

ORIGINAL RESEARCH

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EFFICACY OF CYRIAX PHYSIOTHERAPY VERSUS ECCENTRIC STRENGTHENING AND STRETCHING EXERCISES IN CHRONIC LATERAL EPICONDYLITIS PATIENTS

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ABSTRACT

Background: Lateral Epicondylitis is the most common lesion of the elbow, affecting the tendinous origin of the wrist extensors. Although conservative treatment of this condition has been the subject of numerous studies, there is no agreement as to the most effective management strategy. Therefore, this study was designed to compare the efficacy of Cyriax physiotherapy Versus Eccentric Strengthening and Stretching exercises in reducing the pain and improving the grip strength and functional status of the affected extremity in chronic lateral epicondylitis.

Method: An experimental study design, 60 subjects meeting the inclusion criteria were selected for the study and were randomly assigned into two groups: Group A (N=30) received Cyriax Physiotherapy and Group B(N=30) received Eccentric strengthening and static stretching of Extensor Carpi Radialis Brevis. Low Level Laser Therapy was a common treatment for both the groups. After 4 weeks of treatment, assessment was performed using Visual Analogue Scale (VAS), Hand Held Dynamometer (HHD) and Patient Rated Tennis Elbow Evaluation Questionnaire (PRTEE) at 0 week and at the end of 4 weeks.

Results: Data analysis revealed that there is no statistically significant difference between the groups in VAS, HHD and PRTEE scores i.e. average improvement post treatment in both the groups are equal, but within group comparisons showed significant improvements in both the groups.

Conclusion: The efficacy of Cyriax Physiotherapy is equal to Eccentric Strengthening and Stretching Exercises in chronic lateral epicondylitis.

Keywords: Lateral epicondylitis, Deep Transverse Friction, Mill's Manipulation, Low Level Laser Therapy, Patient Rated Tennis Elbow Evaluation Questionnaire.

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INTRODUCTION

Lateral Epicondylitis (L.E) or traditionally ‘Tennis Elbow’¹ is a painful and debilitating musculoskeletal condition that poses significant challenges to the healthcare industry². It is generally a work related or sports related pain disorder usually caused by excessive quick, monotonous, repetitive eccentric contractions and gripping activities of wrist.³ Although L.E. occurs at all ages, the peak prevalence of L.E. is between 30 and 60 years of age.^{4, 5} The prevalence of L.E. did not differ in men and women.⁶ Maximum area of tenderness is approximately 1-2cm distal to the lateral epicondyle in ECRB tendon. Pain may radiate to lateral aspect of forearm. Examination reveals increase in pain by resisted wrist extension especially with pronation and wrist radially deviated (Mill’s test). Resisted extension of the middle finger is also painful⁷. The treatment of L.E remains somewhat of an enigma. More than 90% of people respond to conservative treatment. Several interventions for the management of L.E. have been described, including rest, ice for 15 minutes up to 6 times daily, NSAIDs, Muscle stretching and Strengthening exercise, Sports Taping techniques, Cryotherapy, use of orthotic device, Manipulative technique(Mulligan’s MWM)⁸, Acupuncture, Ultrasound, LASER, TENS,ESWT, Electromagnetic field and Ionization. Corticosteroid injection provides relief for up to three months and is seldom used more than two or three times per year. Surgery is often recommended when conservative strategies fail to relieve lateral epicondylitis symptoms after 6 to 12 months.⁹ Once pain has stopped or improved, physiotherapy exercises including stretching which helps lengthen the sore tendon and keep the collagens tissue soft and pliable. Recurrence of tennis elbow can be prevented by using braces to support the wrist, changing technique or equipment, or modifying jobs and activities if possible. Specific manipulation therapy for acute L.E. produces uniquely characteristic hypoalgesia including Cyriax technique.

Need of the Study:

The main complaint in L.E. is pain and decreased grip strength, both of which may affect activities of daily living. Many physical therapies have been recommended for the management of L.E. because no single approach has been widely accepted as the best treatment option.¹⁰ Recent articles states that Cyriax shows significant effect in pain reduction and improving grip strength in patients with lateral epicondylitis.^{2,11} Studies have also proved that exercise regimen consisting of Eccentric Strengthening and Stretching exercises produces

significant pain reduction, and improvement in grip strength and functional status in patients with L.E. Studies done in past have proven that Low Level Laser Therapy is an effective modality to decrease pain and for improving grip strength.^{12,13,14} But there is a lack of evidence revealing comparative effectiveness of Cyriax physiotherapy with Low level laser therapy Vs Eccentric Strengthening and Stretching exercises with Low Level Laser therapy in patients with lateral epicondylitis; hence there is a need to compare both.

Objectives of the study:

1. To find out whether the application of Cyriax physiotherapy with Low Level Laser Therapy can reduce the pain and improve the grip strength and functional status of the affected extremity due to lateral epicondylitis.
2. To find out whether the application of eccentric strengthening and stretching exercises with Low Level Laser Therapy can reduce the pain and improve the grip strength and functional status of the affected extremity due to lateral epicondylitis.
3. To compare the efficacy of Cyriax physiotherapy (DTF and Mill’s) with Low Level Laser Therapy Versus Eccentric strengthening and stretching exercises with Low Level Laser Therapy in reducing the pain and improving the grip strength and functional status of the affected extremity due to lateral epicondylitis.

METHODOLOGY

An experimental study design with two groups- Group A and Group B. As this study involved human subjects, the Ethical Clearance was obtained from the Ethical Committee, Dr. M.V. Shetty College of Physiotherapy, Mangalore as per the ethical guidelines of Bio-medical research on human subjects. Subjects included in the study were within the age group of 30 to 60 years, both males and females, having unilateral symptomatic lateral epicondylitis, presence of tenderness on palpation over the lateral humeral epicondyle, presence of pain with gripping activity, patients with positive Mill’s test, Cozen’s test and Middle finger extension test. Subjects excluded were subjects with bilateral lateral epicondylitis, previous surgery or trauma to the region, history of fracture of Radius/Ulna, Rheumatoid diseases or Neurologic impairment, severe Neck/Shoulder problem likely to cause elbow complaints, and any elbow deformity.

60 subjects meeting the inclusion criteria were recruited from Government Wenlock Hospital and Dr. M. V. Shetty Trust Hospital, Mangalore.

Informed consent was obtained from the patients. Then the patients were randomly assigned into two groups, group A and group B, having 30 subjects in each group.

Procedure for intervention for Group A:

Subjects received Cyriax Physiotherapy with Low Level Laser Therapy.

- a. Cyriax Technique [Deep Transverse Friction (DTF) and Mill's manipulation]^{15,16,17,18,}

DTF

The starting position was patient in sitting with elbow 90° flexion and forearm supination. The therapist's thumb was 90° flexed, with the tip of the thumb lateral to the lateral epicondyle. The deep friction was given at the front of the epicondyle by the thumb onto the anterior aspect of the bone. The other fingers acted as a fulcrum at the medial side of the elbow. The active phase of the deep friction was a translation movement at the front of the lateral epicondyle, with pressure applied in a medial/downward direction. DTF was applied for 10 minutes. To avoid losing contact with the lesion, the patient should not abduct his arm, nor should our thumb be put too high or too flat. Using a layer of cotton wool between finger and skin could be used to prevent damage to the skin (short finger nails are an advantage). The treatment was given for 3 times a week for a period of 4 weeks.

Mill's Manipulation

The therapist had taken up position behind the seated patients. Affected extremity kept in 90 degree abduction with internal rotation enough so that the olecranon was faced up. The therapist stabilized the patient's wrist in full flexion and pronation with one hand while the other hand was placed over the olecranon. While maintaining the full wrist flexion and pronation, the therapist delivered a high - velocity, low amplitude thrust at the end range of elbow extension. The treatment was given for 3 times a week for a period of 4 weeks.

- b. Low Level Laser Therapy (LLLT)^{19,20,21,22}

Low level laser (wavelength 632.8 nm) was given over the site of the lesion. Continuous mode with energy density 2-3 joule/point. Treatment head was held perpendicular to the point of treatment. Minimum distance (0.5 cm) was maintained between treatment head and point of contact. The length of time per session was 10 minutes. The treatment was for 3 times a week for a period of 4 weeks.

Procedure for intervention for Group B:

Subjects received eccentric strengthening for wrist extensors and static stretching of extensor carpi radialis Brevis along with Low level laser therapy.

- a. Eccentric strengthening of Wrist extensors^{23, 24,} Patient was in sitting with elbow in full extension, forearm in pronation and wrist in maximum extension. From this position, the patient slowly lowered the wrist into flexion for a count of 30, and then used the contra lateral hand to return the wrist to maximum extension. The load was increased using free weights based on patients 10 RM. 3 sets of 10 repetitions were performed during each treatment with a 1 minute rest interval between each set.

Static stretching of ECRB^{23, 25, 26,}

Patient was in sitting with elbow in extension, forearm in pronation and wrist in flexion with ulnar deviation. Stretch was given according to patient's tolerance, held for 30-45 seconds. Performed 3 times before and 3 times after eccentric strengthening for a total of 6 repetitions. A 30 seconds rest interval was given between each bout of stretching.

- b. Low Level Laser Therapy (LLLT)

The parameters for LLLT was same as Group A.



Figure 1: DTF (Deep Transverse Friction) technique for tennis elbow.



Figure 2: Mill's manipulation for tennis elbow.



Figure 3: LLLT for tennis elbow.



Figure 4: Static stretching for the ECRB



Figure 5: Eccentric strengthening exercises of wrist extensors

Outcome Measurements:

Pain, pain-free grip strength and functional status were assessed using Visual Analogue Scale, Hand Held Dynamometer and Patient Rated Tennis Elbow Evaluation Questionnaire respectively before starting the treatment and at the end of 4 weeks, for both the groups.

Visual Analogue Scale (VAS) ²⁷

Patient was provided with a VAS and was explained before the treatment about the VAS with respect to 0-10 on scale. The patients were asked to mark pain intensity before the treatment and by the end of fourth week.

Hand Held Dynamometer (HHD) ²⁸

Hydraulic dynamometer was (Baseline Inc. U.S.A) used to estimate grip strength measurement. During the examination the patient was seated comfortably and arm was held at the patient's side with shoulder adducted and neutrally rotated, elbow flexed at 90 degrees, forearm in neutral position, and the wrist 0- 30 degrees of extension and between 0-15 degrees of ulnar deviation and the maximal grip readings were noted with pain free maximum contraction. The same procedure was used to assess hand grip strength before treatment and repeated again at fourth week after treatment.

Patient Rated Tennis Elbow Evaluation Questionnaire (PRTEE) ²⁹

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:

- 1) PAIN subscale (0 = no pain, 10 = worst imaginable)
 - Pain - 5 items
- 2) FUNCTION subscale (0 = no difficulty, 10 = unable to do)
 - Specific activities - 6 items
 - Usual activities - 4 items

In addition to the individual subscale scores, a total score can be computed on a scale of 100(0 = no disability), where pain and functional problems are weighted equally.

RESULTS

Statistical tools:

In both the groups, to find the significance between pre and post test values of

- a) VAS: Wilcoxon Signed Rank Test has been used.
- b) Grip strength and Functional status: Paired t-test has been used.

To compare the effectiveness between the groups in,

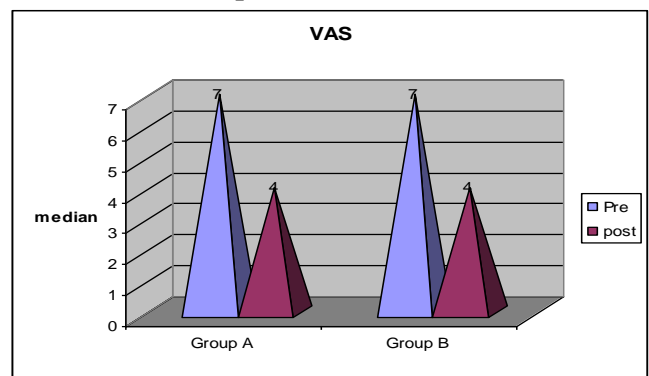
- a) VAS: Mann Whitney U Test has been used.
- b) Grip strength and Functional status: Unpaired t-test has been used.

Table 1: Within group comparison of average improvement in vas (between pre and post test values) in both the groups

	Average improvement	Z-value	p-value	Result
Group-A	3	4.837	0.000	P<0.05 sig
Group-B	3	4.832	0.000	P<0.05 sig

Shows that p-value <0.05 which means there is a significant reduction in pain in both the groups post treatment.

Graph 1: Within group comparison of average improvement in VAS



Shows significant reduction in pain in both the groups post treatment.

Table 2: Between group comparison of average improvement in vas

	Average improvement(A)	Average improvement(B)	t-value	p-value	Result
VAS	3	3	0.435	0.831	P>0.05 not sig

Result shows that the p-value is >0.05 which means there is no significant difference between groups in VAS (pain intensity), average improvement in both the groups are equal.

Table 3: Within group comparison of improvement in hand grip strength (between pre and post test values) in both groups

	Average improvement (mean difference)	t-value	p-value	Result
Group-A	5.566	11.2407	0.000	P<0.05 sig
Group-B	5.333	10.8901	0.000	P<0.05 sig

Result shows that p-value in both the groups pre and post test comparison is P<0.05 i.e. there is very highly significant improvement in both the groups post treatment.

Table 4: Between group comparison of average improvement in hand grip strength

	Average improvement(A)	Average improvement(B)	t-value	p-value	Result
HG	5.566	5.333	0.335	0.739	P>0.05 not sig

Result shows that the p-value >0.05 which means there is no significant difference between groups in hand grip strength, average improvement in both the groups are equal.

Table 5: Within group comparison of average improvement in prtee (between pre and post test values) in both groups

	Average improvement	t-value	p-value	Result
Group-A	22.733	14.75	0.000	P<0.05 sig
Group-B	22.866	15.106	0.000	P<0.05 sig

Result shows that p-value in both the groups pre and post test comparison is<0.05 which means there is very highly significant improvement in both the groups post treatment.

Table 6: Between group comparison of average improvement in prtee (between group a and b)

	Average improvement(A)	Average improvement(B)	t-value	p-value	Result
PRTEE	22.733	22.866	0.062	0.951	P>0.05 not sig

Result shows that the p-value >0.05 which means there is no significant difference between groups in functional status, average improvement in both the groups are equal.

DISCUSSION

The results of this study demonstrate that both the Cyriax with LLLT and Eccentric Strengthening and Stretching Exercises with LLLT experienced significant improvements in pain, pain-free grip strength and functional status following 12 treatment sessions (3 days /week for 4 weeks). Both the groups experienced equal outcomes for all variables in comparison to one another.

The proposed mechanism of Mill's Manipulation is the lengthening of scar tissue which decreases tension on the scar leading to less pain.^{30, 31}

The application of Cyriax transverse friction massage is proposed to provide the patient with analgesia (due to modulation of nociceptive impulses at the spinal cord level) prior to the manipulation as well as softening the scar.³⁰

The mechanism behind the success of using LLLT in lateral epicondylitis is due to cellular biostimulation, accelerated collagen synthesis, decreased prostaglandins and vasodilatation leading to accelerated tissue healing.³²

It is claimed that eccentric training results in tendon strengthening by stimulating mechanoreceptors in tenocytes to produce collagen, which is probably the key cellular mechanism that determines recovery from tendon injuries.³³ Ohberg et al³⁴ believe that eccentric training leads to neovascularisation which improves blood flow and healing in the long term.

Cyriax and Cyriax, Stasinopoulos D, Stasinopoulos I recommended that DTF regimens should comprise 10 min every other day or at a minimum interval of 48hrs. This suggestion was strictly followed in the treatment protocol, which would have been the reason for the very comparable results to the other studies.³⁶

Stasinopoulos D, Johnson M I after their extensive study on Cyriax physiotherapy has concluded that DTF and Mill's manipulation should always be administered in combination to the patient with L.E. instead of any one technique alone. This suggestion from many authors was strongly considered in the present study where DTF and Mill's manipulation combinedly applied to patient with L.E. and not selecting individual manipulation technique.³³

The reported equal success of Cyriax with LLLT and Eccentric Strengthening and Stretching Exercises with LLLT in the present study conflicts with previously published trials^{35,36} by Stasinopoulos et al³⁶ which concluded that supervised exercise consisting of static stretching and eccentric strengthening produced the more

effect in reducing pain and improving function compared to Cyriax. However the study lacked randomization, which can result in unbalanced groups regarding prognosis.

The improvements experienced by eccentric strengthening and stretching exercise are consistent with previous trials addressing this interventions. In a study done by Amit V Nagrale et al¹¹, treatment of lateral epicondylitis using Phonophoresis and supervised exercise showed significant improvements in all outcome measures from baseline to discharge at 4 weeks.

LIMITATIONS AND RECOMMENDATIONS:

1. Study has only 60 subjects which is a small sample size. Larger study involving an increased number of participants can be employed.
2. Patient should be of same gender .Men generally have stronger grip strength as compared to women and this could affect the grip strength results.
3. A longer study, over 6 weeks, with a follow up a month later should be conducted to determine the long term effects of the treatment.
4. The study should be repeated as a double or a single blinded randomized controlled study to eliminate any possible bias.
5. An electronic digital dynamometer should be used to measure grip strength, as it may be more accurate results.

CONCLUSION

The results of this study demonstrate that both the Cyriax with LLLT and Eccentric Strengthening and Stretching Exercises with LLLT experienced significant improvements in pain, pain-free grip strength and functional status in chronic lateral epicondylitis patients post treatment, but both the groups experienced equal outcomes for all variables in comparison to one another. It can be concluded that both the regimens of treatment are equally effective in chronic lateral epicondylitis.

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CONFLICT OF INTEREST: None

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