A Comparative Study on The Effectiveness of Soft Tissue Work and Transcutaneous Electrical Nerve Stimulation: In Patients with Non-Specific Lower Back Pain

***Annosha Syed, PhD**
Moomal Institute of Physiotherpy and Allied Health Sciences, Hyderabad, Sindh, Pakistan.
saleem_alishah32@yahoo.com

Uroosa Syed
Pns Shifha, Lily Bridge Rd, Dha, Karachi, Sindh, Pakistan
uroosasyed@hotmail.com

Mohsin Ali
Communication System & Networks, Applied Engineering- Appengg
Hyderabad, Sindh, Pakistan
mohsin_2@hotmail.com

Muhammad Amir
Institute Of Physical Medicine and Rehabilitation, Jinnah Post Medical Center, Karachi, Sindh, Pakistan.
placil@hotmail.com

Corresponding author: Annosha Syed,
saleem_alishah32@yahoo.com

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Abstract:

In Pakistan, one of the primary causes of the reduced functional activities output at work is the lower back pain (LBP) which are in general non-specific. In physiotherapy clinical practice multiple treatments for non-specific lower back pain (NSLBP) are available including soft tissue work (STW), transcutaneous electrical nerve stimulation (TENS), exercise and heat therapy. This study focused to compare the effectiveness of STW and TENS in patients suffering from NSLBP. A RCT with two-groups pre & post-test was conducted at Physiotherapy OPD, JPMC, Karachi. A total of 40 NSLBP patients in the 15 - 45 years of age were included through non-probability purposive sampling method. Baseline screening was performed Through systematic random sampling allocation of subjects were taken place into two groups. A-group received STW with standardized exercise protocol (SEP) while B group received TENS with SEP. Calculated data were entered into SPSS V-16.0. For categorical variables percentages and frequencies were computed. Results are expressed in mean and standard deviation. Each group was compared with the final measure after four weeks of data collection as pre and post by using paired t-test and independent t-test. Pain, tenderness and functional disability were assessed using Numeric pain rating scale (NPRS), Tenderness index (TI) and Oswestry Disability Index (ODI) respectively. Pre & post treatment scores were documented. A maximum rate of drop-out 20% was presumed. This study showed a significant decline at the end of treatment sessions in Pain scale, TI and ODI scores in both groups (A & B), although a more obvious reduction was observed in ODI of group-A in comparison to the group-B. It spotlights that STW along with SEP should be used in patients with NSLBP.

Keywords: Non-specific lower back pain, TENS, Soft Tissue Work

Introduction:

Back ache is one of the most prevalent musculoskeletal complaints and most of the people in their life-time experiencing pain in back (Walker, 2012). Occupational and work-related problems reported as the main cause of low back pain among many peoples (Allan, & Waddell, 1989 and Lis et al., 2006). About 75-84% of low back pain complaints were recorded in the general population and severe morbidity growing health care costs, sick leaves and individual endure as a result of low back pain (LBP) reported around 5-10% (Heliövaara, et al., 1989, Cassidy, 1988 and Dagenais, 2008). The term non-specific low back (NSLBP) pain is elucidated as pain in the back that is not linked with specific pathology. Anatomically the source is unfitted to link with NSLBP in about 80% people (McIntosh, & Hall, 2011). In primary care higher prevalence (85-90%) of NSLBP in patients is observed (Deyo, & Phillips, 1996). The NSLBP patients seen by physical therapists, help in the proper diagnosis (Wand, & O'Connell, 2008). Worldwide, more disability is observed due to back pain rather than any other condition (Rudy, et al., 2007). In developing countries years lived with disability (YLDs) about 59% of global burden in adults age 50-69 due to back pain reported in 1990, but by 2010 this proportion had increased to 67%. Moreover, it is ranked by Global Burden of Disease Study as the highest number of YLDs and sixth in terms of disability-adjusted life years (DALYs) (Brooks, 2006, Hoy, et al., 2014 and Woolf, & Pfleger, 2003). One of the studies reports that in LBP cases, over 90% are NSLBP (Mirza Baig, et al., 2018). In Pakistan, 19.5 % prevalence of LBP has been found and its third leading cause of YLDs (Buchbinder, et al., 2013). On the contrary, in other countries like China, Bangladesh, Iran, the United Kingdom and India prevalence of LBP has been reported as 34.1, 20.1, 14.8, 9.0 and 8.4% respectively (Hoy, et al., 2012). One of the surveys shows that Men and women are equally affected by LBP. Moreover, 50% of adults and 30% of adolescents at least once (Papageorgiou et al., 1995). Likewise, incidence of LBP among many young adults (18-50%) and children also raising (Diepenmaat, 2006). Karahan, et al., (2009) studied the frequency of back pain among hospital staff and found that 65.8% had suffered from back pain and about 61.3% within the previous 12 months. Additionally, the Bradford-Hill causation criteria in relation with systematic reviews from workers studies summarizing the independent contributing factors of low back pain were, improper occupational sitting (Langevin, & Sherman, 2007), postural instabilities, (Roffey, et al., 2010a), standing and walking (Roffey, et al., 2010b), inappropriate patients handling (Roffey, et al., (2010c) pulling or pushing, avoidance of ergonomically positioning during bending, twisting, lifting and carrying (Roffey, et al., 2010d, Wai, 2010a and Wai, 2010b). Among the various treatment options evidences to compare the effectiveness between STW and TENS in NSLBP has not been evaluated. Research from the past advocate that STW decreases pain threshold and improves activities of daily living (ADL) by applying the proper modalities that direct towards the muscle and fascia (Marzouk, 2012). The TENS is a therapeutic non-invasive modality mainly used for pain relief by electrically stimulating peripheral nerves via skin surface electrodes (APTA Anthology, 1993). Milne et al., in (2022) conducted a meta-analysis suggest that TENS does not have clinically important benefit on pain in patients with chronic LBP. Regardless of the evidence of efficacy of TENS in treating chronic LBP, it is a common modality for treating LBP due to higher demand for noninvasive, nonpharmacologic interventions. It is highly prescribed due to low cost and low occurrence of side effects (Williams, 2010). In addition to this, Paley et al., (2021) conducted a comprehensive review in which there were no examples of meta-analyses with 'sufficient data' regarding TENS demonstrating no benefit. Therefore, this study evaluates TENS to be considered or not as a treatment option.

Materials and Methods:

Location, Design and Duration:

This study was conducted at the outpatient department of Jinnah postgraduate medical center, Karachi, Pakistan. This was a self-controlled trial with two-groups in pre and post study design among patients of NSLBP was used. Those patients willing for participation were selected for this study after written informed consent. The total duration of this study was 6 months from March 3, 2019 to August 3,2019.

Inclusion and Exclusion criteria:

The patients included were 15-45 years old with a history of non-specific lower-back pain. Negative modified Schober's test. Negative SLR (Straight leg raise). Localized pain or either radiate up to gluteal folds. Those who were not fitting to the aforementioned criteria were excluded from the study i.e., patients age less than 15 and more than 45, having lower-back pain that radiate to the lower limbs and

having other complications like, cauda equina syndrome, malignancy, a pregnant woman with cardiac pacemaker were excluded from this study.

Sample Size:

The total patients consented for the study were 40 both genders including 30 male 10 female. They were randomly equally divided into two groups (A & B) through non-probability purposive sampling technique having 20 participants. The patients were precisely explained about the study.

Study Protocol:

The group A received soft tissue work (STW) including, Myofascial release (to and fro mobilizations or oscillations, alternate up and down stokes on either side). Three sets of 30 stokes/oscillations were applied at the rate of three oscillation per second. Localized stretching of erector spinae muscles. The generalized stretch of para-spinal muscles of low back simultaneously.

The group B received a program of electrotherapy using Trans electrical nerve stimulator (TENS) for 20 minutes on continuous mode in the prone lying position.

Additionally, both groups received the program of standardized exercise protocol (SEPs) as supportive treatment include: Stretching Ex: through alternate quadruped position, pelvic tilting, bridging, wall squatting with 10 cycles (repetitions).

Outcome Measurements:

Outcome were measured in all participants at the first and last treatment session by using Numeric pain rating scale (NPRS), which is a valid and reliable scale to measure the intensity of pain with higher reliability (Dailey et al., 2017).

The Tenderness Index (TI), which is ranging from 0 - 4 (no pain, patient (pt) winces, pt winces and withdraw, pt not allow the joint to touch) (Basford, 1987 and Childs, 2005).
Oswestry Disability Index (ODI), is a principle lower-back functional outcome tool and is considered as the Gold Standard (Childs, 2005, Jensen et al., 1993, Rodriguez, 2001 Ferraz, 1990 and Hawker, 2011). Each subject received a total of 12 treatments sessions (three sessions per/week) for four consecutive weeks.

The duration of each session given to group A (STW and SEPs) and group B (TENS and SEPs) was 30 minutes.

The Appendix 1 provides further detailed treatment procedure adopted in this study at the end of this manuscript.

Justification for the use of SEP

According to Ganong, (1978), the release of fascial tension is a more efficient biomechanical function. Moreover, muscles and bone both are structures that work dynamically in response to exercises therefore, all the participants were given SEP within joint range. Exercise training program help in restoring the loss of muscle mass due to disuse. Therefore, it is put forwarded that SEPs should be included as a crucial component of treatment and prophylaxis. Through SPSS-version 16.0 data were scrutinized, results are expressed in mean and standard deviation and are displaced graphically as well in tables. Following are some pictures with explanation of treatment procedures and protocols.

Statistical Analysis

The collected data on the various aspects was compiled key in into SPSS (Version 16.0). In this mainly descriptive statistics and paired t-test was performed. The differences in the mean were regarded significant at $P<0.05$ of confidence interval.

Results:

As mentioned earlier, that the total numbers of patients suffering from non-specific lower back pain (NSLBP) were 40. The means were analyzed for numeric pain rating scale"(NPRS) at pre and post-treatment. The "tenderness index"(TI) at pre and post-treatment and "oswestry disability index"(ODI), for pre and post-treatment of both groups (A &B). To compare the mean levels for pre and post treatment of NPRS, TI and ODI between Soft tissue work and TENS. The results are presented in the following section;

The Table 1 summarizes the data on patients various aspect i.e. numbers, percentages, age, gender and the numbers in the treatment groups (STW & TENS).

Table 1: Mean age by gender and groups of STW and TENS

Age (Years)	Numbers	Percent	Mean ± SD
15-20	3	7.5	3.63 ±1.275
21-25	5	12.5	
26-30	9	22.5	
31-35	10	25.0	
36-40	13	32.5	
Gender			
Male	30	75	
Female	10	25	
Group			
STW	20	50	
TENS	20	50	

The mean, standard deviation and comparisons of "Numeric Pain Rating Scores" of soft tissue work and TENS in patients at pre and post level of treatment shows that there was significant (P<0.001) difference in the NPRS score of soft tissue work and TENS after treatment. The pre and post treatment is shown in the Table 2.

Table 2: Comparisons of "Numeric Pain Rating Scores" of soft tissue work and TENS in patients at pre and post level of treatment

	Pre	**Post**	**p-value**
	Mean ± SD	**Mean ± SD**	
STW Patients (n=20)	4.40 **±** 1.635	0.80 **±** 1.152	P<0.001
TENS Patients (n=20)	4.40 **±** 1.314	0.90 **±** 0.968	P<0.001
*p<0.05 was considered significant using Paired Sample t-test			

The data on the mean & standard deviation comparisons of "Tenderness Index" of soft tissue work and TENS in patients shows that there was significant (P<0.05) effect as well at pre and post level of treatment. The results shows that there was significant (P<0.05) difference in the TI score of soft tissue work and TENS after treatment with as shown in the Table 3.

Table 3: Comparisons of "Tenderness Index" of soft tissue work and TENS in patients at pre and post level of treatment.

Tenderness Index (TI)	**Pre**	**Post**	**p-value**
	Mean ± SD	**Mean ± SD**	
STW Patients (n=20)	1.30 ± 0.733	0.20 ± 0.523	P<0.001
TENS Patients (n=20)	1.15 ± 0.589	0.25 ± 0.444	P<0.001
*p<0.05 was considered significant using Paired Sample t-test			

The data on comparisons reveals some interesting effects of the STW modality on the "Oswestry Disability Index" of soft tissue work in patients at pre and post level of treatment. This modality shows that ODI value of soft tissue work greatly improved after treatment being the effect was highly significant (P<0.001) as shown in the Figure 1.

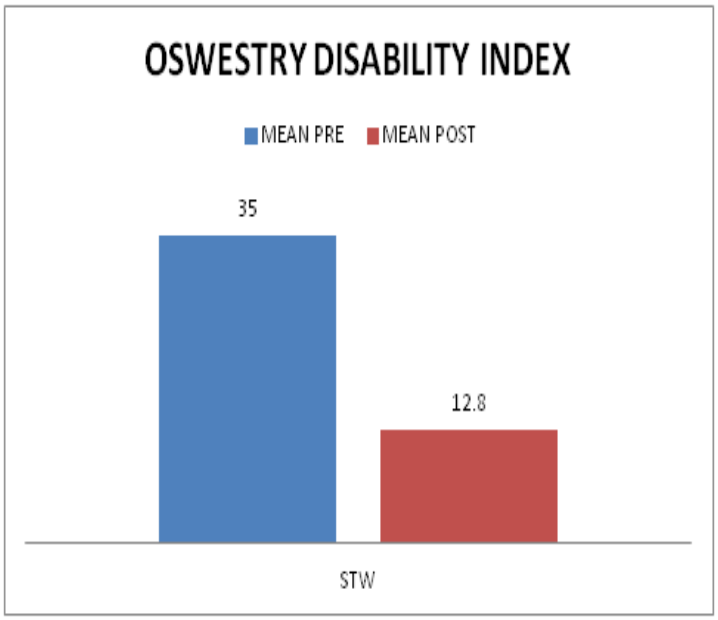

Figure 1: Comparisons of "Oswestry Disability Index" of soft tissue work in patients at pre and post level of treatment

Similarly, the effect TENS modality followed the same trend of effect on ODI in patients at pre and post level of treatment. This modality shows that ODI value greatly improved after treatment. There were significant (P<0.001) differences in the pre and post period as shown in the Figure 2.

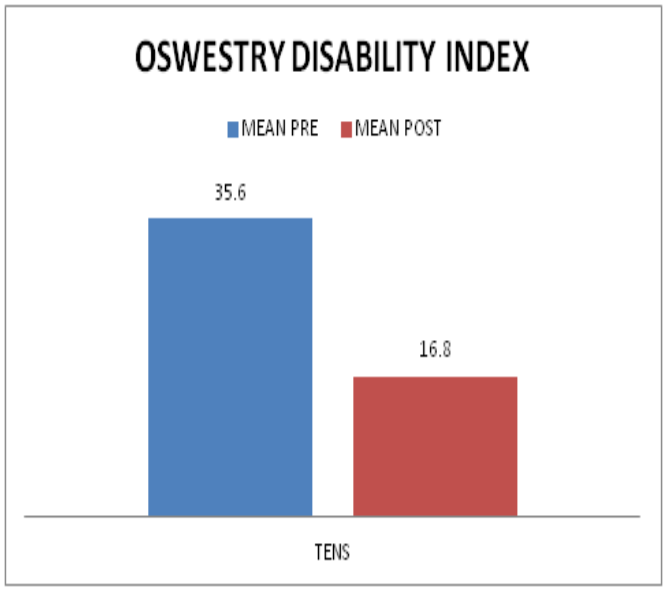

Figure 2: Comparisons of "Oswestry Disability Index"(ODI) with TENS in patients at pre and post level of treatment

Looking at the mean comparisons of NPRS, TI and ODI scores between the two modalities (STW & TENS) all the three parameters' values significantly (P<0.001) equally improved for both groups. Therefore, was no difference between STW and TENS on the NPRS and TI scores of patients (Table 4).

Table 4: Comparisons of TW and TENS on the NPRS, TI and ODI scores

Post-Treatment	STW Mean ± SD	TENS Mean ± SD	p-value
NPRS	0.80 ± 1.151	0.90 ± 0.968	0.721
TI	0.20 ± 0.523	0.25 ± 0.444	0.729
ODI	12.80 ± 7.606	16.80 ± 12.007	0.078
*p<0.05 considered significant using independent sample t-test			

Discussion:

In this study, it was observed that either STW or TENS are effective in treating patients with non-specific lower back pain. In this study, significant dropping was observed in the intensity of pain, tenderness and disability at the end of treatment sessions, but the decline in ODI was more marked in participants receiving STW in comparison with TENS. Remarkable difference in pain intensity and functional disability were observed in data collection after 4 weeks. Additionally, NPRS, TI and ODI were having significant differences in pre and post treatment scores for group A & B were noticed. In comparison with this study, Nesrin Yağcı conducted a study on 122 participants on the effects of soft tissue mobilization on pain, disability level in patients with chronic low-back pain (CLBP). A significant difference between pain intensity and disability level (p<0.005) was observed. Soft tissue techniques in manual therapy applications are described in the text of muscle energy technique, trigger point relaxation, myofascial relaxation and post isometric relaxation technique Nesrin et al., 2020). Ziyan Chen et al in 2021 conducted a meta-analysis which showed that myofascial release (MFR) has a significant effect on reducing back disability in patient with back pain (Ziyan et al., 2021). Core stability has reached a wide spread in recent years, considering that several studies have observed in CLBP. The purpose of core stability exercises is to recreate normal muscle function in order to increase spinal stability, neuromuscular control within the lumbopelvic region, induce inter-segmental stiffness and prevent shear force that causes injury to the lumbar spine (Frizziero, et al., 2021). In a study of Cleland et al., (2006) explained that SEP for managing NSLBP should include pelvic tilting, bridging, wall squats and quadruped alternate arm and legs activities in patients were asked to perform 3 sets of 10 repetitions of each exercise within pain free range that result in clinically meaningful improvement in dysfunctions (Cleland, et al., 2006). Although the current study findings of pain reduction with application of STW, are congruous with the study finding of Antony Leo Aseer. P et al, signified lessen pain in CLBP through STW (Antony Leo Aseer, & Iyer, 2013). Wu zugui et al conducted a systemic review and meta-analysis in 2021. Improvement in pain and physical function were observed for CLBP after receiving myofascial release. Pain (SMD=0.37, 95% CI (-0.67, -0.08), I^2 =46%, P=0.01 and physical function as (SMD=0.43, 95% CI (-0.75, -0.12), I^2 =44%, P=0.007. On the contrary, the present study findings and undoubtedly evidence related to the effectiveness of STW along with exercise were found (Wu, et al., 2021). Jauregui, (2016) conducted a meta-analysis of TENS for CLBP. Demonstrated noticeable pain reduction. The standardized mean difference in pain from pre-post treatment for TENS was 0.844 which is much similar to current study in which mean difference in pain from pre-post treatment for TENS reduced from4.4000 to 0.9000. In addition to this, Thiesis with fellows, conducted a 12 weeks double blinded RCT on electrical stimulation for CLBP. In that they assessing the therapeutic effectiveness of TENS in NSCLP which relatively small as compare to other modalities (Thiese, et al., 2021). This study affirms significant effects of STW than TENS along with SEP in NSLBP. In contrast, both the treatments had prominent effects in generating remarkable improvement in pain intensity and disability. In LBP

wide range of cases are NSLBP, which is a paramount health issue which socially augment the burden of disease. Therapeutic procedures that are economical and safe like STW and TENS combined with exercise (SEP) possibly will show substantial value.

Limitations of the Study

This study was unable to address the long-term benefits of STW and TENS because the duration since the duration of the treatment is short around 4 weeks for the non-specific lower back pain (NSLBP) management.

Conclusion:

In summing up, the current study reveals that physical therapy interventions such as STW and TENS have remarkable results in dropping pain intensity and ameliorating disability in NSLBP patients. It is suggested that STW along with SEP should be used in the patients with NSLBP.

References:

Allan, D.B., & Waddell, G. (1989). An historical perspective on low back pain and disability. Acta Orthopaedica Scandinavica, 60 (sup234), 1–23.

Antony Leo Aseer, P., & Iyer, L.S. (2013). Effectiveness of Integrated Soft Tissue Mobilization on the Functional Outcome in Chronic Low Back Pain Patients. Journal of Exercise Science and Physiotherapy, 9(1), 57.

American Physical Therapy Association Anthology (1993). Electrical Stimulation: Management of Pain. American Physical Therapy Association Anthology, Vol. 2.

Basford, J. Electrical Therapy (1987). Krusens Handbook of Physical Medicine and Rehabilitation. 4th ed. Oxford: Oxford University Press; pp.375 - 380.

Brooks, P.M. (2006). The burden of musculoskeletal disease—a global perspective. Clinical Rheumatology, 25(6), 778–781.

Buchbinder, R., Blyth, F.M., March, L.M., Brooks, P., Woolf, A.D., & Hoy, D.G. (2013). Placing the global burden of low back pain in context. Best Practice & Research Clinical Rheumatology, 27(5), 575–589.

Cassidy, J.D., Carroll, L.J., & Côté, P. (1998). The Saskatchewan Health and Back Pain Survey. Spine, 23(17), 1860–1866.

Childs, J.D., Piva, S.R., & Fritz, J.M. (2005). Responsiveness of the Numeric Pain Rating Scale in Patients with Low Back Pain. Spine, 30(11), 1331–1334.

Cleland, J., Childs, J., Palmer, J. and Eberhart, S., 2006. Slump stretching in the management of non-radicular low back pain: A pilot clinical trial. Manual Therapy, 11(4), pp.279-286.

Dagenais, S., Caro, J., & Haldeman, S. (2008). A systematic review of low back pain cost of illness studies in the United States and internationally. The Spine Journal, 8(1), 8–20.

Dailey, D.L., Rakel, B. A., Vance, C G.T., Liebano, R.E., Amrit, A.S., Bush, H.M., Lee, K.S., Lee, J.E., & Sluka, K.A. (2013). Transcutaneous electrical nerve stimulation reduces pain, fatigue and hyperalgesia while restoring central inhibition in primary fibromyalgia. Pain, 154(11), 2554–2562.

Deyo, R.A., & Phillips, W.R. (1996). Low Back Pain. Spine, 21(24), 2826–2832.

Diepenmaat, A.C.M. (2006). Neck/Shoulder, Low Back, and Arm Pain in Relation to Computer Use, Physical Activity, Stress, and Depression Among Dutch Adolescents. PEDIATRICS, 117(2), 412–416.

Ferraz, M. B., Quaresma, M.R., Aquino, L.R., Atra, E., Tugwell, P., & Goldsmith, C.H. (1990). Reliability of pain scales in the assessment of literate and illiterate patients with rheumatoid arthritis. The Journal of rheumatology, 17(8), 1022–1024.

Frizziero, A.; Pellizzon, G.; Vittadini, F.; Bigliardi, D.; Costantino, C. (2021). Efficacy of Core Stability in Non-Specific Chronic Low Back Pain. J. Funct. Morphol. Kinesiol., 6, 37.

Hawker, G.A., Mian, S., Kendzerska, T., & French, M. (2011). Measures of adult pain: Visual Analog Scale for Pain (VAS Pain), Numeric Rating Scale for Pain (NRS Pain), McGill Pain Questionnaire (MPQ), Short-Form McGill Pain Questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short Form-36 Bodily Pain Scale (SF. Arthritis Care & Research, 63(S11), S240–S252.

Heliövaara, M., Sievers, K., Impivaara, O., Maatela, J., Knekt, P., Makela, M., & Aromaa, A. (1989).

Descriptive Epidemiology and Public Health Aspects of Low Back Pain. Annals of Medicine, 21(5), 327–333.

Hoy, D., Bain, C., Williams, G., March, L., Brooks, P., Blyth, F., Woolf, A., Vos, T., & Buchbinder, R. (2012). A systematic review of the global prevalence of low back pain. Arthritis & Rheumatism, 64(6), 2028–2037.

Hoy, D., March, L., Brooks, P., Blyth, F., Woolf, A., Bain, C., Williams, G., Smith, E., Vos, T., Barendregt, J., Murray, C., Burstein, R., & Buchbinder, R. (2014). The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. Annals of the Rheumatic Diseases, 73(6), 968–974.

Jauregui, J.J., Cherian, J.J., Gwam, C.U., Chughtai, M., Mistry, J.B., Elmallah, R.K., Harwin, S. F., Bhave, A., & Mont, M.A. (2016). A Meta-Analysis of Transcutaneous Electrical Nerve Stimulation for Chronic Low Back Pain. Surgical technology international, 28, 296–302.

Jensen, M.P., & McFarland, C.A. (1993). Increasing the reliability and validity of pain intensity measurement in chronic pain patients. Pain, 55(2), 195–203.

Langevin, H. M., & Sherman, K. J. (2007). Pathophysiological model for chronic low back pain integrating connective tissue and nervous system mechanisms. Medical Hypotheses, 68(1), 74–80.

Lis, A.M., Black, K.M., Korn, H., & Nordin, M. (2006). Association between sitting and occupational LBP. European Spine Journal, 16(2), 283–298.

Maher, C., Underwood, M., & Buchbinder, R. (2017). Non-specific low back pain. The Lancet, 389(10070), 736–747.

Ellythy, M.A. (2012). Efficacy of Muscle Energy Technique versus Myofascial Release on function outcome measures in patients with chronic low back pain. Bull.Fac.Ph.Th.Cario Uni., Vol.17, No.(1)

McIntosh, G., & Hall, H. (2011). Low back pain (acute). BMJ clinical evidence, 2011, 1102.

Milne S, Welch VA, Brosseau L, Saginur MMDS, Shea B, Tugwell P, Wells GA. (2022). Transcutaneous electrical nerve stimulation (TENS) for chronic low-back pain. Cochrane Database of Systematic Reviews 2000, Issue 4. Art. No.: CD003008.

Mirza Baig, A.A., Ahmed, S.I., Ali, S.S., Rehmani, A., & Siddiqui, F. (2018). Role of posterior-anterior vertebral mobilization versus thermotherapy in non specific lower back pain. Pakistan Journal of Medical Sciences, 34(2), 435–439.

Nesrin Yağcı, Şule Şimşek, Emine Aslan Telci, Muhammet Murat Çubukçu(2020). The effect of soft tissue mobilization on pain, disability level and depres- sive symptoms in patients with chronic low back pain. Ann Clin Anal Med;11(4):257-261.

Paley, C.A., Wittkopf, P.G., Jones, G., & Johnson, M. I. (2021). Does TENS Reduce the Intensity of Acute and Chronic Pain? A Comprehensive Appraisal of the Characteristics and Outcomes of 169 Reviews and 49 Meta-Analyses. Medicina (Kaunas, Lithuania), 57(10), 1060.

Papageorgiou, A.C., Croft, P.R., Ferry, S., Jayson, M.I.V., & Silman, A.J. (1995). Estimating the Prevalence of Low Back Pain in the General Population. Spine, 20(17), 1889–1894.

Rodriguez, C.S. (2001). Pain measurement in the elderly: A review. Pain Management Nursing, 2(2), 38–46.

Roffey, D.M., Wai, E.K., Bishop, P., Kwon, B.K., & Dagenais, S. (2010a). Causal assessment of occupational sitting and low back pain: results of a systematic review. The Spine Journal, 10(3), 252–261.

Roffey, D.M., Wai, E. K., Bishop, P., Kwon, B.K., & Dagenais, S. (2010b). Causal assessment of awkward occupational postures and low back pain: results of a systematic review. The Spine Journal, 10(1), 89–99.

Roffey, D.M., Wai, E.K., Bishop, P., Kwon, B. K., & Dagenais, S. (2010c). Causal assessment of occupational standing or walking and low back pain: results of a systematic review. The Spine Journal, 10(3), 262–272.

Roffey, D. M., Wai, E. K., Bishop, P., Kwon, B. K., & Dagenais, S. (2010d). Causal assessment of occupational sitting and low back pain: results of a systematic review. The Spine Journal, 10(3), 252–261.

Roffey, D. M., Wai, E. K., Bishop, P., Kwon, B. K., & Dagenais, S. (2010e). Causal assessment of occupational pushing or pulling and low back pain: results of a systematic review. The Spine Journal, 10(6), 544–553.

Rudy, T.E., Weiner, D.K., Lieber, S.J., Slaboda, J., & Boston, R.J. (2007). The impact of chronic low back pain on older adults: A comparative study of patients and controls. Pain, 131(3), 293–301.

Thiese, M., Hughes, M. and Biggs, J., 2021. Electrical stimulation for chronic non-specific low back pain in a working-age population: a 12-week double blinded randomized controlled trial.

Wai, E.K., Roffey, D.M., Bishop, P., Kwon, B.K., & Dagenais, S. (2010a). Causal assessment of occupational bending or twisting and low back pain: results of a systematic review. The spine journal: official journal of the North American Spine Society, 10(1), 76–88.

Wai, E.K., Roffey, D.M., Bishop, P., Kwon, B.K., & Dagenais, S. (2010b). Causal assessment of occupational lifting and low back pain: results of a systematic review. The spine journal: official journal of the North American Spine Society, 10(6), 554–566.

Walker, J. (2012). Back pain: pathogenesis, diagnosis and management. Nursing Standard, 27(14), 49–56.

Wand, B.M., and O'Connell, N.E. (2008). Chronic non-specific low back pain – sub-groups or a single mechanism? BMC Musculoskeletal Disorders, 9(1), 9–11.

Williams, C.M. (2010). Low back pain and best practice care: A survey of general practice physicians. Arch Intern Med., 170 (3): 271-10.1001.

Woolf, A.D., and Pfleger, B. (2003). Burden of major musculoskeletal conditions. Bulletin of the WHO, 81(9), 646–656.

Wu, Z., Wang, Y., Ye, X., Chen, Z., Zhou, R., Ye, Z., Huang, J., Zhu, Y., Chen, G. and Xu, X., 2021. Myofascial Release for Chronic Low Back Pain: A Systematic Review and Meta-Analysis. Frontiers in Medicine, 8.

Ziyan Chen, Jinlong Wu, Xiaodong Wang, Jieqing Wu, Zhanbing Ren. (2021). The effects of myofascial release technique for patients with low back pain: A systematic review and meta-analysis. Complementary Therapies in Medicine, Volume 59.

Appendix 1 Detailed Treatment Procedure and Protocol

Figure 1A. Application of TENS in patient

The patient lay down on treatment table in a prone position comfortably. Then TENS electrodes were accustomed to its mode of treatment was set for duration, intensity according to the patient bearing threshold. The treatment mode continuous, with 20 minutes on alternate days for four weeks

Figure 1B. Soft tissue work treatment-1 (Myofascial release)

The patient lay down on treatment table in a prone position comfortably. Therapist apply analgesic for pain relief and to get skin smoother to apply the soft tissue mobilization. In this figure therapist firmly grasp the patient lower back soft tissues and start giving mobilization in to and fro

Figure 1C. Soft tissue work treatment-2 (Myofascial release)

In this figure therapist firmly grasp the patient lower back soft tissues and start giving mobilization in rotational or alternate upward and downward direction

Figure 1D. Soft tissue work treatment-3 (Friction).

The therapist applying small localized stretching on the sideways of spinal bony prominences

Figure 1E. Soft tissue work treatment-4 (Stretching).

The therapist firmly gives generalized stretch in epsilateral side of lower back

Figure 1F. Soft tissue work treatment-5 (Stretching).

The therapist firmly gives generalized stretch in both sides of lower back

Figure 1G. Standardized Exercise protocols (SEPs) (Quadruped Position-1)

In this figure, the patient was taught to perform alternate arm and leg raise in

Figure 1H. (Quadruped Position-2).

In this figure, the patient was taught to perform pelvic tilting while tighten the muscles of stomach and hip. Straighten the back and press the floor. Bend the

Figure 1I. Pelvic Tilting.

In this figure, the patient was taught to perform trunk stability exercise (bridging). Patient lie down and bend the knee. keep the soles of the feet flat on the

a quadruped position. Firstly, start with no hold but after few sessions as pain threshold decrease start holding with counting of 5 - 10

Figure 1J. Bridging

In this figure, the patient was taught to perform wall squats. The patient stands and back supported with the wall. The patient is guided to bend his/her knee while keeping the back straight and supported with the wall. Whereas, keep the soles of feet in complete contact with the ground. Firstly, start with no hold but after few sessions as pain threshold decrease start holding with counting of 5 -10

legs at the knees and keep soles of the feet touching the floor. Firstly, start with no hold but after few sessions as pain threshold decrease start holding with counting of 5 than 10

Figure 1K. Wall Squatting. 10.

In this figure, the patient was taught to perform wall squats. The patient stands and back supported with the wall. The patient is guided to bend his/her knee while keeping the back straight and supported with the wall. Whereas, keep the soles of feet in complete contact with the ground. Firstly, start with no hold but after few sessions as pain threshold decrease start holding with counting of 5 than 10.

ground. slowly try to lift the body low back and keeping the both hands on the side touching the ground. Firstly, start with no hold but after few sessions as pain threshold decrease start holding with counting of 5 than 10