique, although some complications (20%) were recently reported using the arthroscopic version of the Latarjet technique [12, 41, 42]. However, both techniques, if performed correctly, are reliable but should be used in cases with glenoid bone defects exceeding 25% [43]. Currently, these guidelines are not strictly followed, as reported in some retrospective series. In fact, many surgeons who treat young and active patients practicing contact sports usually perform bone augmentation procedures even in the case of moderate bone defects [13, 42].This study represents the first consecutive control group of patients who underwent surgery in the same unit with the same experienced shoulder surgeon (R.R.), comparing an open bone grafting procedure (Latarjet–Patte) with a new arthroscopic technique that involved only soft tissues such as capsular and subscapularis tendon tissue. In a recent retrospective study [5], the arthroscopic Bankart repair associated with the ASA technique demonstrated very good results, with a re-dislocation rate of only 3.2%, which is an important improvement over the findings of the Mologne study [27]. Our failure rate was 4% in group A and 0% in group B, which can be considered a very satisfactory outcome, especially in comparison with the average rate of the classical arthroscopic Bankart technique, which ranges from 8 to 64% [13, 16, 18, 32]. In our series of sportsmen, all patients returned to sports activities at the same preinjury level, despite representing a heterogeneous group composed of recreational and competitive subjects. The loss of external rotation (14° + −4 in the RE1 position and 9 + −2 in the RE2 position) was inferior to that of the Putti-Platt open surgery (from 6° to 25°) and was not superior to other techniques (arthroscopic Bankart or arthroscopic with open Latarjet). As it is evident from Tables 2 and 3, which assess tabs of individual and objective satisfaction of results, do not appear evident differences between two techniques, whereby we can correctly indicate to patients affected by anterior instability with moderate glenoid bone loss an arthroscopic treatment rather than a transfer of the coracoid at least on short-term follow-up. Moreover, the rate of osteoarthritis was not increased in comparison with open or arthroscopic bone block transfer. The limitation of this study is the entity and quality of soft tissue healing, and there are few details of the healing modalities of the capsular and subscapularis tendon on the glenoid bone junction despite the good clinical results already reported in the literature and observed in our experience. In contrast, the analysis of coracoid graft evolution over time, done on group A, is important to correlate coracoid graft healing and the position of the glenoid to predict the clinical results [44, 45]. Based on CT scan study, our conclusion is that in cases of glenoid bone loss, approximately 20% of the bone surface was a well-suited socket for the shape of the coracoid graft, resulting in screwing fixation a very high percentage of graft consolidation. In the case of GBL <20%, there was a lower percentage of coracoid healing and that was confirmed by CT scan findings showing resorption of the graft in the cranial area low on the glenoid surface (Fig. 5). Furthermore, a high rate of bone resorption of the coracoid graft was observed when it was placed in the equatorial area of the glenoid. On the other hand, a better bone integration was obtained with a coracoid placed in the lower part. The fixation of a 2- to 2.5-cm graft using one screw and washer was commonly effective in our series. Two Latarjet failures were observed: one due to a nonunion at one year of follow-up and one due to a coracoid fracture after one year from the operation. In the first case, the volume of the bone coracoid was too small to fix using a washer. In such cases, it is worth choosing another surgical technique to avoid this complication because the coracoid tip was not effectively fit for an appropriate screwing fixation. During the selection of patients, a Latarjet procedure for a small coracoid morphology should not be indicated. In the second case, in which the choice has been determined by a higher effectiveness of the Latarjet technique for contact sports, the absence of bone loss, with a normal morphology of the glenoid, could cause a nonunion graft and failure. These results demonstrated that one surgeon with experience using the Latarjet technique is often not able to calculate the evolution of the graft healing on the glenoid because the morphology of the coracoid and glenoid could be very variable.

Conclusions

The strength of this study consisted of a small but very homogenous group of patients treated in the same unit by a unique surgeon who was experienced in both techniques (5, 10, 20, 32, 46). The Latarjet–Patte procedure is a safe, reproducible procedure that provides very good results, but its correct indication is in patients with GBL > 25%, which represents a small number of the associated lesions in shoulder instability. Currently, the Latarjet technique for instability with moderate bone loss from 10 to 20% may be considered as an overtreatment because this new arthroscopic technique combining Bankart repair plus ASA demonstrated similar clinical results at the short-term follow-up.

Limitations

This study has several limitations. First, although the rate of re-dislocation was lower than that observed in other series, we did not report several parameters, such as the preoperative evaluation of the Hill-Sachs severity index tested only during the surgery in the arthroscopic cases or the number or entity of laxity for the treated patients. The second limitation is the short follow-up period of observation and the low number of patients. In fact, the incidence of osteoarthritis could not be examined. A third limitation may be considered, which is the absence of a

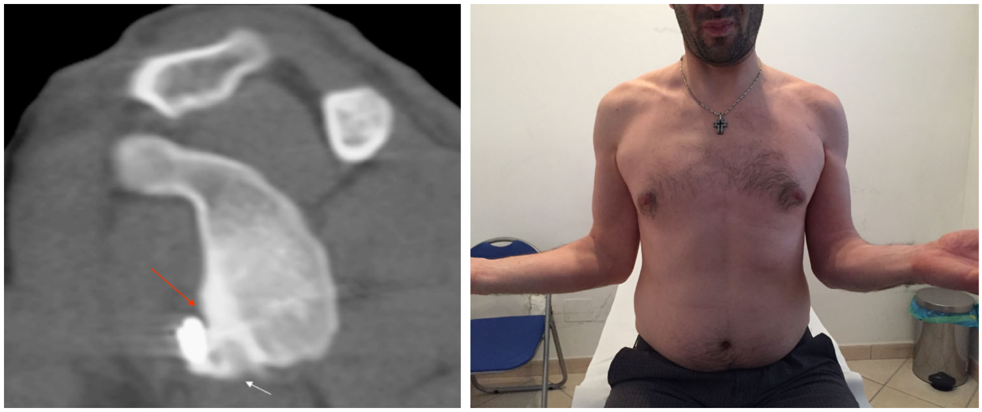

Fig. 5 **a** A two years postoperative Pico CT scan with coracoid graft healed. **b** Clinical limitation of extrarotation (−15°)

control group of patients treated with a simple Bankart repair with a high number of anchors on the anterior edge for glenoid bone loss using the arthroscopic technique, or treated with the arthroscopic Latarjet procedure.

Compliance with ethical standards

Conflict of interest None.

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