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PHYSIOTHERAPY OF PATIENT WITH DIABETES AND ARTHRITIS

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ABSTRACT

Background: Diabetes causes musculoskeletal changes that lead to symptoms such as joint pain and stiffness; swelling; nodules under the skin, particularly in the fingers; tight, thickened skin; trigger finger; carpal tunnel syndrome; painful shoulders; and severely affected feet. After having had diabetes for several years, joint damage called diabetic arthropathy can occur. ***Objective:*** The study aimed to present the effect of diabetes on arthritis pathology and tried to establish correlation with these diseases. ***Methodology:*** Fifteen participants were randomly assigned into 3 groups; control group G1 (receive exercises only) and 2 experimental groups; G2 (shock wave + exercise) and G3 (ultrasound + exercise). Each group received two sessions per a week for 4 weeks; each session includes 15 min. exposure (shock wave or Ultrasound) and 15 min. exercise (flexion, extension, abduction, external rotation and internal rotation). The outcome measures used in this study were the Visual Analogue Scale (VAS) that scored by all participants who completed the four-week course. ***Results:*** In control group G1, the average VAS was 6.2cm upon entry to the program and the average ODQ score was 43.4% before treatment. Four weeks later, average scores were 5.9 cm for the VAS and 40.7% for the ODQ. Age-related pre- and post-test differences were interesting. The 16-35-year-old age group was improved by 70% on VAS scores and by 23% on ODQ scores. The 36-50-year-olds scored an average of 24% improvement on the VAS and 9% on the ODQ while the 51-65-year-olds improved by 35% and 16% on the VAS and ODQ respectively. ***Conclusion:*** A treatment plan include sessions of shock waves and stretching and strengthening exercises for a month was more effective in the treatment of diabetes and rheumatoid arthritis.

KEYWORDS: *Diabetes, Rheumatoid arthritis, pain.*

1. INTRODUCTION

Type 1 diabetes and inflammatory arthritis are both autoimmune diseases. The classic sign of any autoimmune condition is inflammation, and that may be the link between these two diseases. In diabetes, the immune system attacks the pancreas, whereas in inflammatory arthritides, it attacks the joint tissues.

Diabetes causes musculoskeletal changes that lead to symptoms such as joint pain and stiffness; swelling; nodules under the skin, particularly in the fingers; tight, thickened skin; trigger finger; carpal tunnel syndrome; painful shoulders; and severely affected feet. After having had diabetes for several years, joint damage called diabetic arthropathy can occur.

Diabetes mellitus (also known as 'sugar' diabetes) interferes with the body's ability to use sugar. It is a long-term condition requiring treatment by diet, pills and often injections of insulin. Generally doctors recognize two types of diabetes. Type I typically occur in younger people and often requires treatment with insulin. Type 2 occurs in older overweight people and is treated with tablets but there can be a lot of overlap between the two types. There is often a family history of diabetes in both. Early symptoms of diabetes include thirst and passing a lot of urine and some people lose a lot of weight. The problems with handling sugar and specifically high blood sugar levels, can eventually lead to complications in the blood vessels, kidneys, eyes and the nerves to the hands and feet. These complications can be delayed and minimized by controlling the blood sugar with treatment.

People with diabetes are also prone to a number of musculoskeletal complications but the relationship between these complications and the diabetic control is not clear. Many of these problems are not unique to diabetes but occur more frequently in this condition. This short article describes the complications and offers advice on treatment and prevention.

Another reason so many people with diabetes develop arthritis and vice versa, could be a matter of shared risk factors and lifestyle behaviors. Non-modifiable risk factors, such as your age, gender and genetic make-up, are primary ingredients for a diagnosis of either arthritis or diabetes. Similarly, modifiable risk factors that include smoking, diet, obesity and physical activity also affect your likelihood of developing either arthritis or type 2 diabetes.

Physical activity is essential. The benefits of exercise include improved physical function and mobility, reduced blood glucose levels and weight control all factors that can affect disease progression and lower your risk of complications in diabetes and arthritis. In spite of this, people with both conditions tend to exercise less even compared to those with either condition alone. In a 2008 article in the Morbidity and Mortality Weekly Report, adults with diabetes and arthritis were nearly three times more likely to be sedentary than those with neither condition. Pain, excess weight, fear of injury, lack of motivation or desire and time were other barriers to physical activity. However, the Arthritis Foundation has many tools and programs to help you stay active.

Another vital part of disease management is proper medication. In the case of inflammatory arthritides, inhibiting proinflammatory cytokines and reducing joint damage are the primary goals of treatment. These same inflammatory biomarkers are also increased in people with diabetes. A number of studies indicate that biologic agents prescribed for arthritis, such as adalimumab (Humira), etanercept (Enbrel) and infliximab (Remicade), also work to reduce your risk of developing either type of diabetes.

The prevalence of type 2 diabetes has rapidly increased in many Asian populations, thought to be the result of a combination of a sedentary lifestyle and unhealthy dietary habits. Type 2 diabetes is characterized by pancreatic β cell dysfunction and insulin resistance. Obesity can trigger chronic low-grade inflammation and the resulting inflammatory mediators are detrimental to β cell function. Modulating inflammatory reactions in patients with type 2 diabetes with the use of salsalate has been shown to improve glycemic control, strongly suggesting that inflammatory pathways are involved in the metabolic abnormalities of type 2 diabetes.

Rheumatoid arthritis (RA) is a chronic and disabling disease characterized by persistent synovitis, systemic inflammation and the presence of autoantibodies. Inflammatory mediators such as Creactive protein (CRP), interleukin (IL)-6 and tumor necrosis factor (TNF)-a are frequently elevated in patients with type 2 diabetes as well as in the sera of patients many years before the clinical onset of RA, suggesting a critical role in the immunopathogenesis of this disease. This observation also suggests that low-grade inflammation should have already existed in patients with RA during the preclinical phase.

In addition, smoking causes chronic lung inflammation and could subsequently lead to the production of autoantibodies, resulting in the development of RA among genetically susceptible individuals. Therefore, it is plausible that chronic low grade inflammation observed in patients with type 2 diabetes could also contribute to the development of RA in these patients. Several studies show the risk of diabetes is higher in patients with RA, but less is known about RA risk in established type 2 diabetes. Therefore, the aim of this case-control study was to explore the risk of incident RA in patients with type 2 diabetes using a nationwide health claims database. To our knowledge, this is the first study to investigate the risk of incident RA among patients with type 2 diabetes using nationwide, population-based data.

The incidence of obesity and diabetes has been increased with alarming rate in recent years and became a common problem around the globe including developing as well as in developed countries with incalculable social costs. Obesity and type 2 diabetes are two common co-morbidities occur together. Obesity and diabetes is closely associated with many diseases, osteoarthritis, hypertension, certain form of cancer, sleep-breathing disorders and coronary heart disease.

Impacts of diabetes (insulin resistance) on arthritis have been seen in patients that we associated with combination of various factors like increased availability of high energy foods, genetic susceptibility and decreased physical activity in modern society. Arthritis is becoming pandemic around the globe and its occurrence with obesity and diabetes has been observed more common than ever. Combination of these two chronic conditions makes these diseases more vulnerable for human health. Till now very limited information is established about the pathological and mechanistic correlation among these health ailments. In this study we aimed to present the effect of diabetes on arthritis pathology and tried to establish correlation with these diseases.

2. METHODOLOGY

2.1. Study Population

Participants, who met the inclusion criteria, were taken as sample in this study. Fifteen female participants with type 2 diabetes and rheumatoid arthritis were selected from General Hail Hospital, after they agreed to participate in the study and then receiving explanations regarding the purpose and procedures of the study and signed an informed consent statement before participation. At the time of the study the participants were not receiving any medical or physical therapy.

2.2. Inclusion criteria

Participants suffers from type 2 diabetes and rheumatoid arthritis for more than 12 months ago, aged from 34 to 65 years, weight from 55 to 89 kg, and height from 159 to 187 Cm and body mass index (BMI) from 24.9 to 35.7.

2.3. Exclusion criteria

Participants were excluded if they have any of these symptoms; pain radiating to the limb, recent trauma, any contraindication are found, Vertebral malignancy, Bone infections, Fracture, Joint irritability, Osteoporosis, Osteopenia, Hypertension, Spinal tumors and Structural abnormality or any deformity.

2.4. Procedures

Fifteen participants were randomly assigned into 3 groups; control group G1 (receive exercises only) and 2 experimental groups; G2 (shock wave + exercise) and G3 (ultrasound + exercise). Each group received two sessions per a week for 4 weeks; each session includes 15 min. exposure (shock wave or Ultrasound) and 15 min. exercise (flexion, extension, abduction, external rotation and internal rotation).

2.5. Outcome measurements

The outcome measures used in this study were the Visual Analogue Scale (VAS) that scored by all participants who completed the four-week course.

2.6. Data analysis

Standard deviation and mean for the obtained data were calculated. Also, the data obtained were analyzed by SPSS version 22.

3. RESULTS

The ODQ is used to score disability induced by diabetes and rheumatoid arthritis. It is a validated tool that is designed to assess a patient's level of function or disability, providing quantitative data that are suitable for quality assurance and research purposes. The VAS scale is a valid and reliable tool to rate pain intensities along a 10cm line. The patient is asked to put a mark along this line to reflect the intensity of the pain.

A total of 15 participants were eligible to take part in this study. These were divided into 3 groups; control group G1 ($n = 5$) and treated or experimental groups G2 and G3 ($n = 5$ *for each*).

The VAS readings indicated a significant difference at the 1% level (p = 0.003) between the control group and the experimental groups, and shoed highly significant in participants that treated with shock wave and followed by stretching and strengthening exercises as compared with the control group that received only the exercises. Also, ODQ readings showed significant difference (p = 0.123) between the control and treated groups. Results showed an improvement across experimental groups in pain and disability scores, as illustrated in Table 1 and Figure 6.

In control group G1, the average VAS was 6.2cm upon entry to the program and the average ODQ score was 43.4% before treatment. Four weeks later, average scores were 5.9 cm for the VAS and 40.7% for the ODQ.

The average VAS score for experimental groups was 8.5 cm and 6.5 cm for groups G2 and G3, respectively upon entry to the program, and ODQ results showed that the average disability measure pre-intervention was 46.6% and 42.8% for groups G2 and G3, respectively. Four weeks later, average scores of VAS stood at 5.4 cm and 5.9 cm, 6.4 cm, and 6.3cm for groups G2 and G3, respectively. However, the results of ODQ after four weeks of treatment become 35.1% and 39.2% for groups G2 and G3, respectively (Table 1 and figure 1).

From the mentioned results, group G2 after one week of exposure to shock wave and 4 weeks of practice on stretching and strengthening exercise at home showed the best improvement in scores and pain relief as compared with the control and other experimental group (Table 1 and figure 1).

Table 1: Showing the values of VAS and the percentage of ODQ before and after the treatment.

	Before treatment			After treatment		
	G1	G2	G3	G1	G2	G3
VAS (cm)	6.2	8.6	6.5	5.9	5.4	5.9
% of ODQ	43.4	46.6	42.8	40.7	35.1	39.2

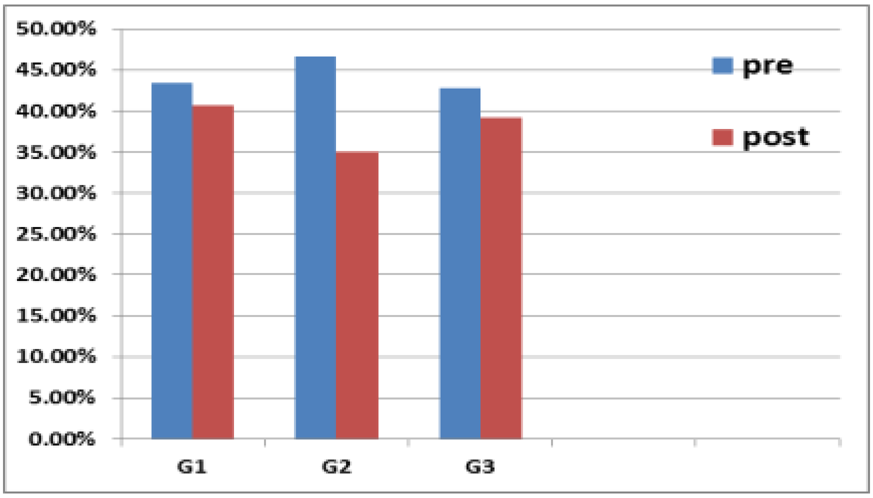

Fig. 1: Showing a histogram for the values of VAS pre- and post- treatment.

Age-related pre- and post-test differences were interesting. As shown in Figure 2, the 16-35-year-old age group improved by 70% on VAS scores and by 23% on ODQ scores. The 36-50-year-olds scored an average of 24% improvement on the VAS and 9% on the ODQ while the 51-65-year-olds improved by 35% and 16% on the VAS and ODQ respectively (Table 2 and figure 2).

Table 2: Showing the percentage of improvement for VAS and ODQ related to age of participants.

Age/year	% of improvement	
	For VAS	For ODQ
24-35	70	23
36-50	24	9
51-65	35	16

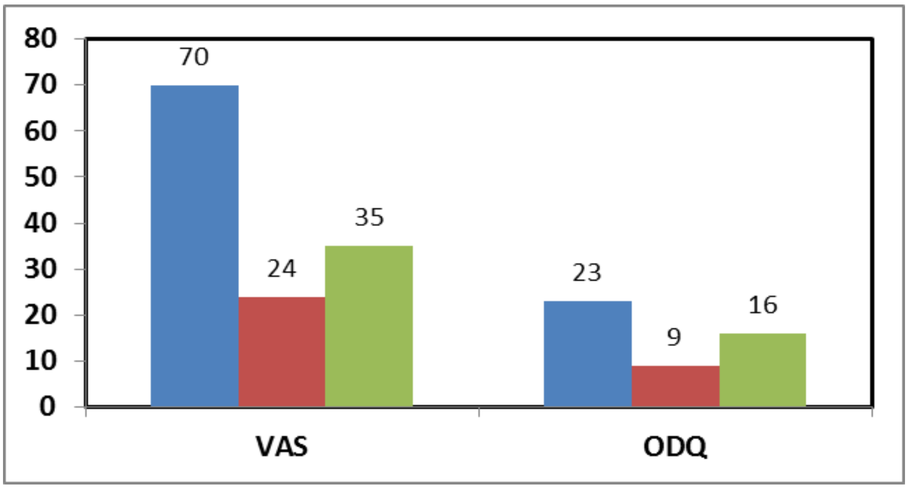

Fig. 2: Showing the percentage of improvement for VAS and ODQ related to age of participants.

4. DISCUSSION

The present study evaluate the effectiveness of Stretching and strengthening exercise of participants suffering from diabetes and rheumatoid in combination with other physiotherapy techniques such as shock wave and ultrasound in comparison with only exercise for participants with diabetes and rheumatoid.

In this experimental study 15 patients with diabetes and rheumatoid were randomly assigned to the experimental groups and to the control group. Among these 15 patients, 10 patients were included in the experimental group who received Stretching and strengthening exercise with other technique of physiotherapy and the rest of the 15 patients (5) were included in the control group, who received exercises only. Each group attended for 3 sessions of treatment within one week in the physiotherapy outdoor department in order to demonstrate the improvement. The outcome was measured by using visual analogue scale for pain intensity in different functional position VAS, and goniometer for measuring ODQ.

The outcome of the present study reveals significant improvement of pain. In Experimental group G2 whose members received exercises and exposed to shock waves, Mean difference of reduction of pain that measured by visual analog scale (VAS) was 5.4 cm which were 8.6 cm more than Mean difference in control group.

Electrical stimulation for pain relief has widespread clinical use, thought the direct research evidence for the use of IFT in this role is limited. Logically one could use the higher frequencies (90-130Hz) to stimulate the pain gate mechanisms & thereby mask the pain symptoms. Alternatively, stimulation with lower frequencies (2-5Hz) can be used to activate the opioid mechanisms, again providing a degree of relief. These two different modes of action can be explained physiologically & will have different latent periods & varying duration of effect. It remains possible that relief of pain may be achieved by stimulation of the reticular formation at frequencies of 10-25Hz or by blocking C fiber transmission at >50Hz. Although both of these latter mechanisms have been proposed (theoretically), neither has been categorically demonstrated.

The mechanism of action of SW described in explaining SW effects, including direct stimulation of healing, neovascularisation, direct suppressive effects on nociceptors and an hyperstimulation mechanism, that would block the gate-control mechanism. In spite of the initial studies, which showed high-energy SW treatment can induce fibrinoid necrosis, Parthenon fibrosis and inflammatory cell infiltration in normal tendons, as well as an impaired tensile strength of tendons.

More recent studies have demonstrated that SW treatment can increase the number of neovessels at the normal tendon–bone junction, through the release of growth factors and some other active substances. Even though ESWT has a history of more than 10 years of clinical applications in tendinopathy, relatively few experimental studies were done to understand its biological effects on tendon tissue. The researchers are working nowadays to describe the cellular and biochemical mechanisms by which SW can enhance tendon repair.

The most important evidence are that ESWT promotion of tendinitis repair coincides with an increases in TGFb1 and IGF-I. These growth factors have been found to up-regulate extracellular matrix biosynthesis by tenocytes. It has been proposed that these increased mutagenic and anabolic responses of tendon tissue can be responsible of the clinical success of SW treatment in resolving tendon pathologies. Tenocytes can respond to mechanical stimulation by increasing TGF-b1 gene expression. These findings seem to indicate that tendon tissue can convert SW stimulation into biochemical signals via release of TGF-b1 and IGF-I for tendinitis repair.

In view of the assumption that UT is often overactive in patients with impingement, a decrease in activity implicates a more efficient scapular recruitment pattern. In addition, SPADI scores showed significant functional improvement and less pain after completing the scapula-based exercise program. A few randomized controlled trials confirmed the value of exercises in the treatment of muscle pain. In general, these studies show better results regarding functional outcome, strength and patient satisfaction if a muscle approach is implemented in the treatment protocol.

5. CONCLUSION

Our results suggest that a treatment plan include sessions of shock waves and stretching and strengthening exercises for a month more effective in the treatment of diabetes and rheumatoid arthritis.

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