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The efficiency of the conventional physical treatment of the shoulder pain compared to conventional treatment plus the Mulligan's joint mobilization technique and acupuncture

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ABSTRACT

Introduction: Shoulder pain is the most common form of extra-articular rheumatism. We aimed to determine the efficiency of the conventional physical treatment of the shoulder pain compared to the conventional treatment plus the Mulligan's joint mobilization technique and acupuncture.

Methods: We included a total of 277 patients with the shoulder pain c aused by adhesive capsulitis (frozen shoulder), calcific tendinitis, rotator cuff syndrome, or the tendinitis of the biceps muscle. We used clinical and radiological diagnostic criteria to make the diagnosis. Patients were assigned into group treated with conventional physiotherapy treatment during 10 days (CP) (n = 148), and the group treated with conventional physiotherapy treatment plus the Mulligan joint mobilization and acupuncture (CP+MA) (n = 128). Treatment efficiency was evaluated by assessing the status of the patients before and after the treatment with the work abilities and activities of daily living (WAADL) scale as well as the treatment success scale.

Results: Mean treatment duration was 13.36 ± 5.83 and 10.86 ± 4.55 days in CP and CP+MA group, respectively ($p < 0.05$). Mean WAADL scores after the treatment were 3.98 ± 1.04 and 4.61 ± 1.10 in CP and CP+MA group, respectively ($p < 0.05$). Mean treatment success score was 3.16 ± 0.74 and 4.35 ± 0.78 in CP and CP+MA group, respectively ($p < 0.05$).

Conclusion: Conventional physical therapy plus the Mulligan's joint mobilization technique and acupuncture resulted in shorter treatment duration and higher WAADL and treatment success scores in patients with shoulder pain.

Key words: Painful shoulder; physical treatment; shoulder mobilization

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INTRODUCTION

One of the most prevalent rheumatic diseases is extra-articular rheumatism, most commonly affecting the shoulder region (1,2). The pain in the shoulder or shoulder region is highly prevalent in

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the general population ranging between 15% and 20% in patients aged between 45 and 50 years (3,4). Shoulder pain may be caused by a number of reasons, among which the most common are adhesive capsulitis (frozen shoulder), rotator cuff syndrome, tendinitis of the biceps muscle, calcific tendinitis, impingement syndrome, and shoulder bursitis.

Calcific tendinitis is a condition characterized by the formation of calcium deposits in the tendons, most commonly in the supraspinatus tendon. The formation of calcium deposits may be caused by mechanical simulation or repeated and long-lasting microtrauma. It causes pain which is aggravated when activating the shoulder joint (5). Along with the impingement syndrome and rotator cuff injuries, it makes one of the most common orthopedic shoulder conditions, with females affected more frequently than males. In 1% of cases, it occurs combined with the rotator cuff injury, while it affects the supraspinatus, infraspinatus, and subscapularis muscle tendon in 80%, 15%, and 5%, respectively. Pain associated with the long head of the biceps brachii has been recognized in the past several years as an issue causing a severe disorder of the shoulder function. Abnormal changes in the biceps brachii tendon are often associated with the damaged rotator cuff (6,7).

Frozen shoulder (stiff shoulder, adhesive capsulitis) is a condition characterized by the painful and weakened shoulder, whereby the normal range of shoulder movements is reduced, occurring in 2-5% of the population worldwide, more often in women. The joint gradually becomes stiff or frozen, hence, the names stiff and frozen shoulder. The condition occurs gradually, which often makes patients unaware of the magnitude of the issue as well as the degree of movement reduction. It most commonly occurs in the age of 50 and 60, but it may develop at any age (5,8).

The rotator cuff injury may be caused by the impingement syndrome, a trauma, or a repeated monotonous movement. The injury may be small and diffuse, as well as in the form of a minor or greater partial rupture. In about 75% of cases, it affects the supraspinatus muscle tendon which initiates abduction of the arm (9). According to some authors, anatomical explanation of the rotator cuff collision with acromion is insufficient to explain the pathology of the condition. Therefore, subacromial pain syndrome is more commonly used term that better defines the condition (10).

Impingement syndrome is a common condition caused by the repeated and frequent impingement of soft tissues between the humeral head and the overhead arc (11). It occurs when the bursa and the associated part of the rotator cuff become inflamed. Historically, it was believed that it occurs when the acromion compresses the rotator cuff tendons. However, the evidence shows that impingement syndrome is not an isolated shoulder condition that can be easily diagnosed in clinical trials (12,13).

The most common form of bursitis is subacromial bursitis caused by inflammation of the bursa located on the upper surface of the supraspinatus tendon, separating it from the overlying coracoacromial ligament and the acromion (14). In some cases, the bursa may become inflamed and grow to the size of a tennis ball. It is caused by the shoulder injury during falls, inflammation of the surrounding tendons, or frequently repeated movements of overhead activities of lifting arms. Bricklayers, electricians, volleyball, handball, and tennis players are at higher risk of developing such condition (5).

Often, shoulder gets injured in competitive sports. About 8-13% of sports injuries affect the shoulder. Shoulder disorders may cause significant disability and affect everyday life activities such as dressing up, personal hygiene, nutrition, and work. Furthermore, shoulder pain is commonly associated with a sleep disorder, thus affecting the mood and concentration. Some studies have shown the prevalence of aggressive shoulder pain followed by persistent pain and disability lasting between 12 and 18 months in up to 50% cases (15).

The prevalence of shoulder pain in the general population varies from 7% to 36% (3). Some studies report increasing prevalence with age, while others report peak incidence between 56 and 60 years (16,17). The conditions causing shoulder pain are frequent and considerably contribute to the musculoskeletal morbidity of the population. In Australia, shoulder pain interventions make 1.2% of all general interventions (17). The Dutch general practice reports the prevalence rate of shoulder pain at 11.2 in 1000 registered patients per year (15).

The Mulligan concept is a new method of the treatment of muscle, joint, or tendon pain focusing on correcting altered movement patterns by mobilizing joints during active movement. Acupuncture involves the insertion of very thin needles through the skin at strategic points on a body. It is commonly used to treat pain. Increasingly, it is being used for overall wellness, including stress management.

This study aimed to determine the efficiency of the conventional physical treatment of the shoulder pain compared to conventional treatment plus the Mulligan's joint mobilization technique and acupuncture.

METHODS

Patients

We included a total of 277 consecutive patients from two institutions, from January 2013 to December 2016. Shoulder pain was diagnosed by the physical medicine specialist based on medical history and extensive physical examination, including inspection, palpation, range-of-motion testing, provocative, and instability testing. Diagnostic imaging was used in cases when necessary to exclude the differential diagnoses. Patients with upper extremity sensorimotor disturbances, neck and elbow injuries were excluded from the study, as well as patients who dropped the treatment or were lost for follow-up. Patients were assigned into two groups based on the treatment received. The first group received conventional physiotherapy for 10 days (Group CP) (n = 148), while the second group received the same conventional physiotherapy protocol plus the Mulligan's joint mobilization technique and acupuncture (Group CP+MA) (n = 129). In the *post hoc* analysis, groups were stratified by a specific condition, i.e., adhesive shoulder capsulitis, rotator cuff syndrome, and calcific shoulder tendinitis.

Physical therapy protocols

CP group was treated by conventional physical treatment for shoulder pain, which lasted for 10 days and included physiotherapeutic procedures such as ultrasound, transcutaneous electrical nerve stimulation, interferential current stimulation, manual massage, cryomassage or hot pack, as well as kinesiotherapy procedures including pendular exercises, and active and actively assisted exercises for the upper extremities, stick exercises, and rotation wheel exercises.

CP+MA group was treated with the same conventional physiotherapy treatment as CP group plus the Mulligan's mobilization exercises and acupuncture.

Efficacy assessment

Before the therapy, we used the work abilities and activities of daily living (WAADL) scale to assess the patients (18) and gave the following scores: (0) Incapable of performing ADLs dependent on other people's assistance; (1) permanently incapable of working, capable of performing ADLs; (2) temporarily incapable of working; (3) capable for performing ADLs with limited working abilities; (4) additional training and retraining required; and (5) capable of working and performing ADLs.

Treatment assessment (18) was done by giving a score: (0) Unchanged status (no treatment results); (2) minimum improvement; (3) satisfactory functional improvement including sequelae (sensory and motor); (4) significant improvement and satisfactory functional restitution with minimum sequelae; and (5) significant restitution with no sequelae or an injury.

Statistical analysis

SPSS version 19.0 was used to analyze the data. We used descriptive statistics to present the arithmetic means and proportions, and Mann–Whitney U-test to compare the means between groups. $p < 0.05$ was considered statistically significant.

RESULTS

We recorded the WAADL score for each patient before the initiation of therapy protocols and after the completion of the protocol. In both groups, we performed a stratification of patients and *post hoc* analysis according to specific diagnosis encompassed in the painful shoulder syndrome.

In the group of patients with adhesive shoulder capsulitis, there were no statistically significant differences in pre-treatment versus post-treatment WAADL score. Furthermore, no significant

difference was observed in the treatment success score between CP and CP+MA group (Table 1).

Similarly, in the group of patients with rotator cuff syndrome, no significant differences were found in pre-treatment versus post-treatment WAADL score, as well as treatment success score between CP and CP+MA group (Table 2).

In patients with tendinitis of biceps muscle, a significant difference in pre-treatment versus post-treatment WAADL score was found in CP+MA group ($p < 0.05$). Furthermore, differences in mean treatment success score between CP and CP+MA groups were significant ($p < 0.05$) (Table 3).

Patients with calcific shoulder tendinitis showed significant WAADLL score reduction pre- versus post-treatment. Furthermore, the treatment success score was significantly different between CP and CP+MA group (Table 4).

TABLE 1. Adhesive capsulitis: Condition of respondents in the study groups

Parameters	CP group n (%)	CP+MA group n (%)	*p*
Sex			
Male	7 (37.5)	3 (23.1)	
Female	15 (62.5)	10 (76.9)	
Age (years)	55.54±9.41	59.61±12.97	
Treatment duration (days)	12.54±2.11	13.43±3.42	*p*>0.05
WAADL score			
Pre-treatment	2.84±0.41	4.38±0.86[b]	
Post-treatment	2.96±0.83	4.12±0.62[b]	
Treatment success score	3.93±0.44	4.00±0.0	*p*>0.05

WAADL: Work abilities and activities of daily living, [b]*p*>0.05

TABLE 2. Rotator cuff syndrome: Condition of respondents in the study groups

Parameters	CP group n (%)	CP+MA group n (%)	*p*
Sex			
Male	5 (35.71)	10 (58.82%)	
Female	9 (64.29)	7 (41.18%)	
Age (years)	52.78±10.13	49.29±10.06	
Treatment duration (days)	13.07±4.63	11.41±2.20	*p*>0.05
WAADL score			
Pre-treatment	3.35±0.77	4.65±0.74[b]	
Post-treatment	3.14±0.84	4.07±0.89[b]	
Treatment success score	4.07±0.89	4.53±0.60	*p*>0.05

WAADL: Work abilities and activities of daily living. [b]*p*>0.05

Overall, treatment success score was higher in patients in CP+MA group, and this difference was statistically significant ($p < 0.05$) (Table 5).

TABLE 3. Tendinitis of biceps muscle: Condition of respondents in the study groups

Parameters	CP group n (%)	CP+MA group n (%)	*p*
Sex			
Male	4 (50.0)	3 (36.36)	
Female	4 (50.0)	8 (63.64)	
Age (years)	48.25±2.97	50.84±3.14	
Treatment duration (days)	15.12±3.31	10.50±3.45	*p*>0.05
WAADL score			
Pre-treatment	3.12±0.93	4.61±0.63[a]	
Post-treatment	3.00±0.00	3.62±0.72[a]	
Treatment success score	3.77±0.52	4.30±0.61	*p*<0.05

WAADL: Work abilities and activities of daily living, [a]*p*<0.05

TABLE 4. Calcific shoulder tendinitis: Condition of respondents in the study groups

Parameters	CP group n (%)	CP+MA group n (%)	*p*
Sex			
Male	2 (14.29)	10 (76.92)	
Female	7 (85.71)	3 (23.08)	
Age (years)	55.57±12.11	48.38±5.89	
Treatment duration (days)	12.36±6.15	10.84±4.24	*p*>0.05
WAADL score			
Pre-treatment	3.38±1.16	4.85±1.01[a]	
Post-treatment	2.86±0.32	3.50±0.91[a]	
Treatment success score	3.43±0.72	4.46±0.51	*p*<0.05

WAADL: Work abilities and activities of daily living, [a]*p*<0.05 between groups

TABLE 5. Shoulder pain: Condition of respondents in the study groups

Parameters	CP group n (%)	CP+MA group n (%)	*p*
Age	59.97±12.73	50.86±8.25	
Treatment duration (days)	13.36±5.83	10.86±4.55	
Post-treatment status of respondents	3.98±1.04	4.61±1.10	*p*<0.05
Treatment success score	3.16±0.74	4.35±0.78	*p*<0.05

WAADL: Work abilities and activities of daily living

DISCUSSION

We investigated the efficacy of conventional physical medicine treatment versus conventional physical medicine treatment complemented with Mulligan's joint mobilization technique and acupuncture. We found that a subgroup of patients with tendinitis of biceps muscle and calcific shoulder tendinitis had increased benefit from conventional protocol complemented with Mulligan's joint mobilization and acupuncture, as shown by the significantly higher treatment scores and WAADL. At the same time, subgroups with adhesive shoulder capsulitis and rotator cuff syndrome showed no benefit from the complementing Mulligan's joint mobilization and acupuncture. Nevertheless, overall treatment score and WAADL were significantly higher for the group treated with complementing protocol.

In a study by Bang et al., mobilization and therapeutic exercises combined had better effects than exercises alone in patients with minor injuries of the rotator cuffs, but not in patients with adhesive capsulitis (7). The results of our study were similar, as we did not find complementing protocol beneficial for patients with adhesive capsulitis and rotator cuff syndrome. In a study by Diercks and Stevens, 77 patients with frozen shoulder syndrome were subjected to intensive physical rehabilitation treatment, including passive stretching and mobilization, versus the group with supportive therapy and exercises within the pain limits. Patients were followed up for 24 months after the treatment had been initiated. A total of 89% of the patients provided with supportive therapy and dosed exercises had normal or near-normal painless shoulder function at the end of the observation period, while only 63% of patients receiving the intense physical rehabilitation with mobilization reached the same normal painless shoulder function (15). The results of this study show that a moderate treatment and less difficult exercises yield better results than the intense rehabilitation with mobilization in patients with frozen shoulder. Conroy and Hayes compared two groups of patients with rotator cuff syndrome in their study. The first group had a mild joint mobilization. At the end of the study, the mobilization group showed a significant improvement compared to the non-mobilization group of patients, within the first 24 h (16). Our study also showed that the treatment of patients in CP+MA has been significantly effective than the one in CP, where the mobilization method was not applied. Yiasemides et al. included 98 patients with shoulder pain caused by tendinitis of biceps muscle and with minimal movement restrictions. The patients were assigned to a control group receiving only exercises to restore neuromuscular shoulder control, and the group receiving the same exercises with the addition of passive mobilization of the shoulder joint (17). This randomized controlled clinical trial reported that mobilization and exercises are more effective than exercises alone, which was also shown in our study. Mandić et al. reported high efficacy of outpatient 14-day physical treatment, consisting of physical agents and kinesiotherapy procedures, in 62 patients with painful shoulder syndrome (19). In a study on 424 patients by Albrecht et al., acupuncture significantly improved the outcome of the patients. The patients were followed for 3 months after the treatment and had significant improvements of movement and reduced pain in the shoulder joint (20). These results were in concordance with our study results.

CONCLUSION

We conclude that the conventional physical treatment of the shoulder pain complemented with Mulligan's joint mobilization and acupuncture may be more beneficial to patients with tendinitis of biceps muscle and calcific shoulder tendinitis than conventional physical therapy treatment alone. Nevertheless, patients with adhesive capsulitis and rotator cuff syndrome may not benefit from Mulligan's joint mobilization and acupuncture.

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