Isometric Contractions Combined with Eccentric Contractions and Stretching Exercises on patient with subacromial impingement syndrome

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ABSTRACT

Many people with shoulder pain and disability have signs of subacromial impingement syndrome. The subacromial impingement syndrome of the shoulder is a general term, which is often used to describe pain and dysfunction in the area around the shoulder. The aim of the present report is to find the effect of isometric contractions combined with eccentric contractions and stretching exercises on a patient with subacromial impingement syndrome. A patient with subacromial impingement syndrome for 1 year was included in the case report. The patient followed an exercise program consisted of stretching exercises of shoulder muscles extensors, isometric contractions of shoulder extensors and eccentric exercises of shoulder extensors, 4 times per week. The exercise program was individualized according to pain and symptoms of the patient. Outcome measures were pain, pain rest, pain activity, pain night measured on a visual analogue scale (VAS), disability index (DASH score) and range of motion (Goniometer). The patient was evaluated at baseline and after 4 weeks. At the end of the program, there was a significant improvement pain, disability and range of motion. In this clinical case the patient was improved significantly in all outcome measures. Further studies based on better design, are needed to investigate the effect of those methods on a random population group with subacromial impingement syndrome.

Key Words: Subacromial impingement syndrome, Rotator cuff, Tendinopathy, Eccentric, Isometric, Stretching, Exercises
INTRODUCTION

Subacromial impingement syndrome (SIS) is an umbrella term, encloses many pathological causes, such as rotator cuff tendinopathy, long head of the biceps tendinopathy and subacromial bursitis [1]. SIS is an important cause of ill-health with a prevalence of 2-8% of the working people [2]. Shoulder pain occurs in patients at all ages and all physical activity levels [3]. SIS appears in 44-60% of all patients with shoulder pain in primary care [4, 5]. The shoulder pain occurs due to compression and mechanical friction of the rotator cuff and subacromial bursa against the anterior undersurface of the acromion and coracoacromial ligament at elevation of the brachial [1, 4, 6]. The clinical examination is conducted by the physiotherapist who performs various special tests [7]. The main symptoms, often described by patients, are pain in the shoulder joint, shoulder dyskinesia, difficulty in the upper activities and muscle weakness [8]. Treatment of the SIS usually treated conservatively and/or surgically in I and II degree friction [4]. When conservative treatment does not become effective and also, when there is III degree SIS, then the patient will need surgery [4].

CASE REPORT

HISTORY

Mr. A., a 70 year-old male, was a taxi-driver and showed pain in elevation, flexion and abduction. Furthermore, he showed pain in the middle of the brachial if he sleeps with his hand high above his head. He had pain on activities, but he did not stop his job. The symptoms started 1 year ago and the patient did not receive any medical/physiotherapy treatment. He did not have any previous problems in the spine, the shoulder or the peripheral joints. Even, he did not have cancer, thyroides, diabetes and cardiologic problems.

EXAMINATION FINDINGS

The posture of his body was good, but he had shoulder anterior protraction, such as head anterior protraction. He didn’t have swelling or others inflammatory signs.

The movements of the neck were pain free, in full range of motion. The movements of the right shoulder were tested passively, actively and under resistance. These movements were flexion, extension, adduction, abduction, external rotation and internal rotation both. The passive movements were painful with no full range of motion, but with normal end feel. The active movements were painful too, in
the end of range of motion. The Hawkins-Kennedy test, Neer test, Yocum test and painful arc of abduction and flexion of the shoulder (60-120°) were positive.,

TREATMENT

Patient followed a supervised exercise program, under a physiotherapist’s supervision, that included stretching exercises, isometric contraction and eccentric exercises (Table 1), for muscles of the rotator cuff. Static stretching exercises were repeated six times at each treatment session, three times before and three times after the exercises with a 30 second rest interval between each repetition. It was a self-stretching exercise with the patient in sideway posture, the brachial located in 90° abduction and internal rotation for external rotators’ muscles stretching of the right shoulder, using the healthy arm.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Set</th>
<th>Duration</th>
<th>Repetitions</th>
<th>Rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stretch</td>
<td>1</td>
<td>30 sec</td>
<td>6</td>
<td>30 sec</td>
</tr>
<tr>
<td>Isometric</td>
<td>3</td>
<td>7 sec</td>
<td>10</td>
<td>30 sec</td>
</tr>
<tr>
<td>Eccentric</td>
<td>3</td>
<td>20 sec</td>
<td>10</td>
<td>30 sec</td>
</tr>
</tbody>
</table>

Then, from the same patient position and the same brachial posture, the patient performed isometric contraction of external rotators against the physiotherapist, with 25-30% of his power. The isometric contraction lasted 7 seconds of 3 sets of 10 repetitions.

In addition, there was eccentric contraction, like the empty can test. In the beginning, it was carried out with red Thera-Band and the three finals sessions with gold Thera-Band. This exercise was for 3 sets of 10 repetitions, then the patient measuring 20 seconds during the eccentric contraction. The arm elevation was without elastic, during the concentric contraction, but and with helping healthy arm. Then, the brachial return was controlled, from the elastic Thera-Band eccentric.

At the end of the exercise program, the sleeper’s stretch carried out. Between the sets there was a rest for 30 seconds and between the exercises 1 minute.
METHODOLOGY

The patient was evaluated at the baseline (0 week) and at the end of the program exercises (after 4 weeks). Pain, pain rest, pain activity and pain night were measured on a visual analogue scale (VAS). 0 (cm) indicates no pain and 10 (cm) means the worst pain possible. Disability was measured on Disabilities of the Arm, Shoulder and Hand (DASH scale). Range of motion was measured with goniometer (°).

RESULTS

In the baseline evaluation the pain intensity was 5, pain rest was 4, pain activity was 8, pain night was 4 (Table 2), disability was 25.833 (Table 3), range of motion (Table 4) in flexion was 130° and pain at the end range flexion was 7, extension was 35° and pain was 3. Adduction was 60° and pain 5, abduction was 82° and pain 8, external rotation was 21° and pain 6 and internal rotation was 25° and pain 4. At the fourth week evaluation the pain intensity was 2, pain rest was 2, pain activity was 3 and pain night was 1. Disability was 4.17, range of motion, flexion was 142° and pain 3, extension was 41° and pain 1, adduction was 73° and pain 3, abduction was 93° and pain 3, external rotation was 31° and pain was 2 and internal rotation was 38° and pain was 2.

Table 2.

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th>Baseline (0 weeks)</th>
<th>Follow up (4 week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain¹</td>
<td>5/10</td>
<td>2/10</td>
</tr>
<tr>
<td>Pain rest¹</td>
<td>4/10</td>
<td>2/10</td>
</tr>
<tr>
<td>Pain activity¹</td>
<td>8/10</td>
<td>3/10</td>
</tr>
<tr>
<td>Pain night¹</td>
<td>4/10</td>
<td>1/10</td>
</tr>
</tbody>
</table>

¹Pain was measured on a visual analogue scale (VAS)

Table 3.

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Baseline (0 weeks)</th>
<th>Follow up (4 week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disability²</td>
<td>25,833</td>
<td>4,17</td>
</tr>
</tbody>
</table>

²Disability index was measured on Disabilities of the Arm, Shoulder and Hand (DASH scale)
Table 4.

<table>
<thead>
<tr>
<th>Motion(^1)</th>
<th>Degrees Baseline 4 weeks</th>
<th>Pain baseline(^2)</th>
<th>Pain at 4 weeks(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>130°</td>
<td>142°</td>
<td>7/10</td>
</tr>
<tr>
<td>Extension</td>
<td>35°</td>
<td>41°</td>
<td>3/10</td>
</tr>
<tr>
<td>Adduction</td>
<td>60°</td>
<td>73°</td>
<td>5/10</td>
</tr>
<tr>
<td>Abduction</td>
<td>82°</td>
<td>93°</td>
<td>8/10</td>
</tr>
<tr>
<td>External rotation</td>
<td>21°</td>
<td>31°</td>
<td>6/10</td>
</tr>
<tr>
<td>Internal rotation</td>
<td>25°</td>
<td>38°</td>
<td>4/10</td>
</tr>
</tbody>
</table>

\(^1\) Motion was measured with goniometer (degrees °)
\(^2\) Pain was measured on visual analogue scale (VAS)

DISCUSSION

The present study has looked at the effect of eccentric training of supraspinatus combined with isometric training of supraspinatus and static stretching exercises of external rotators of the shoulder in a patient experiencing subacromial impingement syndrome and its findings have demonstrated significant improvements in terms of pain and disability. Many studies, in the description below have showed significant improvement with exercises program, in patient with SIS. In protocols exercises, there was usually, main use of strengthening and stretching exercises, of rotator cuff muscles, but also, scapula muscles [9-11]. In reported studies it was not given a precise description of the types of strengthening exercises. In another study, it was given isometric and concentric-eccentric contraction of rotator cuff muscles [4, 17,19]. In addition, it was given isotonic exercises, particularly eccentric exercises [12-16], stretching exercises [12, 14-15] and isometric exercises [13].

Most studies used isometric, concentric-eccentric and stretching exercises for treatment tendinopathies. Moreover, in the lateral elbow tendinopathy [20, 21] and in patella tendinopathy the most popular protocol exercises are eccentric contraction and stretching exercises [22,23]. In Achilles tendinopathy, eccentric and stretching exercises were used [24]. All studies marked an important improvement of the patients using the exercises mentioned above.
CONCLUSION

The exercise program showed a significant improvement in subacromial impingement syndrome, reducing pain, function and range of motion. However, this study showed an efficacy in these exercises in short term (4 weeks). Further well-designed trials are needed to confirm the results of the present case report.

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