ARTHROSCOPIC TREATMENT OF CALCIFYING TENDINITIS OF THE ROTATOR CUFF

Arnaldo Amado Ferreira Neto[1], Cassio Silva Trevizani[3], Eduardo Benegas[2], Eduardo Angeli Malavolta[2], Mauro Emílio Conforto Gracitelli[2], Alexandre Carneiro Bitar[2], Francisco José dos Santos Neto[3]

ABSTRACT

Objective: To evaluate the clinical and radiographic results from arthroscopic surgical treatment of the rotator cuff in patients with calcifying tendinitis. Method: A retrospective study was conducted on twenty patients who underwent arthroscopic treatment for calcifying tendinitis of the shoulder between March 1999 and November 2005. Six patients were excluded due to loss of follow-up. The average follow-up period was 41.4 months. Eight patients (57%) were female and six (43%) were male. The right side was affected in 10 cases (71%) and the left in four cases (29%). Nine cases (64%) had calcification in the supraspinatus tendon, two (14%) in the infraspinatus tendon, and three (21%) in both tendons. Results: In all cases, resection of the calcium deposits was performed by means of a needle (Jelco® No. 14) in combination with curettage (mini-curette). Two shoulders (14%) underwent subacromial decompression, and one (7%) underwent excision of the distal clavicle. A tendon-tendon suture was performed in three shoulders (21%). None of the patients underwent tendon-bone reinsertion. The mean score obtained on the UCLA scale was 33 points (26-35), thus indicating that a majority of patients had good results. In the final radiographic evaluation, none of the patients showed signs of calcification. Conclusion: Arthroscopic treatment of calcifying tendinitis of the shoulder safely allows excision of the calcification, leading to good results in relation to shoulder pain and function.

Keywords – Arthroscopy; Rotator Cuff; Tendinopathy; Shoulder; Debridement; Calcinosis

INTRODUCTION

Calcifying tendinitis of the rotator cuff is a pathological condition that may cause shoulder pain of uncertain etiology. It is characterized by calcium deposition (hydroxyapatite) in an undamaged tendon. It should be differentiated from exostosis at the tubercles, consequent to degenerative processes in the rotator cuff[1]. It is considered to be a self-limiting disease that, in some situations, presents spontaneous cure through natural drainage of the calcification into the subacromial space, with tendon regeneration. However, there is a clinical form in which the painful condition is prolonged, with periods of improvement and worsening, without reabsorption of the calcification, because of blockage of the natural cycle[2].

Its etiology is still controversial. The most commonly cited causal factors are delimited tissue hypoxia and local mechanical pressure. Some authors have mentioned that genetic predisposition may lead to the primary deposition of hydroxyapatite crystals[3].

The pathogenesis is divided into three stages: precalcification, calcification and post-calcification. In the

1 – Head of the Shoulder and Elbow Group of the Institute of Orthopedics and Traumatology, HC/FMUSP, SP.
2 – Attending Physician in the Shoulder and Elbow Group of the Institute of Orthopedics and Traumatology, HC/FMUSP, SP.
3 – Trainee Physician in the Shoulder and Elbow Group of the Institute of Orthopedics and Traumatology, HC/FMUSP, SP.

Work performed at the Institute of Orthopedics and Traumatology, HC/FMUSP, SP.
Correspondence: Rua Dr. Ovídio Pires de Campos 333, 3º. Andar, Ala A, Cerqueira Cesar, 05403-010 São Paulo, SP. E-mail: aafneto1@gmail.com

Declaramos inexistência de conflito de interesses neste artigo

Rev Bras Ortop. 2010;45(5):432-6

first stage, the phenomena of hypoxia and tissue metaplasia occur. From a clinical point of view, this phase is painless. The calcification phase is subdivided into formation, resting and reabsorption phases[4]. During the formation phase, calcium crystals are deposited in the tendon, with fibrocartilaginous transformation. During the resting phase, a fibrocartilaginous edge is formed around the focus of the calcification, which indicates the end of the deposition stage. During the reabsorption phase, after a period of inactivity of variable length, spontaneous reabsorption of the focus of the calcification starts, with the appearance of small vascular canals on the periphery of the deposit. Macrophages and giant multinucleated cells are responsible for phagocytosis of the calcium[4]. The formation and resting phases are related to lower intensity of pain. In the reabsorption phase, there is intense pain with functional limitation[5]. The post-calcification stage presents few or no symptoms, and the affected shoulder presents normal functioning. Radiographs do not show any signs of deposits.

To plan the treatment, knowledge of these different stages is essential[1]. Non-surgical treatment is preferable, and this produces good results in most patients[1,2,6-11]. Each stage of the condition may require different therapeutic measures, such as the use of oral analgesia, infiltration of anesthetics and corticosteroids, physiotherapy, barbotage (drilling of the calcification) and shockwave therapy[12].

Surgical treatment is indicated if conservative treatment fails, which most commonly may occur in the formation and resting phases. In the reabsorption phase, surgical treatment is rarely indicated, since the natural mechanisms enable removal of the deposit. According to Gschwend *et al*[13], the main indications for surgical treatment are progression of the symptoms, constant pain that interferes with activities of daily living and absence of improvement after non-operative treatment. Surgery can be undertaken either arthroscopically or as an open procedure[3]. A variety of advantages of arthroscopy over open surgery are cited in the literature, such as: less aggression to the deltoid and, consequently, lower duration of rehabilitation; the possibility of treating associated intra-articular lesions; and better esthetic appearance[2,7-9,11].

SAMPLE AND METHOD

A retrospective study was conducted on 20 patients who had undergone arthroscopic treatment for calcifying tendinitis of the shoulder between March 1999 and October 2006. Six patients were excluded because of loss of follow-up. Thus, in March 2006, 14 patients of mean age 55 years (range: 37 to 72 years) were reevaluated. Eight of them (57%) were male and six (43%) were female. The right side was affected in nine patients (64%) and the left side in five (36%). All of them presented calcifications in the tendon of the supraspinatus (Table 1). Radiographs were produced in anteroposterior view with neutral, external and internal rotations of the shoulder, in true lateral view of the shoulder, and in axillary lateral view of the shoulder and supraspinal tunnel (Figure 1). The size of the calcifications was measured in millimeters along their major axis using a standard ruler graduated in millimeters. All the calcifications (100%) were greater than or equal to 5 mm in length and were classified as large (greater than 1.5 mm), according to the Bosworth classification[14] (Figure 2).

All the patients underwent the operation in a deckchair position, and standard ports for shoulder arthroscopy were used (posterior, anterior and lateral). We started the arthroscopy procedure with inspection of the joint and made an attempt to locate the calcification by means of tendon puncture using a Jelco® no. 14 until calcification was observed in the joint space, in the form of calcareous particles. After confirming the location, we kept the Jelco® in this position, removed the optical device from the joint space and started to position it in the subacromial space. Using the Jelco® itself, or a mini-curette, were carried out drainage of the calcium deposits without tendon transfixation. Using a shaver blade for soft tissue, we performed aspiration of the calcareous material that was released into the subacromial space and also performed local bursectomy with local superficial debridement of the tendon. Two patients (14%) who presented signs of impact seen through arthroscopy underwent subacromial decompression. In one patient (7%), distal excision of the clavicle was performed because clinical and radiographic signs of acromioclavicular arthrosis were presented. In three patients, there was a need for tendon-tendon suturing because of a longitudinal lesion consequent to excessive curettage of the calcium deposit. None of the patients required tendon-bone reinsertion. The patients were immobilized using a Velpeau sling with an abdominal belt for the first five postoperative days. This was then removed and physiotherapy was started. The standardized return visits to the clinic were after one week, two weeks and

Tabela 1 – Dados de casuística e dos resultados obtidos para cada caso.

	Name	Age	Sex	Side affected	Size of calcification	UCLA before operation	UCLA after operation	Surgical procedure	Associated procedure	Total length of follow-up (months)	Degree of reduction of calcifications in the shoulder six months after operation, on radiograph T = total; P = partial
1	IMP	45	F	L	18	22	35	Drainage	none	74	T
2	EG	51	F	L	13	20	33	Drainage	Subacromial decompression	88	T
3	VB	37	F	R	18	22	35	Drainage	Subacromial decompression	97	T
4	MGP	45	F	R	10	20	35	Drainage	Tendon-tendon suture	64	T
5	WFD	51	M	R	15	22	35	Drainage	none	65	T
6	IAA	61	M	R	28	22	35	Drainage	Subacromial decompression	58	P
7	ZBS	55	F	R	23	22	33	Drainage	Subacromial decompression and tendon-tendon suture	33	P
8	JJ	58	M	R	30	20	35	Drainage	Subacromial decompression	44	T
9	RAT	46	M	R	23	20	35	Drainage	Subacromial decompression	42	P
10	GMA	72	M	R	35	20	35	Drainage	none	39	P
11	DVNF	61	M	L	10	21	33	Drainage	Subacromial decompression and distal excision of clavicle	23	P
12	IAA	64	M	L	30	22	35	Drainage	none	19	T
13	CZF	63	F	R	20	14	26	Drainage	none	19	T
14	SRC	61	M	L	32	26	35	Drainage	Subacromial decompression	14	P

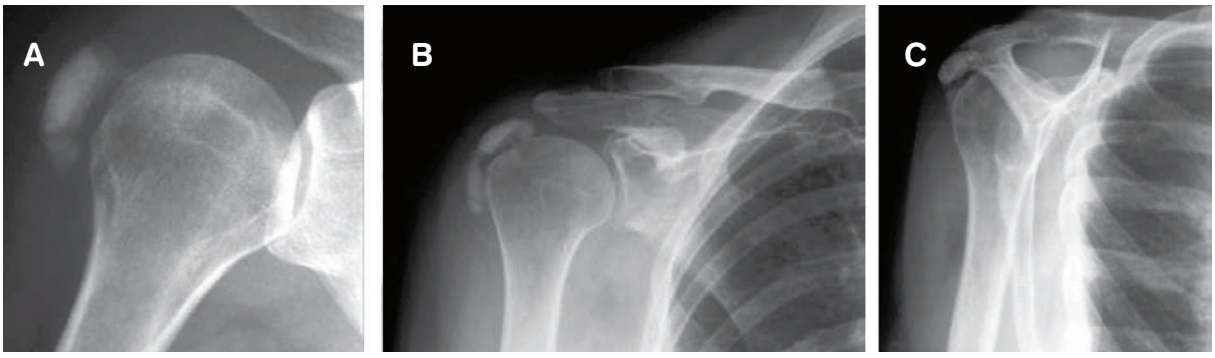

Figure 1 – A) AP radiograph with internal rotation of the shoulder; B) AP radiograph with external rotation of the shoulder; and C) Lateral scapular radiograph of the shoulder.

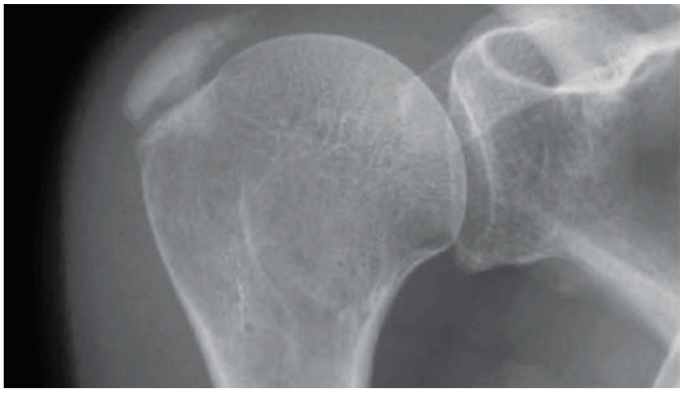

Figure 2 – Calcification of the supraspinal tendon, of length 1.5 cm.

one, two, six and twelve months after the operation, and according to demand. The mean follow-up was 48.5 months (range: 14-76 months).

The statistical evaluation included descriptive analysis on the quantitative parameters, with calculations of the means, standard deviations, standard error of the mean, medians and minimum and maximum values. For qualitative parameters, the frequency distributions and proportions were determined, with calculation of the absolute and percentage frequencies. The Shapiro-Wilk and Shapiro-Francia tests were used, and asymmetry

and kurtosis were assessed with regard to sample normality. For comparisons between quantitative data, the Wilcoxon test was used. For correlations between two quantitative parameters, the Pearson index was used if both of the parameters could be approximated to normal distribution. For comparisons between qualitative variables, the chi-square test was used. In all cases, the significance level of 5% ($\alpha = 0.05$) was used.

RESULTS

In the evaluation six months after the operation, six shoulders (42.8 %) presented residues of calcification (Figure 3), but this had disappeared by the time of the final evaluation. There were no cases of recurrence (Table 1).

According to the UCLA scale, 10 patients presented an excellent functional result, three presented a good functional result and only one patient presented a fair result. The preoperative mean was 20.9 points (range: 14-26) and the postoperative mean was 33.9 points (range: 26-35), thus indicating that most of the results were good. The difference between the preoperative and postoperative values on the UCLA scale was significant (Wilcoxon test; $p = 0.0009$).

Among the other correlations between the quantitative variables, a significant result was obtained through correlating age and the size of the calcification (Pearson index: $p = 0.0245$) (Table 2).

Six patients (42.86%) were female and eight (57.14%) were male. Nine cases (64.29 %) were affected on the right side and five (35.71%), on the left side. Eight cases (57.14%) presented complete reduction of the calcification over the postoperative period, and six cases (42.86 %) presented partial reduction (Table 1). There was no significant association between these parameters (chi-square test: $p = 0.872$ for the association between side and sex; $p = 0.086$ for the association between sex and reduction of calcification; and $p = 0.872$ for the association between side and reduction of calcification).

DISCUSSION

The epidemiological data on our sample were similar to those of many studies in the literature. We observed that female patients predominated; the mean age was 55 years; and the dominant side was more affected[6,12] (Table 1).

There is a consensus in the literature that the treatment for calcifying tendinitis should be conservative[1,2,6,7,12].

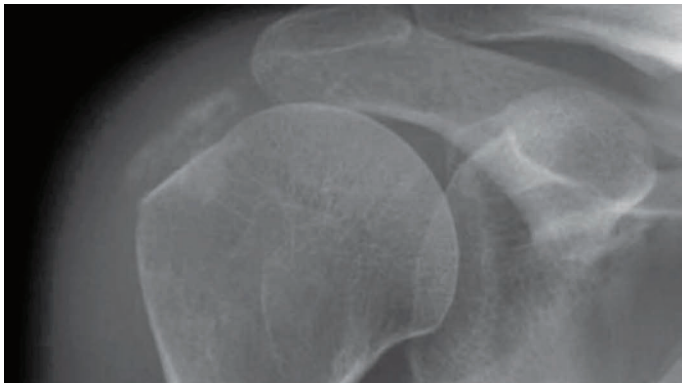

Figure 3 – Radiograph produced six months after the operation.

Table 2 – Descriptive statistics on the quantitative parameters.

	Age	Size of calcification	UCLA before operation	UCLA after operation
Mean	55	21.79	20.93	33.93
Standard deviation	9.60	8.27	2.56	2.43
Standard error	2.55	2.21	0.68	0.65
Median	56.5	21.5	21.5	35
Minimum	37	10	14	26
Maximum	72	35	26	35

However, the pain may persist or be only partially alleviated with this type of treatment, and this may affect the patient's quality of life. This is an indication for surgical treatment, which may be either an open or an arthroscopic procedure[2,6,8,10,11].

Reports in the literature have shown good results from surgical treatment of calcifying tendinitis, both as an open and as an arthroscopic procedure. Although there are no studies comparing these two treatment methods, the current preference from a functional and radiographic point of view is for arthroscopic treatment because of the lower surgical aggression, the faster postoperative recovery because of the lower aggression to the deltoid muscle and the better esthetic appearance[2].

In most of our cases, we obtained good results in terms of scores on the UCLA scale (preoperative mean of 20.9 and postoperative mean of 33.9), and the result was statistically significant ($p = 0.0009$).

In a recent study, Seil *et al*[8] presented excellent functional results according to the Constant scale, for more than 90% of their patients operated using the arthroscopic technique. Several other authors have also demonstrated good results with this treatment[2,6-12,15,16] (Table 1).

From the correlation between the quantitative variables of age and size of calcification, we observed a

ratio that showed that the size of the calcification increased with age. We believe that the explanation for this observation is that the natural history of the process of formation of the chronic deposit is one of non-resolution, thus maintaining a deposit that can be increased. Hence, older patients tend to have larger deposits. We did not find any similar correlation in other series in the literature.

The approach taken to the calcium deposits is to drill into them using a Jelco® nº 14 needle and to perform curettage using a mini-curette on the foci with greater quantities of calcium. Debridement inside the tendon using a shaver in an attempt to remove all the calcification should be avoided because of the risk of causing tears that might even be irreparable[8]. The shaver for soft tissues is used for local bursectomy, aspiration of the calcification and gentle debridement of the tendon edges. We emphasize that complete removal of the calcification is unnecessary. We had three cases that required tendon-tendon suturing because of longitudinal tearing of the tendon, but this did not interfere in the final result.

The mean amount of calcification removed is between 40% and 88%, according to some studies[7-11,15,16]. We agree that god clinical results are attained even with partial removal of the deposit[12]. On the radiographs produced six months after the intervention, we observed residues from the calcification that did not interfere with the medium to long-term result. We agree with Gosens and Hofstee[2] that the pain in cases of calcifying tendinitis is due to the inflammatory process that the calcium causes, together with the subacromial impact and the stretching of the tendon itself . Thus, the inflammatory process can be treated even with partial removal, which is sufficient to diminish the pressure within the tendon, thereby also eliminating the mechanical element of the calcification[2].

We do not routinely perform subacromial decompression. This can be done in cases with signs of impact (slicing of the coracoacromial ligament on its bursal face) under arthroscopic viewing, or when there is a protruding subacromial osteophyte. In the two cases of subacromial decompression that we performed, we observed such signs. There is no evidence that routine subacromial decompression performed in association with removal of the calcification presents better functional results than simply removal of the calcification[16].

We do not agree with Tillander and Norlin[17], who only performed subacromial decompression to treat calcifying tendinitis, without dealing with the calcification. These authors reported that they had good results, and that 54% of the calcifications had disappeared two years later. We believe that excision of the focus of the calcification is necessary, since in addition to combating the inflammatory and mechanical phenomena discussed above, it enables resolution of the disease within a shorter time.

CONCLUSION

Arthroscopic treatment of calcifying tendinitis of the shoulder enables safe excision of the calcification, thus obtaining good results in relation to pain and shoulder function.

REFERENCES

1. Uhthoff HK, Loehr JW. Calcifying tendinitis of the rotator cuff: patho-genesis, diagnosis, and management. J Am Acad Orthop Surg. 1997;5 (4):183-91.
2. Gosens T, Hofstee DJ. Calcifying tendinitis of the shoulder: advances in imaging and management. Curr Rheumatol Rep. 2009;11(2):129-34.
3. Peach CA, Zhang Y, Dunford JE, Brown MA, Carr AJ. Cuff tear arthropathy: evidence of functional variation in pyrophosphate metabolism genes. Clin Orthop Relat Res. 2007;462:67-72.
4. Archer RS, Bayley JI, Archer CW, Ali SY. Cell and matrix changes associated with pathological calcification of the human rotator cuff tendons. J Anat. 1993;182(Pt 1):1-11.
5. DePalma AF, Kruper JS. Long-term study of shoulder joints afflicted with and treated for calcific tendinitis. Clin Orthop Relat Res. 1961;20:61-72.
6. Checchia Sl, Miyazaki NA, Fregoneze M, Doneux Santos P, Silva LA, Mazza LFF, et al. Tratamento artroscópico da tendinite calcária do ombro. Rev Bras Ortop. 2007;42(6):161-8.
7. Ark JW, Flock TJ, Flatow EL, Bigliani LU. Arthroscopic treatment of calcific tendinitis of the shoulder. Arthroscopy. 1992;8(2):183-8.
8. Seil R, Litzenburger H, Kohn D, Rupp S. Arthroscopic treatment of chronically painful calcifying tendinitis of the supraspinatus tendon. Arthroscopy. 2006;22(5):521-7.
9. Molé D, Kempf JF, Gleyze P, Rio B, Bonnomet F, Walch G. [Results of endoscopic treatment of non-broken tendinopathies of the rotator cuff. 2. Calcifications of the rotator cuff]. Rev Chir Orthop Reparatrice Appar Mot. 1993;79(7):532-41.
10. Jerosch J, Strauss JM, Schmiel S. Arthroskopische therapie der tendinitis calcarea. Wie wichtig ist die Kalkentfernung? Arthroskopie. 1996;9:241-5.
11. Jerosch J, Strauss JM, Schmiel S. Arthroscopic treatment of calcific tendinitis of the shoulder. J Shoulder Elbow Surg. 1998;7(1):30-7.
12. Lorbach O, Kusma M, Pape D, Kohn D, Dienst M. Influence of deposit stage and failed ESWT on the surgical results of arthroscopic treatment of calcifying tendonitis of the shoulder. Knee Surg Sports Traumatol Arthrosc. 2008;16(5):516-21.
13. Gschwend N, Scherer M, Löhr J. [Tendinitis calcarea of shoulder joint (T.c.) (author's transl)]. Orthopade. 1981;10(3):196-205.
14. Bosworth BM. Calcium deposits in the shoulder and subacromial bursitis: a survey of 12122 sholders. JAMA. 1941;116:2477-82.
15. Resch H, Povacz P, Seykora P. Excision of calcium deposits and acromioplasty? In: Gazielly DF, Gleyze P, Thomas T, editors. The cuff. Paris: Elsevier; 1997. p. 169-71.
16. Gleyze P, Montes P, Thomas T, Gazielly DF. Compared results of the different treatments in calcifying tendinitis of the rotator cuff. A multicenter study of 149 shoulders. In: Gazielly DF, Gleyze P, Thomas T, editors. The cuff. Paris: Elsevier; 1997. p.181-4.
17. Tillander BM, Norlin RO. Change of calcifications after arthroscopic subacromial decompression. J Shoulder Elbow Surg. 1998;7(3):213-7.