

Comparative Study on the Effect of Shock Wave Therapy and Phonophoresis in the Treatment of Lateral Epicondylitis in Healthcare Professionals

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Dr. Tushar J Palekar¹, Manasvi Dodia², Dr. Soumik Basu³, Rachel D'Silva⁴, Dr. Pramod Palekar⁵, Dr. Maithili Deshpande⁶

Principal and Professor¹, Intern^{2,4}, Associate Professor^{3,5}, Assistant Professor⁶

Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Sant Tukaram Nagar, Pimpri, Pune-411018

Contact Details:

Email Id – manasvi.dodia@gmail.com

Phone No. 9820666062

Affiliation Details: Intern, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Sant Tukaram Nagar, Pimpri, Pune-411018

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Abstract

Background : Lateral Epicondylitis a commonly occurring overuse injury associated with repetitive use of wrist and forearm. History and provocative tests can be used to reproduce the symptoms and diagnose the same. Conservative management of lateral epicondylitis includes a variety of electrotherapeutic modalities.

Aims and Objectives : To study and compare the effect of shock wave therapy and phonophoresis on pain pressure threshold, grip strength and function in subjects with acute lateral epicondylitis.

Methodology : 30 subjects with lateral epicondylitis were randomly allocated into two group groups via chit method after gaining ethical clearance. The study was conducted in 2022. Group A was given shock wave therapy and group B was given phonophoresis sodium diclofenac for 6 sessions, alternately, 3 sessions per week. Primary outcome measures- pain pressure threshold in kg/cm², grip strength in kg and PRTEE score were evaluated before the first session and after the end of sixth session.

Results : Results revealed statistical significance in terms of pain pressure threshold ($P < 0.05$) and PRTEE score ($P < 0.05$) within the groups, while grip strength ($P < 0.05$) in the shock wave therapy group. No statistical significance was revealed for any outcome measures between groups ($P > 0.05$).

Conclusion : It can be concluded that shock wave therapy and phonophoresis with sodium diclofenac both are equally effective in the treatment of lateral epicondylitis.

1. Introduction

Lateral epicondylitis or tennis elbow is an overuse injury involving the forearm muscles, commonly the extensor carpi radialis brevis. It affects between 1% to 3% adults each year.¹ Presence of fibroblasts, vascular hyperalgesia and disorganized collagen are the signs of tendon degeneration and are its classical presentation.² Pathophysiology consists of three stages 1)STAGE1 involves acute inflammation, with no angioblastic invasion and pain during activity 2)STAGE2 involves chronic inflammation, with some angioblastic invasion

and pain during activity and at rest as well 3)STAGE3 consists of chronic inflammation with extensive angioblastic invasion and pain during daily activities, at rest and also at night.³ Patients present with lateral elbow pain which radiates along the extensor muscle mass and is exacerbated by wrist and finger extension against resistance.⁴ Healthcare professionals – medical, homeopathic and ayurvedic practitioners, nurses, physiotherapists, dentists are prone to overuse injuries because of continuous workload thus giving more strain to elbows and wrist. The acute phase involves

acute inflammation, without any angioblastic invasion and the patient often complains of pain during activity. Healthcare professionals frequently make use of wrist and elbow while documentation, assessing and treating patients, other patient care activities, using laptops, doing fine wrist hand movements in labs, treating paediatric population, practicing panchakarma and much more. When the muscle goes into fatigue, they tend to adopt poor posture, proximal muscles may go into weakness and hence this muscle is strained. This decreases the productivity at workplace. Provocation tests like Cozen's, Mill's and Maudsley's tests are used to reproduce the symptoms.⁵ Patients suffering from lateral epicondylitis complain of pain spreading from lateral side of elbow to forearm which in turn affects most activities of daily living involving wrist and forearm movements.

A wide variety of conservative treatment methods with different mechanisms are available, such as – ultrasound therapy, kinesio taping, shock wave therapy, phonophoresis, mulligan mobilization, laser therapy. Shock wave therapy, also known as Extracorporeal shock wave therapy uses high pressure sound waves that passes through body via a hand-held

applicator. Micro trauma caused by repeated shocks produce a rapid increase in blood circulation in the target area, promoting healing. The angiogenetic growth factors lead to improvement in blood circulation and tissue regeneration.⁶ Shock Wave Therapy has proven to be effective in reducing the pain and improving function in patients with lateral epicondylitis.^{7,8,9} Phonophoresis or sonophoresis is the movement of drug through skin into the subcutaneous tissues under the influence of therapeutic ultrasound. It depends on perturbation of tissues causing more quick molecule movement through the surface of skin, thus empowering retention of drug. Low frequency and pulsed ultrasound improve drug penetration and the latter reduces skin heating also.¹⁰ Phonophoresis have been proven to be effective in the treatment of lateral epicondylitis by improving the grip strength and the PRTEE score.¹¹ No literature is present stating the superiority of these modalities. Thus, our study aims to study and compare the effect of shock wave therapy and phonophoresis on pain pressure threshold, grip strength and function in subjects with acute lateral epicondylitis.



Figure 1 : Shock Wave Therapy Unit.



15g

Composition:

Diclofenac Diethylamine IP..... 1.16% w/w
(equivalent to Diclofenac Sodium 1% w/w)
Linseed Oil BP..... 3% w/w
Methyl Salicylate IP..... 10% w/w
Menthol IP..... 5% w/w
Preservative :
Benzyl Alcohol IP..... 1% w/w
Gel base..... q.s.



Figure 2 : Phonophoresis – Volini (Sodium diclofenac) via Therapeutic Ultrasound

2. Methodology

Design and Study Setting

This is an experimental study conducted on healthcare professionals having acute lateral epicondylitis. The study was conducted in the year 2022, at Dr. D. Y. Patil College of Physiotherapy OPD, Dr. D. Y. Patil Vidyapeeth, Pune. The proposal of this research topic was scrutinized and cleared from administrative and ethical issues.

Participants

The participants who met the inclusion criteria – unilateral acute lateral elbow pain (0-7days), NPRS 4 or more on 10, positive Cozen's, Mill's or Maudsley's test, healthcare professionals aged 22-45years, both genders willing to participate, were selected. participants who had a history of recent trauma or surgery of upper limb, any neurological condition or any cervical spine disfunction were excluded. Participants who met the inclusion criteria were

informed about the nature and purpose of the study and a written consent was taken.

A total of 30 participants were recruited and were randomly allocated into two groups- Group A Shock wave therapy and Group B Phonophoresis, via chit method. The sample size was calculated using Winpepi Software Version 11.38.

Outcome measures

Pain pressure threshold : It was measured using a handheld pressure algometer. It was assessed in all patients at a site 1cm lateral to the epicondyle. The participant was in sitting with shoulder 30 degrees of abduction, elbow at 90 degrees flexion and forearm and wrist supported on the table. Average of three readings were taken. It was taken as the amount of pressure required to elicit a painful sensation.

Grip Strength : Power grip was measured using a handheld dynamometer (Jamar Hydraulic Dynamometer). The participant was in sitting with the involved shoulder in 0 degrees of abduction, elbow at

90 degrees of flexion, forearm in mid-prone and wrist in neutral. Average of three readings were taken. The participants were asked to squeeze as hard as possible while holding the dynamometer.

Patient Rated Tennis Elbow Evaluation (PRTEE) Score : It is a reliable and valid functional outcome measure to evaluate pain and function including specific and usual activities in patients with lateral epicondylitis.¹²

Intervention

Demographic data of all the participants of both groups was taken and pre-treatment assessment was done. For Group A participants, shock wave therapy was administered thrice a week (alternate days) using Shockwave Pro-1000 device with TR-15 applicator, pressure of 1.8 bar, frequency of 10 Hz with 2000 shocks. Affected extremity was placed on plinth with elbow flexed up to 90-degree and forearm in mid prone. Shock waves were transmitted to the epicondylar

region with maximum pain with small circular movements with an adequate amount of gel. Subjects were asked to icing at home post treatment session. For Group B, Sodium diclofenac Phonophoresis was administered thrice a week (alternate days) using therapeutic ultrasound device and Volini gel with frequency of 1 MHz and intensity of 1 W/cm² on pulsed mode for 7 minutes. Affected extremity was placed on a pillow with elbow flexed up to 90-degree and forearm in mid prone. Drug was transmitted to the epicondylar region with maximum pain with constant circular movements of the applicator head with an adequate amount of gel. Pressure algometer readings, hand held dynamometer readings and Patient Rated Tennis Elbow Evaluation (PRTEE) score were taken for pain pressure threshold, grip strength and function respectively before first session and after the sixth session.



Figure 3 : Patient treated with Shockwave Therapy



Figure 4 : Patient treated with Phonophoresis

3. Results

Data of 30 participants (Group A- 5Males, 10Female and Group B- 3Males, 12Female) were analysed using Statistical Package for Social Sciences Version 26.0 (SPSS Inc., Chicago, IL). Descriptive statistics was performed in order to assess the mean and standard

deviation of the respective groups. Normality of the data was assessed using Shapiro Wilkison Test. Interferential statistics to find out the difference between the groups was done using Mann Whitney U Test / Independent T test and within group analysis was done using Wilcoxon Sign Rank Test / Paired T test.

Table 1 : Gender Distribution in both the groups

		Shockwave therapy	Phonophoresis
	MALE	5 (33.3%)	3 (20%)
	FEMALE	10 (66.7%)	12 (80%)
X ² VALUE		4.10	
P VALUE (CHI SQUARE TEST)		0.05	

Graph 1 : Gender Distribution in both the groups

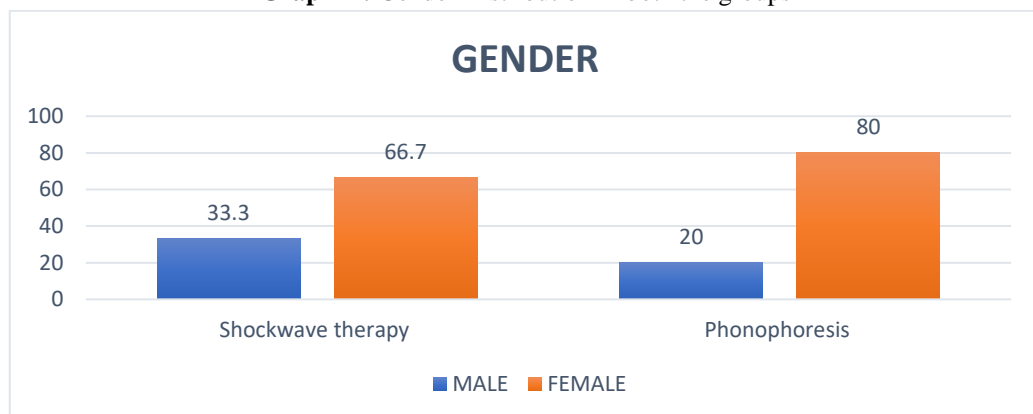


Table 2 : Comparison of Pain Pressure Threshold

		Shockwave therapy	Phonophoresis	P VALUE (INDEPENDENT T TEST)
Pain pressure threshold	PRE	1.81±0.40	1.96±0.34	0.27 (t=1.11)
	POST	2.98±0.40	2.78±0.34	0.15(t=1.47)
DIFFERENCE		1.17±0	0.82±0	
t VALUE		8.01	6.60	
P VALUE (PAIRED T TEST)		0.0001	0.0001	

Graph 2 : Comparison of Pain Pressure Threshold

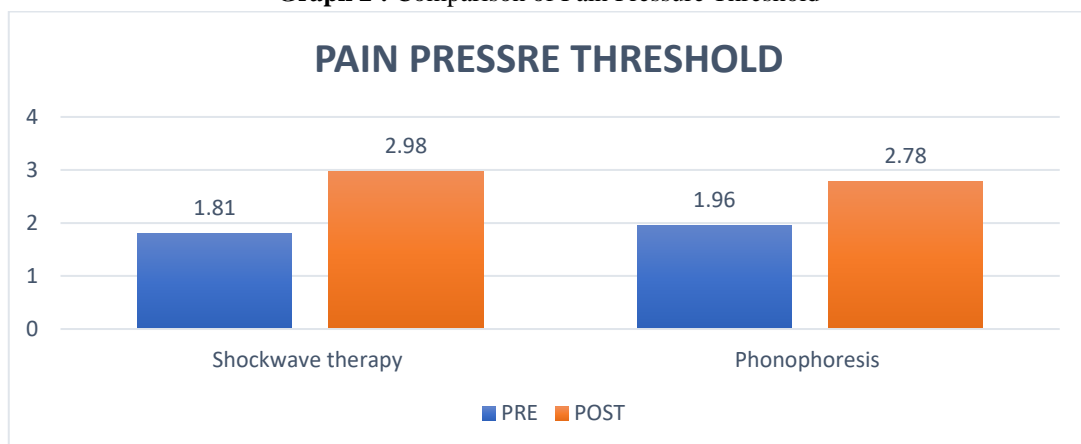


Table 3 : Comparison of Grip Strength

		Shockwave therapy	Phonophoresis	P VALUE (MANN WHITNEY U TEST)
GRIP STRENGTH	PRE	18.93±4.51	19.9±4.79	0.56(Z=0.57)
	POST	22.81±4.29	22.72±4.72	0.89(Z=0.13)
DIFFERENCE		3.88±0.22	2.82±0.07	
Z VALUE		2.44	1.64	
P VALUE (WILCOXON SIGN RANK TEST)		0.02	0.11	

Graph 3 : Comparison of Grip Strength

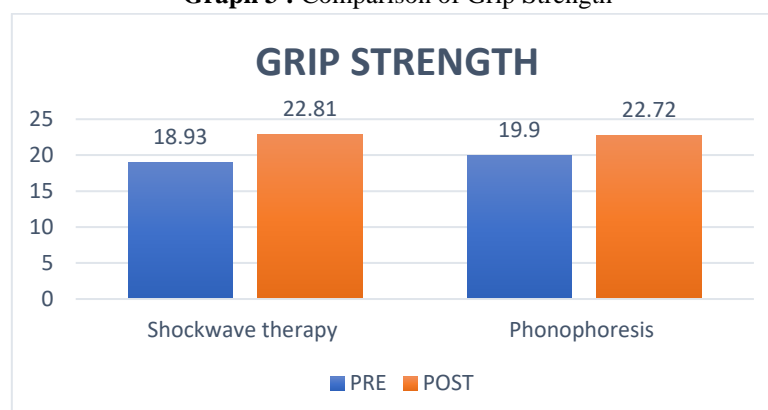


Table 4 : Comparison of PRTEE Score

		Shockwave therapy	Phonophoresis	P VALUE (MANN WHITNEY U TEST)
PRTEE	PRE	33.67±13.17	28.7±6.33	0.19 (t=1.32)
	POST	20.3±7.79	21.47±5.23	0.62(t=0.48)
DIFFERENCE		13.37±5.38	7.23±1.1	
Z VALUE		3.46	3.42	
P VALUE (WILCOXON SIGN RANK TEST)		0.001	0.0001	

Graph 4 : Comparison of PRTEE Score

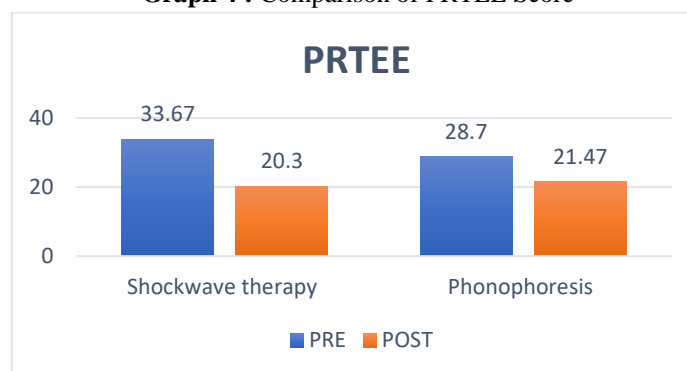


Table 1 and Graph 1 represents the Gender Distribution in both the groups

For pain pressure threshold (Table 2 and Graph 2), between group analysis by Independent T test did not report statistically significant difference with respect to pre/ post session ($P>0.05$). Within group analysis was done paired T test and both study groups show statistically significant result ($P<0.05$) but higher mean difference was observed in SWT group ($1.17>0.82$).

For grip strength (Table 3 and Graph 3), between group analysis by Mann Whitney U test did not report statistically significant difference with respect to pre/ post session ($P>0.05$). Within group analysis by Wilcoxin Sign Rank Test reported statistically

significant result in SWT group ($p<0.05$) higher mean difference was observed in SWT group ($2.44 > 1.64$). For PRTEE score (Table 4 and Graph 4), between group analysis by Mann Whitney U test did not report statistically significant difference with respect to pre/ post session ($P>0.05$). Within group analysis by Wilcoxin Sign Rank Test reported statistically significant result in both the groups ($p<0.05$) higher mean difference was observed in SWT group ($3.46>3.42$).

4. Discussion

The purpose of the study was to compare the effect between shockwave therapy and phonophoresis on pain

pressure threshold, grip strength and function. It was an experimental study where 30 individuals having unilateral acute lateral elbow pain were recruited and randomly divided into two groups via chit method. Group A was treated with shockwave therapy and B with phonophoresis (Sodium diclofenac-Volini via therapeutic ultrasound). Group A subjects were asked to ice at home post the treatment session. The study was conducted in Dr. D. Y. Patil College Of Physiotherapy OPD, Dr. D. Y. Patil Vidyapeeth, Pune. Treatment was given for 6 sessions, on alternate days in two weeks. Outcome measures used in the study were – pain pressure threshold, grip strength and Patient Rated Tennis Elbow Evaluation score. Pre-treatment assessment was done on the first day before treatment and post assessment was at the end of the sixth session. Both treatment groups showed the improvement individually in the objective and subjective symptoms. But on comparison, between the group analysis did not show any statistical significance.

Shockwave therapy, which is a non-invasive therapeutic modality, has reported to exert various therapeutic effects. Micro trauma caused by repeated shocks produce a rapid increase in blood circulation in the target area, promoting healing. The angiogenetic growth factors lead to improvement in blood supply and help in regeneration of tissue.⁷ A study about short term effects of shockwave therapy for tennis elbow by Mehran Razavipour et al concluded that shockwave therapy is effective in reducing severity of pain and improving daily activity, in patients recently with tennis elbow. It included 40 patients who received 2000 pulses daily for one week. Outcomes were measured at baseline, 30 and 60 days after the treatment.⁹ Thus, the current study correlates with the evidence that shockwave therapy stimulates the healing of soft tissues, inhibits pain receptors, forms new blood vessels at the common extensor origin and promotes tissue regeneration.

Phonophoresis depends on perturbation of tissues causing more quick molecule movement through the surface of skin, thus empowering retention of drug. Low frequency and pulsed ultrasound improve drug penetration and the latter reduces skin heating also.¹⁰ It leads to the local rise in temperature of the tissue causing increase in blood flow due to vasodilation, promoting healing and thus increases the pain pressure threshold.

From this study, we conclude that Shock wave therapy can be given as the first line of treatment in managing

acute pain in lateral epicondylitis as it is statistically proven and the participants reported sense of satisfaction in the Shock wave therapy group than the phonophoresis group. Limitations of this study could be, since all the participants were healthcare professionals, it was not possible for them to take sufficient rest for the involved part over the span of the treatment, this could have hampered the normal result. Another drawback is that there was no control group, thus no comparisons were made in the control group. In further studies, physiotherapy exercises can be included along with either of these protocols, a larger group of participants can be included, dominance can be taken into consideration and a long term follow up can be maintained.

5. Conclusion

This study concludes that both Shock Wave Therapy and Phonophoresis with sodium diclofenac are equally effective in the treatment of lateral epicondylitis by increasing pain pressure threshold and improving grip strength and function. This study also concludes that statistically there was no significant difference between shock wave therapy and phonophoresis with sodium diclofenac in the treatment of lateral epicondylitis but clinically shock wave therapy have better response in increasing pain pressure threshold and improving grip strength and function.

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