IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 4, Issue 5 Ver. I (Sep. - Oct. 2015), PP 110-114
www.iosrjournals.org

Effect of Ultrasound and Exercise together and TENS alone in the Management of Chronic back pain

Dr. Faisal M. Alyazedi[1], Mrs. Shabana Khan[2], Mr. Abdulmohsen Hassan. Al Ghamdi[3], Mr. Nezar Al-Toriri[4],Mr. Sharick Shamsi[5]

[1]*(Prince Sultan Military Medical City, School of Allied Health Professions- Kingdom of Saudi Arabia)*
[2]*(Assistant Professor- Raj Nursing and Paramedical College-Gorakhpur-India)*
[3]*(Director of Physiotherapy Department, Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia)*
[4]*(Clinical Supervisor in Ortho OPD at Prince Sultan Military Medical City Riyadh, Kingdom of Saudi Arabia)*
[5]*(Physiotherapist in Ortho OPD at Prince Sultan Military Medical City Riyadh, Kingdom of Saudi Arabia)*

Abstract:
Study Objective: *Effect of Ultrasound and Exercise together and TENS alone in the managementof Chronic back pain.*
Design: *Pre & post test control group design.*
Method and Measurements*: 40 patients from Raj Nursing Home [Age group 25-55 yrs] who werediagnosed with Low back pain, with onset >1-3 months (chronic) were randomly assigned to either group A receiving US and Exercise together or group B receiving TENS alone. Treatment was given for 10 sessions for the period of 5week. Before treatment and after 5 weeks of treatment pain was assessed on VAS and MPQ.*
Results:*Subjects in-group A that received Ultrasound and exercise showed greaterImprovement in pain compared with the TENS groupon 5thweek compared with pre treatment. (p<0.050)*
Conclusion: *The result of study suggests that both Ultrasound and TENSimproves the symptoms of chronic back pain. TENS alone improved the pain symptoms but was too small to reach satisfactory outcome for patients. Based on these results Ultrasound and Exercise should be the treatment of choice for chronic back pain rather than TENS alone.*
Key Words: *Ultrasound,Exercise,TENS, Chronic back pain.*

I. Introduction

Low back pain (LBP) is the most frequent self-reported type of musculoskeletal pain, is often recurrent, and has important socio-economic consequences[1].

80% of population suffers from LBPat some time in their lives, and chronic LBP is the biggest factor limiting activity in young adults under the age of 45.[2]

LBP is the most frequent self-reported type of musculoskeletal pain. LBP is defined as pain and discomfort in the lumbosacral region, below the twelfth rib and above the gluteal crease. There are three types of LBP 1) non-specific 2) back pain with nerve root symptoms 3) back pain resulting from serious pathology .Non-specific LBP, in which there is no recognized pathoanatomic cause, is usually a benign condition but without appropriate management can develop into chronic LBP. LBP is alsocategorized according to its duration from onset, as acute (<6 weeks), sub-acute (6 weeks - 12 weeks), and chronic (>12 weeks)[3-4] .

The main objective of treatment for chronic LBP is for the patient to return to their desired level of activities and participation, as well as the prevention of chronic complaints and recurrences[5].

Many treatments are commonly used for LBP such as medication, physiotherapy, and surgery. Many of these interventions have been evaluated in randomized controlled trials and systematic reviews. Evidence shows that the effectiveness of some of the interventions is supported (e.g. exercise), while it shows that other interventions are not effective for LBP (e.g. laser therapy and traction)[6-8].

Ultrasounds (US) refer to mechanical vibrations, which are essentially the same as sound waves but of a higher frequency. US is a deep penetrating modality capable of producing changes in tissue through both thermal and non thermal (mechanical) mechanisms. Depending on the frequency of the waves, US is used for diagnostic imaging, therapeutic tissue healing or tissue destruction[9].

TENS therapy can be used in the management of acute LBP. For, TENS is the appropriate treatment for acute and chronic low back pain which cannot be treated less expensively, more safely or more effectively by other means. For more than four decades TENS has been applied in the treatment of acute and chronic pain syndrome[10].

There is no evidence regarding the benefit ofusing electrotherapy modalities such as interferential,laser, even though these modalitiesare commonly used in physiotherapy practice. Theguidelines and recent systematic reviews of therapeutic US have highlighted a need for furtherresearch to investigate the true effect of these

modalitiesin the context of well conducted randomized controlledtrials. As the application of US may have adverseeffects for patients with LBP (e.g. because of the transmissionof thermal energy), it is important to knowwhether the benefits outweigh the risks of this commonlyused intervention[11].

The aim of Study to investigate the effects of US and Exercise together with pre-defined doses, TENS program alone on pain intensity and function in patients with chronic LBP.

II. Material and Method

Subjects: 40 patients from Raj Nursing Home [Age group 25-55 yrs] who werediagnosed with Low back pain, with onset >1-3 months (chronic) were randomly assigned to either group A receiving US and Exercise together or group B receiving TENS alone. Treatment was given for 10sessions for the period of 5week. Before treatment and after 5weeks of treatment pain was assessed on VAS and MPQ[12].

Design: Study utilized pre & post test control group design.

Inclusion and exclusion criteria: Patients with LBP who have pain for more than 3 months will be eligible. Patients with nerve root symptoms, underlying systematic or visceral disease and specific conditions such as neoplasm, fractures, spondylolysthesis, spondylolysis, spinal stenosis, ankylosing spondylitis, previous low back surgery, and pregnancy will be excluded. Ifpatient taking any medication for specific psychological problems they will be excluded.

Equipments & Measuring Tools:

Examination table, US machine, US gel, TENS machine, VAS,Cotton, Pillow,

Interventions:

Subjects in each group received 10 sessions of treatment, each around 20 minutes, during a period of 5 weeks. All treatment, Ultrasound, exercise, andTENS delivery prescription was provided by qualified and experienced physiotherapist who were instructed by the researcher about study protocol.

Ultrasound treatment procedure and technique

Before starting treatment a consent form was given to patients and benefits and risks of procedure including sensations expected during procedure were explained to them. They were positioned (Sitting or lying) with additional pillow support comfortably and assessed thoroughly. Time and intensity was kept at '0' before switching on power. Patients were also instructed to report any excess heat or pain[13].

Gel is applied to skin and surface of transducer. US head is moved in overlapping circles, rate of transducer movement is slow, maximum 3-4cmsq.Dose of US was $1w/cm^2$ with frequency of 1MHz in continuous mode, 1MHz was chosen due to its increased penetration depth[9].Treatment lasted eightminutes over the paravertebral low back region.

Placebo Ultrasound

Patients in placebo group received same duration of Ultrasound with the apparatus switched on (so that patients see lights flashing on machine) but without any current output. In this way, patients were blinded for Ultrasound treatment.

TENS:

The TENS stimulators used were standard equipment in the Physiotherapy Department: The active electrode was placed securely at the center of the painful area of the back, and the second electrode was placed on the lateral aspect of a thigh. The frequency of the output was set at 4 to 8 Hz, and the current intensity was raised until the patient reported that it was unpleasant. The intensity was then reduced to a level that the patient reported he could tolerate. Adjustments in the intensity were made during the session to maintain it at the same tolerable level. The gentle massage used was produced by placing on the skin four suction cups which were kept in place by mild negative pressure within each cup. A specially constructed apparatus produced slowly varying changes in pressure so that a constant, gentle massage was applied to the skin[14]. The treatments were given twice a week, for 20 minutes.

Exercise therapy:

Exercise therapy appears to be slightly effective for decreasing pain and improving function in adults with chronic LBP[7].The intervention included 12 stretching exercises(i.e.,gastrocnemius, soleus, quadriceps, posterior and inferior shoulder, upper trapezius, hip flexor, back extension, back rotation, hamstrings, hip external rotators, back flexion), plus 3 additional stretches (hip internal rotators, hip adductors and hip flexors). Each stretching exercise was held for approximately 60 seconds and repeated once.In addition to a complete set (15) of full-body stretches,the class began with five minute warm-up periodconsisting of basic aerobics steps

(i.e., one minute each ofwalking in place, marching, lateral shuffling, turning andreaching, and box step) and also included four exercises to strengthen back,abdomen and hips (i.e., squats, crunches, obliquecrunches, back extensions)[15].

In this study both groups received pamphlets in which all the exercises that are going to be taught during the treatment period were available in combination with pictures.

The patients were treated for 10 sessions for period of 5 week. Pain was assessed by VAS and MPQ before starting treatment and on 5th week of post treatment session.

In VAS Patients were asked to describe their pain status on a 10cms horizontal line, where 0 represented no pain while 10 represented extremely intense pain. VAS was given to all participants then asked them to placed a vertical mark along the line where they feel pain[16].

MPQ consists of a set of pain descriptor list, and are read to a patient with the explicit instruction that he chooses only those words which described his feelings and sensations at that moment.

PRI is based on the rank values of words. In this scoring system, the word in each subclass implying the least pain is given a value of 1, the next word is given a value of 2, etc. The rank values of words chosen by a patient are summed to obtain a score separately for the sensory (subclass 1-10), affective (subclasses 11-15), evaluative (subclass 18) and miscellaneous (subclasses 17-20) words, in addition to provide a total score (subclasses 1-20).The PPI is recorded as a number and is associated with the following words 1-mild, 2-discomforting, 3-distrcession, 4- horrible, and 5-excruciating.

Data Analysis: All Data was analyzed using statistical test-pair t test. Mean and SD for pre treatmentand after 5th weektreatment pain values were calculated for each group. Significance was accepted at 0.05 level of probability.

Findings:

In this study 40 patients participated with a mean age of 46.25±13.41 in group A (M, n=10; F, n=10) and 44.65±14.23 in Group B (M, n=10; F, n=10) ranging from 25 to 55 years (Table 1). Sex was matched in both the groups.

	Group A (N=20) Mean±SD	Group B (N=20) Mean±SD
Age (Yrs)	46.25±14.41	44.65±14.23

Table1: Mean and SD of age between group A and B.

Mean reduction in PRI, PPI &VAS of group A & B with p & t values:

Mean reduction in PRI (Table 2,)

Both groups had significant difference in pretreatment to 5th week values as t and p values for group A and B were t=13.35, p=0.000 and t=10.61,p=0.000 respectively (table 2).

Groups	Pre R_X	5th week	Pre R_x to 5th week		
			Mean±SD	Paired t value	P value
Group A (N=20) Mean±SD	21.21±4.27	2.13±1.26	17.69±4.21	13.35	0.000
Group B (N=20) Mean±SD	16.25±4.54	7.43±3.71	7.10±2.44	10.61	0.000

Table 2: Mean reduction in PRI values between group A and B. Mean and standard deviation at pre treatment, 5th week and pre treatment to 5th week with t and p values.

Mean reduction in PPI (Table 3,)

Both groups had significant difference in pre R_x to 5th week values as t and p values for group A and B were t=11.38, p=0.000 and t=10.29,p=0.000 respectively (table 3).

Groups	Pre R_X	5th week	Pre R_x to 5th week		
			Mean±SD	Paired t value	P value
Group A (N=20) Mean±SD	4.45±0.63	0.50±0.55	2.34±0.81	11.38	0.000
Group B (N=20) Mean±SD	4.22±0.63	1.53±0.67	1.79±0.65	10.29	0.000

Table3: Mean reduction in PPI values between group A and B. Mean and standard deviation at pre treatment, 5th week and pre treatment to 5th week with t and p values.

Mean reduction in VAS (Table 4,)

Both groups had significant difference in pre R_x to 5th week values as t and p values for group A and B were t=18.06, p=0.000 and t=11.27,p=0.000 respectively (table 4).

Groups	Pre R_X	5^{th} week	Pre R_x to 5^{th} week		
			Mean±SD	PairedTvalue	p value
Group A (N=20) Mean±SD	7.61±1.26	0.45±0.47	6.51±1.28	18.06	0.000
Group B (N=20) Mean±SD	6.67±1.51	2.83±1.17	2.97±0.89	11.27	0.000

Table 4: Mean reduction in VAS values between group A and B. Mean and standard deviation at pre treatment, 5^{th}week and pre treatment to 5^{th}week with t and p values.

Thus, it can be concluded from above results that both interventions (US and Exercise) were effective in Pain reduction as reflected by VAS and MPQ .But, Patients (group A) that received US and Exercise showed greaterimprovement in pain compared with TENS (group B)on 5^{th} week compared with pre treatment .

III. Discussion

The fact that there are more than 20 types of treatment for chronic LBP, each of which has multiple subcategories, is a testament that no single approach has yet been able to demonstrate its definitive superiority[17]. For example, exercise therapy is one promising treatment option, but there is still no consensus upon which kind is the most effective [18]. This situation makes it very challenging forClinicians, policy makers, insurers, and patients to make decisions regarding which treatment is the most appropriate for chronic LBP. Despite the widespread use of therapeutic Ultrasound as one of the most popular and commonly used modalities in the field of physiotherapy for LBP patients.

US was effective in seven RCT in a review of the medline[19]. The biophysical effects of US revealed that there was insufficient biophysical evidence to provide a scientific foundation for the clinical use of US[20]. US with 1MHz produce biophysical effects in tissues[21].

PENS therapy was more effective than repeated TENS therapy in reliving chronic LBP[22].

TENS is significantly more effective for relieving pain and increasing straight leg raising than massage. The lack of significant improvement in back flexion, however, is indicative of the complexity of the back pain syndrome. It is not surprising that activity in a particular set of muscles is improved while that in another set is not. Nevertheless, the highly significant correlation between flexion and the PRI—the more sensitive of the two pain measures[14].

In a randomized clinical trial, Deyo et al.compared the effectiveness of TENS and a stretching program and did not find any significant differences between TENS and placebo after one month of treatment. Over the same period, the groups that performed workouts, whether or not in association with TENS, showed meaningful improvements in their painful state, or in function or pain frequency. In a recent systematic review, Khadilkar et al. only included two of the 47 clinical trials that had previously been performed to investigate the effects of TENS in cases of chronic low back pain. Even though the inclusion criteria were stated, the reviewers emphasized that there was a lack of a standardization system, and they did not find enough evidence to justify TENS use in cases of chronic low back pain[23].

The advantages of this study would be comparing the Ultrasound with placebo Ultrasound, which would clarify the value of adding Ultrasound to a semi-supervised exercise program. Limited possibilities for double blinding can be a potential limitation to this study.

The thoracolumbar fascia has been the subject of recent attention as a potential pain-generatingStructure in the back, its role in LBP pathophysiology is poorly understood. In a previous study using Ultrasound, we found that human subjects with chronic LBP of more than 12 months duration had increased thickness and echogenicity of the perimuscular connective tissues forming the thoracolumbar fascia in the LBP[24-25].

There is not a 'standard therapy' for any type (acute, sub-acute, chronic) of LBP that is agreed upon to use as a comparison in clinical trials. Exercise therapy is recommended by various guidelines, but it is not clear which type of exercises are best.[26-27].

According to Maher C.G. Physical therapy treatment including Ultrasound either of unknown value or ineffective. The available evidence suggests that the typical chronic LBP patient is left with some residual pain and disability. Developing new, more powerful treatments and refining the current group of known effective treatments is the challenge for the future[28] .

All the above study supported our work.

IV. Conclusion

This study has shown that for the group of patients involved Ultrasound and Exercise is effective in the treatment of ChronicLBPthanTENS alone.

Interest of Conflict Reference:

Some limitations of this study when no follow up was done by patient and variable patient mass. To reach significant conclusion further prospective study with comparable patient variables like ROM, Muscle force, disability & muscle strength. Further research is clearly indicated to establish if there is effectiveness of exercise alone in the treatment of LBP. There was an improvement of pain in the LBP, but it was too small to reach a satisfactory outcome for patient, most of whom required further physiotherapy to reduce their symptoms. This is a dire necessity in the field since a number of physiotherapy approaches are in vogue. So, further research can be done with a large sample using the same protocol to study which modality is more effective in treatment of LBP.

References

[1]. Walker BF: The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. J Spinal Disord 2000, 13:205-217.

[2]. Clinical diagnosis for discogenic low back pain -International Journal of Biological Sciences2009; 5(7):647-658 -Yin-gang Zhang1 , Tuan-mao Guo1, Xiong Guo2, and Shi-xun Wu1 .

[3]. Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F,Mannion AF, Reis S, Staal JB, Ursin H, Zanoli G: Chapter 4. European guidelines for the management of chronic nonspecific low back pain. Eur Spine J 2006, 15(Suppl 2):S192-300.

[4]. Waddell G: The Back Pain Revolution. 2 edition. Churchill-Livingstone; 2004.

[5]. Bekkering GE, Hendriks HJM, Koes B, Oostendorp RA, Ostelo R, Thomassen J,Van Tulder M: Dutch Physiotherapy Guidelines for Low Back Pain. Physiotherapy 2003, 89:82-96.

[6]. Gay RE, Brault JS: Evidence-informed management of chronic low back pain with traction therapy. Spine J 2008, 8:234-242.

[7]. Hayden JA, van Tulder MW, Malmivaara AV, Koes BW: Meta-analysis:exercise therapy for nonspecific low back pain. Annals of Internal Medicine 2005, 142:765-775.

[8]. Yousefi-Nooraie R, Schonstein E, Heidari K, Rashidian A, Pennick V, Akbari-Kamrani M, Irani S, Shakiba B, MortazHejri SA, MortazHejriSO,Jonaidi A: Low level laser therapy for nonspecific low- back pain. Cochrane Database Syst Rev 2008, 16:CD005107.

[9]. Low, J & Reed, A (2000) Electrotherapy explained: - Principles & practice, Butter Worth Heinemann, Oxford (a) 191, 365(b) (195-207.)

[10]. Ahmed B, Alam S, Rashid I, Rahman N, Rahman A, Uddin T, Azad GN, Effects of Transcutaneous Electrical Nerve Stimulation (Tens) On Patients With Acute Low Back Pain.

[11]. Robertson VJ: Dosage and treatment response in randomized clinical trials of therapeutic Ultrasound. Physical Therapy in Sport 2002, 3:124-133.

[12]. SafooraEbadi, NoureddinNakhostin Ansari, Nicholas Henschke, Soofia Naghdi, Maurits W van Tulder- The effect of continuous Ultrasound on chronic low back pain: protocol of a Randomized controlled trial - Ebadi et al. BMC Musculoskeletal Disorders 2011, 12:59- P-2-6.

[13]. Barbara J Behrens, Susan L Michlobitz (physical agent theory & practical.).

[14]. Ronald Melzack, Phyllis Vetere , Lois Finch, Transcutaneous Electrical Nerve Stimulation for Low Back Pain: A Comparison of TENS and Massage for Pain and Range of Motion. PHYS THER. 1983; 63:489-493.

[15]. Sherman KJ, Cherkin DC, Erro J, Miglioretti DL, Deyo RA: Comparing yoga, exercise, anda self- care book for chronic low back pain: a randomized, controlled trial. Ann Intern Med 2005, 43:849-856.

[16]. Khaled Othman AlAmoudi, Sharick Shamsi, Thamer Mohammad Al Mugheeb- Effect of Maitland's Oscillatory Technique on Acute HemiplegicShoulder- IJHSR Vol.5; Issue: 7; July 2015, 224-233.

[17]. Haldeman S, Dagenais S: What have we learned about the evidence informed management of Chronic low back pain? Spine J 2008, 8:266-277.

[18]. Hayden JA, van Tulder MW, Malmivaara AV, Koes BW: Meta-analysis: exercise therapy for nonspecific low back pain. Annals of Internal Medicine 2005, 142:765-775.

[19]. Naslund, J (2001) 'Modes of sensory stimulation, clinical trials and physiological aspects'physiotherapy: 87, 8, 413-423.

[20]. Baker KG, Robertson VJ and Duck FA (2001) A review of therapeutic Ultrasound:- Biophysical effects, Physical effects, Physical therapy, 81, 7, 1351-58.

[21]. Wadsworth, H and Chanmurgan, APP (1980). Electrophysical agents in physiotherapy, science press, Marrickville, NSW, Australia.

[22]. Masataka Yokoyama, Xiaohui Sun, Satoru Oku, Naoyuki Taga, Kenji Sato, Satoshi Mizobuchi, Toru Takahashi,and Kiyoshi Morita-Comparison of Percutaneous Electrical Nerve Stimulation with Transcutaneous Electrical Nerve Stimulation for LongTerm Pain Relief in Patients with Chronic Low Back Pain, International Anesthesia Research Society, 2004; 98:1552–6.

[23]. Ligia Maria Facci, Jean Paulus Nowotny, Fabio Tormem, Virgínia Fernandes MoçaTrevisani- Effects oftranscutaneous electrical nerve stimulation (TENS) and interferential currents (IFC) in patients with nonspecific chronic low back pain: randomized clinical trial- Sao Paulo Med J. 2011; 129(4):206-16.

[24]. Taguchi T, Hoheisel U, Mense S: Dorsal horn neurons having input from low back structures in rats. Pain 2008, 138(1):119-129.

[25]. Langevin HM, Stevens-Tuttle D, Fox JR, Badger GJ, Bouffard NA, Krag MH: Ultrasound evidence of altered lumbar connective tissue structure in human subjects with chronic low back pain. In Fascia research ii. Edited by: Huijing PA, Hollander AP, Findley T, Schleip R. Elsevier, Munich; 2009.

[26]. Bekkering GE, Hendriks HJM, Koes BW, Oostendorp RAB, Ostelo RWJG, Thomassen JMC, van Tulder MW: Dutch Physiotherapy Guidelines for Low Back Pain. Physiotherapy; 2003, 89(2):82-96.

[27]. Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F, Mannion AF, Reis S, Staal JB, Ursin H, Zanoli G: Chapter 4: European guidelines for the management of chronic nonspecific low back pain. Eur Spine J; 2006, 15(Suppl 2):S192-S300.

[28]. C.G. Maher, Effective physical treatment for chronic low back pain, Orthop Clin N Am; 2004 (35) 57– 64.