

Arthroscopic Removal and Tendon Repair for Refractory Rotator Cuff Calcific Tendinitis of the Shoulder

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Background: The purpose of this study was to evaluate clinical and radiological outcomes of arthroscopic treatment for refractory rotator cuff calcific tendinitis of the shoulder.

Methods: Subjects were 37 patients (35 women and 2 men; mean age, 47.8 years; age range 34–61 years) who had undergone arthroscopic treatment for calcific tendinitis of the shoulder. Despite sufficient non-surgical treatments, all patients had residual calcific deposit with persistent or recurrent pain. Before surgery, all patients underwent 3-directional radiographs of the shoulder and three-dimensional computed tomography to determine the location and size of calcific deposit. Arthroscopic surgery was performed with the patient under general anesthesia in the lateral decubitus position. A 2-cm single longitudinal incision was made with a radiofrequency hook blade on the tendon surface above calcific deposit. Calcific deposit was removed as much as possible with a curette and a motorized shaver. The incised tendon was repaired with a side-to-side suture with strong sutures. The Japanese Orthopaedic Association shoulder score was used to evaluate clinical outcomes. The extent of calcific deposit removal was evaluated with radiographs obtained before surgery, 1 week after the surgery and at the final follow-up examination.

Results: The mean follow-up duration was 30.4 (range, 13–72) months. The mean shoulder score significantly improved from 69.7 (range, 58–80) points before surgery to 97.8 (range, 89–100) points at the final follow-up examination. Postoperative radiographs in all patients, showed that the calcific deposit was resolved or reduced and those from 1 week after surgery to the final examination showed no evidence of recurrence or enlargement of calcific deposit. The calcific deposit had completely resolved in 34 patients but remained in 3 patients.

Conclusion: When treating calcific tendinitis of the shoulder, it is important to accurately determine the size and location of calcific deposit by radiographs and 3-dimensional computed tomography. Satisfactory clinical and radiological outcomes can be expected after reliable removal of calcific deposit through a single longitudinal incision and side-to-side repair with strong sutures, in association with an appropriate rehabilitation program. (*J Nippon Med Sch* 2017; 84: 19–24)

Key words: calcific tendinitis, shoulder, arthroscopic removal, rotator cuff repair

Introduction

Calcific deposits of the shoulder are seen more frequently compared with the other joints¹. Calcific deposits in rotator cuff tendon of the shoulder are mainly located in the supraspinatus tendon but occasionally in the infraspinatus and subscapularis. This condition most commonly affects women aged 40 to 49 years old. Three stages of

calcification has been defined: (1) precalcification with formative phase; (2) calcification with resting phase; and (3) postcalcification with remodeling². During surgery, calcific deposits can be observed in the form of a sandy tough mass, a toothpaste-like fluid, or an amorphous mass. Although calcific deposits have been found to contain calcium carbonate apatite, their pathogenesis is not

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Journal Website (<http://www.nms.ac.jp/jnms/>)

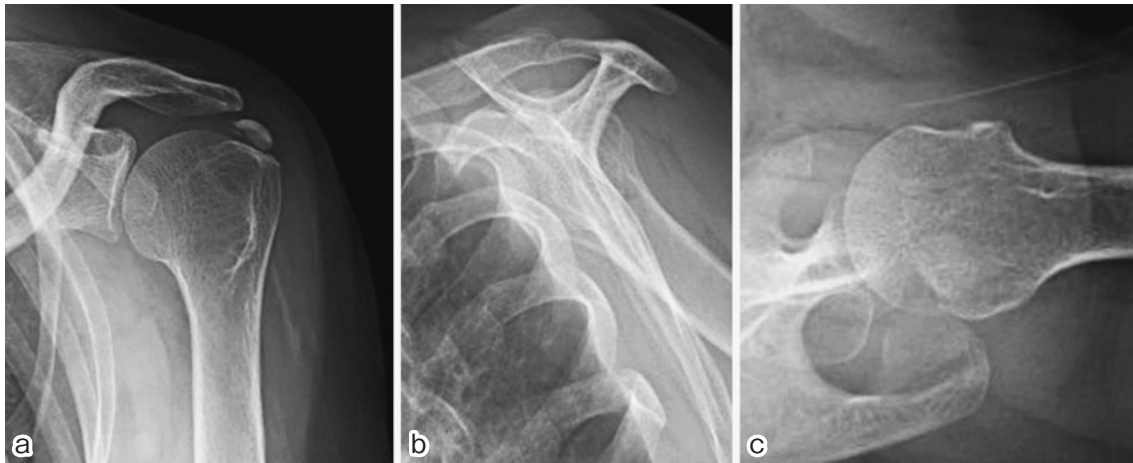


Fig. 1 Preoperative radiographs of the left shoulder (a: AP view, b: scapular Y view, c: axial view) show a large calcium deposit.

fully understood. Calcific deposits cause various symptoms, from mild pain to severe pain, with motion restriction. Nonsurgical treatment improves symptoms in about 90% of patients³. These treatments include nonsteroidal anti-inflammatory drugs, physical therapy, subacromial bursa injection with corticosteroid and local anesthetic, and ultrasound-guided needling of calcific deposit³⁻⁵. Recent studies have also shown extracorporeal shock wave therapy to be effective^{6,7}. For patients in which nonsurgical treatment is ineffective in improving symptoms and results in residual calcific deposit, surgery may be indicated. Two surgical approaches have been described: open and arthroscopic procedures. Although a prospective randomized study has suggested the equivalence of the two procedures in clinical outcomes⁸, arthroscopic procedures have been more commonly performed due to its lower invasiveness^{9,10}. Disadvantages of arthroscopic procedures include difficulty in determining the extent of removal of calcific deposit and potential rotator cuff defect after removal.

The purpose of this retrospective study was to evaluate clinical and radiological outcomes of arthroscopic removal and tendon repair for refractory calcific tendinitis.

Materials and Methods

This study was approved by the ethics committee of our hospital. The subjects were 37 patients (35 women and 2 men; mean age, 47.8 years; age range, 34–61 years) with calcific tendinitis treated arthroscopically by the same surgeon between 2009 and 2014. The mean time between symptom onset and surgery was 27.2 (range, 16–72) months. Before surgery, all patients underwent nonsurgi-

cal treatments, including nonsteroidal anti-inflammatory drugs, physical therapy, and subacromial bursa injection, for a mean period of 24.5 (range, 13–70) months. Four patients underwent needling and aspiration of calcific deposits, and 2 patients underwent extracorporeal shock wave therapy. Despite nonsurgical treatments more than a year, all patients had residual calcific deposits with persistent or recurrent pain and difficulty in activities of daily living or occupation. Five patients also had restricted range of motion because of contracture of the glenohumeral joint. All patients underwent 3-directional radiographs of the shoulder (Fig. 1) and 3-dimensional computed tomography (3D-CT) (Fig. 2) preoperatively, to determine the location and size of calcific deposit.

Operative Techniques

The surgery was performed under general anesthesia in the lateral decubitus position. Diagnostic arthroscopy of the glenohumeral joint was performed to identify any intraarticular lesion. Capsular release was performed in 5 patients with joint contracture. Then, the arthroscope was advanced to the subacromial bursa to determine the location of calcific deposit that appeared as a pale-yellow blister in the swollen tendon (Fig. 3). A lateral portal was created above the calcific deposit and bursectomy was performed around the calcific deposit. A 2-cm single incision was made on the tendon parallel to its direction with a radiofrequency hook blade (Fig. 4). In patients with the calcific deposit extending to the footprint, the incision was extended to the footprint. A blunt hook probe was inserted into the calcific deposit. The typical “snow storm” pattern, in which snow flake like carbonate apatite appears to flutter under irrigation liquid, was



Fig. 2 3D-CT (a: anterolateral view, b: superior view) shows size and location of the calcium deposit in the supraspinatus tendon.

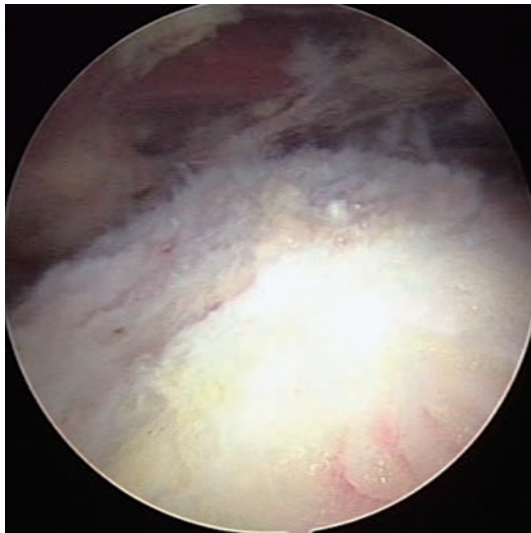


Fig. 3 Arthroscopic image in the subacromial space demonstrates swelling of the tendon by the calcium deposit.

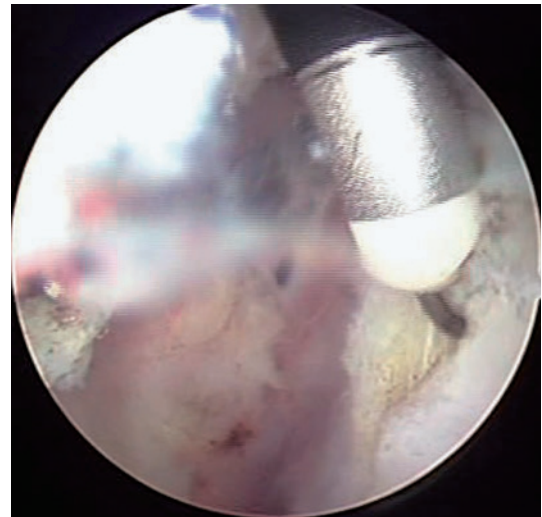


Fig. 4 RF hook blade is used to make a 2 cm single longitudinal incision in the roof of calcium deposit.

observed in all of the patients. The calcific deposit was removed as much as possible with a curette and a motorized shaver (Fig. 5). After confirming that the swelling of the tendon was resolved and the calcific deposit was adequately removed from the tendon, the incised tendon was repaired by side-to-side suture with 2 #2 FiberWire® sutures (Arthrex Inc., Naples, FL, USA). In the 11 patients with an extended incision up to the footprint, side-to-side suture repair was achieved with 2 JuggerKnot® anchors (Zimmer Biomet, Warsaw, IN, USA) placed on the footprint (Fig. 6). Subacromial decompression was performed in all patients. The undersurface of the anterior third of the acromion was completely flattened using a motorized barrel-shaped burr, and no impingement on

the undersurface of the acromion and the repaired cuff was identified in passive shoulder abduction and forward elevation. After calcific debris was removed and aspirated, a suction tube was placed in the subacromial bursa.

Postoperative Protocol

After the surgery, all of the patients underwent protection with a sling for 2 weeks to the repaired cuff. On the second postoperative day, the suction tube was removed, and passive and assisted active range of motion exercises were started under the supervision of a physiotherapist to prevent joint contracture and muscle weakness. Two weeks after surgery, the sling was removed, and the patient was allowed to perform active shoulder motion. Subsequently, an exercise program for strengthening of

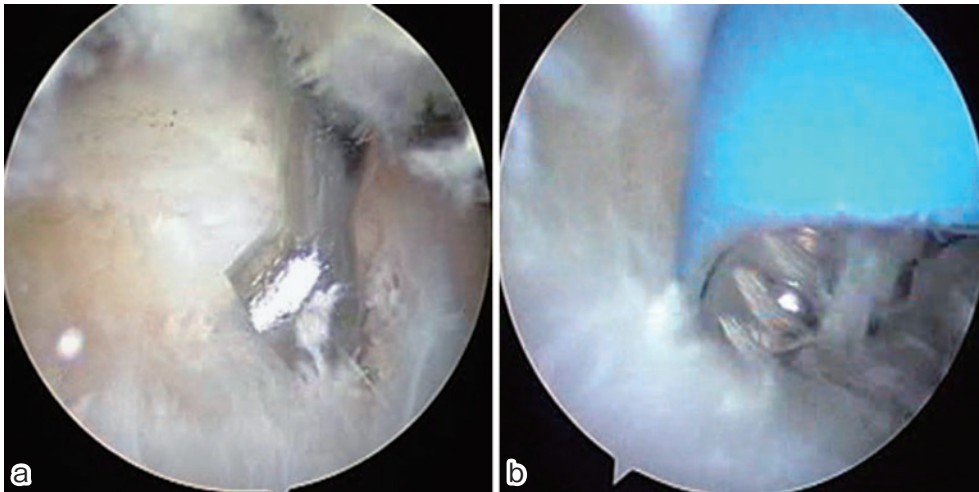


Fig. 5 Complete removal of calcium deposit is performed by a curette (a) and a motorized shaver (b).

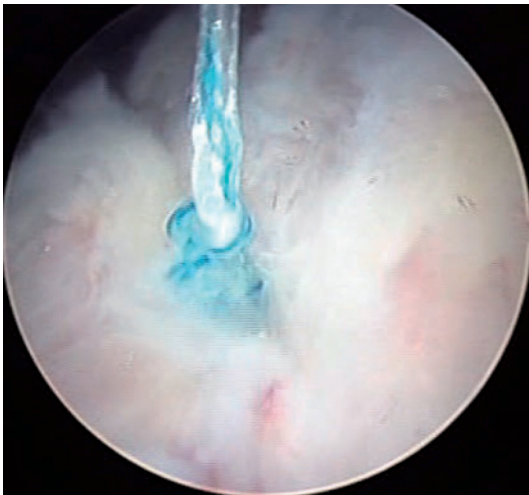


Fig. 6 Split tendon or rotator cuff defect is repaired using suture anchors.



Fig. 7 Postoperative radiograph shows complete removal of the calcium deposit.

the muscles around the scapular and the rotator cuff was started 6 weeks postoperatively, and daily activities such as lifting heavy objects, work and sports activities were allowed 8 weeks postoperatively.

Clinical and Imaging Evaluation

Clinical outcome was assessed using the Japanese Orthopaedic Association (JOA) shoulder score at the final follow-up examination. The extent of calcific deposit removal was evaluated on true shoulder-AP and scapular Y-view X-rays taken preoperatively, 1 week after the surgery and at the final follow-up. The mean follow-up duration after the surgery was 30.4 (range, 13–72) months.

Statistical Analysis

Statistical analysis was performed with the program

IBM SPSS Statistics 21 (IBM Japan, Tokyo, Japan). The JOA shoulder score was evaluated using paired t-tests. A P value less than 0.05 was considered statistically significant.

Results

The mean JOA shoulder score significantly improved from 69.7 (range, 58–80) points before surgery to 97.8 (range, 89–100) points at the final follow-up examination ($p < 0.05$). Except for one patient who had joint contracture preoperatively and has postoperative JOA shoulder

score of 89 points with mild pain and limited external rotation of the shoulder at 13 months postoperatively, all of the patients could obtain complete pain relief at the final follow-up examination.

On the postoperative radiographs, calcific deposit was resolved or reduced in all of patients (Fig. 7). A comparison of radiographs taken 1 week postoperatively with those taken at the final follow-up examination showed no evidence of recurrence or enlargement of the calcific deposit. The calcific deposit was completely resolved in 34 patients and remained in 3 patients. The mean postoperative JOA shoulder score was 97.9 (range, 89–100) points in the patients who achieved complete resolution of calcific deposit and 96.3 (range, 94–100) points in those with residual calcific deposit, showing no significant difference.

No patient experienced complications related to anesthesia or surgery, including infection and neurovascular injuries. No patient required revision surgery for rotator cuff retear or other complications.

Discussion

Arthroscopic procedures intended to completely remove calcific deposit may result in rotator cuff tear or defect that requires repair surgery. It has also been associated with a high risk of postoperative joint contracture. Rotator cuff defect or tear may lead to the need for long-term immobilization after repair, retear, inflammation and other complications^{11,12}. Several reports have suggested that complete removal of calcific deposit associated with the risk of rotator cuff defect should not be attempted^{12,13}. Others have also suggested that subacromial decompression alone can lead to favorable outcomes without calcific deposit removal¹⁴. However, techniques intended for preserving tendons or involving a small tendon incision have been associated with a higher rate of residual calcific deposit (17%–56%)^{10,15}, as well as concern about symptomatic relapse. Subacromial decompression alone is also likely to be followed by recurrence, as it has been shown to result in residual calcific deposit in all the patients at the final follow-up examination¹⁴. Previous studies have suggested that residual calcific deposit has no impact on postoperative outcome, as evidenced by no significant difference in postoperative outcome between patients who achieved complete resolution of calcific deposit and those with residual calcific deposit, although long-term outcome has not been described yet^{12,13}. On the other hand, some authors recommended complete removal of the deposits with repair of the rotator cuff if neces-

sary^{16–18}. Balke et al. described that ultrasound examination in patients with worse clinical outcomes after arthroscopic resection of the deposits revealed a high rate of a partial supraspinatus tendon tear¹⁷. Porcellini et al. reported that the postoperative Constant score in a follow-up over 36 months was significantly lower in patients with residual calcific deposits¹⁸. There is no common agreement with the extent of the removal of calcific deposit. However, the aim of the surgery to calcific tendinitis is to prevent symptomatic relapse. Therefore, complete removal of the calcific deposit should be performed, although rotator cuff repair may be necessary.

The current technique involving a single longitudinal incision and the use of a curette and a motorized shaver enables almost complete removal of the calcific deposit. Residual calcific deposit was only observed in 8% of the patients on radiographs at the final follow-up examination in our study. It is likely that the use of 3D-CT to accurately determine the location and size of calcific deposit prior to the surgery contributed to the low rate of residual calcific deposit. Side-to-side repair with strong sutures has been shown to achieve rigid fixation of the rotator cuff. In this study, all of the patients obtained satisfactory pain relief postoperatively, indicating complete repair of the rotator cuff tear. The current technique also allowed the patients to start active range of motion exercise under a physiotherapist's supervision as early as 2 days postoperatively, and only one patient experienced postoperative joint contracture.

When treating calcific tendinitis of the shoulder, it is important to accurately determine the size and location of calcific deposit by radiographs and 3D-CT. Satisfactory clinical and radiological outcomes can be expected after complete removal of calcific tendinitis through a single longitudinal incision and side-to-side repair with strong sutures, in association with an appropriate rehabilitation program.

Conflict of Interest: One or more of the authors has declared the following potential conflict of interest or source of funding: H.H. has received remuneration for lecturing from Zimmer Biomet.

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(Received, December 14, 2015)

(Accepted, November 25, 2016)