COMPLICATIONS RESULTING FROM THE USE OF METAL ANCHORS IN SHOULDER ARTHROSCOPY

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ABSTRACT

Objective: To identify the complications concerning the use of metal anchors in shoulder arthroscopic procedures. Methods: 28 shoulders of 28 patients (23 male and 5 female) have been re-operated in the period between December 1997 and August 2007, at Hospital Ortopédico, Belo Horizonte Hospital and Military Police Hospital in Belo Horizonte, MG, as a result of complications such as loose anchors and prominent anchors. The primary surgeries intended to treat 20 anterior traumatic instabilities (71.5%), one posterior instability (3.5%), one slap injury (3.5%), six procedures for treating injuries on the rotator cuff (21.5%). We used the X-ray classification suggested by Samilson and Prieto and Outerbridge arthroscopic classification for assessing patients' degree of arthrosis. All patients were evaluated by the UCLA (University of California at Los Angeles) index criteria. Results: In all patients, arthroscopic reviews were made. In two cases, after anchors removal, clinical signs of instability were seen, leading to the decision of providing open stabilization by Latarjet-Patte technique. Conclusion: the complications with metallic-suture anchors result from inappropriate surgical techniques applied in arthroscopy.

Keywords – Shoulder joint; Arthroscopy; Bone anchors

INTRODUCTION

The anterior inferior lip inserts into the rim of the glenoid cavity, increasing its depth and assisting in the stabilization of the humeral head[1]. In 1997, Koss et al.[2] described the repair of the Bankart lesion using metallic sutures. We evaluated 26 patients without complications related to the device. With the evolution of arthroscopic techniques for the treatment of shoulder injuries, suture anchors have been improving. There is consensus in the literature that the strength of suture anchors is related to the type of bone (osteoporosis, cortical porosity)[3]. Zuckerman and Matsen[4] classified the complications according to their causes: 1) incorrect placement of the implant, 2) migration, 3) release (loss), and 4) break. These complications have the potential to cause chondral erosion and osteoarthritis, consequences that are extremely harmful to the glenohumeral joint. The objective of this study is to identify the most common complications arising from the use of metal anchors in shoulder arthroscopy. The late consequences of osteoarthritis are not the object of the study.

METHODS

Twenty-eight patients (28 shoulders) affected by the complications arising from the use of metal anchors underwent arthroscopic review. All cases were reoperated at the Hospital Ortopédico, Hospital Belo Horizonte or at the Hospital da Polícia Militar in Belo Horizonte, MG, by the three surgeons of the group.

The age ranged from 19 to 69 years, with a mean of 35.2 years. Twenty-three patients were male and five female.

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The right side was affected 18 (64.3%) times and the left, 10 (35.7%) times. The dominant side was re-operated 17 (60.7%) times. After primary surgery, the most frequently reported symptoms were pain, limited range of motion (ROM), and especially in intra-articular procedures, crepitus while performing the Jobe maneuver (abduction above 90° against resistance, in the frontal plane, with the upper limbs internally rotated: the supraspinatus test)[5]. These symptoms were detected at a mean period of 19.2 months, ranging from two to 52 months. In 22 patients (78.5%), the symptoms were identified in 5.3 months, on average. Twenty-seven months was the time necessary for the detection of clinical symptoms in six patients (21.5%). By assessing the time interval between the first surgery and revision, we found an average period of 20.5 months, ranging from four to 52 months. In 22 patients (78.5%) patients the average period was 7.09 months and in six patients, 28 months.

The mean follow-up period was 37 months, ranging from seven to 108 months.

Our study had 20 anterior instabilities, one posterior instability, a superior labrum anterior to posterior (SLAP) lesion, and six revisions of rotator cuff repairs, of which 75% cases were intra-articular and 25% were extra-articular.

All patients were evaluated according to the UCLA index criteria (University of California at Los Angeles)[6]. We used the Outerbridge classification[7] (Table 1) in the arthroscopic evaluation to determine the degree of chondral injury and the Samilson and Prieto radiographic classification[8] for glenohumeral osteoarthritis.

Table 1 – Outerbridge Classification.

Grade I	Softening of the cartilage.
Grade II	Fragmentation and fissure in an area with a diameter of 1.5 cm or less.
Grade III	Fragmentation and fissure in an area with a diameter greater than 1.5 cm.
Grade IV	Erosion of the subchondral cartilage.

Revisions were performed in the lateral decubitus position, with posterior, anterosuperior and anteroinferior portals, for intra-articular procedures and posterior, anterosuperior and lateral portals, for extra-articular procedures. All procedures consisted of removing or burying inadequate anchors, synovectomy, and bursectomy. Two patients still showed signs of instability after the arthroscopic withdrawal

of anchors. We decided to perform glenohumeral stabilization by the open technique described by Patte and Debeyre(9) in these cases of residual instability.

The procedures, initial diagnosis, and surgeries performed are summarized in Table 2.

All intra-articular cases underwent release of adhesions and synovectomy, and bursectomy was performed in all extra-articular cases.

RESULTS

Eighty-two metal anchors were used in 28 primary surgeries, with an average of 2.9 anchors per patient.

Forty-seven anchors (57.31%) were positioned inadequately (41 intra-articular and six extra-articular). Of the total of inadequate anchors, 43 were removed and four were buried.

We removed 100% of the inadequate extra-articular anchors and 90.2% (37) of the intra-articular anchors. The largest number of the intra-articular anchors with complications were in the lower positions: at 5 o'clock (31.70%) and 3 o'clock (26.82%) (Table 3). Only four (9.75%) anchors were buried (Table 4).

Nine patients had glenohumeral osteoarthritis according to the Samilson and Prieto classification [8] (Table 5).

All patients had some degree of chondral injury. Nineteen patients (67.8%) showed more severe degrees of impairment (III and IV) according to Outerbridge[5] (Table 6).

After arthroscopic revision, patients were evaluated according to the UCLA index scoring criteria (Table 7).

DISCUSSION

Complications with the use of metallic materials in the shoulder are described in some studies in the literature, but the descriptions of complications with the use of metal anchors in shoulder arthroscopies are very scarce.

Zuckerman and Matsen[4] studied 37 patients with complications in the glenohumeral joint related to the use of screws or staples after open surgery. Ten of the 37 patients had erosive changes in the glenoid cavity or the humeral head directly related to the incorrect placement of the fixture. Fourteen patients had permanent loss of glenohumeral function.

Kaar et al.[3] observed eight patients with complications after open surgery in which metal suture

Table 2 – Sequence of patients according to diagnosis, primary surgery and arthroscopic revision, emphasizing the inadequate position of the anchor on the glenoid compared with the numbers of a clock dial (1, 3, 5 o'clock for the right shoulder and 7, 9, 11 o'clock for the left shoulder).

Patient No.	Diagnostic	Initial surgery	Anchor removed	Anchor buried	Other procedures
1	RC injury	Repair with 2 Rotax	1 Rotax anchor		RC repair + BLH tenotomy
2	RC injury	Repair with 2 Rotax	1 Rotax anchor		RC repair
3	RC injury	Repair with 3 Rotax	1 Rotax anchor		RC repair
4	RC injury	Repair with 2 Revo	1 Revo anchor		
5	RC injury	Repair with 2 Revo	1 Revo anchor		
6	RC injury	Repair with 2 Revo	1 Revo anchor		
7	SLAP	Repair 2 mini-Rotax	2 mini- Rotax (11 and 1 o'clock)		BLH tenotomy
8	TAI	Repair 3 mini-Rotax	2 mini- Rotax (5 and 3 o'clock)		Microfracture
9	TAI	Repair 3 mini-Rotax	1 mini-Rotax (5 o'clock)	2 mini-Rotax (3 and 1 o'clock)	
10	TAI	Repair 3 Rotax	3 Rotax (5, 3 and 1 o'clock)		
11	TAI	Repair 3 Rotax	3 Rotax (5, 3 and 1 o'clock)		New repair of Bankart lesion
12	TAI	Repair 3 Revo	1 Revo (7 o'clock)		
13	TAI	Repair 4 mini-Rotax	2 mini-Rotax (11 and 9 o'clock)		Latarjet-Patte
14	TAI	Repair 3 Revo	3 Revo (11, 9 and 7 o'clock)		Osteophyte resection humeral head
15	TAI	Repair 2 mini-Rotax	2 mini-Rotax (5 and 3 o'clock)		Osteophyte resection
16	TAI	Repair 4 mini-Rotax	1 mini-Rotax (3 o'clock)	1 mini-Rotax (5 o'clock)	
17	TAI	Repair 3 mini-Rotax	1 mini-Rotax (7 o'clock)		Radiofrequency + microfractures
18	TAI	Repair 4 mini-Rotax	1 mini-Rotax (5 o'clock)		
19	TAI	Repair 4 mini-Revo	1 mini-Revo (3 o'clock)		
20	TAI	Repair 4 mini-Revo	1 mini-Revo (7 o'clock)		
21	TAI	Repair 3 mini-Revo	2 mini-Revo (5 and 3 o'clock)	1 mini-Revo (1 o'clock)	
22	TAI	Repair 3 mini-Rotax	2 mini-Rotax (3 and 1 o'clock)		
23	TAI	Repair 3 mini-Rotax	1 mini-Rotax (5 o'clock)		Latarjet-Patte
24	TAI	Repair 3 mini-Revo	3 mini-Revo (5, 3 and 1 o'clock)		
25	AI	Repair ????	1 anchor (5 o'clock)		
26	TAI	Repair 3 mini-Revo	1 mini-Revo (5 o'clock)		
27	TAI	Repair 3 mini-Revo	1 mini-Revo (7 o'clock)		
28	TPI	Repair 3 Rotax	2 Rotax (3 and 5 o'clock)		

RC = rotator cuff; TAI = traumatic anterior instability; BLH = biceps long head; TPI = traumatic posterior instability

Table 3 – Number of intra-articular anchor complications according to position.

1 o'clock	3 o'clock	5 o'clock	7 o'clock	9 o'clock	11 o'clock
7 (17.0%)	11 (26.8%)	13 (31.7%)	5 (12.2%)	2 (4.9%)	11 (7.3%)

Table 4 – Anchors removed and buried according to position.

	1 o'clock	3 o'clock	5 o'clock	7 o'clock	9 o'clock	11 o'clock
Removed	5	10	12	5	2	3
Buried	2	1	1			

Table 5

No. of patients	Type I	Type II	Type III	Type IV
9	1	3	3	2

Table 6

No. of patients	Type I	Type II	Type III	Type IV
28	8		9	10

Table 7

UCLA index	Patients	%
34 – 35 (excellent)	6	21.4
28 – 33 (good)	15	53.6
21 – 27 (fair)	5	17.8
0 – 20 (poor)	2	7.1

anchors were used. They reported that three patients (38%) developed severe joint damage directly caused by a loose or exposed metal anchor.

Ejnisman et al.[10] studied eight patients with complications due to the use of anchors in open (three patients) and arthroscopic surgeries (five patients). In this study, 100% of cases had chondral injuries of the humeral head and 80% had chondral injuries of the glenoid cavity.

Our study shows complications with the use of metal anchors in exclusively arthroscopic procedures (100% of cases). Of the 28 patients total, 22 underwent articular procedures and had glenohumeral chondral damage in various grades of the Outerbridge classification[7], with 19 of these cases (86.3%) having grades III and IV. The remaining six cases refer to extra-articular procedures. Malpositioned and exposed anchors were the cause of such damage.

Koss et al.[2] observed a case in which there was increasing pain and crepitus a few weeks after open stabilization of a Bankart lesion. The symptoms were more prominent in abduction and internal rotation of the arm.

In our series we found that the most common symptoms were pain and crepitus, which worsened with the arm in 90 degrees abduction and internal rotation, especially when patients were asked to resist the force of the examiner in the opposite direction, down (Jobe test position to evaluate the strength of the supraspinatus muscle). The limited range of motion (ROM) was a common sign.

Rhee et al.[1] reported performing the second surgery an average of 12 months after primary surgery.

Ejnisman et al.[10] reported that only one (12.5%) of the eight patients was revised in the first six weeks, the remainder were revised after three months.

The data in the literature regarding the time of the revision are contradictory. In this study, the average amount of time observed between the first and second surgeries was 20.5 months. We found that, out of 28 patients, 22 (78.5%) had a mean of 7.1 months, and in six patients (21.5%), this average increased to 28 months or more. These data coincide with the observation that these six patients, with the highest average, were among the seven cases with fair and poor results according to the UCLA index.

We performed a short-term functional evaluation taking into account the criteria of the UCLA index. We noted 75% excellent and good results. It is noteworthy that our study addresses a catastrophic and irreversible complication and that the data obtained in this early evaluation reflect improvements mainly in the pain and patient satisfaction criteria, which raised the final score. We believe that these numbers are likely to be less favorable over time according to the osteoarthritis that tends to evolve.

The patient number 9 presented a UCLA index of 14 (poor) because of axillary neurapraxia as a postoperative complication of the first procedure.

Nine patients in the study had some degree of osteoarthritis (Table 5), according to the radiographic classification of Samilson and Prieto[8]. Because this classification is radiographic, and because for there to be radiographic changes, chronicity of the disease is needed, we observed that the changes found in our patients correspond to those six who had an average period of equal to or greater than 28 months between the first and second surgery and those who already had radiographic signs of osteoarthritis before the first surgery.

An important finding of our study is that of the 41 inadequate intra-articular anchors, 24 (38.5%) were in the 3 and 5 o'clock positions (Table 3). These data suggest that the cause can be probable technical difficulty or material of questionable quality, which could have made access to the most distal portion of the glenoid cavity more difficult.

Rhee et al.[1] warned of taking intraoperative care in the placement of anchors to reduce the likelihood of releases: 1) The first anchor is essential to establish the appropriate capsular tension and should be placed in the 5 o'clock (to the right shoulder) or the 7 o'clock position (to the left shoulder) in relation to the glenoid cavity; 2) The hole for the introduction of the anchor should be located on the joint aspect of the glenoid cavity, 1 to 2 mm from its margin, with average slope of 45 degrees until the mark indicating the introduction has exceeded the cortical bone; gentle posterior-inferior force can be used on the humeral head with the introducer, as if moving a lever, which facilitates the placement of the anchor with the best inclination; 3) The anchor must be screwed without forceful manipulation through the hole created with the introducer, one should be careful that the anchor is not positioned under the articular cartilage but under the subchondral bone; 4) Surgeons should remember that forceful manipulation during insertion of the anchor may inadvertently cause the tip to become blunt and that this may make it impossible to unscrew. If the anchor is malpositioned or displaced during the arthroscopic surgery, it should be removed.

Our findings after evaluating these 28 patients lead us to agree with the above statements. However, with regard to the removal of improperly placed anchors,

when we noticed that repeated attempts could cause even more damage to the glenoid cartilage adjacent to the anchor, we chose to bury it.

The use of absorbable anchors has been proposed as an alternative for minimizing complications; however, it is known that the initial resistance seen with bioabsorbable anchors has been inferior and the period of absorption is not less than one year.

Verified in radiographic studies, taking as references the changes in the diameter of holes for inserting absorbable anchors in 10 patients with a maximum follow-up of 38 months, the signs of absorbable anchors being replaced by bone were only observed beginning at one year postoperatively[11]. However, after six months, the resistance seen between absorbable and non-absorbable anchors is similar[12].

Researchers agree that the strength of suture anchors is mainly related to the quality of bone into which the anchor is inserted and secondarily depends on the strength of the suture wire, the knots, and the quality of the repaired tissues.

Currently, there is greater economic pressure on the use of bioabsorbable anchors due to their high costs. It should be noted that errors with radiolucent (bioabsorbable) anchors is less clear, which may delay the diagnosis of poor positioning of the anchor, the treatment, and significantly worsen the prognosis.

CONCLUSION

Inadequate placement of metal suture anchors in shoulder arthroscopy is the essential factor in the complications arising therefrom.

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