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Long Term Effects of Instrument Assisted Soft Tissue Mobilization (IASTM) With Supervised Exercise Program in Improving Pain & Functions Among Subject with Tennis Elbow.

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ABSTRACT

Background: *The purpose is to find long term effect of Instrument assisted soft tissue mobilization technique with supervised exercise program in the Decreasing of pain and improvement of functional ability for subjects with tennis elbow.*

Method: *An experimental study design, 30 subjects with Tennis Elbow randomized 15 subjects each into Study and Control group. Control group received only Supervised Exercise program while Study group received Instrument assisted soft tissue mobilization with Supervised exercises program thrice in a week for 4 weeks and post intervention follow up after 2 weeks. Outcome measurements were measured for pain using Visual analogue Scale (VAS) and Patient Rated Tennis Elbow Evaluation (PRTEE) for functional ability.*

Results: *There is no statistically significant difference in pre- intervention means of VAS and PRTEE when compared between the groups using independent 't' test as a parametric and Mann Whitney U test as a non-parametric test. When means of post intervention and follow-up measurements were compared there is a statistically significant ($p<0.05$) difference in VAS and PRTEE scores between the groups. However greater percentage of improvements was obtained in study group than control group.*

Conclusion: *It is concluded that there is significant long term effect with greater percentage of improvement in pain and functional ability up to 2 weeks follow-up following 4 weeks of combined Instrument assisted soft tissue mobilization with supervised exercise program than only supervised exercise program for subjects with tennis elbow.*

Key words: *Instrument Assisted soft tissue mobilization, supervised exercise program, Tennis Elbow, Pain, Visual analogue scale, functional ability, lateral epicondylitis, PRTEE.*

I. Introduction

Tennis elbow (TE) is a painful condition at the elbow joint observed in tennis players. It is also known as lateral epicondylitis, lateral epicondylgia which is produced by muscle fatigue and overuse of the common extensor origin muscles of forearm [1-2]. The common reasons of the TE were repetitive movements of the arm, with the use of plumbing tools and paint, driving heavy cars, using wrench and trauma to the epicondyle as direct blows. Its incidence ranges from 1% to 3% between the ages of 30and54.It can affect both arms, but the dominant arm is most common [3-4]. While it disturbs equally both sex groups, it persists longer and more in females than in males. Generally, the beginning of TE is regular due to repeated movements and strain injuries with aggregate symptoms over time as the pain is described as severe and insightful with a decrease in grip strength and functional ability of the upper limb[5-6].In roughly some cases, the severity of symptoms in lateral epicondylitis improves lacking any mediation within 6 to 24 months. Still, the untouched TE may lead to chronic pain nearby the elbow and deteriorate the arm's functional daily activity [7]. More than a few methods are used to avoid, treat, and escape the recurrence of TE, including instructions and rest, corticosteroid injections, braces or straps about muscle belly, physiotherapy, and surgery [8-9]. Physiotherapy comprises few modalities such as resistive exercises, peripheral and neural mobilization, phonophoresis, cryotherapy, manual massage, and electrical stimulation. The advantage of these modalities were increasing blood supply to muscles, increasing regeneration of muscle fibers, regeneration, and reducing pain, but for the short time. Though, if rest and multimodal exercises were added, the advantage of these modalities show average to long-term pain relief, which is considered an reasonable treatment option [10-12]. IASTM: Is developed by GRASRON. IASTM is

instrument-assisted soft tissue mobilization. It is another type of manual therapy that combines different ergonomic tools that are used to softly massage and scrape portions of the skin. These stainless steel tools are used to treat heal injuries or condition of soft tissues, such as sprains, strains, subluxations, and repetitive use injuries. At the start of an IASTM Technique treatment, the are as of the soft tissue fibrosis will be moved to make the scar tissue more receptive. The edge of the stainless steel tool will be used to slowly glide through the affected soft tissue until it comes in interaction with an adhesion. Therapist will then rub terminated to the adhesion to prompt movement. This rubbing will help promote the healing process of your soft tissue injury. The quantity of pressure used through the instrument, and the speed in which it is done resolve vary depending on the nature of condition, and it will be adjusted during the treatment. After treatment, the affected area will be stretched and therapist will provide subject to ice packs if he experience any soreness. Most patients who receive the IASTM technique will experience two treatments a week. Patients should expect to notice relief by the third or fourth treatment session. The conventional treatment intervention of tennis elbow is most often accompanied by exercise program which may include strengthening, flexibility,or endurance training exercises[3]. It is recommended the use of static stretching of the Extensor Carpi Radialis Brevis (ECRB) and eccentric strengthening exercises[4] for the wrist extensors is beneficial in the treatment of lateral epicondylitis.[5] The eccentric exercise has faster effect on reducing pain and improving muscle strength, but there was no major difference in improving functional ability. Future studies are needed to investigate factors that may influence the outcome of eccentric training is painful and duration of eccentric training.[6,7] However, supervised exercise program found superior to home exercise program to reduce pain and improve functional ability in patient with tennis elbow.[8] Several authors have reported the effectiveness of the many treatment techniques but after the initial reduction or disappearance of the symptoms some patients have had recurrence of pain. Both instrument assisted soft tissue mobilization and exercises program found limited with its effects, it was found that there is significant combined effect of instrument assisted soft tissue mobilization and supervised exercise program on improvement inpain and functional ability for subjects with Tennis Elbow. However the study has been limited to find the long term effect of this combined techniques. There is a need to know the long term effect of instrument assisted soft tissue mobilization and Supervised exercise program in subjects with Tennis Elbow. This study with research question whether the instrument assisted soft tissue mobilization a with supervised exercise program does have long term effect on reducing pain andimproving functional ability for subjects with Tennis Elbow? Hence, the purpose of the study withobjective to find long term effect of instrument assisted soft tissue mobilization a with supervised exercise program in reduction of pain and improvement of functional ability for subjects with tennis elbow. It was hypothesized that there will be a significant long term effect of instrument assisted soft tissue mobilization with supervised exercise program in the treatment of tennis elbow.

II. Materials and Methods:

Pre to post test follow-up experimental study design with two group- Study and Control group. The study was conducted at integral institute of medical sciences ,Integral University Lucknow, U.P, India. Subject were included both male and females, age group between 30 to 40 years,subjects with tennis Elbow more than 3 weeks confirmed by tenderness on palpation over the lateral epicondyle of humerus, positive mill's and cozen's test, having symptoms such as pain, functional disability from past 8 to 10 weeks. Subjects who willing to participate. Subjects excluded with neurological impairments, neuromuscular diseases previous trauma to the elbow region, previous surgery to the elbow region, peripheral nerve entrapment, Cervical radiculopathy, Corticosteroid injection within 6 months. Total 30 Subject (n=30) were recruited by Simple random sampling method using Group marked 30 paper slips in closed envelopes randomly allocated 15 subjects into study group and 15 into control group. Intervention was given 3 sessions in week for 4 week and subjects were asked to follow-up after 2 weeks following post intervention. No subjects were missed any treatmentsessions and dropped from the study. All the subjects fulfilling the inclusion criteria were informed about the study and a written informed consent was taken.

Procedure of Intervention Study group:

In this group, subjects received instrument assisted soft tissue mobilization and supervised exercise program for 4 weeks.

IASTM therapy: The edge of the stainless steel tool will be used to slowly glide through the affected soft tissue until it comes in interaction with an adhesion. Therapist will then rub terminated to the adhesion to prompt movement. This rubbing will help promote the healing process of your soft tissue injury. The quantity of pressure used through the instrument, and the speed in which it is done resolve vary depending on the nature of condition, and it will be adjusted during the treatment. After treatment, the affected area will be stretched and therapist will provide subject to ice packs if he experience any soreness. Most patients who receive the IASTM technique will experience two treatments a week. Patients should expect to notice relief by the third or fourth treatment session.

Supervised exercise program – This included static stretching of the Extensor Carpi Radialis Brevis followed by eccentric strengthening of the wrist extensors. Static stretching was performed in the seated position with elbow extension, forearm pronation, and wrist flexion with ulnar deviation.[11] According to the patient tolerance stretch force was applied. This stretch position was held for duration of 30–45 seconds and was performed 3 times before and 3 times after the eccentric exercise portion of thetreatment for a total of 6 repetitions. There was a 30-second rest interval between each bouts of stretching. Eccentric strengthening exercise was performed in the seated position with full elbow extension, forearm pronation, and maximum wrist extension. From this position, the patient slowly lowered wrist into flexion for a count of 30, using thecontralateral hand to return the wrist to maximum extension. Patients were instructed to continue the exercise even when they experience mild discomfortand to stop the exercise if the pain worsens and becomes disabling. For whom the eccentric exercise could be performed without minor discomfort or pain, the load was increased using free weights based on the patients 10 RM (Repetition Maximum). Three sets of ten repetitions were performed during each treatment, with a one-minute rest interval between each set. Patients were also provided with education manual regarding ergonomics and activity modification technique to avoid aggravation of symptoms.

Outcome Measurements:

Measurements were measured for pain using Visual analogue Scale (VAS) and Patient Rated Tennis Elbow Evaluation (PRTEE) for functional ability before, after 4 weeks of intervention and follow-up at 2 weeks post intervention.

Visual analogue Scale (VAS) for pain: VAS is presented as 10cm line. No pain at one end and worstimaginable pain at other end. Patient is asked to mark a 10 cm line to indicate pain intensity. VAS is highly reliable and concurrent valid pain measurement $_{\text{tool.}}$[12,13,14,15]

Patient Rated Tennis Elbow Evaluation (PRTEE) for functional ability:

The PRTEE, formerly known as the Patient-Rated Forearm Evaluation Questionnaire (PRFEQ), is a 15-item questionnaire designed to measure forearm pain and disability in patients with lateral epicondylitis (also known as "tennis elbow"). The PRTEE allows patients to rate their levels of tennis elbow pain and disability from 0 to 10, and consists of 2 subscales: Pain subscale (0 = no pain, 10 = worst imaginable) Pain - 5 items; Function subscale (0 = no difficulty, 10 = unable to do), Specific activities - 6 items, Usual activities - 4 items. Computing the TotalScore: Total Score = Sum of pain + function scores (Best Score = 0, Worst Score = 100). The responses tothe fifteen items are totaled out of 100, where pain and disability are equally weighted. PRTEE for Tennis Elbow provide a simple, quick, reliable estimate of arm pain and function in patient with epicondylitis. The pain (ICC = 0.89), function (1CC=0.83), and the total (ICC = 0.89) scores all demonstrated excellent reliability. The ICCs were all greater than 0.75.

Statistical Methods

Descriptive statistical analysis was carried out in the present study. Outcome measurements analyzed arepresented as mean SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. Repeated Measures Analysis of Variance (RAMANOVA) and Friedman's ANOVA was used analysis for Visual analog scale in centimeters and functional ability using Patient Rated Tennis Elbow Evaluation (PRTEE) within the group and Bonferroni's as post-hoc test was used to find the significance in pair-wise comparison pre to post treatment, post to follow-up treatment and pre-treatment to follow-up.Paired 't' test as a parametric and Wilcoxon signed rank test as a non-parametric test have been used toanalysis the variables pre-intervention to post- intervention with calculation of percentage of change. Independent 't' test as a parametric and Mann Whitney U test as a non-parametric test have been used to compare the means of variables between two groups with calculation of percentage of difference between the means. The statistical software namely SPSS 16.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables, etc.

III. Results

The table-1 shows that in study group there were 20 subjects with mean age 41.15 years and there were 9males and 11 females were included in the study. In control group there were 15 subjects with mean age 30.07 years and were 6 males and 9 females were included in the study. There is no significant difference in mean ages between the groups. In boththe groups there were 8 right sided and 7 left sided subjects with no significant difference between the side distributions between the groups. The table-2 and 3 shows that there is a statistically significant change in means of VAS and PRTEE when means were analyzed from pre intervention to post intervention and to follow measurements within the groups with negative percentage of change showing that there is decrease in the post means and with positive percentage of change showing there is increase in post

means. There is a clinical significance effect withlarge effect size. In table-4 shows that there is no statistically significant difference in pre- interventionmeans of Visual analogue scores for pain and PRTEE for functional ability when compared between study and Control groups. When means of post intervention and follow-up measurements were compared there is a statistically significant difference in means of Visual analogue scores and PRTEE scoresbetween the groups.

Table 1: Basic Characteristics of the subjects studied

Basic Characteristics of the subjectsstudied		Study Group	Control Group	Between the groups Significance[a]
Number of subjects studied (n)		15	15	--
Age in years (Mean± SD)		37.67± 5.65 (30-45)	37.47± 5.19 (30-45)	p= 0.833 (NS)
Gender	Males	7	8	P=0.705**
	Females	8	7	
	Within Group Significance	P=0.000**	P=0.000**	
Side	Right	9	7	P=0.317**
	Left	6	8	
	Within Group Significance	P=0.000**	P=0.000**	

a - Pearson Chi-Square

Table 2: Analysis of VAS and PRTEE scores within the study Group (Repeated measures analysis)

Study Group	Pre intervention(Mean±SD) min-max	Post intervention(Mean±SD) min-max	Follow –up(Mean±SD)min-max
Visual analog scale score in cm	7.46± 1.67 (3.8- 10.0)	3.78±1.69 (1.5-8.4)	1.96± 1.34 (0.1-5.4)
PRTEE score	82.53± 15.42 (40- 98)	32.00± 13.20 (10-60)	15.87± 11.45 (5-50)

** Statistically Significant difference p<0.05; NS- Not significant; a. Friedman's ANOVA.

StudyGroup		Percentageof change	F value[a]	Significance[b]P value	Effect size r	95% ConfidenceInterval for Difference	
						Lower Bound	Upper Bound
Visual analog scale score in cm	Pre to Post	-49.32%	62.498	P= 0.000**	+0.73 (Large)	2.25	5.10
	Post to follow-up	-48.14%	79.735	P= 0.000**	+0.51 (Large)	1.19	2.44
	Pre to follow-up	-73.72%	203.08	P= 0.000**	+0.87(Large)	-6.68	-4.31
PRTEE	Pre to Post	-61.22%	165.93	P= 0.000**	+0.86(Large)	38.49	62.57
	Post to follow-up	-50.40%	73.89	P= 0.000**	+0.54 (Large)	10.37	21.89
	Pre to follow-up	-80.77%	282.54	P= 0.000**	+0.92(Large)	-78.83	-54.49

Adjustment for multiple comparisons: Bonferroni.

Table 3: Analysis of VAS and PRTEE scores within the control Group (Repeated measures analysis)

Control Group	Pre intervention(Mean±SD) min-max	Post intervention(Mean±SD) min-max	Follow –up (Mean±SD) min-max
Visual analog scale score in cm	8.04± 1.53 (5.0- 10.0)	5.56±1.50 (3.2-8.4)	3.94± 1.56 (0.0-6.2)
PRTEE score	77.40± 13.60 (60- 100)	60.87± 15.60 (30-98)	44.00± 15.26 (10-60)

** Statistically Significant difference p<0.05; NS- Not significant; a. Friedman's ANOVA.

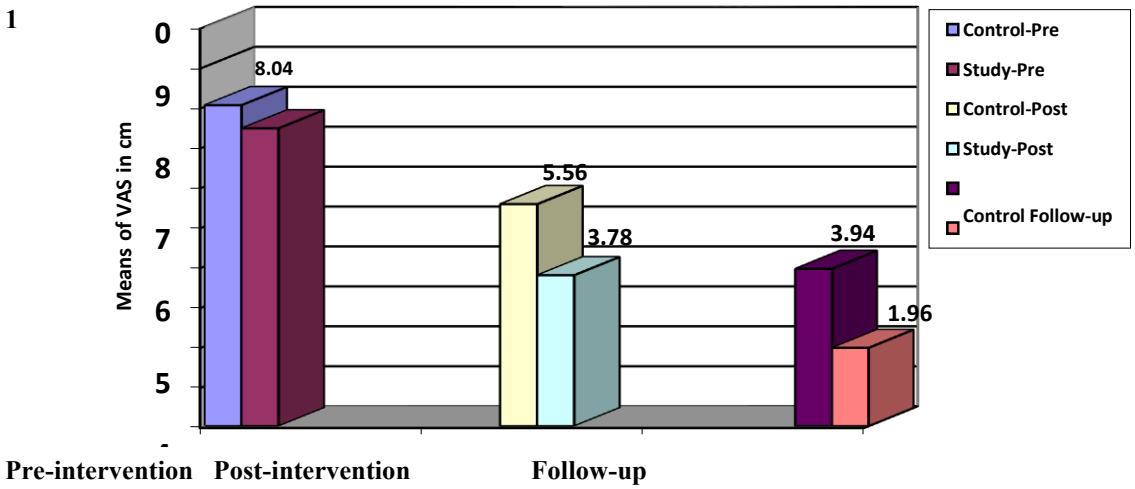
		Percentage of change	Significance[b]P F value[a]value		Effect size r	95% ConfidenceInterval for Difference	
						Lower Bound	Upper Bound
Visual analog scale score in cm	Pre to Post	-30.84%	74.389	P= 0.000**	+0.63 (Large)	1.59	3.35
	Post to follow-up	-29.13%	14.179	P= 0.002**	+0.46 (Large)	.30	2.95
	Pre to follow-up	-50.99%	149.96	P= 0.000**	+0.79(Large)	-5.12	-3.07
PRTEE	Pre to Post	-21.35%	35.616	P= 0.000**	+0.49(Large)	8.03	25.03
	Post to follow-up	-27.71%	12.788	P= 0.000**	+0.48 (Large)	2.39	31.34
	Pre to follow-up	-43.15%	59.164	P= 0.000**	+0.75(Large)	20.07	46.72

a - Adjustment for multiple comparisons: Bonferroni.

Table 4: Comparison of means of VAS and PRTEE scores between control and study Groups

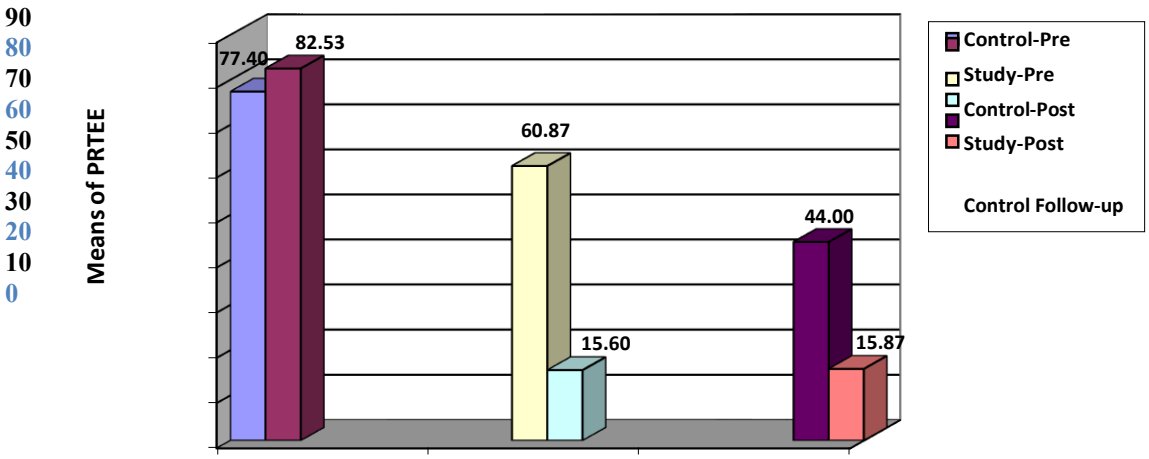
		Percentage of difference	Effect size	Parametric t value[a]	Significance [a]P value	Z value[b]	Non- parametric SignificanceP value [b]
Visual analog scale score in cm	Pre	7.31%	+0.17 (Small)	-.977	p=0.337 (NS)	-.955	p=0.345 (NS)
	Post	38.11%	+0.48 (Large)	-3.045	p=0.005**	-2.864	p=0.003**
	Follow-up	67.11%	-0.56(Large)	-3.702	p=0.001**	-3.113	p=0.004**
PRTEE	Pre	-6.41%	+0.17(Small)	0.967	p=0.342 (NS)	-1.189	p=0.235 (NS)
	Post	62.17%	+0.70 (Large)	-5.470	p=0.000**	-4.005	p=0.000**
	Follow-up	93.98%	+0.72 (Large)	-5.710	p=0.000**	-3.823	p=0.000**

Graph- 1: Comparison of means of pain between control and study Groups



Graph 1: shows that there is no statistically significantdifference in pre- intervention means of Visual analogue scores for pain when compared between study and Control groups. When means of post intervention and follow-up measurements were compared there is a statistically significant differencein means of Visual analogue scores between the groups.

Graph- 2: Comparison of means of PRTEE between control and study Groups



Graph 2: shows that there is no statistically significant difference in pre- intervention means of PRTEE for functional ability when compared between study and Control groups. When means of post intervention and follow-up measurements were compared there is a statistically significant difference in means of PRTEE scores between the groups.

IV. Discussion

The finding from the present study found that there is statistically significant long term effect for a period of 2 weeks following 4 weeks of intervention on improvement of pain and functional ability, in study group who received IASTM Physiotherapy with Supervised Exercise Program showed greater effect than control group subjects who received only Supervised Exercise Program.

In control group, statistically significant improvement in outcome measures from pre intervention to post intervention, and post intervention to follow up within the group could be because of effects of the eccentric training and stretching exercise. Eccentric training results in tendon strengthening by stimulating mechano-receptors in tenocytes to produce collagen, which is probably the key cellular mechanism that determines recovery from tendon injuries. In addition, eccentric training may induce a response that normalises the high concentrations of glycosaminoglycans. It may also improve collagen alignment of the tendon and stimulate collagen cross-linkage formation, both of which improve tensile strength. The effects of exercise programmes for tendon injuries may be attributable to either the effect of stretching, with a lengthening of the muscle-tendon unit and consequently less strain experienced during joint motion, or the effects of loading within the muscle-tendon unit, with hypertrophy and increased tensile strength in the tendon. Ohberg et al believe that, during eccentric training, the blood flow is stopped in the area of damage and this leads to neovascularisation, the formation of new blood vessels, which improves blood flow and healing in long term which leads to reduces pain and improves functional capacity.[20]

In study group, statistically significant greater percentage of improvement in outcome measures from pre intervention to post intervention, and post intervention to follow up within the group could be because of effects of the eccentric training and stretching exercise along with IASTM Technique. IASTM has a local pain diminishing effect and results in better alignment of connective tissue fibrils.

When the means of Post intervention and follow up were compared there is statistically significant difference in VAS and PRTEE between the control and study groups. Subjects receiving instrument assisted soft tissue mobilization technique with supervised exercise program found reduction in pain level by -48.14% than the one who receive only exercise found reduction by -29.13%. Study group also showed reduction in PRTEE by -50.40% than the control group which was reduced by -27.71%. There is clinical significant improvement in post intervention values with large effect size in both groups with VAS +0.48 and PRTEE + 0.70.

When the means of Follow up were compared there is statistically significant difference in VAS and PRTEE between the control and study groups. Subjects receiving instrument assisted soft tissue mobilization technique with Supervised exercise program found reduction in pain level by - 73.72% than the one who receive only exercise found reduction in pain level by -50.99%. Study group also showed reduction in PRTEE by -80.77% than the control group which was reduced by -43.15%. Further, both the groups shown some percentage of pain still persisted up to 2 weeks after intervention this could be because the subjects taken into the study were more than 4 weeks old and the severity of the condition which was not considered might have interfered with the long term effect. The duration and frequency of treatment techniques used in the

study might have affected the long term effect. However, there is clinical significant improvement in follow up values with large effect size in both groupswith VAS +0.56 and PRTEE + 0.72.

Therefore, based on the findings the present study found that there is a statistically significant long term effect of instrument assisted soft tissue mobilization technique with supervised exercise program in improving pain and functional ability than supervised exercises program alone. Hence, the present study rejects null hypothesis.

V. Limitations Of the Study

Subjects with small range group between 30 to 45 years of age were considered for the study, thus results can not be generalized to individual age. The duration for long term effect measured only for 2 weeks follow-up. Only pain and functional ability were studied, measurements such as grip strength, sensitivity to pain, range of motion and quality of lifewere not studied. The effects on occupation related tennis elbow was not studied. Advising home program during and after intervention was not considered.

VI. Conclusion

It is concluded that there is significant long termeffect with greater percentage of improvement in pain and functional ability up to 2 weeks follow-up following 4 weeks of combined instrument assisted soft tissue mobilization technique with supervised exercise program than only supervised exercise program for subjects with tennis elbow. It is clinically important to consider combined instrument assisted soft tissue mobilization technique and supervised exercise program for patients with Tennis Elbow when the treatment effect is aiming for long term effect.

References:

[1]. Arslan M, YeşilçamN, AydinD,YükselR, Dane S. Wet cupping therapy restores sympathovagal imbalances in cardiac rhythm. J Altern Complement Med. 2014 Apr;20(4):318-21. doi: 10.1089/ acm.2013.0291. Epub 2014 Feb 12. PMID: 24520978. https://www.muscleandfitness.com/features/edge/how-grastontechnique-can-heal-stubborn-scar-tissue

[2]. Assendelft W, Green S, Buchbinder R, StruijsP, Smidt N. Tennis elbow. BMJ. 2003 Aug9;327(7410):329. doi: 10.1136 /bmj.327.7410.329. PMID: 12907489; PMCID: PMC1126728.

[3]. BijurPE,SilverW,GallagherEJ.Reliabilityofthevisual analog scale for measurement of acute pain. Acad Emerg Med. 2001 Dec;8(12):1153-7. doi: 10.1111/ j.1553- 2712.2001.tb01132.x. PMID: 11733293.

[4]. Burke J, Buchberger DJ, Carey-Loghmani MT, Dougherty PE, Greco DS, Dishman JD. A pilot study comparing two manual therapy interventions for carpal tunnel syndrome. J Manipulative Physiol Ther 2007;30(1):50-61 https://www.ncbi.nlm.nih .

[5]. Cheatham SW, Lee M, Cain M, Baker R. The efficacy of instrument assisted soft tissue mobilization: a systematic review. J Canadian Chiropr Assoc 2016:60(3): 200-209 https://www.ncbi.nlm. nih.gov/pmc/articles/

[6]. Chen JJ. Clinical observation of therapeutic effect of combination of electroacupunture and wet cupping therapy for scapulohumeral periarthritis[in Chinese]. JCAM. 2009;25(1):27–28.

[7]. Cohen M, da Rocha Motta Filho G. LATERAL EPICONDYLITIS OF THE ELBOW. Rev Bras Ortop. 2015 Dec 8;47(4):414-20. doi: 10.1016/ S2255-4971(15) 30121-X. PMID: 27047843; PMCID: PMC4799438.

[8]. Cramer H, Lauche R, Hohmann C, Choi KE, Rampp T, Musial F, Langhorst J, Dobos G. Randomized controlled trial of pulsating cupping (pneumatic pulsation therapy) for chronic neck pain. Forsch Komplementmed. 2011;18(6):327-34. doi: 10.1159/000335294. Epub 2011 Dec 2. PMID: 22189364.

[9]. Croisier JL, Foidart-Dessalle M, Tinant F, Crielaard JM, Forthomme B. An isokinetic eccentric programme for the management of chronic lateral epicondylar tendinopathy. Br J Sports Med. 2007;41(4):269-275. doi:10.1136/bjsm.2006.033324

[10]. Crothers A, French S, Hebert J, Walker B. Spinal manipulative therapy, Graston technique and placebo for non-specific thoracic spine pain:a randomisedcontrolled trial. Chiropr Man Ther 2016;24(16):1mhttps://chiromt.biomedcentral.com/artic

[11]. Pienimäki TT, Tarvainen TK, Siira PT, VanharantaH. Progressive strengthening and stretching exercises and ultrasound for chronic lateralepicondylitis. Physiotherapy. 1996; 82(9):522– 530.

[12]. Ngoc Quan Phan, Christine Blome, Fleur Fritz, Joachim Gers, Adam Reich, Toshi Ebata , Matthias Augustin, JacekC. Szepieto wski, Sonja Stander. Assessment of pruritusi intensity: prospective study on validity and reliability of the visual analogue scale, numerical rating scale and verbalrating scale in 471 Patients with chronic pruritus.Acta Derm Venereol 2012; 92(5): 502-507.

[13]. Leighann Litcher-Kelly, Sharon A. Martino, Joan E. Broderick, and Arthur A. Stone. A systematic review of measures used to assess chronicmusculoskeletal pain in clinical and randomized controlled clinical trials. J Pain.2007;8(12): 906–913.

[14]. Sandra A Sherman, Sarajane Eisen. The PedsQLTM Present Functioning VAS: Preliminary reliability and validity: BML Health and Quality oflife Outcomes: Oct 2006.

[15]. Polly E. Bijur, Wendy Silver. E, John Gallagher. Reliability of VAS for measurement of acute pain. Academic Emergency Medicine. 2001; 8(12): 1153-1157.

[16]. Tom J Overend, Jennifer C, Wuori-fearn, John F Kramer. Reliability of PRTEE. Journal of Hand Therapy.1999;12(1):31-37

[17]. Bryan Chung, J Ability du e Wiley. Validity, Responsiveness and reliability of PRTEE. Hand Therapy September 2010; 15 (3): 62-68.

[18]. Overend TJ, Wuori-Fearn JL, Kramer JF, et al. Reliability of a patient-rated forearm evaluation questionnaire for patients with lateral epicondylitis. J Hand Ther 1999; 12:31-37.

[19]. Joy C. Mac Dermid. The Patient-Rated Tennis Elbow Evaluation (PRTEE)-User Manual. December 2007.

[20]. Kim J, Sung DJ, Lee J. Therapeutic effectiveness of instrument-assisted soft tissue mobilization for soft tissue injury: mechanisms and practical application. J Exerc Rehabil. 2017;13(1):12–22 [Internet]. Available from: 10.12965/jer.1732824.412.