Comparison of ultrasound therapy and local steroid injection in rotator cuff tendinitis

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ABSTRACT

Objective: To evaluate the effectiveness of ultrasound therapy compared with local steroid injection for pain relief and movement limitation in rotator cuff tendinitis.

Methods: Patients with rotator cuff tendinitis at the rheumatology and rehabilitation outpatient clinic at Cipto Mangunkusumo General Hospital were enrolled in a parallel randomized trial, in which each eligible patient were randomly assigned to one of two groups: one group received 10 sessions of ultrasound therapy given in 2 weeks, the other received a single dose of local steroid injection. Evaluation of the visual analog scale (VAS) was performed in 10 days (5 days for each week: day 1–5 and 8–12), while evaluation of the abduction as well as external and internal rotation range of motion (ROM) was performed twice a week (day 2, 5, 9, and 12). Change in the variables between the two groups at the end of the second week (day 12) was then compared.

Results: Thirty patients, divided into two groups consisting of 15 patients each, were recruited in the study. Significant decrease in VAS during the follow-ups was obtained in both groups, slightly earlier in the steroid injection group (day 2; p = 0.041) compared with the ultrasound group (day 3; p = 0.001). Significant increase in abduction ROM was achieved at the same rate (beginning at day 5) in both groups. Significant increase in internal rotation ROM was achieved at day 9 in the ultrasound group (p = 0.043) and day 12 in steroid injection group (p = 0.044). The increase in external rotation ROM in both groups was not found to be statistically significant. At the end of the second week, significant difference between the two groups was only shown in the abduction ROM, with higher increase in the steroid group.

Conclusions: Ultrasound therapy provided a comparable effectiveness to steroid injection in alleviating pain and improving ROM in patients with rotator cuff tendinitis.

Rotator cuff tendinitis is an inflammatory and degenerative process of the tendon and is the main cause of shoulder pain.1 The most commonly affected tendon are the supraspinatus and infraspinatus tendon.2–5 This disease occurs as a result of overuse syndrome in the young adult (25–40 years old) and results in degenerative process in older age.1,4–6 causing pain and limitation in range of motion (ROM) that is difficult to treat with nonsteroidal anti-inflammatory drugs (NSAIDs). Therefore, an additional therapy is usually needed, such as local steroid injection, transcutaneous electrical nerve stimulation, ultrasound, and other modalities.

Shoulder pain is the third most common cause of musculoskeletal disorder after low back pain and cervical pain. Estimates of the cumulative annual incidence of shoulder disorders vary from 7–25% in the Western general population. The annual incidence is estimated at 10 cases per 1,000 population, peaking at 25 cases per 1,000 population in persons aged 42–46 years. In persons aged 70 years or older, 21% of persons have shoulder symptoms, most of which were attributed to the rotator cuff.7 Women are affected more commonly than men. There is right side predominance. In 13–47% of patients this disease affects both shoulders.8

In a study by Hay et al9 who investigated shoulder pain in patients with adhesive capsulitis, steroid injection have similar effectiveness with ultrasound therapy. Van der Windt et al10 in their study concluded that local steroid injection is more effective than ice or hot packs and electrotherapy, although it has more adverse reactions, such as facial flushing, gastric ulcer, and irregular menstrual bleeding.

In this study we aim to investigate the effectiveness of ultrasound therapy as an alternative therapy to avoid the adverse reactions of local steroid therapy.

METHODS

Patients

This study was conducted at the rheumatology and rehabilitation clinic at Cipto Mangunkusumo General Hospital, Jakarta from June until October 2005. Patients between 20–65 years old who were diagnosed with stage II rotator cuff tendinitis, had not received analgesic medication since the time of diagnosis, and visual analog scale (VAS) of more than 3 were enrolled in the study. The exclusion criteria were hypersensitivity with corticosteroid, menstrual disorders (e.g. dysfunctional uterine bleeding), and presence of local infection or fracture at the site for injection. Patients were then randomly assigned to one of the two groups: steroid injection group or ultrasound group. The initial ROM of each patient was measured with goniography manufactured by Academy of Physiotherapy, Solo, Indonesia.
Treatment
Patients in the steroid group received one dose of 1 mL of triamcinolone acetonide mixed with 1 mL of lidocaine 2%, injected at a site 2 cm under the posterolateral angle of the acromion. Patients in the ultrasound group were given ultrasound therapy in 10 sessions, each with a duration of 10 minutes, performed with Sonopuls 590 (Enraf-Nonius B.V., Rotterdam, The Netherlands) using 1 MHz frequency and 1.5 Watt/cm² intensity, given at approximately the same location as the steroid injection.

Follow-ups
Evaluation of VAS was performed in 10 days (5 days for each week: day 1–5 and 8–12), while evaluation of the abduction as well as external and internal rotation ROM was performed twice a week (day 2, 5, 9, and 12).

Statistical analysis
Comparison was made between the change of variables in the two groups at the end of the second week (day 12). Statistical analysis of subsequent follow-ups (compared with baseline value) were performed with paired T-test, while the comparison of the post-treatment change of VAS as well as abduction, internal and external rotation ROM between the two groups were performed with unpaired T-test.

RESULTS
Thirty patients, consisting of 15 patients in each group, were enrolled in the study. Most of the patients were female (63.33%). The age range was between 42 to 65 years old. Right shoulder was the most commonly involved (50%); 11 patients (36.67%) had left shoulder involvement, and four patients (13.33%) had both their shoulders involved (table 1).

Table 1 Baseline characteristics of both groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Ultrasound group (n = 15)</th>
<th>Steroid injection group (n = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, female, n (%)</td>
<td>9 (60)</td>
<td>11 (73.3)</td>
</tr>
<tr>
<td>Age</td>
<td>56 (5.8)</td>
<td>54.8 (7.4)</td>
</tr>
<tr>
<td>Visual analog scale</td>
<td>6.1 (1.2)</td>
<td>6.2 (0.8)</td>
</tr>
<tr>
<td>Abduction range of motion</td>
<td>103.0 (44.3)</td>
<td>122.0 (35.9)</td>
</tr>
<tr>
<td>Internal rotation range of motion</td>
<td>39.5 (16.7)</td>
<td>49.7 (16.8)</td>
</tr>
<tr>
<td>External rotation range of motion</td>
<td>79.7 (21.7)</td>
<td>83.7 (15.2)</td>
</tr>
</tbody>
</table>

Unless otherwise specified, values are presented as mean (SD).

Because the pain usually occurs after waking up in the morning, most of the patients could not identify the underlying cause of their tendinitis. Five patients suspected their sport activities, either golf or badminton, which required repeated movement of the arm over the head, as the cause of their symptoms. Four patients suspected their occupation as shopkeeper, which required lifting heavy objects repeatedly, as the underlying cause. Only one subject who could recall a single traumatic event that led to the symptoms.

The decrease in VAS during the follow-ups was mostly significant, slightly earlier in the steroid injection group (day 2; p = 0.041) compared with the ultrasound group (day 3; p = 0.001) (figure 1). Significant increase in abduction ROM was achieved at the same rate (beginning at day 5) in both groups (figure 2). Significant increase in internal rotation ROM was achieved at day 9 in the ultrasound group (p = 0.043) but only seen at day 12 in steroid injection group (p = 0.044) (figure 3). There was no statistically significant increase in the external rotation ROM in both groups (figure 4). At the end of the second week, significant difference between the two groups was only shown in the abduction ROM, with slightly higher increase in the steroid group (table 2).

Figure 1 Daily evaluation of visual analog scale (VAS). Values shown are mean and standard deviation. Significant (p<0.05) decrease in VAS was observed at day 3, 4, 5, 9, 10, 11, and 12 in the ultrasound group and at day 2, 3, 4, 5, 8, 10, and 11 in the steroid injection group.

Figure 2 Evaluation of abduction range of motion (ROM). Values shown are mean and standard deviation. Significant increase (p<0.05) in abduction ROM was observed at day 5 and 9 in the ultrasound group and at day 5, 9, and 12 in the steroid injection group.
**DISCUSSION**

Most of the patients with rotator cuff tendinitis were female, and right shoulder was more commonly affected than left shoulder. These findings confirmed what has been stated in literature.8

Compared with the baseline levels, the decrease of VAS in the two groups were mostly significant. However, there was no significant difference between the two groups, which indicated that ultrasound therapy was as effective as local steroid injection in alleviating pain in patients with rotator cuff tendinitis. This result is similar with a study by Hay et al9 which involved patients with adhesive capsulitis.

There were significant increase of abduction ROM at day 5 and 9 in the ultrasound group and at day 5, 9, and 12 in the steroid group. The higher increase in the steroid group may be due to the direct infiltration of the steroid into the supraspinatus tendon. We performed ultrasonography to the patients and found that 83% had supraspinatus tendinitis. Since the supraspinatus muscle, together with the deltoid muscle, is the main muscle involved in the first 90° of abduction movement, this may explain the improvement seen in the group who received steroid injection.

Significant increase in internal rotation ROM was seen at day 9 in the ultrasound group and at day 12 in the steroid group. There was no significant difference between the two groups. There was also no significant difference in external rotation ROM between the two groups. While this may indicate similar effectiveness of both methods, it is also important to consider the limitation of this study such as the limited number of samples and that not all patients experienced all types of ROM limitation. Because steroid injection has more adverse effects, such as gastric ulcer, flushing, and dysfunctional uterine bleeding,10 ultrasound therapy may provide a safer alternative to steroid injection, particularly in patients to whom steroid injection was contraindicated.

**CONCLUSION**

The ultrasound and steroid injection showed comparable effectiveness in alleviating pain and improving ROM limitation in patients with rotator cuff tendinitis. Because of its less adverse effects, ultrasound therapy may be used as a safer alternative to steroid injection.

**REFERENCES**


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**Table 2**: Comparison of visual analog scale and shoulder range of motion (ROM) between the two groups at the end of the second week.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Ultrasound group (n = 15)</th>
<th>Steroid injection group (n = 15)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual analog scale</td>
<td>3.0 (1.3)</td>
<td>2.8 (1.7)</td>
<td>0.677</td>
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<tr>
<td>Abduction ROM</td>
<td>131.8 (37.9)</td>
<td>157.0 (29.6)</td>
<td>0.049</td>
</tr>
<tr>
<td>Internal ROM</td>
<td>55.7 (9.8)</td>
<td>61.5 (9.6)</td>
<td>0.078</td>
</tr>
<tr>
<td>External ROM</td>
<td>85.0 (14.0)</td>
<td>88.7 (3.5)</td>
<td>0.365</td>
</tr>
</tbody>
</table>

Unless otherwise specified, values are presented as mean (SD). Statistically significant results are in boldface.