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Management of Adhesive Capsulitis in Physical Medicine and Rehabilitation Department: A Comparative Study

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Abstract

Objective: This study aimed to compare the outcome of two different populations, diabetes mellitus (DM) patients with adhesive capsulitis of the shoulder (ACS) and those with idiopathic ACS undergoing rehabilitation treatment.

Methods: A retrospective study was carried out between January 2005 and December 2016 in Physical Medicine and Rehabilitation (PMR) Department including patients diagnosed with ACS divided into two groups: diabetic ACS (G1) and idiopathic ACS (G2) (N=166 patients with 177 ACS). Both groups were evaluated before and after 3 months of a conventional physical therapy program. Epidemiological characteristics were gathered. Pain was measured with a visual analog scale (VAS), abduction and external rotation (ER) range of motion (ROM) with goniometry and internal rotation with hand behind back (HBB). Functional disability was assessed by the Constant modified score and general satisfaction by a Likert verbal scale.

Results: The mean age was 56 ± 7.3 years for G1 and 57 ± 10.6 years for G2. The sex ratio was respectively 1.25 and 0.47 for G1 and G2. A statistically significant improvement was noted in pain, ROM, and the modified Constant score after 3 months of treatment ($p<0.05$) as well as a general satisfaction in both groups. This improvement was significantly better in G2 than G1.

Conclusion: This study suggests that rehabilitation care is beneficial among population suffering from ACS with better results for the idiopathic one. This care should be early and regular with a balance in the diabetic in order to ensure a better response of the treatment.

Keywords: Shoulder; Bursitis; Diabetes mellitus; Rehabilitation; Comparative study

Introduction

Adhesive capsulitis of the shoulder (ACS), also referred to as frozen shoulder, is a common disabling but self-limiting condition from progressive fibrosis and ultimate contracture of the glenohumeral joint capsule. The condition is associated with pain, limited range of motion (ROM), sleep deprivation, anxiety, and disability that may be hugely disruptive and impact nearly every aspect of daily living and occupational activities of an individual [1-5]. The etiology is classified as primary (idiopathic) and secondary (diabetes, post-traumatic or post-surgical, cervical radiculopathy, thyroid disorder, myocardial infarction) [6]. Preferentially women 30–60 years old are affected, but it can occur in patients of any age [7]. The prevalence of primary adhesive capsulitis is reported to affect 2% to 5.3% of the general population and secondary adhesive capsulitis related to diabetes mellitus (DM) is reported to be between 4.3% [8]. The mean age of onset for capsulitis in diabetic patients is lower than in the general population, the duration of the disease is longer and the response to treatment is lower. Bilateral involvement is seen more among diabetics [9].

Many physical therapy and home exercises can be used as a first-line treatment for adhesive capsulitis [10]. Physical therapy has been shown to bring about pain relief and return of functional motion [11]. Passive mobilisation and capsular stretching are two of the most commonly used techniques [12].

Previous data only suggested some differences between diabetic and idiopathic ACS [13]. Therefore, it is of importance to compare the outcome in both ACS types. This study aimed to compare the outcome including pain, ROM and function of two different populations, DM patients with ACS and those with idiopathic ACS undergoing rehabilitation treatment.

Materials and Methods

Patients

Patients enrolled, in this study, followed for ACS in the PMR Department. Patients were divided into two groups: idiopathic ACS and diabetic ACS. Subjects were included if they had pain, stiffness, and limitation of passive shoulder external rotation, abduction, and internal rotation of more than 50% compared with the opposite side [14]. We excluded patients presented with other cause of ACS: stroke, trauma or subsequent immobilization, an associated rupture of the

rotator cuff or a glenohumeral arthropathy based on clinical and radiological investigations.

All participants gave oral consent for the study.

Methods

We carried out a retrospective study between January 2005 and December 2016 including 166 patients with 177 ACS. The first group (G1) was composed of 97 DM patients with 104 ACS. The second one (G2) included 69 patients diagnosed with 73 idiopathic ACS.

Patients were asked about their occupation, dominant arm, medical history, DM history (chronicity, type, and complications), affected arm, medical treatment, time when they started to experience the discomfort when moving the arm, and consultation delay.

Assessments were made at baseline (before the first treatment session) and after 3 months of physical therapy.

For assessing pain during shoulder joint movement, subjects used a visual analog scale (VAS) [15]. The reliability of this test was reported to be 0.94 for literate and 0.71 for illiterate patients [16].

In the present study, active and passive abduction (in the frontal plane) and external rotation (with the arm at 0 degrees of abduction) ROM was measured with a conventional goniometer as per the guidelines given by the American Academy of Orthopaedic Surgeons [17]. Goniometric measurements are highly reliable provided measurements (test-retest reliability: 0.94–0.98) [15,18].

Hand behind back (HBB) reach was measured in centimeters using inch tape with subjects in the standing position to assess the internal rotation. They were instructed to achieve the maximum HBB reach position by moving their affected extremity upwards and towards the midline with the thumb extended. In this position, the distance between the C7 spinous process and the thumb was measured.

Functional disability was measured with the Modified Constant score [19]. This score included pain evaluation, daily functional capacity and active joint amplitudes of shoulder without pain. The total score is 75 points (appendix).

Therapeutic protocol included corticosteroid injection and rehabilitation. The conventional physical therapy treatment for ACS was administered in both groups. It included one daily rehabilitation session during one month followed by 3 sessions weekly during two months.

Patients benefitted from learning pain-relieving techniques. These exercises included gentle shoulder mobilisation exercises within the tolerated range for 20 minutes (e.g. pendulum exercise, passive supine forward elevation, passive ER, and active assisted range of motion in extension, horizontal adduction, and internal rotation). A heat or ice pack was applied for 10 minutes as a modality to relieve pain before the start of these exercises. Stretching exercises for the chest muscles and muscles at the back of the shoulder were performed for 15 minutes. The application of moist heat in conjunction with stretching has been shown to improve muscle extensibility [20]. Strengthening exercises (15 minutes) based on isometric or static contractions were added to maintain muscle strength. Patients were advised to practice home exercises (3 sessions per week) [21].

General satisfaction was assessed using a Likert verbal scale in 4 stages from 0 to 3:

Stage 0: not satisfied, Stage 1: not much satisfied, Stage 2: satisfied, Stage 3: very satisfied

Statistical analysis

Statistical analysis was performed using the statistical software SPSS 20.0. Kolmogorov-Smirnov Test was used to check non-parametric variables. To assess follow-up outcome in each group, we used Wilcoxon test for comparison of non-Gaussian quantitative variables in the univariate analysis of matched samples. In order to compare baseline parameters and follow-up outcome between the two populations, we performed the Mann-Whitney U-test for non-Gaussian quantitative variables and binary qualitative variables. A significance level of less than 5% was used for all statistical tests with a confidence interval of 95%.

Results

The two groups were comparable according to epidemiological characteristics ($p<0.05$). Idiopathic ACS was significantly more common among women than diabetic ACS ($p=0.009$). At baseline, the VAS scores of the two groups were statistically similar ($p>0.05$). No significant difference between the groups was observed at baseline in abduction and ER mobility ($p>0.05$). The values of HBB reach in the two groups were statistically identical at baseline ($p>0.05$). The Constant modified scores were also statistically similar at baseline (Table 1).

Subject characteristics	G1	G2	p
Age (years)	55 ± 6.4	57 ± 9.6	NS
BMI	27.34 ± 3.7	26.68 ± 2.9	NS
Sex ratio	1.25	0.47	0.009**
Dominant arm	91 right	64 right	NS
Affected arm	81 right, 9 left, 7 bilateral	60 right, 5 left, 4 bilateral	NS
Occupation	35 sedentary, 62 manual	26 sedentary, 43 manual	NS
Symptoms duration (months)	4. 41 ± 1.50	5.17 ± 1.47	0.001**
VAS	71.34 ± 17.77	75.26 ± 13.58	NS

Shoulder abduction	97.33 ± 32.22	95.89 ± 35.67	NS
Shoulder ER	13.84 ± 10.26	13.83 ± 9.55	NS
HBB	54.57 ± 4.66	54.12 ± 6.26	NS
Constant modified score	31.60 ± 6.82	29.87 ± 8.33	NS
BMI: body mass index; NS: non-significant; **: p<0.01			

Table 1: Comparison of baseline characteristics of patients with idiopathic ACS and diabetic ACS groups.

All patients had analgesics and underwent physiotherapy. Intra-articular corticosteroid injections were administered for both G1 and G2 patients respectively in and 68.3% and 94.5% of cases. By the end of the treatment, a significant decrease in pain was observed in both groups (p<0.001). For all movements, ROM increased significantly from baseline to final treatment session in both groups (p<0.05). Moreover, there was a significant improvement in HBB reach after the treatment in both groups (p<0.001). The Constant modified scores increased significantly after the treatment (p<0.001) in both groups (Tables 2 and 3).

Variables	At baseline	After treatment	p
VAS	71.34 ± 17.77	31.32 ± 11.66	<0.001**
Shoulder abduction	97.33 ± 32.22	146.4 ± 12.6	<0.001**
Shoulder ER	13.84 ± 10.26	27.52 ± 13.39	<0.001**
HBB	54.57 ± 4.66	47.29 ± 8.22	<0.001**
Constant modified score	31.60 ± 6.82	50.31 ± 10.07	<0.001**
**: p<0.01			

Table 2: Comparison of baseline outcome and 3-month outcome of G1.

Variables	At baseline	After treatment	p
VAS	75.26 ± 13.58	17.79 ± 14.21	<0.001**
Shoulder abduction	95.89 ± 35.67	171.9 ± 7.7	<0.001**
Shoulder ER	13.83 ± 9.55	34.82 ± 13.53	0.038*
HBB	54.12 ± 6.26	45.46 ± 8.18	<0.001**
Constant modified score	29.87 ± 8.33	55.86 ± 8.23	<0.001**
*: p<0.05,**: p<0.01			

Table 3: Comparison of baseline outcome and 3-month outcome of G2.

A comparison of the VAS pain scores measured at baseline and after the final treatment session in both groups revealed that the idiopathic ACS decreased in pain significantly compared to DM patients (p<0.001) (Table 4). Although abduction ROM increased significantly (p<0.01) in the G2 compared to the G1 after the treatment sessions, the results were not significant for both external rotation ROM (p=0.106) and HBB reach (p=0.133).

The Constant modified scores of idiopathic ACS increased significantly after the treatment compared to those of DM patients (p<0.001) (Table 4).

Variables	G1	G2	p
VAS	31.32 ± 11.66	17.79 ± 14.21	<0.001**
Shoulder abduction	146.4 ± 12.6	171.9 ± 7.7	0.001**
Shoulder ER	27.52 ± 13.39	34.82 ± 13.53	NS
HBB	47.29 ± 8.22	45.46 ± 8.18	NS
Constant modified score	50.31 ± 10.07	55.86 ± 8.23	<0.001**
**: p<0.01, NS: non-significant			

Table 4: Comparison of follow-up outcome variables between G1 and G2.

Patients were significantly more satisfied in G2 than in G1 (p<0.001).

Discussion

The objective of the present study was to compare the evolution of pain, ROM and function of two different populations, DM with ACS and those with idiopathic ACS after a rehabilitation treatment. The patients were treated for 3 sessions per week for three months, and changes in pain, ROM, and functional disability were recorded before and after the intervention. We proved a significant clinical improvement of different parameters after rehabilitation of ACS in diabetic and non-diabetic patients. In the current study, recovery of pain, ROM and functional abilities was significantly better in idiopathic ACS group after physical therapy than the DM one. It also showed no difference in ROM, functional activity level and, pain between diabetic and non-diabetic patients before treatment. It could be because the patients' diabetic levels were under control with medication by general practitioner.

Concerning DM patients, our study revealed a favorable evolution with a significant gain in VAS pain, joint amplitudes and modified Constant score contrary to the results found by Harris et al. [22] and Cinar et al. [23]. These patients were treated early (<6 months) and their diabetes was balanced, explaining the favorable results that we obtained. Duzgun et al. [24] found significant improvement in pain and joint amplitudes after 17 sessions of rehabilitation.

As to patients with idiopathic ACS, physical therapy allowed a significant improvement of pain, ROM and the Constant modified score. Griggs et al. [25] reported a prospective study of non-operative

treatment on 75 consecutive patients (77 shoulders) with idiopathic adhesive capsulitis. They were treated with a specific four-direction shoulder-stretching exercise program and evaluated prospectively. The mean duration of follow-up was 22 months (range 12–41 months). Ninety percent of the patients reported a satisfactory outcome and the author concluded that the vast majority of patients who have idiopathic adhesive capsulitis could be successfully treated with a specific four-direction shoulder-stretching exercise program. Dierks et al. [26] on the contrary reported that exercise below pain threshold and active movements within the painless range, gave good results. Seventy-seven patients with idiopathic frozen shoulder syndrome were included in a prospective study. The author compared the effect of intensive physical rehabilitation treatment, including passive stretching and manual mobilization versus supportive therapy and exercises within the pain limits. Results at 24 months follow-up showed that 89% of the patients in the supervised neglect group reached a Constant score of 80 or more. This is in contrast to the physical therapy group, in which only 63% reached a score of 80 or more, after 24 months.

Based on pain VAS, shoulder abduction and the Constant modified score, we noticed that idiopathic ACS group had more benefit from rehabilitation than DM group. However, there was no statistically significant difference in shoulder ER and HBB. To our knowledge, this is the first study that compared pain, ROM and function between diabetic and idiopathic ACS undergoing physical therapy. Griggs et al. [25] found that DM was associated with worse motion at the final evaluation. Cinar et al. [23] observed similar results (internal rotation and abduction) after arthroscopic capsulotomy. Furthermore, Pollock et al. [27] reported a less favorable outcome in the ACS of DM patients than those who had idiopathic ACS with arthroscopic release. Nicholson et al. [28] found that there was a great deal of pain relief in all the included groups except for the diabetic group. Although there was a significant improvement in diabetic patients in view of pain and ROM, these were the lowest values among the other groups. Ogilvie-Harris et al. [22] explained that patients with diabetes did worse initially, but the outcome was similar to patients without diabetes. Duzgun et al. [24] found no difference between diabetic and non-diabetic shoulder parameters both before and after treatment. This might be related to good control of diabetes by the endocrinology department in diabetic patients.

Study limitations

The limitations of the present study are as follows. First, the difference in subject numbers of our two groups. Second, we did not determine the relationship between the effect of the treatment and the glucose level of all patients. Third, the follow-up duration of the treatment was relatively short, and further studies are recommended to assess long-term evolution.

Conclusion

In conclusion, the present study supports the clinical use of the rehabilitation as a treatment of ACS which aimed to decrease pain and improve ROM and functional scores in diabetic and non-diabetic patients with ACS. It suggests that rehabilitation care is beneficial among population suffering from ACS with better results for the idiopathic one.

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