

Efficacy Of Physiotherapy On Adhesive Capsulitis Of Shoulder In Diabetic And Non-Diabetic Patients.

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Abstract: Background and Purpose: Shoulder stiffness is one of the common clinical conditions which affect both diabetic and non diabetic of both genders as a primary or secondary problem. However the improvement varies between diabetic and non diabetic following physiotherapy. The purpose of this study was to compare the effectiveness physiotherapy (mobilization techniques and interferential therapy) in diabetic and non diabetic subjects with adhesive capsulitis of the shoulder. Subjects and Methods: Thirty patients (15 with diabetes mellitus, fasting blood glucose ≥ 127 mg/dl, and 2hr blood glucose is ≥ 180 mg/dl, and 15 with non-diabetes). They had unilateral adhesive capsulitis, lasting more than three months and $\geq 30\%$ loss of passive movement of the shoulder joint compared to the non-affected side. Pain with motion with a minimum visual analogue scale (VAS) score of 5. Subjects assigned to the diabetic and non diabetic groups were treated with interferential therapy, mobilization techniques and home exercise programme. The duration of treatment was 10 days in both groups. Assessment of patients was at first and at 3, 5, 7 and 10 days by visual analogue scale (VAS), for pain intensity and goniometer for shoulder range of motion (abduction and external rotation). Results: The mean age, duration of symptoms, ratios of sex were similar in the two groups. Comparison of the initial pain scores and ROM values between the two groups revealed no statistical significance ($P > 0.05$). The mean changes in pain scores values and shoulder range of motion abduction and external rotation revealed highly statistical significant ($P < 0.01$), reduction. Improvement in pain, shoulder range of motion abduction and external rotation were, however; significantly better in the non diabetic group. Discussion and Conclusion: In subjects with adhesive capsulitis of the shoulder, physiotherapy appear to be more effective in improving shoulder joint mobility and pain in non-diabetic than diabetic during short period follow up.

Key Words: Adhesive capsulitis, Physical therapy, diabetes mellitus, mobilization.

INTRODUCTION

Adhesive capsulitis or frozen shoulder is characterized by painful condition with gradual restriction of all planes of movement in the shoulder that may continue for a years. It is a common disorder; with annual estimated incidence rate of 3% to 5% in the general population between 40 -60 years, and up to 20% in people with diabetes [1][2]. The thyroid illness, brain stroke, diabetes, autoimmune diseases, trauma and cervical spine problem might be factors that associated with adhesive capsulitis; these factors also may include female gender, myocardial infarction, immobilization and people aged above 40 years old [3]. Idiopathic adhesive capsulitis is a commonly characterized by painful, restricted active and passive movements of the shoulder joint that cause joint stiffness. The disease typically lasts 12 to 18 months, includes three stages: stage I, stage II and stage III. Stage I is a painful and inflammation phase and known as freezing stage, it characterized by symptoms of pain and shoulder joint stiff. Stage II known as frozen and stage III as thawing stage with decrease of pain and shoulder motion improvement. [4].

It was suggest that there were higher prevalence of shoulder capsulitis in diabetic patients that could be explained by atherosclerotic changes in vessels, leading to changes in local blood flow and producing altered physiology in tendons, with resultant shoulder capsulitis [5] [6]. Despite the several number of frozen shoulder managements such as a mobilization, rest and exercise, physiotherapy, surgical interventions and injections. There is no specific standard strategy of treatment preferred as a standard therapy for frozen shoulder [7]. Therefore this randomized, comparative clinical trial was planned to compare the early response to (pain and range of motion) of diabetic and non diabetic patients with shoulder stiffness to physical therapy.

MATERIAL AND METHODS

The study was conducted at the outpatient clinic of the Khadra Center for Physiotherapy, Behind Khadra Hospital, Tripoli, Libya, and written informed consent was received from all patients enrolled in the study. The study consisted of 30 patients; Diabetic group (15 with type 2 diabetes mellitus, fasting blood glucose ≥ 127 mg/dl, and 2hr blood glucose is ≥ 180 mg/dl,[6] and non- diabetic group. Their age ranged between 40— 60 years. The criteria for inclusion in the study were; unilateral adhesive capsulitis, defined as losing greater than 50% of shoulder passive movement, in one or more of three movement directions of the shoulder joint, for at least three months of illness. The Pain during motion should be at least score 5 by Visual analogue scale (VAS). while the patients were excluded if they had former manipulation under anesthesia of the shoulder joint, People who have been diagnosed with some illnesses such as rheumatoid arthritis, osteoarthritis, osteoporosis, dislocation, and cuff tears that prevent normal shoulder motion, pain and/or any disorders of the whole arm that may impact the normal motion of the affected shoulder joint [8] [9].

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PROCEDURE

Interferential therapy was applied in a triangular pulse, mode through using bipolar electrode, with frequency of 80 to 100Hz for highly irritable group, and frequency of 100 to 150Hz for non irritable group, with total duration of treatment about 10 minutes for each patient. Intervention in the low -grade (I&II) and high-grade (III-IV) mobilization were used, as described by Maitland [10], and Vermeulen et al.,[11]. In the low-grade mobilization techniques (LGMTs) for highly irritable group; the patients were informed clearly about the research, patient's information sheet was understood. Any questions related to the research and techniques were answered and all techniques should be performed with pain-free in the shoulder (Grade II). While high-grade (III-IV) mobilization techniques (HGMTs) are performed for non irritable group, in the end-ranges of the limited motion of the shoulder joint and are planned to impact the capsular adhesions, reduce the stiffness, and increase shoulder mobility. Both groups were treated daily for 40 minutes for a period of 10 days. Patients were attended all treatment sessions. Home exercise programme start with active exercise which are taught to the patients to maintain or improve range of motion within symptom free range and all the physiological movements of shoulder are done twice daily with 20 repetition for each movement. A standard plastic goniometer was used to measure active shoulder range of motion (abduction and external rotation). For measurement the patient was lying supine on plinth with the thorax firmly strapped to the plinth **to avoid any unwanted body movements, which may impact the movement** of the shoulder. For shoulder abduction; the affected arm was moved away from the side of the body in a coronal plane from 0 to 180 degrees, and within limit of pain. For shoulder external rotation; the arm abducted to 90 degree, with flexed elbow 90 degree, and the palm facing the ground, and movement toward external rotation was allowed within limit of pain [12]. Assessment of shoulder pain using VAS; The patients are instructed how to use 10 cm VAS, end points labeled "no pain" on the right side and "the worst possible pain" on the left side, and marked the point that represent their level of pain by an non erasable marker [8]. The assessment of pain and shoulder range of motion (abduction and external rotation) was carried out at 1st, 3rd, 5th, 7th and 10th day.

STATISTICAL ANALYSIS

The data was described as mean and standard deviation, for normally disturbed data. Paired t test was used to compare between variable within each group, while student unpaired t test was used to compare between two groups. The P value was set at level less than 0.05.

RESULTS

Thirty patients with a mean age of 56.0 ± 8.6 (40-60) years and diagnosed as having adhesive capsulitis were enrolled in the study. In diabetic group; nine of the patients were female and six were male, while in non- diabetic group eleven patients were female and 4 patients were male. Mean age, duration of symptoms, ratio of sex were similar in the two groups. Comparison of the initial pain scores and ROM values between the two groups revealed no statistical significance ($P > 0.05$) (table 1).

Table (1): Demographics of the two groups according to age, sex, duration of symptoms, pain and ROM values at the beginning of the study.

	Diabetic	Non-diabetic	P-value
Age (years)	53.6±6.9	58.4±9.7 0.1	0.1†
Duration of symptoms (months)	5.6±3.9	7.6±3.9	0.1†
Sex: F/M (%)	60/40%	73/27%	0.4†
VAS	7.4.1±1.32	6.8.9±2.24	0.63†
Abduction	116.0±25.6	114.8±22.3	0.4†
External rotation	36.3±16.5	40.8±11.7	0.8†

†(non significance, $P > 0.05$)

The mean changes in pain scores values were obtained in diabetic, and non-diabetic groups during evaluation period and at the end of the treatment revealed highly statistical significant ($P < 0.01$), reduction in pain intensity in each group. Improvements in pain were, however; significantly better in the non diabetic group, table (2) & fig (1).

Table (2): The mean changes in VAS within and between diabetic and non-diabetic patients.

Days	Diabetic			Non-diabetic			t-value
	Mean	±SD	t-value	Mean	±SD	t-value	
1-3	0.47	±0.74	2.43*	1.33	±0.64	6.86***	2.63*
1-5	1.0	±1.25	3.09**	1.8	±1.32	5.28***	1.7†
1-7	1.4	±0.99	5.5***	2.6	±1.55	6.5***	2.53*
1-10	2.27	±1.22	7.18***	3.6	±1.55	9.0***	2.62*

*Significance ($P < 0.05$)

*** Very highly significance ($P < 0.001$)

** highly significance, ($P < 0.01$)

† Non significance

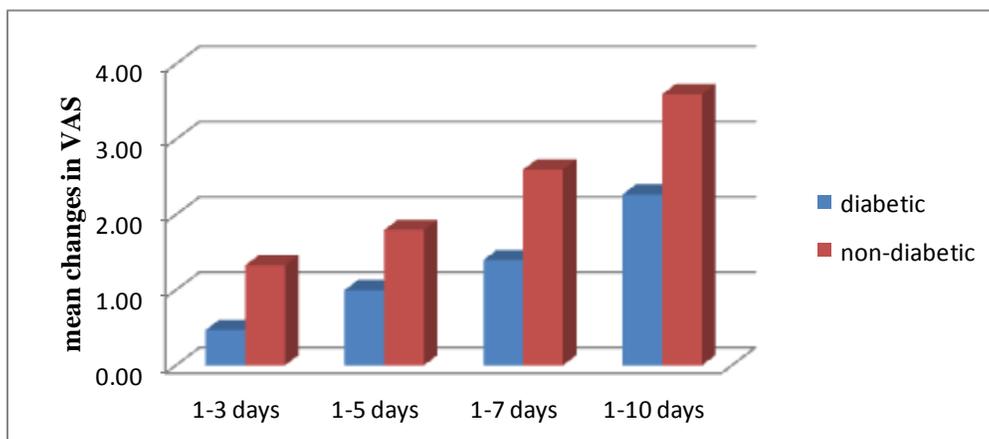


Fig.(1):The mean changes in VAS between diabetic and non-diabetic groups during period of the study.

The mean changes in range of motion values were obtained in diabetic, and non-diabetic groups during evaluation period and at the end of the treatment revealed highly statistical significant ($P < 0.01$), increased in range of

motion (abduction and external rotation) in each group. Improvement in shoulder flexion, and external rotation values were, however; significantly better in the non-diabetic group, table (3&4), fig (2&3).

Table (3): The mean changes in abduction range of motion within and between diabetic and non-diabetic patients.

Days	Diabetic			Non-diabetic			t-value
	Mean	±SD	t-value	Mean	±SD	t-value	
1-3	8.33	±6.73	4.8***	9	±4.51	6.44***	0.33†
1-5	13.33	±7.94	6.5**	20	±8.66	8.94***	2.2*
1-7	16	±7.37	8.41***	28.33	±9.39	11.69***	4***
1-10	20.33	±8.96	8.79***	38.67	±13.16	11.39***	4.46***

*Significance ($P < 0.05$)

*** Very highly significance ($P < 0.001$)

** highly significance, ($P < 0.01$)

† Non significance

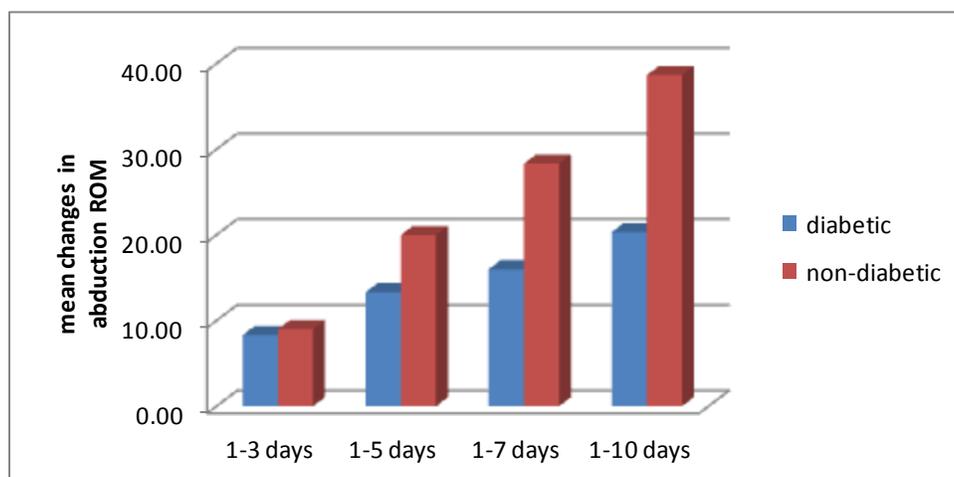


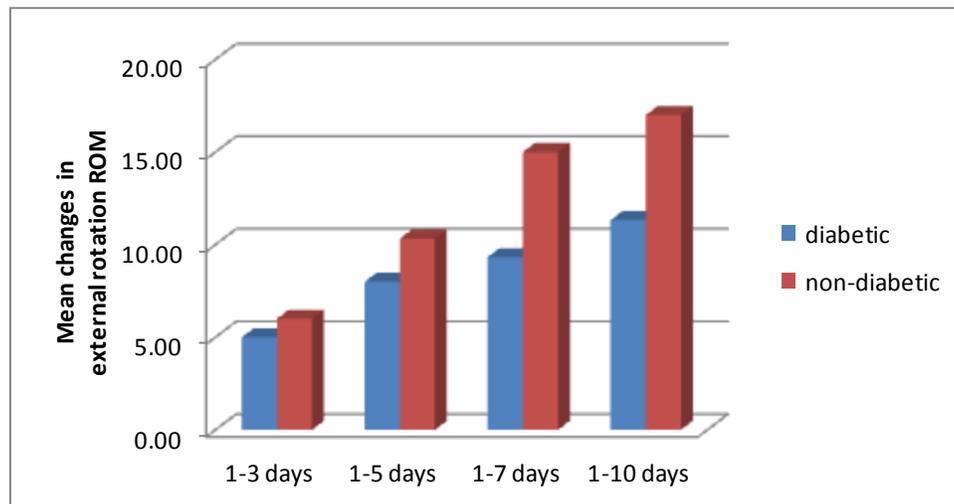
Fig (2): The mean changes in abduction range of motion between diabetic and non-diabetic groups during period of the study.

Table (4): The mean changes in external rotation range of motion within and between diabetic and non-diabetic patients.

Days	Diabetic			Non-diabetic			t-value
	Mean	±SD	t-value	Mean	±SD	t-value	
1-3	5	±5.98	3.24**	6	±5.41	4.29***	0.48†
1-5	8	±7.02	4.41**	10.33	±7.19	5.57***	0.9†
1-7	9.33	±7.04	5.14***	15	±7.79	7.46***	2.09*
1-10	11.33	±7.18	6.11***	17	±7.97	8.06***	2.04*

*Significance ($P<0.05$)*** Very highly significance ($P<0.001$)** highly significance, ($P<0.01$)

† Non significance

**Fig (3):** The mean changes in external rotation range of motion between diabetic and non-diabetic groups during period of the study.

DISCUSSION

In this study the effectiveness of physical therapy strategies; including mobilization techniques (LGMTs & HGMTs) with interferential therapy in patients with diabetes and unilateral adhesive capsulitis, and non diabetic adhesive capsulitis of the shoulder, it appeared mobilization techniques (LGMTs & HGMTs) were more effective in increasing mobility and reducing pain in non diabetic than diabetes. The up to date, there is no total agreement related to the benefit of shoulder manipulation in the treatment of adhesive capsulitis. Several studies revealed that the technique of shoulder manipulation may cause problems such as fracture, dislocation and rotator cuff tearing [8]. However, Reichmister et al [13] study of 38 shoulder manipulation in 32 patients, demonstrated that 97% of patients had improved without any of mentioned risks. In addition, several studies support the fact that manipulation techniques were useful for the treatment [13]. Study by Noel et al [14] explained the benefit effects of the neurophysiologic and biomechanical effect of the joint mobilization techniques. They described the mechanical changes that may happen during healing process; breaking up scar tissue and adhesions, collagen fiber realignment and gliding muscles fiber during specific movements. The benefit of these techniques is to increase or maintain mobility of the shoulder joint [14]. These results comparable with previous work in which mobilization techniques applied for 12 weeks in 22 subjects with adhesive capsulitis. There were clinical significant improvements in joint ROM, and pain, at 3 months and at 9 months after the start of treatment. There were no significant changes between the

levels of improvements after 3 months. Same results seen with HGMT and LGMT, however the short duration period of our study [15]. This study was in agreement with finding of Vermeulen et al., [15] in which 16 patients with diabetes were participated for mobilization treatment for 12 months. They found that patient treated with HGMTs had clinically significant improvement in shoulder mobility and pain reduction. However they found no evidence that these patients with diabetes showed poorer results than non-diabetic patients. The common explanation for limited joint mobility has been that weakness of collagen leads to its accumulation. Evidence suggested that the increased cross-linking of collagen is due to increase of non enzymatic glycosylation, and these become 13 times higher in patients with diabetic mellitus than in normal subjects. More over patients with diabetes who use insulin treatment for long period are most susceptible to shoulder calcifications. [16]. The limitation to our study may be that we do not have the long-term follow up data for our treatment in both groups. Randomized controlled studies of large study populations are needed to clearly define the efficacy of physical therapy in patients with different stages of frozen shoulder with diabetic and non diabetic.

CONCLUSION

In patients with adhesive capsulitis of the shoulder, physiotherapy seems to be more effective in improving shoulder joint mobility and pain in non-diabetic than diabetic during short period follow up.

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