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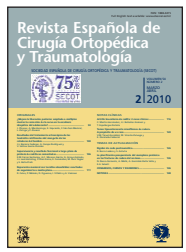

ORIGINAL ARTICLE

Rotator cuff calcifying tendonitis: Results of arthroscopic treatment

J.L. Barrera Cadenas*, A. Campa Rodríguez and V. Vallina García-Prendes

Service of Orthopaedic and Trauma Surgery, Hospital Valle Nalón, Langreo, Asturias, Spain

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KEYWORDS
Rotator cuff;
Calcifying tendonitis;
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Abstract
Purpose: To analyze the results of arthroscopic treatment of calcifying tendonitis of the shoulder.
Materials and methods: This study analyzes 18 cases of calcifying tendonitis treated between 1999 and 2006 with a mean follow-up of 6 months; mean patient age was 46 years. The Constant scale was used to assess shoulder function; the patients' satisfaction with the final result of surgery was also evaluated. Pre- and post-operative radiographs were compared.
Results: In 88.8%of patients an acromioplasty was added to the main procedure, and in 3 cases the tendinous lesion caused when resecting the calcified area was sutured. Mean pre- and postoperative Constant scores were 63.66 and 97.6 respectively. The calcification was absent from postoperative X-rays in 16 patients; a certain amount of calcification persisted in 2 cases. Statistically significant differences were observed in the Constant score before and after the procedure ($p < 0.001$). No significant relation was found between performing or failing to perform an acromioplasty, type and size of calcifications, persistence of calcium deposits and using or failing to use sutures and the final result. 100%of patients were satisfied with the result of surgery.
Conclusions: Arthroscopic resection in calcifying tendonitis has a very high success rate, with high levels of patient satisfaction. No significant relationship was found between cases with residual post-operative calcium deposits and a poorer final result, although it would seem logical to try and remove calcification as thoroughly as possible without causing excessive damage to the tendon.

*Corresponding author.
E-mail: juanlubc@yahoo.es (J.L. Barrera Cadenas).

PALABRAS CLAVE
Manguito rotador;
Tendinitis calcificante;
Artroscopia del hombro

Resultados del tratamiento artroscópico de las tendinitis calcificantes del manguito de los rotadores del hombro

Resumen
Objetivo: Analizar los resultados del tratamiento artroscópico de las tendinitis calcificantes del hombro.
Material y métodos: Se analizaron de forma retrospectiva 18 tendinitis calcificantes tratadas entre 1999 y 2006 con un tiempo de seguimiento mínimo de 6 meses y una edad media de 46 años. Se evaluó la función del hombro mediante la escala de Constant y la satisfacción del paciente con el resultado final de la cirugía. Se realizó un examen comparativo radiológico preoperatorio y postoperatorio.
Resultados: En el 88,8%de los casos se asoció la realización de la acromioplastia y en 3 ocasiones una sutura de la lesión tendinosa producida tras la resección de la calcificación. El resultado del test de Constant medio preoperatorio fue de 63,66 y el postoperatorio de 97,6. En la radiología postoperatoria la calcificación estaba ausente en 16 pacientes y se evidenciaban restos de la calcificación en 2 casos. Se observaron diferencias estadísticamente significativas entre la puntuación de Constant antes y después de la intervención ($p < 0,001$). No se encontró asociación significativa entre la realización o no de acromioplastia, el tipo y tamaño de la calcificación, los restos de depósito cálcico y la realización o no de sutura y el resultado final. El 100%de los pacientes se halló contento con el resultado de la cirugía.
Conclusiones: La resección artroscópica en las tendinitis calcificantes tiene una tasa de éxito muy elevada, con una satisfacción muy importante por parte del paciente. No se ha encontrado una relación significativa entre aquellos casos con depósito cálcico residual y un peor resultado final, si bien parece lógico intentar eliminar la mayor cantidad posible de calcificación, sin dañar en exceso el tendón.

Calcifying shoulder tendonitis consists in intra-tendon deposit of calcium in a previously healthy tendon of the rotator cuff. Its incidence varies from 2.7 to 20% in asymptomatic patients of the population, with a mean age between 30 and 50 years of age, and affects women more than men.[1,2] The aetiology of these calcification is still a subject of debate;[2] and the most affected tendon is the supraspinous.

Calcifying tendinits is described in 3 stages that possess clinical, radiological and histological[2] correlation, but that can on occasions be superimposed: precalcification, calcification (with a formative phase and a reabsorption phase) and postcalcification (with re-establishment of tendon architecture). The clinical image is very variable, it is possible to find asymptomatic patients, patients with chronic pain and patients with acute pain crisis, that are usually associated with the deposit reabsorption phase. Several classifications have been proposed, according to size, stage of evolution, or radiological aspect.[3,4]

Treatment of these patients is initially conservative[5] and depends on their evolution: it varies from abstaining from therapy in asymptomatic patients to conservative treatments (non-steroidal anti-inflammatory drugs [NSAIDS], physiotherapy,[6] anti-inflammatory radiotherapy and lavage techniques [blind or guided][7]. Finally, open[11] or arthroscopic[8-10] surgery can be performed. Surgical treatment, by means of open or arthroscopic techniques, must be carried out on patients that present a progression of symptoms or constant pain that interferes with their usual activities and in whom conservative treatments have failed.

The aim of this study is to retrospectively assess the results achieved with arthroscopic treatment of calcified tendonitis of the rotator cuff, as also to identify the factors that influence final results.

Materials and methods

Between January 1999 and January 2006, 18 calcified tendonitis of the shoulder were treated arthroscopically. We excluded from the study those patients who presented associated conditions of instability, rupture of the rotator cuff or disease of the acromio-clavicular joint.

Of the 18 patients, 8 were males and 10 females, with a mean age at the time of surgery of 46 years (range: 33 to 63 years). In 6 cases the right side was operated and in 12 cases the left side. The time of symptom evolution was always greater than 6 months (range: 7 to 60 months). In all cases conservative treatment was applied prior to surgery (for a minimum period of 4 months) using NSAIDS and physiotherapy, and in 14 cases a treatment with steroid infiltration was associated (4 patients rejected the possibility of receiving these infiltrations). None of the cases suffered from associated work-related or psychiatric disease. On physical exam all cases had a positive Neer test and a negative Jobe test.

Additional studies consisted of conventional X-rays in all cases (with anteroposterior and axillary projections) and magnetic resonance imaging in 16 patients. The type, size and location of calcification were studied, as also possible associated subacromial or acromioclavicular disease. To define calcification morphology the classification of the French Society of Arthroscopy[8] (table) was used and, according to size, these were classified in small, (< 10mm), medium (10 to 20mm) and large (> 20mm).

Arthroscopic surgery was carried out in patients in a "deck-chair" position (13 cases) or lying on their sides (5 cases), with longitudinal traction of about 5kg (according to the weight of the patient). The procedure began with glenohumeral joint exploration to detect any possible associated disease in the area, and special attention was paid to the state of the joint rotator cuff. In those cases in which an area of inflammatory aspect was seen or of calcification of the joint surface itself, a monofilament thread was passed through the area, as a reference for its subsequent location in the subacromial space. Bursectomy was performed in all cases, both with the help of a resector as also the use of a thermal vaporizer system; subsequently a search was made for the calcification with the aid of a needle and repeated tendon punctures.

Once the calcification was located, either by the output of calcium in "snowstorm" form or due to the fact that remains of calcium could be seen on the needle tip (fig. 1), it was eliminated using the vaporizer or the resector, subsequent to a longitudinal incision down the tendon, in the same direction as its fibres. In those cases in which the defect observed after removal of the calcium deposit was greater than 1cm or there was complete rupture, the tendon was repaired using a "side by side" converging suture, or by means of anchorage with harpoons. In all cases a comprehensive lavage of the subacromial space was performed to prevent the remnants of calcification remaining in the area.

The arthroscopic procedure was completed with an antero-inferior acromioplasty in all those cases in which there was subacromial conflict and in those others in which calcification was not identified or there were doubts as to whether any remnant remained.

Postoperative treatment consisted in a one-day hospital stay in all cases, immobilization during 7 to 10 days, beginning of passive pendular movement exercises the day of discharge and active movements at 3 weeks with a delay of force exercises up to a minimum of 6 weeks. All patients carried out programmed postoperative rehabilitation.

The objective clinical results were assessed by means of the Constant scale and patient satisfaction with surgery was also assessed by means of a dichotomic answer (yes/no) to the question "Would you undergo surgery again?" From the radiological point of view, we assessed the elimination or non-elimination of calcification at the time of the first X-ray control a month after surgery with 2 standard projections.

Table

French Society of Arthroscopy
A) Dense, homogeneous, with net contours
B) Dense, lobulated, with net contours
C) Non-homogeneous, with irregular or scalloped contours
D) Dystrophic insertion calcifications

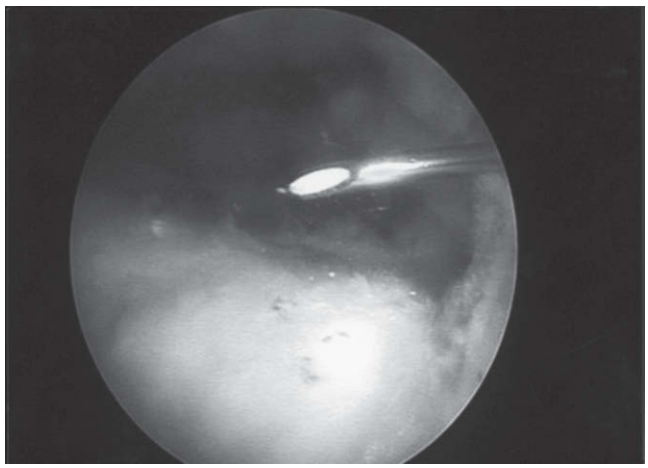


Figure 1 Location of calcification with the aid of a needle.

We assessed the possible existence of statistically significant differences between the score of the Constant test before and after surgery by means of the Wilcoxon test. In the same way, to assess the possible existence of an association between some categorical variables and the difference seen in this association we used a Mann–Whitney U test in the case of dichotomies (performance or not of acromioplasty, radiological remnants or no remnants of calcification, closing suture or no suture) and a Kruskal-Wallis test in the case of those variables of more than 2 categories (type and size of the calcification). A significant association was considered to be present with a $p < 0.05$. Analysis were performed with the SPSS program version 13.0.

Results

Using the classification of the French Society of Arthroscopy we found 10 type A calcifications (55%), 6 type B calcifications (33%) and 2 type C calcifications (11%). As to size, 7 calcifications (33.8%) were less than 10mm; 8 calcifications (44.4%) were between 10 and 20mm, and 3 calcifications (16.6%) were greater than 20mm.

In 16 cases (88.8%) acromioplasty was performed and in 3 cases a suture of the tendon lesion caused by resection of the calcium deposit was performed (2 convergent "side-to-side" sutures and harpoon suture anchor to the greater tubercle). In one case the calcification was not found and an anteroinferior acromioplasty was performed.

The mean result of the preoperative Constant test was 63.66 (range: 44 to 70) and the mean result of the postoperative Constant test was 97.6 (range: 72 to 100). The 2 cases that had a value below 100 for the Constant test were: a patient who suffered a severe hypertension crisis that made it necessary to postpone rehabilitation, due to

which there remained limitation of the last degrees of active movement; and the second patient was a woman who had persistent occasional pain and slight limitation of movement who did not undergo acromioplasty.

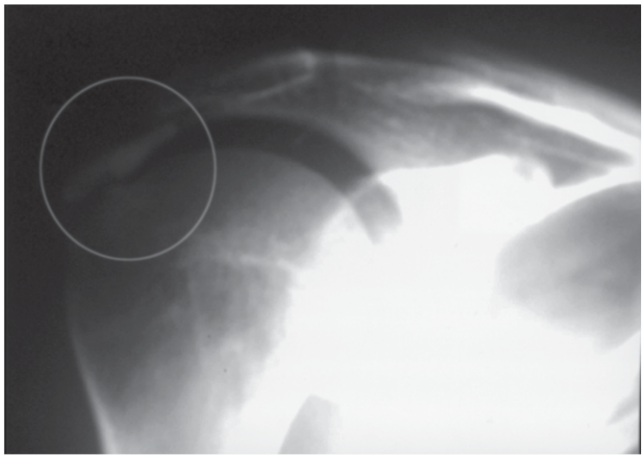
As to the degree of satisfaction, 100% of the patients were happy with the results of surgery and would undergo surgery again.

Postoperative X-rays, carried out one month after surgery, showed no calcification in 16 patients (88.8%) and remains of calcification in 2 patients (11.1%) (fig. 2). In these 2 patients, the final result was excellent (complete movement and absence of pain) and on X-ray control one year after surgery no remains of calcification were seen.

Mean time from surgery to discharge (good results or process stabilization) was 4.3 months (with a variation of 1 to 10 months).

There were statistically significant differences between Constant scores before and after surgery ($p < 0.001$). We assessed the existence of associations between the different variables studied (performance or not of acromioplasty, type and size of calcification, remains or not of calcium deposit, carrying out or not of suture) and the final result, expressed as the Constant difference (post-treatment minus pre-treatment); no statistical significance was found for any of these variables.

A



B

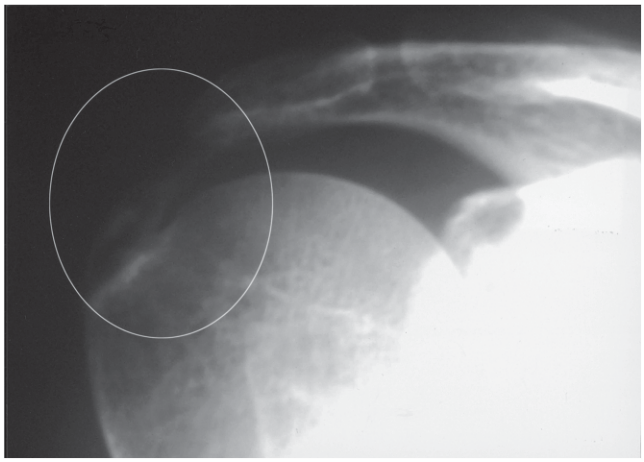


Figure 2 Partial remains of calcification after arthroscopic surgery. A) Preoperative X-ray. B) Postoperative X-ray.

Discussion

Calcified tendonitis of the rotator cuff is one of the most painful acute diseases of the shoulder. Reviewing medical literature no clear consensus is found as to the possible factors that influence the final result of treatment of this condition by means of arthroscopic surgery.

What has been observed in this study, in line with other published articles,[1,8,12-14] is that shoulder function and patient satisfaction after arthroscopic surgery can be considered very good or satisfactory in 100% of cases, with a postoperative Constant test score of 97.6.

As is the case with other authors' work[13,15] no relation has been found between the results obtained and the type of calcification present prior to surgery. Porcellini et al[1] show in a series of 63 shoulders operated arthroscopically that the preoperative Constant value is less in those cases with calcifications greater than 20mm, specially for pain, but that these values even out after 2 years of follow-up in the 3 groups of calcifications, independent of the previous type and size.

As to the association of acromioplasty, it is still a subject of debate.[8,13,14] Although there are authors such as Tillander et al[10] or Postel et al,[17] who advise performing acromioplasty without eliminating the calcification, most surgeons recommend it in cases with a subacromial conflict if the calcium deposit cannot be totally eliminated without excessive tendon damage and if remnants could remain or in those cases in which the calcification is not found. Several studies have shown similar results in both groups, with or without associated acromioplasty.[1,16,17] In this study it was carried out in all cases except 2 (one with good results and another with persistence of discomfort in the last degrees of movement), and it has been seen that the association of acromioplasty does not seem to have any influence or, at least, to negatively influence the final result, which gives rise to a subject for discussion with other authors who believe it is not indicated.[18]

As to the controversy surrounding the subject of total elimination of the calcium deposit, with the consequent risk of weakening the tendon or allowing the persistence of residual deposits, this is also currently the object of discussion. Tillander et al[10] do not find differences in final results in patients with or without residual calcium deposits seen on standard X-rays. Seil et al[12] consider that these calcium remains visible on X-ray as a fine shell of calcifications sticking to the periphery of the deposit are difficult to eliminate without damaging the tendon. Jacobs et al[19] consider that the presence of residual calcifications after arthroscopy do not necessarily influence the final result.

Jerosch et al[13] found an inverse relation between final functional result and the amount of residual deposit. Porcellini et al,[1] by means of ultrasound control, found a strong correlation between the persistence of calcium remnants and the postoperative Constant test value (mainly

in the pain subscale) and recommend eliminating calcifications completely.

In this study a low percentage of residual calcifications are seen on X-ray one month after surgery (11.1%), similar to other series described, such as that of Molé et al[8] (11%) or that of Jacobs et al[19] (8.2%), but lower than most series in the medical literature,[12,13,16] which can be attributed to using radiological evolution to determine the presence of deposits with the potential disadvantage of overlooking microcalcifications (which can only be detected by means of ultrasound studies), or also to the fact that it is a not very large series of cases. At this point in time, no direct relation has been found between those cases with residual calcium deposits and worse results, although it would seem logical to try to eliminate the greatest possible amount of calcification without excessive damage to the tendon. There are studies such as that of Seil et al,[12] that show that these remnants of calcium are re-absorbed during the first year after surgery and indicate that the simple aperture of the calcification and the partial elimination of the same cause clinical improvement by decreasing intra-tendon pressure, without the need for completely eliminating the deposit. In this study it has been proved that in those patients in which it was not possible to completely eliminate calcification, an X-ray control performed one year after surgery showed an absence of calcifications, furthermore, they had excellent final functional results.

As to the indication of whether to repair or not possible breakages caused by the elimination of calcifications, although this has been defined in open surgery,[20] Seil et al[12] have shown, by means of ultrasound, that in 66% of the patients in their series incision of the supraspinous tendon causes minimal structural changes in this tendon after 24 months, and since evolution to a possible breakage is not predictable, suture would not be necessary. On the other hand, as Porcellini et al[1] have commented, the suture of significant ruptures that could endanger the future of the tendon, makes it possible to begin rehabilitation early and can prevent possible secondary ruptures, although in their study the suture of these residual ruptures does not seem to affect final results.

In conclusion, calcified tendonitis is a variable clinical and radiological disease. When conservative treatment fails, arthroscopic resection of the calcium deposit has a success rate above 90%, with significant patient satisfaction with the final result. Associated factors, such as previous type and size of the calcification, the performance of an acromioplasty as an added surgical step or the presence of remnants of calcification after surgery, seem not to influence the results of the process.

It must be mentioned, as the weak point of this study, that it is a retrospective review of a not very large series of patients, which could lead to final conclusions that are considered to be useful as orientation although not supposed to be definitive, and that can be of help when deciding whether to carry out or not certain surgical procedures.

Conflict of interests

The authors have not received any kind of economic aid to carry out this study. Nor have they signed any agreement to receive benefits or fees from any commercial entity. On the other hand, no commercial entity has paid nor will pay any amount to foundations, educational institutions, or other non-profit organisations to which the authors of this article belong.

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