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 subject subjects with adhesive capsulitis of the shoulder.* ***Subjects and Methods:*** *Thirty patients (15 with diabetes mellitus, fasting blood glucose ≥127mg/dl, and 2hr blood glucose is ≥180mg/dl, and 15 with non-diabetes). They had unilateral adhesive capsulitis, lasting more than three months and ≥ 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. Subjects were assessed at baseline and at 3, 5, 7 and 10 days by visual analogue scale (VAS), for pain intensity and genometric evaluation of 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 persist for several years. It is a common disorder; with an estimated annual incidence of 3% to 5% in the general population between 40 -60 years, and up to 20% in people with diabetes[1,2].

Factors associated with adhesive capsulitis include female gender, age older than 40 years, trauma, immobilization, diabetes, thyroid disease, stroke, myocardial infarction, the presence of autoimmune diseases, cervical spine disorders and reflex sympathetic dystrophy syndrome[3].

Idiopathic (primary) adhesive capsulitis is characterized by fibrosis of the capsule resulting with progressive, painful loss of active and passive shoulder motion. There were three stages of the disease: Stage I is mainly characterized by pain usually lasting 2–9 months. In Stage II (frozen stage); pain gradually subsides but stiffness is marked lasting 4–12 months. In Stage III (thawing

phase); pain resolves and improvement in range of motion (ROM) appears[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].

Advocated treatments include rest and analgesics, corticosteroid injections, acupuncture, physical therapy, manipulation under anesthesia, and arthroscopic or open surgery. There is no general acceptance of one standard treatment[1].

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, Tripolis, 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 ≥127mg/dl, and 2hr blood glucose is ≥180mg/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 more than 30% loss of passive movement of the shoulder joint compared to the non-affected side, in one or more of three movement directions (i.e. abduction in the frontal plane and/or forward flexion and/or external rotation in 0 degrees abduction), at least three months of complaints. Pain with motion with a minimum visual analogue scale (VAS) score of 5. while the patients were excluded if they had former manipulation under anesthesia of the affected shoulder, rheumatoid arthritis, osteoarthritis, osteoporosis, neurological deficits, dislocation, and rotator cuff tears that affecting shoulder function in activities of daily living, pain and/or disorders of the cervical spine, elbow, wrist and/or hand and an injection with corticosteroids in the affected shoulder in the preceding four weeks[8,9].

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 therapist informed the patients explicitly that all techniques should be performed without causing pain 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 joint mobility of the shoulder and are intended to influence the capsular adhesions, treat the stiffness, and subsequently increase the joint mobility. The duration of prolonged stress on the shoulder capsule in the end-range position varied according to the patient's tolerance.

In both groups patients were treated daily for 40 minutes during a period of 10 days and were encouraged to attend 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 thee plinth to prevent body shift, which would tend to compensate for 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 to word 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 0.1	7.6 ± 3.9	0.1†
Sex: F/M (%)	60/40 %	73/27%	0.4†
VAS	7.4.1 ± 1.32	6.89 ± 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. Improvement in pain were, however; significantly better in the non diabetic group, table (2) & fig (1).

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 (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) ** Highly significance, (P<0.01)
*** Very highly significance (P<0.001)† Non significance

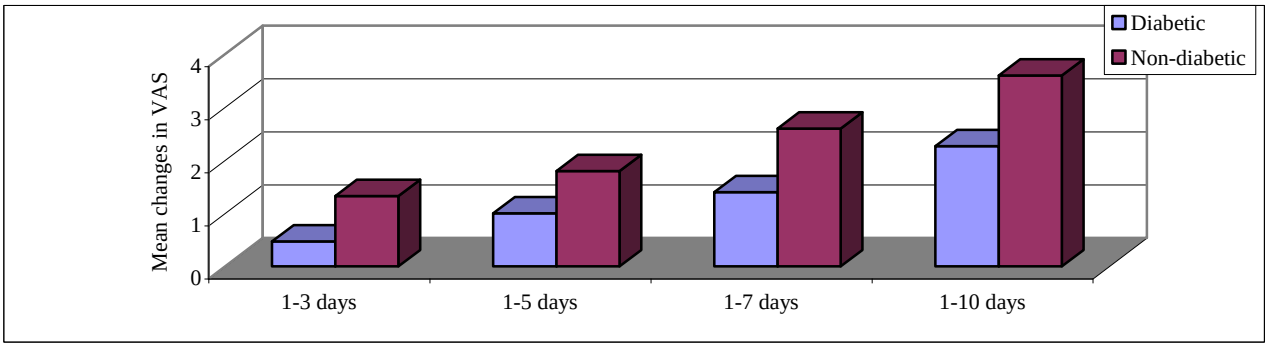

Fig. (1): The mean changes in VSA between diabetic and non diabetic groups during period of the study.

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	±5.41	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) ** highly significance, (P<0.01)
*** Very highly significance (P<0.001)† Non significance

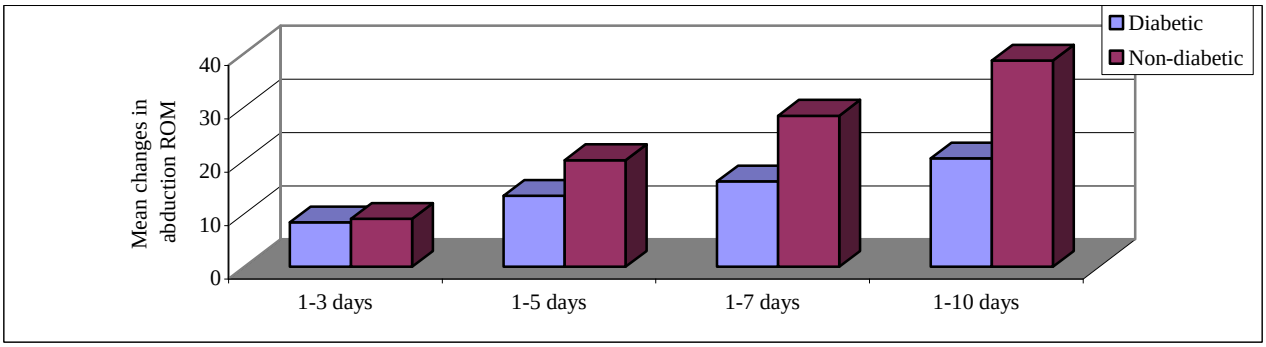

Fig. (2): The mean changes in abduction range of motion between diabetic and non diabetic groups during period of the study.

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	±7.19	6.11***	17	±7.97	8.06***	2.04*

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

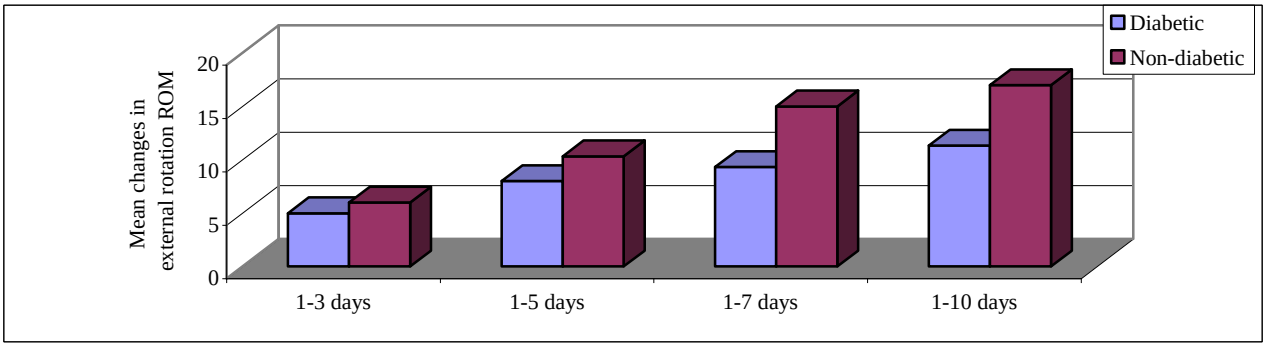

Fig. (3): The mean changes in external rotation range of motion between diabetic and non diabetic groups during period of the study.

DISCUSSION

In this study the effectiveness of physical therapy strategies; including mobilization techniques (LGMTs & HGMTs) with interferential therapy in subjects 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 use of shoulder manipulation in the treatment of adhesive capsulitis remains controversial. Opponents cite the risk of dislocation, fracture, nerve palsy, and rotator cuff tearing as limiting the usefulness of manipulation[8]. However in retrospective study of 38 shoulder manipulations in 32 patients, it have found that 97% of patients had relief of pain and recovery of near complete range of motion with no evidence of biceps tendon rupture, rotator cuff insufficiency, fractures, dislocation or nerve palsies. The literature data supports the fact that manipulative methods acquire a rapid response in the treatment[13].

Joint mobilization techniques are assumed to induce various beneficial effects. The neurophysiologic effect is based on the stimulation of peripheral mechanoreceptors and the inhibition of nociceptors. The biomechanical effect manifests itself when forces are directed toward resistance but within the limits of a subject's tolerance. The mechanical changes may include breaking up of adhesions, realigning collagen, or increasing fiber glide when specific movements stress the specific parts of the capsular tissue. Furthermore, mobilization techniques are supposed to increase or maintain joint mobility by inducing rheologic changes in synovial fluid, enhanced exchange

between synovial fluid and cartilage matrix, and increased synovial fluid turnover[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. The changes after 3 months were in the same range as the improvements 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 subjects with diabetes (insulin and non–insulin dependent) were assigned to 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 subjects with diabetes showed poorer results than subjects without diabetes.

The most commonly suggested explanation for limited joint mobility has been that impaired degradation of collagen leads to its accumulation. Evidence suggested that the diabetic hyperglycemic state leads to an increase in nonenzymatic glycosylatetion causing increased cross-linking of collagen, and these becomes 13 times higher in subjects with diabetic mellitus than in normal subjects. More over diabetes of long duration treated with insulin for a long time was associated with a larger percentage of 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 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.

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الملخص العربي

كفاءة العلاج الطبيعي على التصاقات حافظة الكتفِ الملتهبة في مرضى السكري والغيرِ سُكّريِ

الخلفية والغرض : تيبس الكتفِ أحد الحالات الاكلينيكية التي تُؤثّر على المرضى بالسكر والغير مصابين بالسكر في كلا الجنسين كمشكلة أساسية أو ثانوية . وعليه فان التحسن بالعلاج الطبيعي يَتفاوتُ بين المرضى بالسكر والغير مصابين بالسكر . لذا فالغرض من هذه الدراسة كَانتْ أنْ تُقارنَ تأثيرَ العلاج الطبيعي (العلاج بالتيار التداخلي وطرق التحريك) على المرضى بالسكر والغير مصابين بالسكر والمصابين بالتصاقات حافظة الكتفِ الملتهبة . **الأساليب والطرق :** ثلاثون مريض (15 بداء السكّري ، جلوكوز صائمِ بالدمِّ اقل من127 مليجرام لكل ديسيليتر وجلوكوزِ بالدمِّ بعد ساعتين اكبر من 180 مليجرام لكل ديسيليترو 15غير مصابين بمرض السكّرِ) مع ا لتصاقات حافظة الكتفِ الملتهبة في جانبِ واحد فقط لأكثر مِنْ ثلاثة شهورِ وفقدان أكثر من 30 % من الحركةِ السلبيةِ لمفصلِ الكتفَ للجانب المصاب مقارنته إلى الجانبِ غيرِ المتأثّر ، مع مقياس ألآم مع الحركة لمَقياس المنظار البصري خمسة . وقد عولجت المجمعتين المرضى بالسكر والغير مصابين بالسكر بالعلاج الطبيعي (العلاج بالتيار التداخلي وطرق التحريك) وبرنامج التمرينات المنزلي وكانت مدة العلاج عشرة أيام للمجموعتين . تم تقيم الأشخاص عند البدء وفي اليوم 3 ، 5 ، 7 ، 10 بواسطة مِقياسِ المناظرِ لدرجةِ الألمِ والتقييمِ المقياس الحركي لمدى حركة الكتفِ (التباعد والدوران الخارجي) . النَتائِج: نتائج المتوسط العُمري ، مدّة الأعراضِ ، نِسَب الجَنسِ متماثلة في المجموعتين . المقارنة الأولية لالألمِ والمدى الحركي لم تكن ذات دلالة إحصائية في كلا المجموعتين . النتائج المتعلقة بدرجة التغير في قيم الألم والمدى الحرك ي للتباعد والدوران الخارجي اشر إلى تحسن ذات دلالة إحصائية . وكان التحسن في قيم الألم والمدى الحركي للتباعد والدوران الخارجي للكتف أحسن ما يكون في المجموعة الغير مصابة بالسكر . **المُناقشة والخاتمة :** في الأشخاص المصابين بالتصاقات حافظة الكتفِ الملتهبة ، يَبْدو العلاج الطبيعي أكثرَ فعّالية في تَحْسين قابليةِ الحركة وألمِ الكتفِ للغير مصابين بالسكر عن المصابين بالسكر أثناء المتابعة لفترةِ قصيرةِ .
الكلمات الدالة : التصاقات حافظة الكتف الملتهبة ، العلاج الطبيعي ، داء السكّري ، تحريك .