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Original article

Bankart arthroscopic procedure: comparative study on use of double or single-thread anchors after a 2-year follow-up☆

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ABSTRACT

Objective: To compare the use of anchors with double and single-thread loading in the single-row Bankart arthroscopic procedure.
Methods: 252 patients (258 shoulders) underwent Bankart arthroscopic surgery with evaluation after a minimum follow-up of 2 years. They underwent repairs either using anchors with single loading of a high-resistance non-absorbable braided thread (206 shoulders; group AS) or using double loading of thread with the same characteristics (52 shoulders; group AD). The patients were evaluated using the UCLA and Carter-Rowe scales. The patients' return to sports activity and recurrences were also compared.
Results: There was no significant difference between the groups regarding the surgical failure rate (group AS 5.8%; group AD 7.7%; $p = 0.62$). Group AS presented a better mean Carter-Rowe score (group AS 94.4; group AD 88.6; $p < 0.05$) and greater return to the same sports level (group AS 79.1; group AD 72.1; $p < 0.05$).
Conclusion: Use of anchors with double thread loading did not show any clinical advantage for arthroscopic repair of traumatic anterior shoulder instability, in relation to use of single-thread anchors, over a 2-year follow-up.

Procedimento artroscópico de Bankart: estudo comparativo do uso de âncoras com fio duplo ou simples após seguimento de dois anos

Palavras-chave:
Instabilidade articular
Luxação do ombro/epidemiologia
Luxação do ombro/cirurgia

RESUMO

Objetivo: Comparar o uso de âncoras com carregamento duplo e com carregamento simples de fio no procedimento artroscópico de Bankart com fileira simples.
Métodos: Foram submetidos à cirurgia artroscópica de Bankart e avaliados após seguimento mínimo de dois anos 252 pacientes (258 ombros). Foram submetidos a reparo com âncoras

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com carregamento simples de fio trançado não absorvível de alta resistência 206 ombros (grupo AS) e com âncoras com carregamento duplo com fios de mesmas características 52 (grupo AD). Os pacientes foram avaliados segundo as escalas UCLA e Carter-Rowe. O retorno à atividade esportiva e a recidiva também foram comparados.

Resultados: Não houve diferença significante entre os grupos quanto à taxa de falha cirúrgica (grupo AS 5,8%; grupo AD 7,7%; p = 0,62). O grupo AS apresentou melhor Carter-Rowe médio (grupo AS 94,4; grupo AD 88,6; p < 0,05) e maior retorno ao mesmo nível esportivo (grupo AS 79,1; grupo AD 72,1; p < 0,05).

Conclusão: O uso de âncoras com carregamento duplo de fios não demonstrou vantagem clínica no reparo artroscópico da instabilidade anterior traumática do ombro em relação ao uso de âncoras simples no seguimento de dois anos.

Introduction

The glenohumeral joint is the one that most often presents instability in the human body (dislocation and subluxation), with an incidence of 17 cases per 100,000 inhabitants per year.[1] Anterior instability accounts for approximately 85% of the cases of traumatic dislocation. The natural history of this pathological condition after the first episode has been widely studied and it is known that there are some important factors that influence the recurrence rates, such as age, involvement in contact sports, magnitude of the bone defects, ligament laxity and time elapsed between the first episode and surgery.[2–4] Robinson et al.[5] found a recurrence rate of 55% after 2 years, among patients under the age of 35 years, with a probability of 86% for patients aged 15 years and 26% for patients aged 35 years.

In the past, the elective option for treating traumatic anterior instability was open surgery, even after the introduction of the arthroscopic technique, given that studies showed that the latter method led to a higher recurrence rate.[6–8] Lane et al.[6] performed arthroscopic capsulorrhaphy and found that the recurrence rate among their 54 patients was 33%. In the same year, Grana used the transosseous suture technique that had been introduced by Morgan in 1987 and found that the recurrence rate was 44%.[7] In 1997, Godinho et al.[8] also used transosseous suturing and found that the recurrence rate among their 79 patients was 13.9%.

Studies conducted more recently have shown improvements in the clinical results from the arthroscopic technique, particularly with regard to recurrence, with rates of 4–18%,[2,9–11] i.e. equivalent to those from the open technique. These improvements come from better anatomical knowledge of the pathological condition, greater experience among surgeons and evolution of the arthroscopic material, especially through the emergence of suture anchors, which were introduced by Wolf.[12] The challenge of diminishing the recurrence rate has meant that improvement of the technique has become an objective. A recent biomechanical study by Kamath et al.[13] showed that using two anchors with double loading provided resistance greater than or equal to the use of three anchors with single threads.

For the surgical treatment to be successful, not only does an anatomical repair of the Bankart lesion have to be achieved, but also it is fundamental to identify the risk factors that have been proved to be associated with failure of arthroscopic treatment, such as failure to recognize a glenohumeral bone defect or a redundant anterior capsule.[3,14] The open technique is indicated in cases of extensive bone lesions.

The aim of this study was to evaluate whether using anchors with double loading for treating traumatic anterior instability of the shoulder improves the clinical results, particularly with regard to recurrence, and to compare this technique with the results from using anchors loaded with a single thread.

Materials and methods

This was a retrospective analysis on patients who were treated at our institution between 2000 and 2010, for arthroscopic repair of a Bankart lesion. The inclusion criteria were: (1) recurrent traumatic anterior instability of the shoulder; (2) glenoid bone defects and/or Hill–Sachs lesion <25%; (3) signing of the consent statement specified by the ethics committees of the hospitals involved. Patients with large humeral and glenoid bone defects, posterior instability, associated rotator cuff injuries or previous surgery on the shoulder were excluded. Patients with associated SLAP lesions were not excluded.

Between December 2007 and August 2010, 59 consecutive patients (61 shoulders) underwent arthroscopic treatment of Bankart lesions using metal anchors with double loading of high-resistance thread (double group). This group was compared with a second group formed by 202 patients (206 shoulders) who underwent the same procedure between January 2000 and November 2005, but with anchors using single loading (single group). The characteristics of the two groups are compared in Table 1. The minimum follow-up was 24 months.

All of the operations were performed by two surgeons (G.G.G. and J.M.F.) with comparable surgical skills and experience. All of the patients received general anesthesia and regional block of the brachial plexus, and were positioned in lateral decubitus. Lateral and distal traction was applied and

Table 1 – Comparative epidemiological profile of the groups that underwent Bankart surgery.

Characteristics	Single group ($n = 206$)	Double group ($n = 52$)
Mean age at first episode	23.1 ± 8.2	22.3 ± 7.8
Mean age at time of surgery	33.4 ± 10.6	27.6 ± 7.9
Sex (male/female)	181/46	25/04
Dominant side	121 (58.7%)	26 (50%)
SLAP lesion	69 (33.5%)	11 (23.9%)
Mean number of anchors	3.7	3.11

the affected shoulder was maintained at abduction of 30°, flexion of 15° and dorsal inclination of the trunk of 30°. We used classical arthroscopic portals, with the arthroscope positioned in the anterosuperior portal, instruments applied through the anteroinferior portal and irrigation through the posterior portal. The glenohumeral joint was inspected and the pathological condition was verified (Fig. 1). Debridement of the area of the Bankart lesion was then performed, with decortication of the anterior border of the glenoid and the adjacent scapular neck, using a motorized shaver. We marked out the points for fixation of the 4 mm metal anchors (Revo, ConMed/Linvatec). The anchors in the double group were loaded with two braided nonabsorbable suture threads (Ethibond no. 2). The anchors needed to be positioned at an inclination of 45° in relation to the surface of the glenoid and forward of the glenoid border medially, by up to 3 mm. The first anchor in the right shoulder was introduced in the five o'clock position and the remainder with minimum spacing of 1 cm, superiorly. After insertion of each anchor, a curved soft-tissue penetrator (suture hook) was passed through with a no. 1 monofilament thread, firstly through the labrum and the anterior branch of the inferior glenohumeral ligament, at a point located approximately 1 cm caudally in relation to its respective anchor. The first nonabsorbable thread was tied to the monofilament thread and transported through the tissue. The tissue was tensioned upon meeting the anchor and five intercalated knots ("Revo" type) were tied for fixation (Fig. 2).

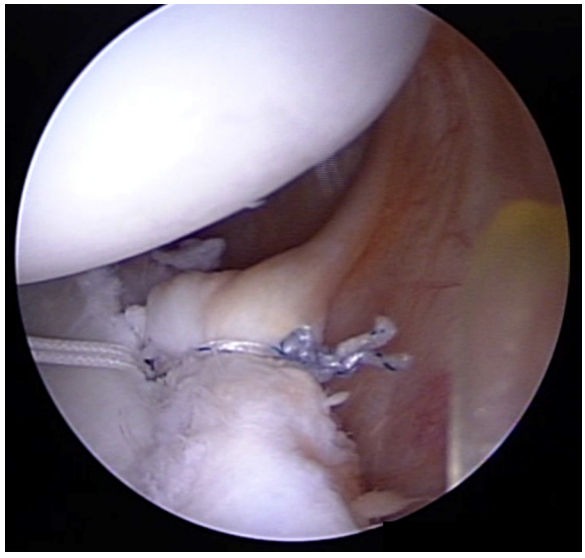

Fig. 2 – Retensioning of the inferior glenohumeral ligament after performing the first suture.

In the case of the patients in the double group, the second thread of the anchor was passed through in the same manner, with transfixation of the remainder of the tissue that was still slack (Figs. 3 and 4). This reinforcement improved the effect of capsule-ligament retensioning. The other anchors were then positioned, until completing the repair on the Bankart lesion. Three anchors were generally used, with six anteroinferior labral repair stitches (Fig. 5). When present, SLAP lesions were repaired in accordance with the type presented.

The patients were immobilized with full-time use of a Velpeau sling (neutral abduction and internal rotation of 70°)

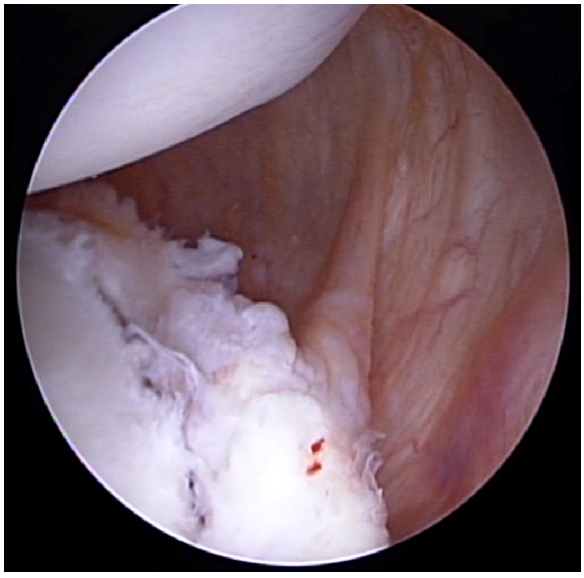

Fig. 1 – View through the anterosuperior portal showing Bankart lesion and anterior branch of the inferior glenohumeral ligament.

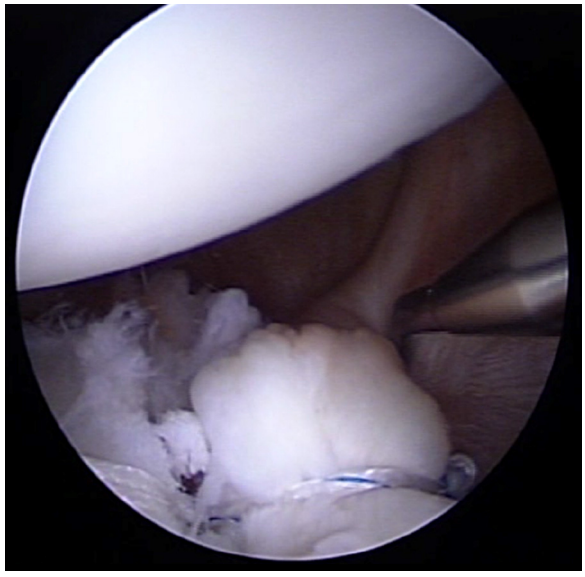

Fig. 3 – Passage of the hooked tweezers through the anterior branch of the inferior glenohumeral ligament after performing the first suture.

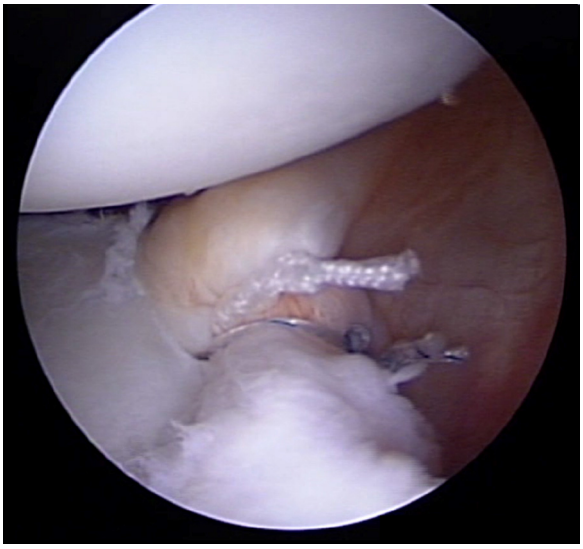

Fig. 4 – Appearance of the anterior branch of the inferior glenohumeral ligament after performing the second suture on the lowest anchor.

and were encouraged to perform flexion-extension of the elbow twice a day. Three weeks later, the sling was withdrawn and the patient started a physiotherapy program aimed at achieving passive gains in range of motion, in all directions. Muscle strengthening was started 12 weeks after the operation, and complete participation in sports activities was allowed 6 months after the operation.

The clinical assessment and data-gathering were done by a physician undergoing a specialization program (R4) in shoulder surgery, and these procedures consisted of a physical examination and application of a questionnaire. The patients were asked about their first episode of instability, the type of sports practiced and their return to the sport after the

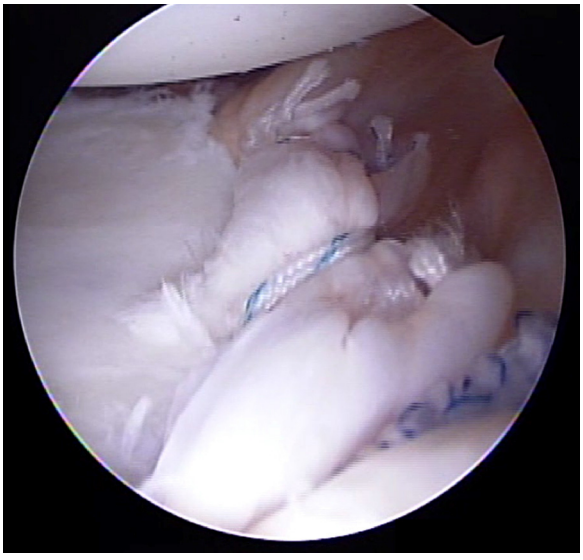

Fig. 5 – Completed repair on the anterior capsulolabral complex after performing six sutures (three anchors with double stitches).

Table 2 – Difference in recurrence after arthroscopic Bankart procedure.

Group	Total number of recurrences	Total number of patients	Recurrence rate (%)
Double	4	52	7.69%[a]
Single	12	206	5.83%[a]

[a] $p = 0.62$.

procedure. Their range of motion was measured using a goniometer and this was compared with the contralateral side. The functional scales used were UCLA and Carter-Rowe. Recurrence or surgical failure was defined as a situation in which the patient presented some evidence or symptom of instability (insecurity, subluxation or dislocation).

For the descriptive statistical analyses and the tests presented in this study, we used the IBM SPSS statistical package, version 19.0.0. In order to test whether the frequencies of the two categorical variables presented any degree of independence, we used the chi-square test. The magnitude of the association between pairs of categorical variables was measured by means of Spearman's correlation test. In order to test and measure the degree of correlation of the responses between two variables of continuous nature, Pearson's correlation test was used. Because of the need to compare the data obtained in the two studies, we used Student's *t* test to ascertain the significance of the difference between the means of the different samples. However, the *t* test would show a difference if the variance of the data in the two samples was the same or different. Therefore, in such cases, the first step was to test the null hypothesis of equality between the variances. For this, we used Fisher's *F* test.[15]

Results

There was no statistical difference in the incidence of recurrence between the group with single loading of anchors (5.83%) and the group with double loading of anchors (7.69%), at the end of the follow-up period (Table 2).

At the end of the study period (after a minimum follow-up of 2 years), the two groups presented similar results in the good-excellent range, according to the Carter-Rowe criteria, although a difference arose when the mean value of the classification was evaluated (Table 3). According to the UCLA functional scale, there was no difference between the groups: mean value for the single group of 33.64 and for the double group, 34.25 ($p = 0.178$). Presence of a SLAP lesion did not interfere with postoperative function.

The patients in the double group presented a mean loss of lateral rotation of 13.93° ($p < 0.001$) with the arm adducted, in

Table 3 – Comparison of functional results according to Carter-Rowe.

Result	Single group	Double group	Significance
Poor/fair	8.3%	10.7%	$p = 0.917$
Good/excellent	91.7%	89.3%	$p = 0.917$
Mean	94.4	88.6	$p = 0.034$

Table 4 – Return to sports activities after repair of Bankart lesion.

	Single group	Double group	*p*
Same level	121 (79.1%)	31 (72.1%)	0.215
Lower level	10 (6.5%)	5 (11.6%)	0.278
Did not return	22 (14.4%)	7 (16.3%)	0.516

relation to the contralateral shoulder. With the arm adducted at 90°, the loss was 16.29° ($p < 0.001$). There was no difference in relation to anterior elevation or medial rotation.

There was a tendency toward greater return to sport at the same level as before the surgery in the single group, but without statistical significance (Table 4). For this analysis, 53 patients in the single group and seven in the double group who were sedentary were excluded.

Discussion

Both groups in the present study had failure rates lower than 10%, which is comparable to the success rates in other studies that used anchors with 2 years of follow-up.[2,9,16–18] Kim et al.[19] were the only authors to publish a series of patients with traumatic anterior instability who were treated by means of arthroscopic repair using anchors with double loading of thread, and they presented a recurrence rate of 8.9%, which was a result very similar to the 7.69% of the present study. However, the success rate was no greater than in the comparison group of patients treated using anchors with single loading.

The results achieved in both groups of the present study were similar to those in literatures,[9,19–24] when evaluated by means of the Carter-Rowe classification, with good and excellent results of the order of 90%. Likewise, Kim et al.[19] obtained excellent functional results, with a mean Carter-Rowe score of 96.8. However, in comparing the groups of our study, we found that increasing the number of suture stitches did not correlate with improvement of function, especially in evaluating the mean Carter-Rowe score, in which there was a worse result in the group with double loading.

We found an important limitation of range of motion in comparing the results with the contralateral side among the patients who underwent repairs using anchors with double loading, particularly with regard to lateral rotation with abduction. Even though loss of lateral rotation has been found to be practically universal in series that used anchors with single loading of thread,[2,18] we obtained a result that was significantly better than that of Kim's sample (loss of 7° of external rotation with abduction).[19] This may be caused by greater tensioning of the anterior capsule. Despite this finding, there was no correlation between loss of lateral rotation and recurrence or worse functional scores.

It has been shown in the literature that the results from arthroscopic repair of Bankart lesions using anchors with one thread deteriorate with the passage of time. Castagna et al.[20] found a recurrence rate of 23% with a mean follow-up of 10.9 years. Van der Linde et al.[21] recorded a recurrence rate of 35% with 8–10 years of follow-up, which was already 20% after 2 years. We believe that with the use of doubly loaded anchors, the recurrence rates may be revealed to be lower as the follow-up period increases. Theoretically, this superiority has already been shown in a recent biomechanical study by Kamath et al.,[13] in which the use of two anchors with double loading presented resistance to failure that was greater than or equal to the use of three anchors with a single thread. Longer follow-up will bring better conclusions regarding this hypothesis.

One of the limitations of our study was the discrepancy between the sample sizes of the two groups, even though they were homogenous in relation to epidemiological characteristics. Another issue is that the study was not prospective and randomized, which may have generated bias. Nonetheless, our study is the first comparative study on arthroscopic repair of traumatic anterior instability using anchors with single and double loading of thread. Further studies are necessary in order to clarify and improve the technique for treating this pathological condition.

Conclusion

So far, treatment of traumatic anterior instability using anchors with double loading of thread does not present any advantage in terms of recurrence or functional improvement, in relation to anchors with single loading.

Conflicts of interest

The authors declare no conflicts of interest.

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