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Muscle shortening manoeuvre and not topical anti-inflammatory therapy is effective in reducing the width of subacromial-subdeltoid bursa in shoulder impingement syndrome

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ABSTRACT

Aim of the study was to compare the efficacy of a muscle shortening manoeuvre (MSM) with the efficacy of a topical NSAID (flurbiprofen) in patients with subacromial impingement syndrome (SIS). The effects of these therapies were evaluated by sonographic exam (US). SIS was diagnosed by US in 78 patients with painful shoulder. Thirty patients (first group) were treated with topical flurbiprofen for 15 days. Forty-eight patients (second group) were treated with MSM, which was performed once. The shoulder was analyzed in all patients by US before and after treatment. Before treatment and 15 days after treatment, pain by Visual Analogue Scale (VAS), range of motion (ROM) and Neer's Test were evaluated. Pain was decreased by both treatments. In only 8 patients of the first group, the encroachment of acromion into the rotator cuff was no more detectable by US after the treatment; ROM increased ($> 45^\circ$) only in 11 patients (36%) and the width of subacromial-subdeltoid bursa (SSB) was not significantly reduced. At variance with the results obtained in the first group, in all patients of the second group the encroachment of acromion was no more detectable by US, ROM increased ($> 45^\circ$) and the width of SSB was significantly reduced after the manoeuvre. Both topical flurbiprofen and MSM were helpful in pain control, but better results, with decrease of width of SSB assessed by US, were obtained by MSM.

Keywords: shoulder impingement syndrome, sonographic exam, muscle shortening manoeuvre, topical flurbiprofen

1. INTRODUCTION

Subacromial impingement syndrome (SIS) is a frequent cause of painful shoulder¹. It involves the rotator cuff tendons and the subacromial-subdeltoid bursa (SSB) and is characterized by a compression of the rotator cuff tendons in subacromial space. Rotator cuff tendons may be damaged by acute or chronic inflammation and by calcifications phenomena. SSB may be involved by inflammation and may also induce compression on supraspinatus tendon. Many therapies have been proposed and used for the treatment of SIS: non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, different modalities of physical therapy and surgical interventions, such as subacromial decompression. NSAIDs are commonly used as the first step of therapy in general medical practice without evidence of efficacy². The use of topical NSAIDs may avoid well known adverse effects and induce a focused therapeutic action on the shoulder³. Physiotherapeutic techniques, above all exercise therapy and joint mobilizations, could induce good therapeutic effects in patients with SIS⁴⁻⁷. Haar *et al*⁷ reported that the results of surgical subacromial decompression were not better than those of physiotherapy. It has been suggested that SIS may be a consequence of an unbalanced action of shoulder muscles with loss of central position of the humeral head^{1,8,9}. Among physiotherapeutic techniques, muscle shortening manoeuvre (MSM)¹⁰⁻¹² is a useful technique that can induce the stabilization and balance of the

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shoulder by increasing muscle strength in patients with SIS. The diagnosis of SIS is now usually performed by sonographic exam (US) which allows a careful evaluation of the different structures involved (tendons, ligaments, muscles, bursae and joints)¹³⁻¹⁵. US may also be useful to evaluate the effects of therapies.

The first aim of the present study was to compare the efficacy of MSM with the efficacy of topical therapy with NSAIDs in patients with SIS by evaluating the results with both clinical assessment and US. The second aim was to investigate whether the clinical effects of therapies, above all pain relief, were related to an improvement of sonographic findings.

2. PATIENTS AND METHODS

The study group included 78 outpatients (48 males and 30 females, mean age \pm SD: 58.6 \pm 13.91) with SIS. In all patients the diagnosis of SIS was performed by US showing an encroachment of acromion into the rotator cuff and a protrusion of coracoacromial ligament in extrarotation of the shoulder. Patients were divided in two different groups. Thirty patients (first group) (mean age \pm SD: 56.14 \pm 14.95) were treated with topical therapy with NSAIDs, i.e. a plaster containing flurbiprofen 40 mg applied twice a day for 15 days. Forty-eight patients (second group) (mean age \pm SD: 61.25 \pm 12.58) were treated with MSM, performed only once.

MSM was introduced by Grimaldi *et al.*^{10,11}: a series of fast accelerations is applied to the upper limb in the upward direction while the limb is also subjected to forces acting in the opposite direction¹⁰⁻¹². MSM provokes a dynamic lengthening associated with sudden shortening of the muscles responsible for protraction and retraction of the shoulder girdle. The subject is lying supine and the upper limb is lifted with the elbow extended. The subject's hand (fist closed) is connected to a spring through a metal plate equipped with a ring and connected to a pulley system. A weight of 2 Kg is applied using an elastic belt positioned around the shoulder. A physiotherapist acting on a rope induces oscillations of the system provoking excursions of 6 cm along the main axis of the arm with a frequency of 2 Hz. The manoeuvre lasts ten minutes.

In the present investigation the shoulder was analyzed in all patients by US (MyLab 70, ESAOTE with a linear probe 6-18 MHz) before and after treatment (in the first group after the treatment lasting fifteen days and in the second group immediately after MSM). Five tendons (supraspinatus, teres minor, infraspinatus, subscapularis and biceps long tendon), SSB, the acromioclavicular joint, the coracoacromial ligament and the glenoid cavity were studied. Before and after treatment, pain intensity was assessed by the Visual Analogue Scale (VAS), the range of motion (ROM) was evaluated and Neer's Test was performed in all patients.

2.1 STATISTICAL ANALYSIS

One way ANOVA for independent samples was used. The probability (*P*) values of less than 0.05 were considered significant. Sonographic findings, pain intensity and Neer's test values observed before and after the treatment were compared in the two groups of patients.

3. RESULTS

The changes of VAS, Neer's test and width of SSB induced by both treatments are shown in table 1.

Table 1. Changes of clinical and instrumental findings in both groups of patients

Clinical and Instrumental Findings	Treatment with topical NSAID						Treatment with MSM					
	VAS (cm)		Neer's Test (°)		Width of SSB (mm)		VAS (cm)		Neer's Test (°)		Width of SSB (mm)	
	before	after	before	after	before	after	before	after	before	after	before	after
Mean ± SD	8,7±0,80	3,4±1,05	149,1±6,44	158,8±7,06	2,7±0,75	2,6±0,63	5,5±1,96	1,4±0,97	150,3±5,88	161,1±8,09	2,7±0,60	1,4±0,29
<i>P</i>	ns		ns		Ns		<0,05		<0,001		<0,05	

In the first group a hypochoic halo around biceps long tendon was observed by US before and after treatment: the width of the halo did not change in all patients. Also the width of acromioclavicular joint did not change after the treatment. In only 8 patients the encroachment of acromion into the rotator cuff and the protrusion of coracoacromial ligament were no more detectable by US after the treatment. Before the treatment ROM was <45° in all patients. After the treatment ROM increased (> 45°) only in 11 patients (36%). No changes of the other tendons and of SSB (fig. 1) were observed after the treatment.

In all patients of the second group the hypochoic biceps long tendon halo, the encroachment of acromion and the protrusion of coracoacromial ligament were no more detectable by US after the treatment. The width of acromioclavicular joint was reduced as observed in a previous study¹². ROM increased (> 45°) in all patients. The width of SSB was significantly reduced after the manoeuvre (fig. 2).

4. DISCUSSION

The results of the present investigation confirmed the efficacy of MSM in the treatment of SIS as demonstrated in a previous study¹². The efficacy of MSM was shown by the relief of pain, the improvement of ROM, the disappearance of Neer's sign and the improvement of sonographic findings. As regards sonographic findings, the most interesting result is the decrease of the width of SSB induced by MSM. The effects of MSM were compared with another kind of therapy, i.e. a plaster containing flurbiprofen¹⁶. Better results were obtained by MSM especially on pain and on pathologic changes of tendons and SSB detected by US. Above all it must be noted that the width of SSB was greatly reduced after MSM if compared to the effect of topical flurbiprofen. This result may be explained by considering that MSM determine the increase of muscle strength with a neuromuscular reassessment inducing a recovery of normal muscle action and stabilization of the shoulder function. The better effects of MSM on sonographic findings, in particular the decrease of width of SSB, are an unexpected result if compared with the effects of topical therapy with flurbiprofen. While pain relief is obtained both by MSM and by topical therapy with NSAIDs, the decrease of width of SSB is observed only after MSM. The mechanism that underlies this decrease is not clear. Our hypothesis is that this finding may be related to a redistribution of fluids consequent to the neuromuscular reassessment induced by the manoeuvre.

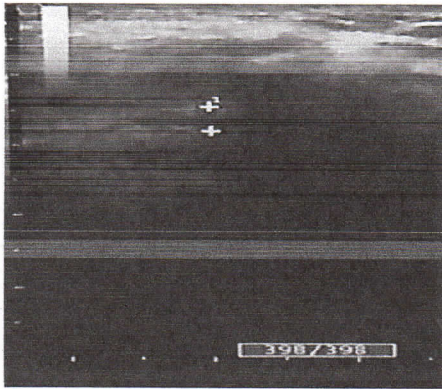


Fig 1 a)

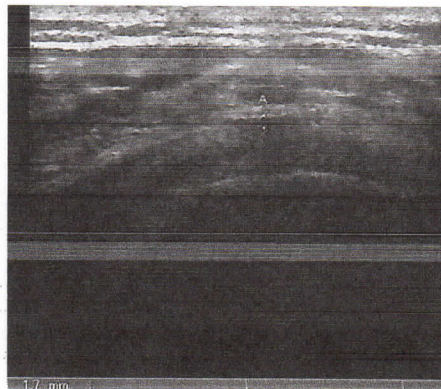


Fig. 1 b)

Fig.1: SSB width assessed by US before (a) and after MSM (b). The calipers show SSB width in millimeters: in (a) 3.5 mm; in (b) 1.7 mm.

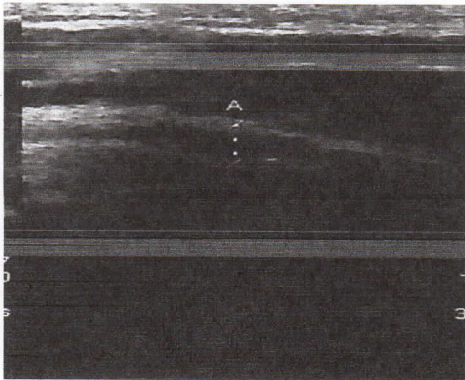


Fig. 2 a)

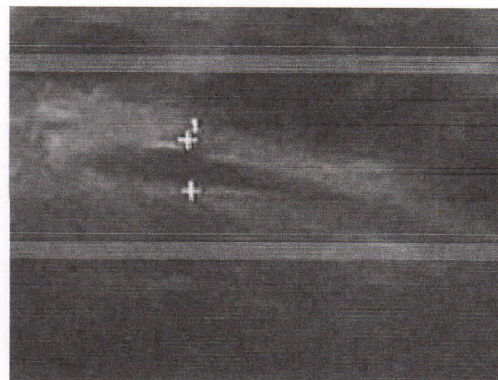


Fig. 2 b)

Fig. 2: SSB width assessed by US before (a) and after topical flurbiprofen (b). The calipers show SSB width in millimeters: in (a) 3.2 mm; in (b) 3.0 mm.

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