Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i18.3279

# ROLE OF HVLAT ON IMPROVING HAND GRIP STRENGTH AND RELIEF OF PAIN IN LATERAL EPICONDYLALGIA (TENNISELBOW)

**Anjali Agarwal[1], G. K. Singh[2], Sunil Kumar[3], Sumit Asthana[4], Gowrishankar Potturi[5]***

[1]Research Scholar, Era University, Lucknow.
[2]HOD, Department of Orthopedics, Era University, Lucknow.
[3]Professor, Department of Orthopedics, UPUMS, Saifai
[4]HOD, Department of Physiotherapy, Era University, Lucknow.
[5]*Lecturer, Department of Physiotherapy, UPUMS, Saifai.

***Corresponding Author:** Dr. Gowrishankar Potturi
*Lecturer, Department of Physiotherapy, UPUMS, Saifai, Etawah. Ph: 9603803011, Email: potturigowrishankar@gmail.com.
Ethical clearance: The study got ethical approval from Era University, Lucknow, Reg.no: ECR/717/inst/UP/2015/RR-21
CTRI registration: the trail is registered with CTRI, Reg.no: CTRI/2021/11/038156

Role of HVLAT on improving hand grip strength and relief of pain in lateral epicondylalgia(TennisElbow)

**Background & purpose:** Tennis elbow is medically known as Lateral epicondylitis is inflammation of the lateral epicondyle at common extensor origin. There is a wide spectrum of treatment modalities in lateral epicondylitis including drug therapy, non-electrotherapeutical treatments, acupuncture, electrotherapeutical treatments and surgery. Most of the available treatment modalities are not cost-effective, requires sophisticated equipment and are time consuming. The present study was conducted with an aim to find the role of HVLA THRUST on improving hand grip strength and relieving pain in patients with lateral epicondylalgia which is cost effective and requires no sophisticated equipment in comparison to conventional physiotherapy.

Materials and Methods: The two groups of the study were Group A (experimental group) who were given HVLAT single thrust at elbow and Group B (control group) who were given conventional physiotherapy.

**Results:** The statistical data of PRTEE, VAS and Hand grip strength, Group A is significantly different from Group B with $p<0.05$, i.e. 95% of significance. The one week trial has found significant differences favouring the experimental group in the form of reduction of pain, improving functional abilities and improvement in hand grip strength.

**Conclusion:** From this study it is concluded that the high velocity low amplitude thrust has a beneficial effect in alleviating pain, improving functional abilities and hand grip strength in patients diagnosed with lateral epicondylalgia. The high velocity low amplitude trust is faster, safer and effective in alleviating pain, improving functional abilities and hand grip strength in patients diagnosed with lateral epicondylalgia over the conventional physiotherapy techniques.

**Keywords:** Epicondylalgia, HVLAT, PRTEE, Tennis Elbow, Physiotherapy

## INTRODUCTION

The syndrome of persistent disabling pain in the elbow, predominantly in the radio humeral joint, is called as lateral epicondylitis, lateral epicondylalgia or tennis elbow.[1] In tennis elbow, microscopic and macroscopic lesions can be found in the Extensor Carpi Radialis Brevis(ECRB).[2] Approximately 40% of people will experience lateral epicondylitis at some point in their life.[3] It is observed in both males and females between the age 35-45.From the previous studies, the prevalence of lateral epicondylitis is between 1 and 3% within the general population, and 4-7 per 1000 patients visiting general medical practitioners. [4]

In 1873, RANGE termed it as the Writer's cramps. It was MADRIS, who coined the term TENNIS ELBOW as it was commonly observed among tennis players.[5] Around 50% of all tennis players experience some type of elbow pain, with 75 to 80% of these elbow complaints inferable to tennis elbow.[6]

In most cases the lesion involves the specialized junctional tissue at the tendinous origin of the common extensor muscle on the lateral humeral epicondyle, specifically extensor carpi radialis brevis. The lesion is caused by macroscopic and microscopic tears, at the origin of the extensor carpi radialis brevis and into the periosteum of the lateral humeral epicondyle.[7]

An insidious pain is felt in Tennis elbow cases. In cases with a more acute onset, there is often a recent change in performance, taking the mechanical load, performing a technique or operating equipment. The severity of pain can range from minor to severe and may lead to sleep disturbances. Pain is usually aggravated by gripping activities, like forceful gripping during industrial work, gripping the broomstick, wringing the clothes and holding the tooth brush. The pain is mostly experienced in straight elbow position and the elbow in maximal flexion. It is also observed that if the elbow is placed in same position for longer duration, stiffness may occur as in the cases of post sleeping mode or carrying load.[8,9]Tennis elbow can be clinically examined with the help of Mills' test-in which a passive stretch of the extensor tendons is produced by full elbow extension, forearm pronation, wrist flexion and ulnar deviation and Cozen's Test- in which Resisted extension of the wrist is performed with the elbow and wrist fully extended and pronated reproduces the pain on the lateral side of the elbow. A positive test for Tennis elbow is indicated if the induced pain is reduced and the grip strength is increased on compression of the muscles of the proximal forearm. Some of the beneficial treatment modules are Wrist manipulation, Strengthening Exercises and Stretching of the Wrist Extensors for tennis elbow. Manipulation provides muscle relaxation and frees the motion segments. Wrist Manipulation can influence the nociceptive afferent transmission and has a direct effect on the articular surfaces.[10]

The management of lateral epicondylitis aims at pain relief, acceleration in healing process via reducing arm overuse, and returning the patient to normal activities of daily living. There is a wide spectrum of treatment modalities which may be pharmacological as well as non-pharmacological in lateral epicondylitis. These include but not limited to drug therapy, non-electrotherapeutical treatments (exercise, manipulation, orthotics, and taping), acupuncture, electrotherapeutical treatments (laser, extracorporeal shock wave therapy, phonophoresis, ultrasound, electromagnetic field and ionization), and surgery. There is no clear evidence that orthotic supports can facilitate activities of daily living, reduce pain and increase handgrip strength.[11]

High-intensity laser therapy (HILT) is found effective for sports injuries (contusions, tendon injuries, muscle spasms, etc.) and other musculoskeletal disorders. Furthermore, it was also evident from the previous studies that epicondylitis bandage, which gives a compressive force near the origin of the wrist extensor muscles, may be used.[12]

HVLAT performed at the end of elbow extension, while the wrist & hand are flexed, is becoming popular treatment option for tennis elbow[13.] A recent study by Stasinopoulus[14] evaluated the clinical efficacy of this manipulation & friction massage in comparison with a supervised eccentric exercise programme which revealed that the former had better and promising results in the cases of tennis elbow. Some research evidences are also present to demonstrate the beneficial effects of scaphoid thrust manipulation technique in the treatment of lateral epicondylalgia. Struijset al[15]in their research found significant decrease in pain by applying scaphoid thrust manipulation.

## AIMS AND OBJECTIVES

### AIM:

To find the role of HVLA THRUST on improving hand grip strength and relieving pain in patients with lateral epicondylalgia in comparison to conventional physiotherapy.

### OBJECTIVES:

To define the time, place and person distribution of the pathology in the study population.
To determine correlation between pain intensity and hand grip strength.
To define the improvement in Pain, hand grip strength in patient with lateral epicondylalgia by HVLAT in comparison to conventional physiotherapy.

## MATERIALS AND METHODS

The study was conducted at physiotherapy OPD of Uttar Pradesh University of Medical Sciences, Saifai, Etawah, U.P and Era University, Lucknow. The study got ethical approval from Era University, Lucknow, Reg.no: ECR/717/inst/UP/2015/RR-21 and the trail is registered with CTRI, Reg.no: CTRI/2021/11/038156. The study was conducted for a period of 6 months. The treatment for each subject was for a period of one week with 3 sessions per week

**INCLUSION CRITERIA-** any or many of the following:
Age – 30-45 years
Sex- Both Male and female.
Complaint of local tenderness on palpation over the lateral epicondyle.
Positive MILL's test.
Complain of pain with gripping
Complain of pain with resisted wrist extension.
Complain of pain with passive wrist flexion with the elbow extension.
Positive Cozen's sign

**EXCLUSION CRITERIA-** Any of the following:
No Consent
When any of the method of treatment is contraindicated
Any other explanation of the pain around elbow
Any comorbidity that adversely affect prognosis

### Materials

Consent form
Assessment proforma
Hand dynamometer
Treatment couch and Chair
Supporting pillow and pads
Conduction gel
Towel and tissues
Therapeutic Ultrasound generator
Hot pack

### Treatment and assessment technique

20 patients with confirmed diagnosis of Lateral Epicondylalgia who satisfied the inclusion criteria by clinical evaluation and investigations were selected and are divided into two groups (n=10). The computerized randomization was done.
The patients were explained the treatment procedure and their consent were taken before randomization.

Group A (experimental group) was given HVLAT single thrust at elbow for 3 sessions a week on alternative days for one week.

**PROCEDURE**

Initial assessment for the pain was done by Pain Visual Analogue Scale (VAS), hand grip strength was measured by Hand Held Dynamometer and functional abilities were assessed by Patient Rated Tennis Elbow Evaluation questionnaire (PRTEE).

The high velocity low amplitude thrust (HVLAT) was given to the Group A (experimental group) patients. The patient was made to sit in a comfortable position. Patient's elbow was flexed at 90º. The therapist then firmly holds the radial head with the thumb and grasps the elbow from behind with the other four fingers with non-dominant handand holds the patient's wrist with forearm in complete pronation with his dominant hand. A low amplitude high velocity thrust was performed at the end of elbow extension while the wrist and hand in flexion, by gently pushing the radial head anteriorly (Fig 2).The experimental group subjects were given HVLAT single thrust at Elbow for three sessions a week on alternative days for 1week.

Group B (control group) was given conventional physiotherapy in the form of DEEP TISSUE FRICTION MASSAGE (DTFM), HOT THERAPY, and ULTRASOUND THERAPY for three sessions a week on alternative days for 1 week.

Both groups were trained for home exercises with an informative booklet having pictorial illustrations. No other treatment is allowed except for comorbidities if any. The subjects were allowed to do daily routine activities. Any strenuous activity was prohibited.

The measurements were taken before starting of the intervention, one week and 3 months Post intervention as follow up. Other parameters detailing patient, disease status and comorbidities were also recorded initially and in subsequent follow-ups if necessary.

**OUTCOME MEASURES**

The outcomes were measured by Pain visual analog scale, Patient rated tennis elbow evaluation questionnaire (PRTEE) and hand grip strength by dynamometer and was compared to initial readings. The patient rated tennis elbow evaluation questionnaire is an important tool to assess how the elbow pain has affected patient's activities of daily living. The patient is asked to tick one box that best describes his condition. The scoring is calculated by following formula

Pain Subscale- Add up5items (Best score= 0; Worst score=50)

Specific Activities- Add up6items (Best Score= 0; Worst Score = 60)

Usual Activities – Add up 4items(Best Score= 0; Worst Score = 40)

Function Subscale= (Specific Activities + Usual Activities)/2

(Best score= 0; Worst score=50)

Total Score = Pain Subscale +Function Subscale (Best Score= 0 Worst Score =100)

The pain visual analog scale (VAS) was used to assess the pain. It is a simple assessment tool consisting of a 10cm line with 0 on one end representing no pain and 10 at the other representing the worst pain ever experienced. The patient is asked to mark a point between 0 and 10 to indicate the severity of his/ her pain.

The hand grip strength is measured by hand held dynamometer.

**Results and Data Analysis**

In this study to analyze the effects on the outcome measures before and after High Velocity Low Amplitude thrust (HVLAT) in Group A (experimental group) and Deep Tissue Friction Massage (DTFM), Heat therapy and Ultrasound therapy in Group B (control group), all data was expressed as mean +/-, standard deviation and was statistically analyzed using paired't' test and independent't' test to determine the statistical difference among the parameters at 0.5% level of significance.

Paired't' test was used to examine the changes in dependent variables from baseline to after completion of intervention in each group. The pretest mean value of Patient rated tennis elbow

Evaluation questionnaire in Group A is 76 (S.D=9.96) and the posttest mean value is 48.4 (S.D=6.89) with t value 16.28 and p value <0.05. (Table 1)

The pretest mean value of Patient rated tennis elbow Evaluation questionnaire in Group B is 69.9 (S.D=10.28) and the posttest mean value is 50.1 (S.D=10.66) with t value 17.94 and p value <0.05. (Table 1)

The independent‘t’ test is done to calculate the significance of difference in PRTEE questionnaire results between Group A and Group B. The mean of differences of PRTEE questionnaire scores between pretest and posttest in Group A is 27.6 (S.D=5.16) and in Group B is 19.8 (SD=3.48) with t-value 3.95 (p<0.05). (Table 2)

The pretest mean value of Pain Visual Analog Scale (VAS) in Group A is 8 (S.D=0.66) and the posttest mean value is 4.4 (S.D=0.84) with t value 16.28 and p value <0.05. (Table 3)

The pretest mean value of Pain Visual Analog Scale (VAS) in Group B is 8.1 (S.D=0.73) and the posttest mean value is2.7 (S.D=0.67) with t value 12.65 and p value <0.05. (Table 3)

The independent‘t’ test is done to calculate the significance of difference in VAS scores between Group A and Group B. The mean of differences of VASscores between pretest and posttest in Group A is 3.6 (S.D=0.69) and in Group B is 2.7 (SD=0.67) with t-value 2.92 (p<0.05). (Table 4)

The pretest mean value of Hand grip strength in Group A is 39 (S.D=6.58) and the posttest mean value is 56.5 (S.D=8.18) with t value 15.65 and p value <0.05. (Table 5)

The pretest mean value of Hand grip strength in Group B is 41 (S.D=8.09) and the posttest mean value is 53 (S.D=8.56) with t value 10.85 and p value <0.05. (Table 5)

The independent‘t’ test is done to calculate the significance of difference in Hand grip strength between Group A and Group B. The mean of differences of Hand grip strength between pretest and posttest in Group A is 17.5 (S.D=3.53) and in Group B is 12 (SD=3.49) with t-value 3.49 (p<0.05). (Table 6)

Thus from the above statistical data of PRTEE, VAS and Hand grip strength, Group A is significantly different from Group B with p<0.05, i.e. 95% of significance, hence we reject the null hypothesis. (Fig 1)

DISCUSSION

This randomised single blinded control clinical trial evaluated the Efficacy of High Velocity Low Amplitude (HVLA)Thrust on improving hand grip strength and relief of pain in the patients diagnosed with lateral epicondylalgia. The one week trial has found significant differences favouring the experimental group in the form of reduction of pain, improving functional abilities and improvement in hand grip strength.

There are many researches emphasizing the beneficial effects of HVLAT in the lateral epicondylalgia.

Brett Windsor (2013), in his study on High-Velocity Thrust Technique for Traumatic Onset Lateral Elbow Pain used a high-velocity, low-amplitude manipulation technique to the humeroulnar joint. This technique harmonised with a restoration in the patient's normal function, along with an eradication of painful symptoms. This case study demonstrated that a high-velocity, low-amplitude manipulation technique performed by a skilled professional play an important role in the efficacious management of traumatic lateral epicondyle pain.

Bill Vicenzino et al (2007), in their study on Joint Manipulation in the Management of Lateral Epicondylalgia, A Clinical Commentary stated that although the most efficient approach remains debatable, there are a number of literatures supporting the tremendous effects and the behind mechanisms of joint manipulation in the management of lateral epicondylalgia. Evidence shows that joint manipulation directed at the elbow and wrist as well as at the cervical and thoracic spinal regions results in clinical alterations in pain and the motor system. They also proposed the underlying physiological mechanisms of joint manipulation associated with the observed clinical effects in their study.

According to Shekelle’s review there are four main hypotheses for lesions that respond to High Velocity Low Amplitude Thrust (HVLAT) manipulation: 1. Release of trapped Synovial folds or

plica, 2. Easing of hypertonic muscle by sudden stretching, 3. Breaking of articular or periarticular adhesions and 4. Unlocking of motion segments that have undergone inconsistent transpositions.
HVLAT is a non-invasive technique which requires no equipment. It is less time consuming and convenient to patients as patients need not to visit the clinic on daily basis.

## CONCLUSION

The following conclusions are drawn from the present study
The high velocity low amplitude thrust has a beneficial effect in alleviating pain, improving functional abilities and hand grip strength in patients diagnosed with lateral epicondylalgia.
The high velocity low amplitude trust is faster, safer and effective in alleviating pain, improving functional abilities and hand grip strength in patients diagnosed with lateral epicondylalgia over the conventional physiotherapy techniques i.e. ultrasonic therapy, hot packs and deep friction massage.

**Table 1:** Comparison of Pre and Post-test values of PRTEE questionnaire scores In Group A and Group B

| PRTEE Score | Group A | | | Group B | | |
|---|---|---|---|---|---|---|
| | Mean | SD | P value | Mean | SD | P value |
| Pre test | 76 | 9.96 | <0.05 | 69.9 | 10.28 | <0.05 |
| Post test | 48.4 | 6.89 | | 50.1 | 10.66 | |
| T value | 16.88 | | | 17.94 | | |

**Table 2:** Comparison of Pre-test and Post-test differences in PRTEE scores in Group A and Group B

| Differences in PRTEE scores pre and post test | Mean | SD | T value | P value |
|---|---|---|---|---|
| Group A | 27.6 | 5.16 | 3.95 | <0.05 |
| Group B | 19.8 | 3.48 | | |

**Table 3:** Comparison of Pre and Post-test values of Pain VAS scores In Group A and GroupB

| Pain VAS Score | Group A | | | Group B | | |
|---|---|---|---|---|---|---|
| | Mean | SD | P value | Mean | SD | P value |
| Pre test | 8 | 0.66 | <0.05 | 8.1 | 0.73 | <0.05 |
| Post test | 4.4 | 0.84 | | 5.4 | 0.69 | |
| T value | 16.28 | | | 12.65 | | |

**Table 4:** Comparison of Pre-test and Post-test differences in Pain VAS scores in Group A and Group B

| Differences in Pain VAS scores pre and post test | Mean | SD | T value | P value |
|---|---|---|---|---|
| Group A | 3.6 | 0.69 | 2.92 | <0.05 |
| Group B | 2.7 | 0.67 | | |

**Table 5:** Comparison of Pre and Post-test values of Hand Grip Strength In Group A and Group B

| Hand Grip Strength | Group A | | | Group B | | |
|---|---|---|---|---|---|---|
| | Mean | SD | P value | Mean | SD | P value |
| Pre test | 39 | 6.58 | <0.05 | 41 | 8.09 | <0.05 |
| Post test | 56.5 | 8.18 | | 53 | 8.56 | |
| T value | 15.65 | | | 10.85 | | |

**Table 6:** Comparison of Pre-test and Post-test differences in Hand Grip Strength in Group A and Group B

| Differences in Hand Grip Strength pre and post test | Mean | SD | T value | P value |
|---|---|---|---|---|
| Group A | 17.5 | 3.53 | 3.49 | <0.05 |
| Group B | 12 | 3.49 | | |

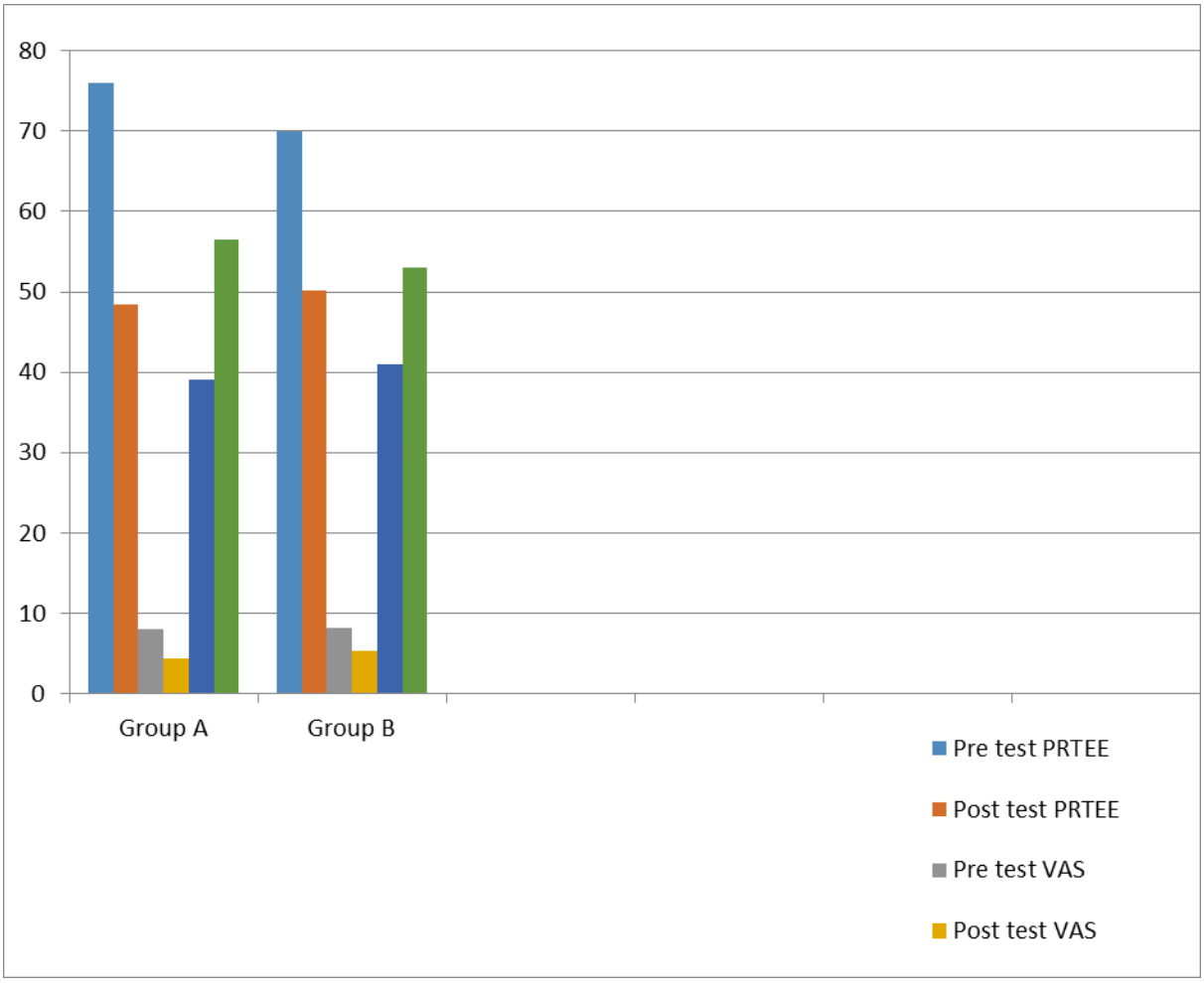


**Fig 1:** Comparision of Pre-test and Post test outcome variables in Group A and B

**Fig 2:** Technique of giving HVLAT.

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