Sonographically Guided Percutaneous Needle Lavage in Calcific Tendinitis of the Shoulder: Short- and Long-Term Results

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OBJECTIVE. The purpose of our study was to evaluate the short- and long-term effectiveness of sonographically guided percutaneous needle aspiration and lavage in calcific tendinitis of the shoulder and to study the progress of calcifications and symptoms in the first year after treatment.

MATERIALS AND METHODS. Symptoms and radiologic findings after percutaneous aspiration of calcific tendinitis were prospectively evaluated in the short and the long term using a shoulder pain and disability index, evaluation of shoulder motion, and a survey of the self-perception by the patients regarding the progress of their disease.

RESULTS. Sixty-seven consecutive shoulders were treated. A significant improvement was seen in shoulder motion, pain, and disability in the short term and in the long term (p < 0.0001). One year after treatment, 91% of shoulders had substantially or completely improved, 64% had perfect motion, and calcifications on radiography had resolved completely or nearly completely in 89%. A transitory recurrence was observed approximately 15 weeks after treatment in 44.3% of shoulders that improved.

CONCLUSION. Percutaneous needle aspiration and lavage is effective in the short term and in the long term in calcific tendinitis of the shoulder, with results similar to or better than those published for other techniques, and it is only slightly invasive and painful. Progress after treatment may include a transitory period of recurrence of the pain.

Calcific tendinitis of the shoulder is caused by carbonate apatite crystal deposition in rotator cuff tendons [1]. These deposits can be seen on radiographs in 7.5–20% of asymptomatic adults [2]. In 50% of patients, these deposits become symptomatic, causing acute or chronic pain [2, 3]. Calcific tendinitis of the shoulder accounts for 7% of cases of shoulder pain [2]; it can be highly incapacitating, causing a significant economic impact due to work days missed. However, calcific tendinitis is a self-limited process in which the calcifications tend to resolve after a period of worsening and intense pain [2].

During the acute period, nonsteroidal anti-inflammatory drugs and even subacromial injections of steroids are currently prescribed. However, they provide only temporary relief and are not free of complications [3]. When conservative methods fail, several alternative treatments have been proposed: surgery, sonography [4], acetic acid iontophoresis [5, 6], shockwave lithotripsy [7–13], and percutaneous aspiration of the calcifications [14–18].

No consensus exists as to the best alternative treatment. Because calcific tendinitis of the shoulder is a self-limited process, its treatment should be not only effective but as little invasive as possible and free of complications. Moreover, because calcific tendinitis of the shoulder is a chronic disease with acute exacerbations and periods of remission, treatment should prove to be effective in the short term and in the long term. To our knowledge, percutaneous aspiration has not become widespread, probably because of the lack of a standardized technique and lack of comparative studies regarding long-term effectiveness.

We studied a technique of sonographically guided percutaneous needle aspiration and lavage in 72 shoulders. The aim of the study was to evaluate the short- and long-term effectiveness of the method, to compare the results with those of other methods of treatment, and to study the progress of calcifications and symptoms in the first year after treatment.

Materials and Methods

Patients and Baseline Studies

Patients who come to the emergency department at our hospital with acute shoulder pain and are di-
Sonographically Guided Needle Lavage of Shoulder Tendinitis

Fig. 1—Examination of shoulder range of motion. A-G, Measurement of motion angles in abduction (0–180°) and adduction (0–50°) (A), anterior (0–180°) and posterior (0–50°) elevation (B), and external (0–90°) and internal (0–90°) rotation (C).

Diagnosis of calcific tendinitis of the shoulder is often made by radiologists based on the presence or absence of an acoustic shadow, which is an alternative to conservative medical treatment. All patients who accepted treatment between October 2002 and November 2004 were included in this study. Patient informed consent and approval of our institutional review board were obtained in every case.

Patient demographic data and information about the course of the disease were gathered. Shoulder motion was measured and the Shoulder Pain and Disability Index questionnaire (SPADI) was used to assess shoulder impairment. Shoulder range of motion was recorded with the patient seated by measuring the maximum angle of active and passive motion of the shoulder in different axes (Fig. 1). The sum of all of the values measured during both active and passive motion represented shoulder range of motion, with values of 0–1,280°.

The Shoulder Pain and Disability Index measures the severity of shoulder pain and the effect of the disease on the functional status of the shoulder [19, 20]. The questionnaire consists of 13 questions classified into two categories referring to disability (eight questions) and pain (five questions) caused by shoulder damage. It uses a visual analog scale to obtain numeric values, given as percentages, for two categories referring to disability and pain. The result is the mean value of both parts, also expressed as a percentage.

Before treatment, radiography and sonography were performed. Rotator cuff calcifications were identified, and their number, size, and location, as well as the presence or absence of an acoustic shadow, were recorded. When calcification had an associated shadow on sonography, the shadow was described as strong (if it did not allow structures located beyond to be seen) or weak (when it did allow visualization). A linear 5–12-MHz transducer on an ATL HDI 3500 or an ATL HDI 5000 (Philips Medical Systems) unit was used to image the shoulder and to guide the procedures.

Procedure Technique

Treatment was performed with the patient seated. For calcifications located in the supraspinatus and infraspinatus tendons, the arm of the patient was placed in internal rotation, with the hand behind the back. For subscapular calcifications, the arm was in external rotation, with the hand supine and resting on the thigh. In bilateral calcifications, initially we treated only the shoulder having more discomfort, and after 1 year we treated the other shoulder if requested.

Lavage of the calcifications was performed after an anterior and caudocranial approach to keep the syringe below the calcification. After the skin was cleaned and sterilized, a 20-gauge needle was introduced into the shoulder under sonographic guidance using a freehand technique, following the plane of the ultrasound beam (Fig. 2). The needle was connected to a syringe filled with 1% lidocaine hydrochloride.

After the pathway and the subacromial–subdeltoid bursa were anesthetized, the tip of the needle was introduced into the calcification. Once there, direct aspiration of the calcium was strictly avoided because our previous experience has shown us that this frequently causes obstruction of the needle by calcium. Therefore, the plunger was pushed a short way until a small quantity of fluid managed to penetrate the calcification and appear on the sonogram. Frequently the plunger needed to be pushed forcefully. If no fluid could be injected into the calcification initially, the tip of the needle was withdrawn to the edge of the calcification. Injection was always possible at that location.

After every short injection, pressure on the plunger was released, allowing lidocaine to flow back into the syringe, carrying the calcium as a cloudlike substance that settled at the bottom of the barrel. When the fluid in the syringe became cloudy, a new syringe was substituted. The procedure was repeated until the calcification disappeared and the aspirated fluid came out clear. When more than one calcification was observed, the procedure was repeated for each one. Treatments took approximately 15 minutes.

Finally, the needle was drawn back to the subacromial–subdeltoid bursa to inject 40 mg of triamcinolone acetonide (Trigon, Bristol-Myers Squibb) to prevent bursitis. Immediately after the procedures, patients were discharged with a prescription for a nonsteroidal antiinflammatory drug in case of shoulder pain.

All examinations and procedures were performed by one of three radiologists, all of whom had more than 4 years of experience in shoulder radiography, sonography, and sonographically guided procedures. After treatment, the remaining content of the syringes was poured into another syringe to let the calcium settle. After it had settled, the volume of the calcium extracted was measured using the scale inscribed on the barrel.

Follow-Up

Patients were followed up 5 weeks, 10 weeks, and 1 year after the procedure. At each visit radiography and sonography of the treated shoulder were performed, and image findings were recorded. Also, treated shoulder range of motion was explored and a Shoulder Pain and Disability Index questionnaire was administered by a rheumatologist at 10 weeks and again at 1 year after treatment. At the 1-year visit, patients filled out a question-
naire giving their opinion about the progress of their disease and the effectiveness of the treatment. Patients who were not present for the 1-year visit answered these questions by telephone.

If pain persisted and both substantial remaining calcifications on radiography and calcifications with acoustic shadow on sonography were observed after 5 weeks, retreatment was prescribed and performed 1 week later.

Statistics
Depending on the distribution of the variables, the Student’s *t* test or the nonparametric Wilcoxon’s signed rank test was used to compare the outcomes of the Shoulder Pain and Disability Index and evaluation of shoulder range of motion before and after treatment. Likewise, the Student’s *t* test or the nonparametric Mann-Whitney test was used to compare the outcomes of the Shoulder Pain and Disability Index and shoulder motion in patients with different imaging features before and after treatment, and in patients who had or had not been retreated or had a late recurrence.

Fisher’s exact test was used to compare the outcomes of the final questionnaires in patients with different imaging features and in shoulders that had or had not been retreated or had a late recurrence after treatment.

Data entry and statistical analysis were performed with the statistical software SPSS, version 12 (SPSS) for Windows (Microsoft). A *p* value of less than 0.05 was considered statistically significant.

Results
We treated 72 shoulders in 70 patients. In five cases, the patients could not be contacted 1 year after treatment, so they were excluded from the study. Finally, the study group comprised 67 shoulders in 65 patients (25 men, 40 women) who ranged in age from 31 to 72 years (mean, 47 years). The right shoulder was treated in 36 cases and the left in 31. The supraspinatus tendon was involved in 57 shoulders, the infraspinatus in 12, and the subscapularis in three. Five patients had calcifications in two tendons, one of them being always the supraspinatus, the infraspinatus in three, and the subscapularis in two.

The time from the onset of symptoms to treatment ranged from 1 to 168 months (mean, 30 months). All shoulders had been previously treated with conservative measures: nonsteroidal antiinflammatory drugs in 65, local steroid injections in 35, and rehabilitation in 22.

In 56 shoulders (83.6%), radiographs showed dense, homogeneous, and well-defined calcifications. In six (9%), the calcifications were irregular and fragmented, and in five (7.5%), thin and linear. In two shoulders, fine linear calcifications were found outlining the rotator cuff and corresponding with calcium deposits in the subacromial–subdeltoid bursa. All calcifications were clearly visible on sonography. In 13 shoulders (19%) the calcification had no acoustic shadow, in 15 (22%), a weak shadow, and in 39 (58%), a strong shadow. Eight patients showed a partial tear in the rotator cuff on sonography.

The amount of calcium extracted from each patient varied. In 17 patients (25%), no calcium could be extracted. The maximum volume of calcium obtained from a single patient was 2 mL (mean per patient, 0.4 mL).

Complications occurred during treatment in three patients who felt faint and lost consciousness. Two of these three patients also suffered seizures. These complications occurred only in the initial treatment session. After 21 procedures, to prevent complications of that nature, 0.25 mg of alprazolam (Tranxilin, Pfizer), a fast-acting anxiolytic, was administered to all patients 30 minutes before the procedure. No further complications occurred.

Most patients referred pain and discomfort in the treated shoulder during the first 48 hours after treatment.

Retreatment was performed in 16 shoulders. Three patients could not attend the annual follow-up visit because of professional obligations, but they responded to the final questionnaire by telephone.

Table 1 shows changes over time in the Shoulder Pain and Disability Index scores and shoulder range of motion. A significant improvement was shown when comparing the results of Shoulder Pain and Disability Index...
scores and the sum of shoulder range of motion angles before treatment and 10 weeks later (p < 0.0001 for both), and when comparing the latter with those of the 1-year follow-up (p < 0.0001 for both).

Table 2 shows the progress of the calcifications on posttreatment radiography. One year after treatment, 78.1% of shoulders showed no sign of calcifications (Fig. 3) and only 3.1% showed no changes (Fig. 4). On sonography, the appearance of calcifications changed on successive follow-ups (Fig. 5). Before treatment, 39 (58.2%) calcifications had a strong acoustic shadow on sonography, 15 (22.4%) had a weak shadow, and 13 (19.4%) had no acoustic shadow; 1 year after treatment, only one calcification (1.6%) had a strong acoustic shadow, six (9.4%) had a weak shadow, and 57 (89%) had no associated shadow.

In the survey performed 1 year after treatment, 34 shoulders (50.7%) were completely free of symptoms, another 27 (40.3%) had experienced a substantial improvement, and three more (4.5%), a moderate improvement. Only three shoulders (4.5%) showed no improvement. Two of those three had been treated on two occasions. Excluding these three, a temporary recurrence of the symptoms after initial improvement was observed in 27 shoulders. In these cases, symptoms appeared 5–28 weeks after treatment (mean, 15 weeks) and lasted for 2–20 weeks (mean, 6 weeks). This temporary recurrence was associated with significantly worse Shoulder Pain and Disability Index scores (p < 0.0001) and a lower sum of shoulder range of motion angles (p < 0.002) at the 1-year follow-up. However, in the final survey most of these patients answered that they had no symptoms (24%) or had notably improved (64%).

No significant differences were found in the outcome of the procedure for patients who were treated once versus those who were treated twice (Table 3). Also, no significant differences were seen in the outcome in shoulders with different pretreatment radiographic or sonographic features (Table 3). However, the patients whose calcification resolved completely or nearly completely scored lower on the Shoulder Pain and Disability Index scale (p < 0.0001) or assessed their progress more positively (p < 0.008) 1 year after treatment. Changes on sonography were not significantly associated with the clinical progress of the patients. No significant differences were seen in final outcome between shoulders from which calcium had been retrieved and those from which no calcium could be retrieved from the shoulder (Table 3).

**Table 1: Shoulder Scores and Measurements Before and After Treatment**

<table>
<thead>
<tr>
<th>Item Scored</th>
<th>Before Treatment (n = 67)</th>
<th>10 Weeks (n = 67)</th>
<th>1 Year (n = 64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPADI pain score (points)a</td>
<td>20–98 (mean, 56.5)</td>
<td>0–86 (mean, 32)</td>
<td>0–74 (mean, 17.4)</td>
</tr>
<tr>
<td>SPADI disability score (points)b</td>
<td>0–86.3 (mean, 43.9)</td>
<td>0–72.5 (mean, 22)</td>
<td>0–64 (mean, 12.1)</td>
</tr>
<tr>
<td>SPADI total score</td>
<td>10–80.1 (mean, 50.2)</td>
<td>0–77.4 (mean, 27)</td>
<td>0–62.8 (mean, 14.7)</td>
</tr>
<tr>
<td>SPADI score &lt; 10g</td>
<td>10</td>
<td>22 (33%)</td>
<td>41 (64%)</td>
</tr>
<tr>
<td>Shoulder range of motion</td>
<td>510–1,280g (mean, 1,039g)</td>
<td>810–1,280g (mean, 1,187g)</td>
<td>940–1,280g (mean, 1,256g)</td>
</tr>
<tr>
<td>Full range of motion without pain</td>
<td>1 (1.5%)</td>
<td>19 (28%)</td>
<td>44 (69%)</td>
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</table>

**Table 2: Shoulder Calcifications on Radiographs After Treatment**

<table>
<thead>
<tr>
<th>Calcifications</th>
<th>5 Weeks (n = 67)</th>
<th>10 Weeks (n = 67)</th>
<th>1 Year (n = 64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No changes</td>
<td>7 (10.4)</td>
<td>5 (7.5)</td>
<td>2 (3.1)</td>
</tr>
<tr>
<td>Lower density</td>
<td>14 (20.9)</td>
<td>9 (13.4)</td>
<td>2 (3.1)</td>
</tr>
<tr>
<td>Lower volume</td>
<td>12 (17.9)</td>
<td>9 (13.4)</td>
<td>3 (4.7)</td>
</tr>
<tr>
<td>Scant remainder</td>
<td>27 (40.3)</td>
<td>27 (40.3)</td>
<td>7 (10.9)</td>
</tr>
<tr>
<td>None</td>
<td>7 (10.4)</td>
<td>17 (25.4)</td>
<td>50 (78.1)</td>
</tr>
</tbody>
</table>

**Discussion**

Several therapies have been proposed when conservative treatment of calcific tendinitis of the shoulder fails. Acetic acid iontophoresis and ultrasound therapy have not proven to be more effective than physiotherapy or a placebo [4–6]. Shockwave therapy is effective in calcific tendinitis of the shoulder. In the short term, shockwave therapy resolves the calcifications in 57–60% of the shoulders and achieves substantial or complete clinical improvement in 53–71% [7–10]. In the long term, calcifications resolve in 47–93% of shoulders, and substantial or complete clinical improvement is achieved in 66–91% [9, 11–13]. Previous sonographically guided aspiration and lavage has been reported to improve the results of shockwave therapy [21]. However, shockwave therapy is frequently painful [7] and requires special equipment, so it is relatively expensive.

Surgery is more effective than shockwave therapy in the long term, achieving a substantial or complete clinical improvement in 79–100% of the shoulders. However, rehabilitation is always required and is not free of complications [13, 22, 23]. Currently, surgery is considered the last option when other methods have failed.

In our patients, in the long term, calcifications resolved completely or nearly completely in 89%, and a substantial or complete clinical improvement was achieved in 91% of shoulders. These results are similar to the best results published for shockwave therapy and are not worse than those for surgery, but percutaneous needle aspiration and lavage is minimally invasive and painful, is widely available, and allows patients to return to work quickly.

To our knowledge, our results have been better than those in any previously published reports of percutaneous needle aspiration and lavage [15, 17]. Differences in the technique used may be the reason for that improvement. Several variants of sonographically guided percutaneous needle aspiration and lavage of calcific tendinitis of the shoulder have been used. Some authors use two needles, one to
Fig. 3—56-year-old woman who had calcific tendinitis for 2 years.
A, Anteroposterior radiograph of shoulder shows large calcifications involving supraspinatus and infraspinatus tendons.
B, Ten weeks after treatment, significant reduction in calcification is seen.
C, No calcification can be seen 1 year after treatment.

Fig. 4—46-year-old man with calcific tendinitis for 4 years in whom aspiration and lavage failed.
A, Anteroposterior radiograph of shoulder obtained before treatment shows dense calcification in supraspinatus tendon.
B, After 10 weeks, no changes are seen, although patient received two percutaneous treatments.
C, Radiograph shows no changes 1 year after treatment. Patient's symptoms remained unchanged.

Fig. 5—39-year-old woman with calcific tendinitis for 6 months. Note changes in sonogram of calcification after percutaneous treatment.
A, Before treatment, longitudinal sonogram of supraspinatus tendon shows focus of calcification and acoustic shadow.
B, Ten weeks after treatment, volume of calcification has been considerably reduced and no acoustic shadow is seen.
introduce the fluid and the other to aspirate the calcium [14]. We find double injections cumbersome and potentially harmful to the tendon. The caliber of the needles used in published studies varies between 18 and 22 gauge [14–17]. We chose 20-gauge needles because, in our experience, needles with a smaller bore tend to become obstructed. The use of 20-gauge needles is a compromise that minimizes the risk of obstruction while using the smallest caliber possible to avoid damage to the tendon. Some authors attempted to aspirate the calcification repeatedly [14, 15]. We used only one aspiration and lavage procedure per calcification in an attempt to avoid unnecessary damage of a tendon already weakened by calcific tendinitis. We performed the procedure with the patient seated and with one arm behind the back. This position has the advantage of allowing the syringe to be placed below the level of the calcification, which permits the calcium to fall to the bottom of the syringe, thus preventing it from being reintroduced. In addition, this arm position increases pressure in the tendon and facilitates draining the fluid without pulling the plunger. However, it is more uncomfortable for the patients. Some authors aspirate the calcium after the needle has entered the calcification [17, 18]. In our experience, this technique frequently causes calcium to obstruct the needle, so we always inject fluid initially.

The outcome in patients from whom calcium was obtained was not statistically significant from the outcome in patients from whom no calcium was extracted. The clinical progress in both groups of patients was generally good. This contradicts the observations of other authors who found no improvement unless calcium was obtained [17]. Our hypothesis is that injecting the calcification causes an inflammatory process that somehow removes the nonextracted calcium, similarly to what occurs with shockwave therapy.

Resolution of the calcification on radiography after percutaneous needle aspiration and lavage showed a statistically significant relationship with clinical success, as described previously for other therapies [8, 10, 11, 13]. Although repeated treatments are less effective than the first treatment [15], in our opinion repeated treatment is the appropriate approach when calcifications and symptoms of the patient do not progress as expected several weeks after the initial aspiration. In our patients, no significant long-term differences were seen between the shoulders that were treated once or those treated twice, despite the poor initial progress of the latter.

After percutaneous needle aspiration and lavage, shoulder function and symptoms improve in the following months [16]. However, nearly half of our patients experience a recurrence approximately 15 weeks after treatment; the recurrence is usually temporary and lasts an average of 6 weeks. This discomfort generally is not as intense as during the peak of the disease and can be controlled with antiinflammatorys. This recurrence of the symptoms has not been described previously, to our knowledge.

After treatment, we frequently observed a temporary worsening of symptoms that lasted approximately 48 hours. This has also been described by Pfister and Gerber [16]. Because those authors also initially injected liquid into the calcification instead of aspirating the calcium, the discomfort may be related to this aspect of the treatment. Some of our patients suffered faint spells and even seizures. This has not been described previously to our knowledge. We hypothesized that the fainting spells and seizures were facilitated by the seated position. Administration of anxiolytics before the procedure appears to prevent such reactions.

Our study had limitations that restrict its validity. First, we had no control group. Therefore, it could be that the improvement observed was actually related to a natural, spontaneous progression of the disease and that the same would have occurred without treatment. However, most patients showed repeated symptoms from long before the treatment, and during that time the calcific tendinitis of the shoulder had not resolved. Therefore, percutaneous needle aspiration and lavage is probably the main cause of the favorable progress of the patients.

A comparison of our results with those of other treatments is difficult because the studies published used different methods to evaluate shoulder function. We chose the Shoulder Pain and Disability Index because it was used in a previous publication on percutaneous treatment [17], but we added an assessment of the range of motion of the shoulder that the Shoulder Pain and Disability Index does not evaluate. In other studies, the Constant scale is the most widely used [24]. In the Constant scale, points are assigned according to the criteria of perception of pain, function, range of motion, and strength, but the scores assigned to each

### Table 3: SPADI Score and Shoulder Range of Motion in Different Groups of Shoulders Before and After Treatment

<table>
<thead>
<tr>
<th>Group</th>
<th>SPADI Score Before Treatment</th>
<th>SPADI Score Follow-Up (1 y)</th>
<th>Shoulder Range of Motion Before Treatment</th>
<th>Shoulder Range of Motion Follow-Up (1 y)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Before Treatment</td>
<td>Follow-Up (1 y)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (n = 16)</td>
<td>10–84.6 (50.5)</td>
<td>0–61.4 (20.4)</td>
<td>600–1,260 (1,037)</td>
<td>940–1,280 (1,235)</td>
</tr>
<tr>
<td>No (n = 51)</td>
<td>18.1–90.1 (50.1)</td>
<td>0–62.7 (13)</td>
<td>520–1,270 (1,058)</td>
<td>940–1,280 (1,244)</td>
</tr>
<tr>
<td>Calcium obtained</td>
<td>No (n = 17)</td>
<td>22.6–81.1 (48.1)</td>
<td>0–61.4 (14.5)</td>
<td>510–1,280 (1,039)</td>
</tr>
<tr>
<td>Yes (n = 50)</td>
<td>10–90.1 (50.9)</td>
<td>0–62.7 (14.8)</td>
<td>510–1,270 (1,047)</td>
<td>940–1,280 (1,230)</td>
</tr>
<tr>
<td>Initial radiographic appearance of calcifications</td>
<td>Dense, well defined (n = 56)</td>
<td>10–90.1 (49.2)</td>
<td>0–62.7 (14.7)</td>
<td>510–1,280 (1,047)</td>
</tr>
<tr>
<td>Irregular or linear (n = 11)</td>
<td>23.7–89.1 (55.4)</td>
<td>0–61.4 (14.9)</td>
<td>510–1,270 (999)</td>
<td>940–1,280 (1,230)</td>
</tr>
<tr>
<td>Shadow on initial sonography</td>
<td>Absent or weak (n = 28)</td>
<td>10–90.1 (47)</td>
<td>0–61.4 (9.8)</td>
<td>510–1,280 (1,044)</td>
</tr>
<tr>
<td>Strong (n = 39)</td>
<td>15–89.1 (52.6)</td>
<td>0–62.7 (18.6)</td>
<td>510–1,280 (1,044)</td>
<td>1,140–1,280 (1,254)</td>
</tr>
</tbody>
</table>

Note—Data are given as range (mean). Patients who were not present for 1-year follow-up were excluded. SPADI = Shoulder Pain and Disability Index [19].
parameter are actually arbitrary. The relationship between the two scales is only moderate, so the results cannot be compared [25]. To compare treatments, we used the final perception of improvement obtained from the patients. Using scales tends to overrate the effect of the treatments because, if enough patients are recruited, slight differences in scores can be significant although patients do not perceive an actual improvement.

In conclusion, percutaneous needle aspiration and lavage is quite effective in calcific tendinitis of the shoulder in the short term and especially in the long term. It has similar or better results than those published for other methods, and it is also minimally invasive, minimally painful, and widely available. Shoulder pain may reappear several weeks after treatment for a relatively brief time. However, comparative studies with other methods and with appropriate control groups are needed to evaluate its actual effectiveness.

References