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Effects of cyriax and dry needling on pain, grip strength and functional outcomes in patients with lateral epicondylitis: A randomized controlled trial

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Abstract

Introduction: Lateral epicondylitis is one of the most usual overuse injuries. Studies have shown that the prevalence rate is 1-3% in the general population but incidence increases to 19% between 30-60 years age and is more severe in women than men.

Objective: To compare the effectiveness of Cyriax technique, Dry Needling and Conventional therapy on pain, function, and grip strength in patients with lateral epicondylitis in a duration of 4 weeks.

Methodology: This study design is a randomized controlled trial involving 60 individuals with lateral epicondylitis who were divided into 3 groups. Group 1 received conventional, group 2 received cyriax, and group 3 received dry needling. They were assessed using VAS, patient rated tennis elbow evaluation, and hand dynamometer at baseline and at 4th week post treatment.

Results: There were no significant between-group differences at baseline. After the treatment period, all the groups showed significant improvement in pain, function, and grip strength, but group 3 showed more significant difference in pain and function at baseline and 4th week post treatment comparison.

Conclusion: Dry Needling with conventional treatment is more effective alternative with positive effects on elbow pain, functional capacity, and pain-free, maximum grip strength than cyriax and conventional treatment alone.

Keywords: Tennis elbow, dry needling, physiotherapy, lateral epicondylitis

Introduction

Lateral epicondylitis is one of the most usual overuse injuries which is characterized by pain and soreness around the lateral epicondyle of the humerus. The prevalence rate is 1-3% in the general population, but the incidence rapidly increases to 19% between 30-60 years of age and happens to be more severe and long lasting in women than men^[2]. In the general population, risk factors that could lead to development of this condition comprise of smoking, being overweight, and performing repetitive motions with vigorous activity^[3].

It is very common in individuals whose jobs require frequent rotatory motion of the forearm like tennis players and carpenters. It is usually due to quicker, more monotonous, cyclic eccentric contractions and wrist gripping activities. It commonly affects the dominant arm. The average period of an episode of lateral epicondylitis is between 6 months and 2 years. Tennis elbow can be acute and chronic. Acute form happens due to tendonitis and chronic form is due to degenerative tendon changes, collagen bundles getting disorganized, scar tissue, and hypervascularity. It is caused due to microtrauma to the tendon. It is a lesion in the common extensor tendon (CET) that attaches to the lateral epicondyle of the elbow and begins from the fibers of Extensor Carpi Radialis Brevis, Extensor Digitorum, Extensor Digiti Minimi, And Extensor Carpi Ulnaris muscles. The tissue attempts repair, but continued muscle contraction pulls the surfaces apart leading to multiple, repetitive tear.

Dry needling is said to promote local blood supply and inflammation in the short-term leading to increased healing over some time. It has been put forward that DN evokes a local twitch response that interrupts the motor end-plate noise, inducing an analgesic effect by reducing spontaneous activity and enhancing oxygenation of the tissue by increasing local vascularization. It can also boost the release of opioids and b-endorphins that control pain transmission.

Cyriax's Deep transverse friction (DTF) is a specific type of connective tissue massage applied precisely to soft tissue structures. DTF should be applied only at the exact site of the lesion, with the depth of friction bearable by the patient. It must be applied transversely to the specific tissue involved. Mill's manipulation should be performed immediately after the DTF is applied, provided that the patient has a full passive range of elbow extension. The aim of this technique is to elongate the scar tissue by rupturing adhesions within the teno-osseous junction, making the area mobile and pain free. Even though many studies have been conducted on treatment of this clinical condition, till date the most effective management strategy is not agreed. Conservative management plays a vital role as the initial treatment for LE. A wide variety of conservative applications with different mechanisms of action have been investigated for years in LE. Hence, the purpose of this study is to find the effects of cyriax technique and dry needling in combination with conventional therapy on pain and function in patients of lateral epicondylitis.

Materials and Methodology

- 1. Source of data:** Dr. APJ Abdul Kalam college of physiotherapy, Pravara Institute of Medical Sciences, Loni
- 2. Study setting:** The study was conducted in department of Orthopedic Physiotherapy, Dr. A.P.J. Abdul Kalam college of physiotherapy, Loni
- 3. Type of data:** Quantitative data
- 4. Study design:** Randomized Controlled Trial
- 5. Study duration:** 2 years
- 6. Sample size:** 60
- 7. Sampling method:** Simple Random Sampling

Inclusion criteria is Patients of age 30 to 60 years, having symptoms for one month or more, Patients with lateral epicondylalgia were clinically identified with the following tests: Cozens test and Mills test

Exclusion criteria is Bilateral Tennis Elbow, Recent shoulder or elbow fractures, Previous surgery or trauma to the region during the last 6 months, Medial epicondylitis, Cervical radiculopathy, Corticosteroid injection within six months.

Outcome measures

- 1. Visual analogue scale:** Pain severity was measured with the visual analogue scale (VAS). The VAS consists of a 10 cm line with 0 cm representing the "least pain imaginable" and 10 cm the "worst pain imaginable." Patients were instructed to intersect the scale with a vertical line based on their current level of pain. The visual analogue scale has been found to be a valid and reliable method of measuring perceived pain [19].
- 2. Hand dynamometer:** Grip strength was measured using a Jamar dynamometer. The patients were instructed to sit on an armless chair with their shoulders at 0° abduction and in the neutral position, their elbow at 90° flexion, and their forearm in the neutral position. The patients squeezed the dynamometer maximally for 3 s. Three trials were attempted with 60 s of rest between each, and the average of all 3 grips were recorded [1, 22, 23].
- 3. Patient-rated tennis elbow evaluation:** It is specifically developed for patients with LE used to determine forearm pain and disability. The scale consists of 2 parts, namely pain with 5 items and functional activities with 10 items. Each item has a score from 0 (no pain or difficulty in

performing a task) to 10 (the worst pain or inability to perform a task). The total score is the combined score of the 2 parts [1, 24, 25].

Procedure

Ethical clearance was obtained from the IEC. All Participants were selected as per eligibility criteria. Written Informed consent was obtained from the participants and demographic data was recorded. Participants were randomly allocated to 3 groups by using chit method-Group 1 received conventional treatment only which included ice pack for 10 mins, ultrasound for 5 mins, stretching exercises and strengthening exercises. 3 sessions on alternate days were given in a week for duration of 4 weeks. Group 2 received cyriax technique with conventional treatment in which Cyriax included deep friction massage immediately followed by mill's manipulation. Conventional therapy was the same as group A. 3 sessions on alternate days were given in a week for duration of 4 weeks. Group 3 received Dry needling with conventional treatment. 3 sessions of dry needling on alternate days were given in a week for 4 weeks. Conventional therapy was the same as group A. 3 sessions on alternate days were given in a week for duration of 4 weeks.

Intervention

Conventional therapy

Procedure

Ice pack for 10 mins

Ultrasound therapy with the frequency of 1 MHz, intensity of 1 W/cm² for 5 mins,

Stretching exercises

Patient position: Patient was in the seated position with elbow in extension, forearm in pronation, and wrist flexion with ulnar deviation.

Procedure: Static stretching of the Extensor Carpi Radialis Brevis was done. This stretch position was held for a duration of 30-45 seconds and was performed 3 times before and 3 times after the eccentric exercise portion of the treatment for a total of 6 repetitions. There was a 30-second rest interval between each bout of stretching.

Repetitions: Stretching was performed 3 times before and 3 times after the eccentric exercise portion of the treatment for a total of 6 repetitions with 30-45 seconds hold.

Strengthening exercises

- Patient position:** Patient in the seated position with full elbow extension, forearm pronation, and maximum wrist extension.
- Procedure:** From this position, the patient slowly lowered wrist into flexion for a count of 30, using the other hand to return the wrist to maximum extension.
- Repetitions:** ten repetitions/3 sets were performed during each treatment, with a one-minute rest interval between each set.

Cyriax technique

Patient position: The patient was in sitting position comfortably with the elbow fully supinated and in 90° of flexion for deep friction massage.

Patients were in the seating position with the affected extremity in 90° of abduction with internal rotation enough so that the olecranon faced up for mills manipulation.

Procedure: After palpating the anterolateral aspect of the lateral epicondyle of humerus, the area of tenderness was mapped. Deep transverse friction is applied with the side of the thumb tip. The pressure was applied in a posterior direction on the teno-osseous junction. It was applied for ten minutes after the numbing effect has been attained, to prepare the tendon for Mill's manipulation.

For mills manipulation, the therapist stabilized the patient's wrist in full flexion and pronation with one hand, while other hand placed over the olecranon. While keeping the full wrist flexion and pronation position, apply a high-velocity low-amplitude thrust at the end range of elbow extension.

Repetitions- 3 sessions/week for 4 weeks



Dry needling procedure

Patient position-The patient was positioned in the supine position with the elbow in slight flexion and the forearm in a neutral position, supported by a pillow underneath.

Procedure: Assessment of the myofascial trigger points was done by palpation of nodules in taut bands along the lateral epicondyle of the humerus and along all extensors, triceps, and supinator. If patient complained of pain, that point was marked for DN. Sterilized disposable single-use needles of size 0.25 to 0.30 mm \times 25 mm were used. A pincer-grip technique was used to gently lift the skin, and needles inserted with an oblique technique at the three or four most tender points at the assessed trigger points. The patient was observed for a local twitch response and once the response was elicited, the needle was left in place (static needling) for 10 minutes. The patient is asked to report any abnormal sensations or discomfort during intervention. Finally, the needles are carefully removed and disposed of. **Precautions-** A standard care protocol for preparing the skin with 70% isopropyl alcohol was used to clear the skin before needling, use sterile

needles, dispose the needles carefully. Repetitions- 3 sessions/week for 4 weeks.



Results

Analysis of data was done using commercial statistical software graph pad instant trial version 13.3 applications. Descriptive statistics for all outcome measures were expressed as mean, SD and test significance such as Paired t test used to compare data within each group and Unpaired t test for comparing the data between groups. The confidence interval was set at 95%.

Demographic data

Table 1: Characteristics of participants at baseline (n=60)

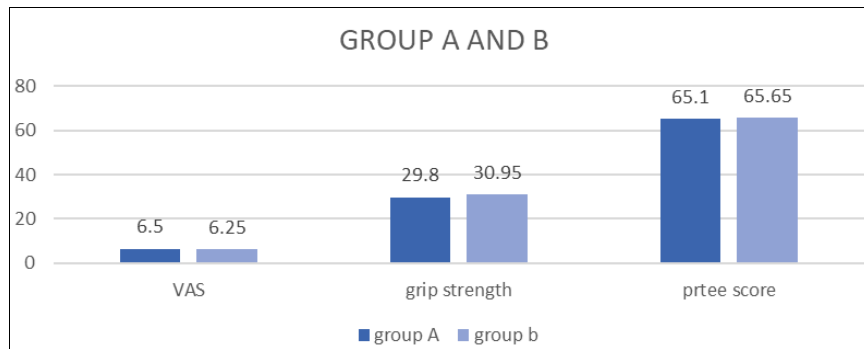
Characteristics of patients	GROUP A (n=30)	GROUP B (n=30)	GROUP C (n=30)
Age(yr), mean (SD)	46.4(9.18)	46.8(9.02)	47.15(8.86)
Gender Male, n (%)	11(36.6)	9(30)	10(33.3)
Gender Female n (%)	9(30)	11(36.6)	10(33.3)

Inter group analysis Between group A and B

Table 2: Comparison between means of outcomes of Group A and Group B

Outcomes	Group A	Group B	Unpaired t test value	P value
VAS	6.5+0.82	6.25+0.71	1.022	0.1567
Grip strength	29.8+4.53	30.95+5.05	0.757	0.2268
PRTEE	65.1+7.57	65.65+6.05	0.2537	0.4

VAS: Visual analogue scale, **PRTEE:** patient rated tennis elbow evaluation

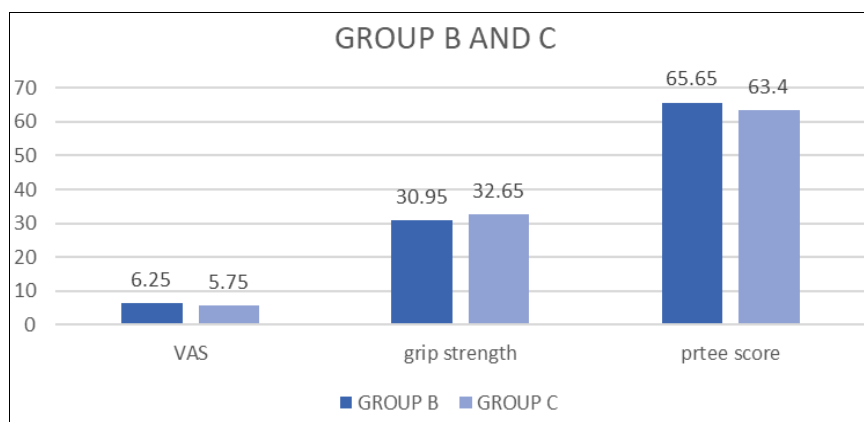


Graph 1: Comparison between means of outcomes of Group A and Group B

Between group B AND C

Table 3: Comparison between means of outcomes of Group B and Group C

Outcomes	Group B	Group C	Unpaired t test value	P value
VAS	6.25+0.71	5.75+1.11	1.684	0.05
Grip strength	30.95+5.05	32.65+5.13	1.05	0.148
PRTEE	65.65+6.05	63.4+5.83	1.19	0.238

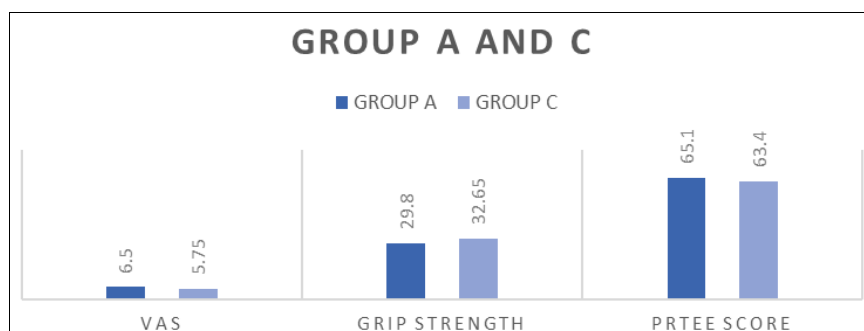


Graph 2: Comparison between means of outcomes of Group B and Group C

Between group A and C

Table 4: Comparison between means of outcomes of group A and group C

Outcomes	Group A	Group C	Unpaired t test value	P value
VAS	6.5+0.82	5.75+1.11	2.412	0.0104
Grip strength	29.8+4.53	32.65+5.13	1.86	0.035
PRTEE	65.1+7.57	63.4+5.83	0.7952	0.2157



Graph 3: Comparison between means of outcomes of Group A and Group C

One way ANOVA test

Table 5: Comparison of all groups together

Source of variance	Degrees of freedom	Sum of squares	Mean square
Treatments (between columns)	17	265109	15595
Residuals (within columns)	342	8090.3	23.656
Total	359	273199	

Value of F= 659.23, P=0.0001, significant

By applying One-Way ANOVA Test, there is a significant difference in mean values of all outcome measures (VAS, GS, PRTEE score) from pre to post level in group A, B, C compared together.

Discussion

The present study was done to determine effectiveness of the cyriax technique, dry needling, and conventional therapy on pain, function, and grip strength in patients with lateral epicondylitis. Data was collected at baseline (week 0) and at week 4 with VAS, Grip Strength, and PRTEE score.

On a statistical basis, all three groups showed significant differences in the pre and post comparison of means of VAS, grip strength, and PRTEE score. However, subjects in the dry needling group with conventional therapy showed better reduction in visual analogue scale and improvement in grip strength than the subjects in conventional therapy group and better reduction in visual analogue scale score than the subjects in cyriax with conventional therapy group.

Conventional therapy

An increase in the amount of time spent using a stationary keyboard causes the elbow extensors to become adversely tense, which in turn causes a number of impairments such as elbow pain, neural tension, and weakened muscles in the grip. According to a comprehensive study, exercise combined with modalities can effectively reduce pain and provide long-term relief in chronic patients. US and stretching exercises promotes pain relief and improved functionality as they have an effect on hypercellularity, the collagen matrix, the proteoglycan content and neovascularisation, which is produced by the accumulation of microinjuries, caused by the repetitive overload that exceeds the healing capacity of the tendon [26]. Furthermore, research has shown that exercise, as opposed to other treatments like friction massage, US, and stretches, is more helpful in the short term in reducing pain and improving function [6]. While typical eccentric exercises offer adequate rehabilitation for tendon issues, not all patients with tendinopathies will benefit from this course of treatment. This is why doctors combine static stretching therapy with eccentric motions when treating tendinopathies. Research has demonstrated that the application of eccentric training and static stretching exercises can effectively cure tendon injuries. Every therapy session included low-speed eccentric activities, since this promotes tissue repair. Animal experiments have shown that eccentric training and static stretching exercises can reverse the pathophysiology of tendinopathy and enhance function while reducing discomfort. It has been widely documented that stretching the forearm muscles is a part of the intervention for lateral epicondylitis. In order to get efficient stretching, one must move the wrist joint to its maximum extension and maximal flexion points of movement.

Cyriax

It is a well-known clinical finding that DTF application results in rapid relief from pain. During the treatment, the patient feels numb, and a quick reassessment following the administration of DTF reveals a decrease in discomfort and a gain in strength and mobility. The way that DTF reduces pain has been explained by a number of ideas. Cyriax & Cyriax suggest that DTF also causes a rise in the breakdown of metabolites that cause pain, including Lewis's compounds. The pain suppression mechanism known as diffused noxious inhibitory controls, which produces endogenous opiates, is

another way to reduce pain.

Following DTF, Mill's manipulation is carried out to lengthen the traumatised tissue by rupturing adhesions inside the teno-osseous junction, restoring mobility and painlessness to the affected region. Stasinopoulos *et al.*, compared in his research the efficacy of treating tennis elbow with polychromatic non-coherent light therapy, Cyriax physiotherapy, and supervised exercise. They came to the conclusion that the most effective method for lowering pain and enhancing function was supervised exercise that included static stretching and eccentric strengthening. It has been suggested that spinal cord-level regulation of pain signals may be the primary mechanism for friction massage's secondary pain reduction effects. In their study, When Pienimaki *et al.* compared a six-to eight-week exercise programme consisting of isometric and isotonic stretches and exercises with pulsed ultrasound treatment over the same period of time, they found that the standard mean difference (SMD) for pain on the visual analogue scale was 0.97 (95% CI 0.30 to 1.63) for pain at rest and 0.66 (95% CI 0.01 to 1.31) for pain under strain.

There was no significant difference in the maximum grip strength between the groups. This points to a positive outcome in which exercise can reduce lateral epicondylalgia pain without impacting maximal grip strength. they said that the mechanism of mills manipulation is the lengthening of scar tissue that occurs after adhesions burst following the manipulation.

Dry needling

Few studies have shown the effectiveness of dry needling in myofascial pain syndrome of the upper quadrant. Some studies found that the combination of ultrasound therapy and dry needling was significantly effective in reducing disability in tennis elbow. Certain patients' ultrasonography images have demonstrated that dry needling can help the tendon heal (Uygur *et al.*, 2017). The application of dry needling stimulates both mechanical and neurophysiological systems, which explains why pressure pain sensitivity improves. Actin and myosin filament overlap is reduced and defective end plates are disrupted as the fundamental mechanical consequences of dry needling. Dry needling works in a variety of ways, including physically altering faulty contractile elements or nerve endings and generating a localised release of intracellular potassium that blocks nerve fibre depolarization. According to Kalichman *et al.*, physicians and physical therapists have started using dry needling as a therapy for L.E. lately. The human body's inherent reaction to foreign objects invading the skin and tissues is triggered by the intrusive nature of dry needling, which breaks trigger points directly. As part of this normal reaction, satellite cells from different muscle regions migrate, promoting muscle regeneration. They said dry needling is cheap, low risk, and minimally invasive. Dry needling is said to reduce peripheral and central sensitization, which promotes tendon repair by increasing blood flow as a result of collagen growth and local vasodilation. Consequently, DN can help individuals with tennis elbow both locally and broadly by restoring range of motion and reducing pain [4].

Conclusion

This study suggests that all the three groups have significant improvement in grip strength and functional capacity and significant reduction in pain intensity. But Dry Needling with conventional treatment is more effective alternative with positive effects on elbow pain, functional capacity, and pain-

free, maximum grip strength than cyriax and conventional treatment alone.

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