Can arthroscopic revision surgery for shoulder instability be a fair option?

Silvana De Giorgi[1]
Raffaele Garofalo[2]
Silvio Tafuri[3]
Eugenio Cesari[4]
Giacomo Delle Rose[4]
Alessandro Castagna[4]

[1] Department Basic Medical Sciences, Neurosciences and Sensory, University of Bari, Italy
[2] Shoulder Service, Miulli Hospital, Acquaviva delle Fonti, Bari, Italy
[3] Department of Biomedical Science and Human Oncology, University of Bari, Italy
[4] Shoulder and Elbow Unit, IRCCS Humanitas Institute, Rozzano, Milano, Italy

Corresponding author:
Silvana De Giorgi
Department Basic Medical Sciences, Neurosciences and Sensory
University of Bari
Piazza G. Cesare, 11
70124 Bari, Italy
E-mail: silvanadegiorgi@virgilio.it

Summary

Background: **the aim of this study was to evaluate the role of arthroscopic capsuloplasty in the treatment of failed primary arthroscopic treatment of glenohumeral instability.**
Methods: **we retrospectively examined at a minimum of 3-years follow-up 22 patients who underwent arthroscopic treatment between 1999 and 2007 who had recurrent anterior shoulder instability with a post-surgical failure.**
A statistical analysis was performed to evaluate which variable could influence the definitive result and clinical outcomes at final follow-up. A p value of less than 0.05 was considered significant.
Results: **we observed after revision surgery an overall failure rate of 8/22 (36.4%) including frank dislocations, subluxations and also apprehension that seriously inhibit the patient's quality of life.**
No significant differences were observed in the examined parameters.
Conclusions: **according to our outcomes we generally do not recommend an arthroscopic revision procedure for failed instability surgery.**

KEY WORDS: arthroscopic failure, capsuloplasty, shoulder instability.

Introduction

Many surgical techniques have been described for the treatment of shoulder instability, each with different indications according to the pathological findings such as Bankart lesion[1], ALPSA lesion, SLAP lesion, Hill-Sachs lesion, Bony Bankart[2], PHAGL[3] and HAGL lesion[4], as well as patient age, sex and activity level[5-11]. Despite the evolution of arthroscopic surgery for shoulder instability, a certain risk of recurrence exists after primary arthroscopic stabilization, even for patients aged over 22 years (6.3%)[12]. An open procedure is usually used for revision surgery in most of these cases[13,14]. Latarjet procedure may be the procedure of choice in revision surgery, even in cases of good glenoid bone loss and in cases of poor capsular tissue[7]. However, there is no literature evidence if, in the case of revision surgery and in the absence of severe bone loss, an arthroscopic procedure could be a viable option. Some authors have already reported satisfactory outcomes with a low risk of recurrence after arthroscopic capsuloplasty in patients with failed glenohumeral stabilisation, either using open or arthroscopic techniques[7,15,16]. Nevertheless, the percentage of failure could be even higher if we consider not only a recurrence of instability (dislocation or subluxation) but also a painful residual apprehension of the shoulder[7] as a failure.
The aim of the present study is to evaluate the risk of failure, in terms of instability or painful residual apprehension after an arthroscopic revision for a failed arthroscopic repair, to know if some variables could influence the clinical outcomes at final follow-up and to compare our results to the reported data of the literature.

Material and method

Study population and inclusion criteria

In the period between January 1999 and December 2007 we performed 1262 arthroscopic capsuloplasties as primary surgery. Seventy-seven patients underwent revision surgery after a failure of a previous

arthroscopic capsuloplasty for anterior instability of the shoulder. In 53 cases we used an open Latarjet procedure, in two cases an open capsulolabral repair and in the remaining 22 cases we used a new arthroscopic capsulolabral repair.
This last group of 22 patients was retrospectively evaluated at a mean follow-up of 56 months (min 36 months - max 120 months).
In this study, failure after the revision surgery was defined as the presence of dislocations, subluxations or residual apprehension, meaning pain in the position of external rotation and abduction of the arm, without any new injury.
All patients underwent previous arthroscopic repair using suture anchor-technique using Panalok anchors (De PuyMytek, Rayam MA).
The average interval from postoperative recurrence to the second arthroscopic surgery was 21±4.5 months (range 3 months-60 months).The mean age of patients at revision surgery was 27.0±5.9 years (range 16-40 years). The mean interval between the first arthroscopy and the revision surgery was 3.2±1.7 years (range=1-7).
The recurrence after first surgery was due to an important trauma in 16 (72.7%) patients (motorbike accident, sport trauma, etc.), to a minor trauma in 5 (22.7%) cases (doing common daily activities), while one (4.6%) patient presented only subluxations following a new trauma without any true dislocation of the joint.
Recorded intraoperative videos of previous surgery for all patients were evaluated before the revision surgery.

Clinical evaluation and outcome measures

Clinically, an apprehension-relocation test was positive in all patients before the second surgery. The Gagey sign was present in 6/22 patients[17].
Patients underwent a contrast enhanced magnetic resonance image (MRI) and radiographs using AP in neutral, internal and external rotation and Bernageau projections, to evaluate significant bone loss and critical Hill-Sachs lesions. Glenoid bone loss was considered to be significant if superior to 20% of the total area of the glenoid and the evaluation of glenoid surface and of the Hill-Sachs lesion, was also done arthroscopically during revision surgery, according to the criteria of Burkhart[18]. In none of these cases a significant anterior glenoid bone loss was detected. In no case was there an engaging Hill-Sachs lesion.
The mean age of patients at revision surgery was 28.6 years (range 16-54) (SD 8.2). The interval between the first arthroscopy and the revision surgery was 3 years (SD 1.7).
Intraoperative findings recorded during the revision surgical procedures are described in Table 2. The kind of surgery performed is shown in Table 3.
The patients were retrospectively evaluated by an independent surgeon at a mean follow-up of 56 months (range 36-120 months) from last surgery, with regard to passive and active ROM (range of motion) of the shoulder involved, compared to the contralateral side. External rotation was measured with a goniometer at 0 degrees of abduction (ER1) and 90 degrees of abduction (ER2). Constant scores[19], ROWE (1978)[20], UCLA[21], ASES[22], VAS (Visuo Analogical Scale) for pain evaluation and return to prior sports and working activities were also considered for all patients.

Arthroscopic technique

An interscalene block was administered and the patient was placed in a lateral decubitus with traction of the involved arm at 4-5 kg. A posterior portal was established and a diagnostic arthroscopy was performed on both the gleno-humeral joint and subacromial space. An arthroscopic drive-through sign was noted when present and the characteristics of the labrum and of the capsule were assessed. The term “drive-through” sign refers to the ability to easily pass the arthroscope from the posterior compartment into the anterior part of the joint[23].
A high rotator interval portal was placed. The anterior labrum was studied and if a new Bankart or ALPSA lesion was noticed, the labrum was debraded, inserting two or more Panalok anchors (De Puy-Mitek, Rayam, MA) and sutured with a single strained Ethibond #2 suture passing through the anchor. We used a suture passer (spectrum hook- Linvatec, Conmed) to place sutures through the capsular tissue and shuttled a PDS#0 to retrieve the suture from the anchor and then tied the sutures. If a drive-through sign was noticed, the capsule was gently roughened with an arthroscopic shaver without detaching it from the labrum and an arthroscopic suture passer (spectrum hook- Linvatec, Conmed) was used to place sutures through the capsular tissue, to plicate the capsule or close the rotator interval if needed. A PDS #1 suture was shuttled through the suture passer and then tied. Postoperative care consisted of a shoulder sling at 15 degrees of abduction for 4 weeks, passive motion was allowed after the first 3 weeks and then we suggested active motion with gradual muscle strength recovery. Return to overhead or contact sports was allowed after 5 months from surgery.

Ethics
We conducted our research ethically according to international standards and as required by the journal[24] and we obtained an ethical consent from our IRB for the present study.

Statistical analysis
This is a cohort retrospective study. The following variables were evaluated to identify the risk factors of failure after this revision surgery: age of patients at first dislocation and at first surgery, number of initial dislocations before primary surgery, time between first dislocation and first surgery, number of dislocations after first surgery, age at second surgery, interval between first and second surgery, findings during revision surgery (drive through sign, ALPSA and Bankart lesions, SLAP lesion).

The data of each enrolled patient was reported in a standardized form. Completed forms were computerized in a database created by File Maker Pro. A statistical analysis was performed by Stata MP11. Multivariate analysis was carried out to evaluate the association between Rowe score (outcome) and the presence of intra-operative findings (such as SLAP lesion, Bankart or ALPSA lesion, capsular elongation, PHAGL lesion) and demographic data (determinants). We calculated OR with 95% CI and z test. Non parametrical tests (Mann Whitney and Kruskall Wallis) were used to compare the means. A Chi-squared test was performed to compare the proportions. A p value of less than 0.05 was considered significant.

Results

Out of 22 patients, 3 (13.6%) were females and 19 (86.4%) males. The dominant shoulder was involved in 12 (54.5%) cases. The demographic data is shown in Table 1. Findings observed during revision surgery in the examined patients are shown in Table 2. Surgeries performed are shown in Table 3.

There were no intraoperative complications during revision surgery.

The failure rate after revision surgery (considering both frank dislocations, traumatic subluxations, and painful apprehension without any trauma), was 8/22 (36.4% of the sample). This occurred in three cases of frank dislocations due to a serious trauma (13.6%) and in one case for a trivial trauma (4.6%). One patient presented subluxations after a trauma (4.6%). Apprehension in abduction at 90° and maximum external rotation of the shoulder was present in three patients (13.6% of the sample).

Clinically, the mean passive ER1 was 70º (min 50º-max 80º), the mean ER2 was 80º (min 70º-max 90º). No statistical significant difference in the external rotation compared to the contralateral side was observed.

All the patients returned to their working activities after a maximum of four months of follow-up. Five patients involved in non-agonistic overhead athletics returned to the same pre-surgery level.

The Gagey sign was negative in all patients at clinical follow-up.

The average Constant score at final follow-up was 88.4±11.6/100, the UCLA mean score was 28.3±5.7/35, the ASES mean score was 107.5±15.6/120, the ROWE

Table 1. Main features of patients enrolled (n=22).

	mean±sd	range
Age at first dislocation	19.8±4.7	14-29
Age at first surgery	23.8±5.8	15-36
Number initial dislocations	12.5±22.4	1-40
Years first dislocation-first surgery	4.6±4-5	0.1-17
Number disl between first & second surgery	3.2±5.4	0-25
Age second surgery	27.0±5.9	16-40
Years first surgery-second surgery	3.2±1.7	1-7

Table 2. Findings observed during revision surgery in examined patients.

Findings	N	% of enrolled patients
Bankart lesions	4	18,2
ALPSA Lesion	2	9,1
Anterior SLAP tear + rotator interval distension with drive through sign	1	4,5
Bankart lesion + SLAP (Superior Labrum Anterior and Posterior) tear	5	22,7
Bankart lesion + instability LHB	1	4,5
Bankart lesion + ligamentous capsular elongation with drive through sign	7	31,8
Bankart + PHAGL (Posterior Humeral Avulsion of the Gleno-humeral Ligament)	1	4,5
PHAGL Lesion	1	4,5

Table 3. Surgeries performed in considered patients.

Surgeries performed	N. of patients	% of enrolled patients
Capsuloplasties (Bankart repair) with suture- anchors	9	40,9
SLAP lesion repair with capsular plication	1	4,5
Capsuloplasties (Bankart repair) with SLAP (Superior Labrum Anterior and Posterior) repair	4	18,2
Multiple plications + arthroscopic capsuloplasties (Bankart repair)	5	22,7
Capsuloplasty (Bankart repair)+ LHB tenodesis	1	4,5
PHAGL lesion repair + posterior plication	1	4,5
Repair surgery for PHAGL lesion and Bankart lesion	1	4,5

rating scale was 71.8±24.2/100. The VAS scale for pain assessment showed an average score of 2.1±2.2/10.
Results according to the ROWE score were good or excellent in 64% of the patients.
Comparing patients that failed (n=8) and those that did not fail (n=14), no statistical significant differences resulted in the age at first dislocation (19.9±4.5 *vs* 19.8±4.9; p=0.94), in the age at first surgery (25.2±5.6 *vs* 23±6.0; p=0.37) and in the age at second surgery (28.4±5.6 *vs* 26.3±6.3; p=0.34). Time between first dislocation and surgery was not statistically different between the two groups (4.8±5.7 *vs* 4.4±4.0; p=0.80). Also the number of dislocations was not statistically different in the two groups (number of dislocations before first surgery 7.0±7.0 *vs* 15.7±27.4; p=0.68; number of dislocations between surgeries 5.4±8.4 *vs* 2±2.2; p=0.28).
We described three classes of ROWE according to the score at final follow-up: less than 50 points (first class), score between 51 and 75 points (second class) and score superior to 75 points (third class).
In Table 4 the main features of patients in the described three classes of ROWE score observed at follow-up and the comparison of the means are reported. No significant differences were observed in the age of patients at first dislocation and at first surgery, in the number of initial dislocations, in the interval between first dislocation and first surgery, in the number of dislocations between first and second surgery and in the age at second surgery among the classes of ROWE score at final follow-up.
The 5 patients with the lowest Rowe score (≤ 50) had sustained a mean of 10 dislocations before the primary surgery and a further mean of 5 dislocations between first surgery and the revision one (Tab. 4).
Table 5 reports the distribution of patients in the three classes of Rowe score at follow-up and presence or

Table 4. Means of evaluated variables in the three classes of Rowe Score at final follow-up (<= 50 N=5; 51-75 N=5; >75 N=12).

	ROWE	average	Std Deviation	P	Power analysis
Age first disl.	<=50	20.7	4.6	0.79	0.05
	51 - 75	18.7	4.6		
	>75	19.9	5.0		
Age first surg	<=50	21.5	4.3	0.69	0.24
	51 - 75	24.2	6.7		
	>75	24.3	6.1		
Number initial dislocations	<=50	16.0	23.0	0.86	0.99
	51 - 75	9.8	8.7		
	>75	12.3	25.8		
Time first disl.-first surgery (years)	<=50	0.95	0.8	0,09	1
	51 - 75	4.25	3.6		
	>75	5.7	5.0		
Number of dislocations between 1 & 2 surgery	<=50	8.8	11.5	0.45	1
	51 - 75	2.2	0.9		
	>75	1.9	2.1		
Age at second surgery	<=50	25.2	4.3	0.74	0.47
	51 - 75	27.0	7.2		
	>75	27.6	6.3		

Table 5. Proportion of patients who presented Bankart, ALPSA, Drive through sign, SLAP or PHAGL lesions at revision surgery, by Rowe Score class at follow-up.

Lesions at revision surgery		**ROWE**			**chi-squared**	**P**
		<=50 (n=4)	51 – 75 (n=4)	>=75 (n=14)		
Bankart	N	3	2	13	3.99	0.136
	%	75	50	93.0		
ALPSA	N	1	0	0	4.71	0.095
	%	25	-	-		
Drive through sign	N	0	0	5	3.69	0.157
	%	-	-	35.7		
SLAP	N	1	3	2	5.79	0.05
	%	25	75	14.3		
PHAGL	N	0	0	2	1.25	0.53
	%	-	-	14.3		

absence of the evaluated pathological findings during the revision surgery. No association was found between intraoperative pathological findings like Bankart lesion, ALPSA lesion, SLAP lesion, PHAGL lesion[3], drive through sign and the three classes of ROWE score at final follow-up.
Our multivariate analysis did not show any association between the failure and investigated determinants ($p>0.05$).

Discussion

The main finding of this paper is that the total percentage of failure or recurrence after revision arthroscopic surgery was 36.4% of the sample. This percentage represents a poorer outcome than the paper by Kim, who found 21% of recurrence after revision surgery[25,26] and also an higher percentage of failure than the studies by Neri and Creighton (27% of recurrence in repeated procedures)[27,28], by Franceschi (10% of recurrence)[16] or Barnes (6% of recurrence)[29]. The difference in outcomes can be related to the fact that the present study is the first in the literature considering also the residual apprehension as a failure. We found this sign in 13.6% of patients. If we exclude it (isolated apprehension in the ABER position) (ER2), the rate of recurrence decreases to 22.8%. This is similar to the findings reported by previous studies[25,27,30].
In our study, the lowest functional levels were observed in patients with a failure. However, although in some studies it has been shown that the number of dislocations before surgery is a poor prognostic factor, in our study we failed to find a statistically significant correlation[12].
We observed no correlation with the kind of first surgery and final outcomes and we did not observe a significant loss of external rotation at final follow-up. This is similar to the results reported by Kim who did not notice any loss of external rotation after arthroscopic surgery[25].
We used the ROWE score to assess the final results because it is the more sensible score for instability. The other scores (Constant, ASES, UCLA) were good in the vast majority of patients. As a matter of fact, if we use only the Constant, ASES and UCLA scores, without considering the ROWE score, even patients with a recurrence or a failure can have a good clinical outcome.
We used bio-absorbable anchors with single-strand No. 2 Ethibond sutures. It remains to be seen if an improvement in outcome can be obtained with current fixation systems, represented by new type of anchors with highly resistant double sutures and by new suture passage and knot-tying techniques[31].
Finally, in this study we failed to identify which variable could really influence the outcome at final follow-up. Consequently, some factors responsible for revision surgery failure can be related to some variables that are difficult to evaluate, such as the quality of capsulolabral tissue. Furthermore, we can suppose that other factors at the time of this study were underestimated. Infact, the glenoid bone loss at the time of this study was evaluated with radiographic examination and with arthroscopic measurement. We know from the literature that both these methods are not so accurate in measuring the defect itself. Therefore it is possible that most of the patients that failed probably had a more significant bone loss than was measured, but we were not able to evaluate it at that time.
The strong points of this paper are that all patients were surgically treated by the same senior surgeon and that it is the first paper to consider the residual painful apprehension of the shoulder as a clinical failure. This is very important because the reported failure rate in revision surgery for instability could be higher than previously reported if this finding is taken into consideration. Another strong point is that no patient was lost at final follow-up.
The main weakness of this study is that it is a retrospective one, that the sample is very small and that the series of patients examined is not perfectly homogeneous. Furthermore, the glenoid bone loss was measured with techniques that are currently no longer used. However, most of the studies considered in the literature deal with a small case series of patients because arthroscopic revision surgery is not a common procedure[25,27-29]. Another weakness of our study is that we did not perform an MRI or TC investigation at final follow-up.
Although the sample is quite small, according to our outcomes, an arthroscopic revision procedure for failed instability surgery may generally be not recommendable. More prospective studies are necessary to evaluate which kind of patient should be selected to undergo successful arthroscopic revision surgery, according to up-to-date knowledge of bone loss and capsular tissue quality.

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