Efficacy of Phonophoresis in the Management of Football Players Adductor Muscle Injuries

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ABSTRACT

To compare the efficacy of phonophoresis (PH) using an ozonated olive oil or anti-inflammatory- analgesic gel (Ketoprofen) as a coupling agent versus ultrasound (US) in the treatment of adductor muscle injuries. Sixty male subjects (Zagazig University football players) with a mean age of 19.9±2.8 years and the onset of trauma ranged between two-eight days were randomly assigned to three equal groups PH or US groups. Continuous US waves were applied for the target area for two weeks with a total of 12 of daily settings applied for the PH and US groups. Treatment: For the PH two groups, an ozonated olive oil or a gel containing an anti-inflammatory-analgesic gel (Ketoprofen) were used as a coupling agent. An identical acoustic gel was used for the US group. A physical therapy program usually involves gradual stretching and strengthening of muscles around hip joint and abdomen for all program participants. Athletes were subjected to the following subjective and functional pre-and post treatment program evaluations: indicated their pain intensity level by a visual analog scale (VAS), Adductor, Abductor muscle strength (Add, Abd St), Quadriceps muscle strength (shooting power), abdominal muscle strength and 20 meters side walking time. At the end of treatment, although all groups (both PH and US group) combined showed a significant decrease in pain intensity level and an increase in functional activity (P<0.05), the ozonated olive oil group showed a significant differences in the pain level at the end of the second week compared to the two other groups (P<0.05). It is concluded that US results in decreased pain severity and increased functional capacity in football players with adductor muscle injuries. The addition of PH with ozonated olive oil augments the benefits of the US therapy.
Key wards: phonophoresis, ozonated olive oil, adductors muscle strength.

INTRODUCTION

Adductor strains are common problems in kicking sports such as soccer [(23)], which can result in significant amounts of missed playing time. Many of the problems are related to the musculoskeletal system[1]. The majority of these are incomplete muscle tendon tears that occur just adjacent to the musculotendinous junction. Hip adductor weakness has been identified as a strong risk factor[18].

Ozone therapy not only reduces infection due its bactericidal activity but also stimulates the metabolism by improving oxygenation and reducing local inflammation[6].

Gastrointestinal upset and local pain commonly limits the use of oral nonsteroidal anti-inflammatory drugs and corticosteroid injection as treatments for musculoskeletal disorders. Transdermal administration of an anti-inflammatory drug could avoid these adverse effects[7].

PH, in addition to deep heating, US are used to enhance percutaneous absorption of drugs. This technique also has been used successfully to deliver anti-inflammatory medication to inflamed subcutaneous tissues[14]. PH is believed to accelerate functional recovery by decreasing pain and promoting

healing[22]. The technique is non-invasive, well tolerated and involves minimal risk of hepatic and renal injury[15]. The possibility of delivering nonsteroidal anti-inflammatory drugs (NSAIDs) through the skin for either local or systemic effects is being investigated increasingly in the management of pain and inflammation in musculoskeletal conditions in sports medicine and orthopedic rehabilitation such as epicondylitis, tendinitis, tenosynovitis, bursitis and OA[8,10].

The aim of this study was to evaluate the short-term effectiveness of ozonated olive oil versus Ketoprofen PH and continuous US therapy in athletes with adductor muscle injuries.

SUBJECTS AND METHODS

Sixty football male subjects from the Faculty of Physical Education, Zagazig University with a mean age of 19.9±2.8 years with a mean body mass index (BMI) of 22.1±1.3 and the onset of trauma ranged between 2-8 days. All of the football players with mild to moderate acute adductors muscle tear injuries were included. Players with severe muscle injury, multiple injuries, subjects who sustained a chronic trauma for more than 3 months, or who had used anti-inflammatory drugs at the onset of injury or within 30 days prior to the test, and subjects with skin problems (Eczema or Ketoprofen allergy) or recent wounds in the treated areas were excluded from this study. Concomitant use of NSAIDs or analgesics was not permitted throughout the study. Athletes were randomly assigned into three equal groups: group 1: Twenty athletes received US with ozonated olive oil as a coupling medium, group 2: twenty athletes received anti-inflammatory-analgesic gel as a coupling medium and group 3: (US group) twenty athletes received US with aqueous gel.

All participants were subjected to the following subjective and functional pre-and post treatment program tests: Pain perception intensity (VAS), 20 meters side walking time, Adductor (Add), Abductor (Abd), Quadriceps (Q), and abdominal muscles strength (Abdom St). Each subject performed three trials of each test.

Informed consent to participate in the study was obtained from all participants.

Ozonated olive oil was prepared according to Maritza et al. (2006)[19] by passing the ozone through a 80 ml of fresh extra virgin olive oil for three h/letter up to solidification complete and then saved in a normal dark room temperature. Ozone was generated by passing oxygen through a Trailigaz Labo model 12-02 ozone generator (Italy) at a fixed voltage (170 V), and a constant flow rate of 30 L h^{-1}. The ozone initial concentration (75.2 mg L^{-1}) was determined by Anseros Ozomat equipment. From observational point of view and several trails of application of olive oil, it was found that olive oil permits ultrasound.

The subjective assessments and functional performance were performed as follows: pain perception intensity which was measured and represented by a line scaled from 0 position which means no pain to 10 position which means unbearable pain, athletes were asked to mark at a point which refer to the degree of pain he feels. 20 meters walking time "as fast as possible" was measured with stopwatch and reported in seconds, adductors muscle strength were measured with the subjects in the side lying position and asking the subjects to forcibly rise their lower limb, abductor muscle strength from standing position and asking the subjects to forcibly rise their lower limb sideward, quadriceps muscle strength (shooting power) were measured with

the subjects in the sitting position and asking the subjects to forcibly rise their leg, abdominal muscle strength were measured with the subjects in the supine position and asking the subjects to forcibly rise their head. All muscles strength measurements were measured by a dynamometer in Newton (Preston Clifton N.J. U.S.A). Measurements and assessments were recorded pre-and post-treatment program by the same physical therapist.

Intervention

The physiotherapy program was conducted six times a week for two weeks, for a total of 12 sessions, while patients in a side lying position and the area to be treated (about 8 cm^2) was marked after detecting it by the clinical examination. Continuous ultrasonic waves with one MHz frequency and 1.5 w/cm^2 power were applied for five minutes to the target area with a four cm diameter applicator (Sonopuls 590 Enraf-Nonus) for all treated groups. In the US group (group 3) the skin was coated with an acoustic gel without any active pharmacological substance. In the PH groups, an ozonated olive oil (group 1) or a gel containing 2.5% Ketoprofen (group 2) was applied over the target area. US were then applied to the affected parts of the adductor muscle over the gel by the same therapist at right angles to ensure maximum absorption of the US energy in a standardized way for all subjects. After the US treatment, the gel was removed from the affected area.

Total energy (in joules) was calculated as watts per square centimeter × applicator size (in square centimeters) × time (in seconds). Energy density = Total energy (in joules)/ area treated[20].

The skin was pretreated with US, moistening or shaving in order to maximize clinical effectiveness and to avoid the influence of superficial heat on our results, outcome data were collected two days after the completion of therapy sessions.

A physical therapy program usually involves gradual stretching and strengthening of adductor muscles, abdominal wall muscles, iliopsoas muscle, quadriceps, and hamstrings for all program participants.

Statistical Analysis

All statistical analysis was carried out using SPSS 9.0 for Windows package program. All data are expressed as mean ± standard deviation. Paired t-test was used to compare the pre-and post-treatment changes in each group, ANOVA was used to compare the results of the three groups, and lest significant difference (LSD) test was used to prove the significant difference between groups. Also chi squared (X^2) was used in qualitative variables. P considered significant at (P value <0.05).

Table (1): Significant deference between the three groups (ozonated olive oil, analgesic gel, and US.) in Post-program measurements.

Variables	Groups	Mean	±SD	A gel	US	L.S.D 0.05
VAS	ozonated olive oil	3.1	1.37	0.8	2.2	0.66
	analgesic gel	3.9	1.83		1.4	
	US	5.3	2.24			
20.mT	ozonated olive oil	4.2	0.31	0.6	2.1	0. 74
	analgesic gel	4.7	0.41		1.6	
	US	6.3	2.24			
Add St	ozonated olive oil	62.3	5.4	2.5	11.7	0.85
	analgesic gel	59.8	6.2		9.2	
	US	50.6	4.3			
Abduct St	ozonated olive oil	76.3	7.65	5.1	11.5	1.75
	analgesic gel	71.2	8.21		6.4	
	US	64.8	6.33			
Q St	ozonated olive oil	82.4	5.2	2.6	10.1	1.46
	analgesic gel	79.8	4.7		7.5	
	US	72.3	6.4			
Abdm St	ozonated olive oil	44.6	5.71	0.6	15	0.67
	analgesic gel	44	5.64		14.4	
	US	29.6	6.54			

Table (2): Comparison between the Pre-to-post program measurements for the three groups (ozonated olive oil, analgesic gel and US group).

Variables	Groups	Pre program		Post program		Changed %
		Mean	±SD	Mean	±SD	
VAS	ozonated olive oil	6.8	2.00	3.1**	1.37	54.41
	analgesic gel	6.9	1.90	3.9**	1.83	43.48
	US	6.7	1.81	4.8*	2.24	28.35
20.mT	ozonated olive oil	7.4	2.39	4.4**	0.31	40.54
	analgesic gel	7.3	2.10	4.5**	0.41	38.36
	US	7.2	2.45	6.3 (NS)	2.24	12.50
Add St	ozonated olive oil	52.9	4.64	62.3**	5.4	17.77
	analgesic gel	54.2	4.91	59.8*	6.2	10.33
	US	54.0	4.31	50.6*	4.3	6.30
Abduct St	ozonated olive oil	65.7	3.71	76.3**	5.65	16.13
	analgesic gel	65.6	3.43	72.2*	6.21	10.1
	US	65.2	3.52	69.3(NS)	6.33	6.3
Q St	ozonated olive oil	66.3	3.53	82.4**	4.2	24.3
	analgesic gel	66.4	3.71	79.8**	4.7	20.2
	US	66.2	3.25	72.3(NS)	6.4	9.2
Abdm St	ozonated olive oil	44.6	4.21	63.4**	5.71	42.2
	analgesic gel	44.9	4.73	58.6**	5.64	30.5
	US	45.1	4.65	51.8*	6.54	14.9

**: Highly significant P<0. 01, *: significant P<0.05. NS: non significant P>0.05

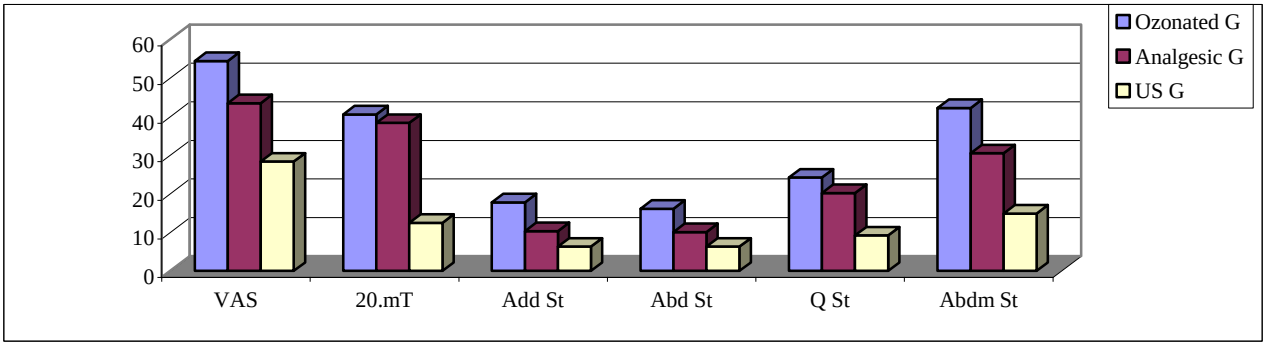

Fig. (1): The percentage change % of all the parameters studded for all groups.

RESULTS

Baseline characteristics of the patients showed no significant differences with respect to age, body mass index (BMI), onset of trauma.

Comparing all groups for the pre-measurements values it revealed no statistically significant differences in baseline measurements between all groups ($P > 0.05$).

All of the enrolled subjects completed the study and none were excluded from analysis. Comparing the post-program results of all groups, the two treatments groups showed a statistically significant differences for all functional tests measurements and pain evaluations ($P<0.01$) except Add and Abduct strength ($P<0.05$). Comparing the pain and functional evaluations of both treatment groups, it showed a statistically significant differences in favor of the ozonated olive oil group ($P<0.05$) (table 1). The US group showed no significant differences for, 20 m side walking time, Abduct St, and Q St ($P>0.05$), but pain, Add, and Abdominal strength showed a statistically significant differences ($P<0.05$) (table 2).

Comparing the percentage of change at the post-program measurements, the ozonated olive oil group showed the highest improvement in all the parameters studded compared to the two other groups. The anti-inflammatory-analgesic gel group showed more improvement compared to the US group (Figure 1), pain, 20 m T and Abdominal St showed the highest change at the end of study, Q, Add, and Abduct strength showed a smaller change (Fig. 1).

No local or systemic side effects were observed in the study population during the treatment program.

DISCUSSION

The results of this study clearly show a significant improvement in traumatic-induced pain and functional activity changes in athletes treated with ozonated olive oil or analgesic gel.

In agreement with our results BYl (1995)[8] reported that approximately 75% of the studies reviewed by them indicated some level of effectiveness of US as an enhancer of topically applied drugs. They attributed the physiological effects of US to the heating effects which increases the kinetic energy of the molecules in the drug and in the cell membrane, dilates points of entry such as the hair follicles and the sweat glands, and increases the circulation to the area sonicated. These physiological changes can enhance the opportunity for the drug molecules to diffuse

through the stratum corneum and be collected by the capillary network in the dermis.

Ozone therapy - i.e. the treatment of patients by a mixture of oxygen and ozone - has been used for many years as a method ancillary to basic treatment, especially in those cases in which traditional treatment methods do not give satisfactory results[2].

Bocci (1994)[4] reported that ozone therapy appears safe, simple, inexpensive and amenable to be adjusted to different pathological states. Bocci (2007)[5] add also that Ozone therapy is proving to be very useful in age-related muscular degeneration, ischaemic and infectious diseases, and in wound healing disorders, where conventional medicine has failed. Interestingly, in spite of its instability, the O_3 molecule can be stabilized as an ozonide between the double bonds of a monounsaturated fatty acid such as oleic acid. As a consequence, ozonated olive oil remains stable for two years at 4 °C[25]. Fabris et al. (1997)[11] and Maritza et al. (2006)[19] reported that in the majority of patients Ozone therapy relives pain, congestion, edema and increase mobility. In the case of ozonized olive oil some active oxygen species which are considered to be generated from the breakdown of triolein triozonide will be able to react and/or stimulate the cells resulting in marked analgesia and decongestion effects. They explained this process as the analgesia produced permits muscle relaxation and vasodilatation, and hence, a reactivation of muscle metabolism by favoring the oxidation of lactate and neutralization of acidosis, the increased synthesis of ATP, Ca^{2+} reuptake and reabsorption of edema. They added also that the diffusion of H_2O_2 into the intracellular and intracytoplasmic water, although transient, can activate biochemical and immunological pathways.

In this study, marked improvements in clinical parameters were obtained with ozonated olive oil and Ketoprofen PH in athletes with adductor muscle injuries, and both PH modality were found to be superior to the therapeutic US. Byl (1995)[8] and Conner et al (1998)[10] clinical studies on PH of topical anesthetics, corticosteroids and phenyl-butazone have shown beneficial effects in the treatment of common musculoskeletal conditions (epicondylitis, tendinitis, and tenosynovitis). Van der Windt et al. (1999)[26] mentioned that although the exact mechanism of action is unknown, heating is the most important of PH effect as it encourages regional blood flow and increases connective tissue extensibility. They added also that non-thermal effects are less understood and include molecular vibration, which increases cell membrane permeability and thereby enhances metabolic product transport.

In this study, we proposed that penetration of ozonated olive oil or Ketoprofen to the deeper sites is enhanced by PH, resulting in benefits additional to those of conventional therapeutic US. However, the two PH treatment modalities were found to be effective. Although all groups (PH and US) revealed a significant reduction in the reported pain during various activities, the ozonated olive oil group showed more significant improvement in pain evaluations as the issues of specificity of PH treatment and reports in the literature. Parallel to the results of our study Cagnie et al. (2003)[9] study results indicate that, in contrast to sham phonophoresis, ultrasound can increase the transdermal delivery of Ketoprofen in twenty-six patients with knee disorders. Also the pain relief achieved in this study was in line with that reported by Vlak (1999)[27] study on the effects of PH with diclofenac gel in treating 64 patients with painful shoulder syndrome has

been found to be highly effective in reducing pain at rest and in motion.

An in-season adductor muscle strain may be debilitating for the athlete. Furthermore, an adductor strain that is treated improperly could become chronic and career threatening[24].

Those results lead one to expect that ozonated olive oil group would demonstrate more functional benefits from the treatment program than would the two other groups. Regarding pain and functionality, the difference detected in this study between the two treatment groups and the US group suggested that PH are effective than the US in reducing pain and improving functionality.

A striking finding in this study is the increase in overall functionality in both PH groups, as measured by 20 side walking time, Add, Abdominal, Abduct, and Q muscles strength tests used in this study. The number of subjects who could perform various tests without symptoms increased significantly for both PH groups (ozonated olive oil and anti-inflammatory-analgesic gel). Although the US group showed a significant difference in the pain values, it did not reflected into significant functional difference; this may be due to the short treatment time (two weeks only). These observed success rate in the functional capacity of the PH treated groups may indicate that PH US have a positive effects in the healing process and that the smaller improvements in the pain and muscle power may be reflected into improvement in functionality which are in consistence with previous findings in the literature concerning the effects of US in soft tissues injuries[21]. Results of the present study explained by Ramirez et al. (1997)[20] who found that US stimulates collagen synthesis in tendon fibroblasts in response to an injury of the connective tissue matrix and that US stimulates cell division during periods of rapid cell proliferation. The Jussi et al. (1999)[13] descriptive study followed the regeneration of contusion injury of the rat gastrocnemius muscle which revealed that US treatment accelerates the rate of repair of injured Achilles tendons of rats.

James and Harold (2002)[12] who reported improved force production after contraction-induced muscle injury after seven days of continuous therapeutic US on thirty-three rats.

The results of the present study also was in line with that of Bocci (1999)[6] who foud that improving delivary of Ozone resulted in release of growth factors which appear beneficial in reducing ischaemia and enhancing wound healing. Valacchi et al. (2005)[25] claimed it to the cleansing effect of ozonated olive oil with improved oxygenation and enhanced healing in several conditions. While López et al.,[17] and Zamora et al. (2005)[28] study results claimed the positive effects to that ozone oxidative preconditioning exerts inhibitory effects on TNF-alpha production and on the other hand it exerts influence on the antioxidant-prooxidant balance for preservation of cell redox state by the increase of endogenous antioxidant systems. This may explain the powerful effect of ozone therapy in decreasing pain. Bocci (1996)[3] explained the increased success rate of ozone therapy in treating different pathologies is that ozone, being a strong oxidizer, can stimulate and increase of cellular anti-oxidant enzymes, eventually inhibiting the oxidative stress.

In contrast to our results, there are studies which have failed to show the efficacy of PH over US. Kozanoglu and his colleagues (2003)[16] failed to find any superior effects of ibuprofen PH over conventional US therapy in knee osteoarthritis. In a study by Klaiman et al. (1998)[15], the efficacy of 0.05% fluocinonide PH versus US therapy was

investigated in the treatment of 49 subjects with soft tissue injuries, and the authors found no difference in pain level and pressure tolerance between groups. This discrepancy may be attributed to: some authors used cream based PH that do not allow for adequate transmission of the acoustic wave, also the differences in the physiological properties of the drug used in PH can play a role, different physical therapy methodology used in those studies and a possible explanation for this is that none of our patients had a major long-standing soft tissues injuries.

Conclusion

Conventional therapeutic US application has a cumulative effect that enhances the overall outcome of treatment for pain and disability caused by soft tissues injuries in athletes. US can increase the transdermal delivery of ozonated olive oil which in turn improves the pain and functional level in subjects with soft tissues injuries. The application of ozonated olive oil with sonation will augment the benefits of US used alone.

REFERENCES

1- Baczkowski, K., Marks, P., Silberstein, M. and Schneider-Kolsky, M.E.: A new look into kicking a football: an investigation of muscle activity using MRI. Australas Radiol. 50(4): 324-329, 2006.
2- Białoszewski, D. and Kowalewski, M.: Superficially, longer, intermittent ozone therapy in the treatment of the chronic, infected wounds. Ortop Traumatol Rehabil. 30;5(5): 652-658, 2003.
3- Bocci, V.: Does ozone therapy normalize the cellular redox balance? Implications for therapy of human immunodeficiency virus infection and several other diseases. Med Hypotheses. 46(2): 150-154, 1996.
4- Bocci, V.: Ozone as a bioregulator. Pharmacology and toxicology of ozonetherapy today. J Biol Regul Homeost Agents. 10(2-3): 31-53, 1996.
5- Bocci, V.: The case for oxygen-ozone therapy.Br J Biomed Sci. 64(1): 44-49, 2007.
6- Bocci, V.: Biological and clinical effects of ozone. Has ozone therapy a future in medicine?, Br J Biomed Sci, 56(4): 270–279, 1999.
7- Burnham, R., Gregg, R. and Healy, P.: The effectiveness of topical diclofenac for lateral epicondylitis. Clin J Sport Med. 8:78-81, 1998.
8- Byl, N.: The use of ultrasound as an enhancer for transcutaneous drug delivery: phonophoresis. Ph Th. 75: 539-553, 1995.
9- Cagnie, B., Vinck, E. and Rimbaut, S.: Phonophoresis versus topical application of ketoprofen: comparison between tissue and plasma levels. Ph Th. 83: 707-712, 2003.
10- Conner-Kerr, T., Franklin, M. and Kerr, J.: Phonophoretic delivery of dexa-methasone to human transdermal tissues: a controlled pilot study. Eur J Phys Med Rehabil. 8: 19-23, 1998.
11- Fabris, G., Tommasini, G. and Lavaroni, A.: Percutaneous treatment of lumber herniated disk. Riv. Neuroradiol. 10: 523-532, 1997.
12- James, L.K. and Harold, W.B.: Continuous therapeutic ultrasound accelerates repair of contraction-induced skeletal muscle damage in rats. Arch Phys Med Rehabil. 83: 1-4, 2002.
13- Jussi Rantanen, Ola Thorsson, Per Wollmer, and Hannu Kalimo: Effects of Therapeutic Ultrasound on the Regeneration of Skeletal Myofibers after Experimental Muscle Injury. Am J Sport Med. 27: 54-59, 1999.
14- Kassan, D.G., Lynch, A.M. and Stiller, M.J.: Physical enhancement of dermatologic drug delivery: Iontophoresis and phonophoresis. J Am Acad Dermatol, 34: 657–66, 1996.
15- Klaiman, Shrader J.A. and Danoff, J.V.: Phonophoresis versus ultrasound in the treatment of common musculoskeletal conditions. Med Sci Sports Exerc, 30: 1349-1355, 1998.
16- Kozanoglu, E., Basaran, S., Guzel, R. and Guler-Uysal, F.: Short term efficacy of ibuprofen phonophoresis versus continuous

ultrasound therapy in knee osteoarthritis. Swiss Med Wkly. 133: 333-338, 2003.

17- López, O.Y., Delgado, R., González, R., Menéndez, S., Hernández, F. and Schulz, S.: Effects of ozone oxidative preconditioning on TNF-alpha release and antioxidant-prooxidant intracellular balance in mice during endotoxic shock. Mediators Inflamm. 24(1): 16-22, 2005.

18- Lynch, S.A., Renström, P.A.: Groin injuries in sport: treatment strategies. Sports Med. 28(2): 137-44, 1999.

19- Maritza, F., Díaz, A., Rebeca Hernández, Harold Fernándeza and Rafael Garcés: Comparative Study of Ozonized Olive Oil and Ozonized Sunflower Oil. J. Braz. Chem. Soc., 17(2): 403-407, 2006.

20- Ramirez, A., Schwane, J.A. and McFarland, C.: The effect of ultrasound on collagen synthesis and fibroblast proliferation in vitro. Med Sci Sports Exerc. 29: 326-332, 1997.

21- Robertson, V.J., Baker, K.G.: A review of therapeutic ultrasound: effectiveness studies. Ph Th. 81: 1339-1350, 2001.

22- Speed, C.A.: Therapeutic ultrasound in soft tissue lesions. Rheumato. 40: 1331-1336, 2001.

23- Tyler, T.F., Nicholas, S.J., Campbell, R.J., Donellan, S. and McHugh, M.P.: The effectiveness of a preseason exercise program to prevent adductor muscle strains in professional ice hockey players. Am J Sports Med. 30(5): 680-683, 2002.

24- Tyler, T.F., Nicholas, S.J., Campbell, R.J. and McHugh, M.P.: The association of hip strength and flexibility with the incidence of adductor muscle strains in professional ice hockey players. Am J Sports Med. 29(2):124-128, 2001.

25- Valacchi, G., Fortino, V. and Bocci, V.: The dual action of ozone on the skin. Br J Dermatol. 153(6): 1096-1100, 2005.

26- Van der Windt, D.A., van der Heijden, G.J., van den Berg, S.G., ter Riet, G. and de Winter, A.F.: Ultrasound therapy for musculoskeletal disorders: a systematic review. Pain 81: 257–271, 1999.

27- Vlak, T.: Comparative study of the efficacy of ultrasound and sonophoresis in the treatment of painful shoulder syndrome. Reumatizm, 46: 5–11, 1999.

28- Zamora, Z.B., Borrego, A., López, O.Y., Menéndez, S. and Hernández, F.: Effects of ozone oxidative preconditioning on TNF-alpha release and antioxidant-prooxidant intracellular balance in mice during endotoxic shock. Med Infl. 24(1): 16-22, 2005.

الملخص العربي

دراسة فعالية العلاج بطريقة إدخال المواد العلاجية إلى الجسم عن طريق الجلد بواسطة الموجات فوق الصوتية لعلاج إصابات العضلة الضامة للاعبي كرة القدم

تهدف هذه الدراسة إلى المقارنة بين كفاءة كلا من العلاج بزيت الزيتون المشبع بالأوزون أو بمضادات الالتهاب بطريقة إدخال المواد الكيميائية إلى الجسم عن طريق الجلد بواسطة الموجات فوق الصوتية والموجات فوق الصوتية فقط لعلاج حالات إصابات تمزق العضلة الضامة الفخذية للاعبي كرة القدم. تم اختيار ستون حالة من لاعبي كرة القدم الذكور يبلغ متوسط أعمارهم 19.9±2.8 عاما ومتوسط كتلة الجسم 22.1±1.3 ومدة الإصابة 2-8 أيام. تم تقسيم الحالات عشوائيا إلى ثلاث مجموعات متساويات يتم علاجهم جميعا باستخدام الموجات الصوتية بطريقة إدخال المواد الكيميائية إلى الجسم عن طريق الجلد. المجموعة الأولى: مجموعة العلاج بزيت الزيتون المشبع بالأوزون كوسيط للموجات فوق الصوتية، والمجموعة الثانية: مجموعة العلاج بمضادات الالتهاب حيث تم استخدام وسيط مائي يحتوى على مادة مضادة للالتهابات ومسكنة (كيتوبروفين) كوسيط موصل للموجات الصوتية والمجموعة الثالثة: المجموعة الضابطة حيث تم استخدام الموجات فوق الصوتية ووسيط مائي فقط. تم استخدام الموجات فوق الصوتية بقوة 1 ميجا هيرتز وتردد 1.5 وات/سم2 لمدة خمسة دقائق يوميا على المنطقة المصابة لمدة اثني عشرة يوم خلال أسبوعان للثلاث مجموعات. تم إخضاع كافة المشاركين بالبحث لعدة اختبارات قبل وبعد البرنامج العلاجي وهى قياس شدة الألم، وزمن مشى 20 مترا للجانب، قياس قوة العضلة الضامة والعضلة المبعدة للفخذ والعضلة الفخذية ذات الأربعة رؤوس والعضلة الباطنية المستقيمة. وقد أظهرت نتائج الدراسة انه وعلى الرغم من أن كل المجموعات العلاجية قد أظهرت تحسنا ذو دلالة إحصائية لمستوى الألم وكذلك القياسات الوظيفية الأخرى، فان المجموعة الأولى قد أظهرت تحسنا أفضل وذو دلالة إحصائية واضحة لمستوى الألم عن المجموعة الآخرتبن في نهاية الدراسة.

وقد استخلصت الدراسة أن الموجات فوق الصوتية تساعد في تخفيف الألم وزيادة القدرة الوظيفية للاعبي كرة القدم المصابين بتمزق بالعضلة الضامة، وإن إضافة زيت الزيتون المشبع بالأوزون تزيد من كفاءة وفعالية العلاج بالموجات فوق الصوتية عن طريق إدخالها للجسم بواسطة الموجات فوق الصوتية عن طريق الجلد.