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# EFFECT OF IASTM, ELECTRO DRY NEEDLING AND CUPPING THERAPY IN THE TREATMENT OF TENNIS ELBOW

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## ABSTRACT

**Background:** Tennis elbow (TE) is a most common condition of the upper limb that is happens due to powerful grip and continues repetitive movements in the wrist joint throughout various daily activities. Although a number of managing approaches have discussed about of the techniques used to decrease pain and increase elbow and wrist movements, the use of new methods remains a vigorous preference to reach the maximum degree of improvement and comprehensive recovery. **Aim:** The current study aimed to investigate the effect of combination of IASTM, electro dry Needling and cupping therapy in treating TE. **Methods:** 150 is actively participate and after examination only 120 is fit in this study patients between the ages of 20 and 50 years of both male and female complained of tennis elbow. They were divided randomly into four groups. Group A (n=30) received IASTM with conventional treatment, group B (n=30) received electro dry needling in addition to conventional treatment, group C (n=30) received cupping therapy with conventional treatment, and group D (n=30) received IASTM, electro dry needling and cupping therapy along with conventional treatment. Visual analog scale (VAS) was used to evaluate pain amount, a hand dynamometer was used to evaluate to pain-free grip strength (PFGS), and a patient rated tennis elbow evaluation (PRTEE) questionnaire was used to check pain and disability of the upper limb before and after four weeks. **Results:** There was a significant reduction in VAS, PRTEE score, and growth in PFGS favoring group D compared to the additional groups post-treatment ($p < 0.001$). **Conclusion:** The combination of IASTM, electro dry Needling and cupping therapy results in better improvement in TE treatment than conventional therapy, electro dry needling, and cupping therapy alone.



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# INTRODUCTION

Tennis elbow (TE) is a painful condition at the elbow joint observed in tennis players. It is also known as lateral epicondylitis, which is produced by muscle fatigue and overuse of the common extensor origin muscles of forarm [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, and trauma to the epicondyle as direct blows. Its incidence ranges from 1% to 3% between the ages of 30 and 54. 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]. Electro-Dry Needling: two needles are put in into the muscle, tendon, joint or both side of the nerve pathway. Alligator clips from an electro needling machine are then applied to the needles and depending all that the wanted outcome is a frequency is set and machine gradually turned up. Common thing that occurs is that the muscles will contraction involuntarily. The numbers of twitches by electro-dry needling can be in the hundreds. It is easy to control the strength of the twitch as it is precise by a dial and the speed (frequency) can be of

importance when treating different conditions. Electro-dry needling has been revealed to have even more effects of pain relief, mostly due to its ability to connect and down regulate pain controlling centers in the brain and increase the threshold of pain at the spinal cord. This treatment can be more effective for tight muscles, atrophied or wasted muscles. It varies from dry-needling in that it can similarly treat tendon pain from overuse (RSI), nerve pain and loss of sensation in the skin efficiently. 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 areas 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. Cupping therapy is an antique alternate medicine, which dates to the ancient Egyptian, Chinese, and Middle Eastern empires. Allowing to traditional Chinese medicine, it is thought that cupping therapy aids to remove blockages in the energy tracks and eradicate imbalances in the physique by stimulating the able flow of energetic energy within its paths [13]. Some studies have been conducted about the advantages of IASTM, electro dry needling and cupping therapy in different musculoskeletal disorders, but there are unsatisfactory studies to prove their effectiveness in tennis elbow [14-15]. Therefore, this study aimed to investigate the effect of IASTM, electro dry needling and cupping therapy in TE treatment.

# MATERIALS AND METHODS

**Subjects:** One hundred and twenty patients (67 females and 53 males) with unilateral TE were include the study from January 2021 to December 2021 and diagnosed by an orthopedics. Both ages group between 20 and 50 years old. It divided randomly into four groups. Group A (n=30) received IASTM with conventional treatment, group B (n=30) received electro dry needling in addition to conventional treatment, group C (n=30) received cupping therapy with conventional treatment, and group D (n=30) received IASTM, electro dry needling and cupping therapy along with conventional treatment. All patients read and signed a consent form before participation in this study. Patients with pain in the lateral epicondyle with aggravation of pain on pressure on the lateral epicondyle and during the resistance to wrist extension, the persistence of symptoms for more than three months, no physiotherapy interventions during the last three months were included in the study while patients with bilateral TE, radio-ulnar joint synovitis, radial, and ulnar nerves entrapment, cervical radiculopathy, medial epicondylitis, paralysis, and previous injury or surgery in the region of Common extension origin were excluded from this study.

**Randomization Method:** The randomization method was performed by therapist by lottery system.

**Procedures**

**Assessment**

**Visual Analog Scale (VAS):** VAS is a 10 cm (100-mm) long line which ranged from "0 = no pain" to "10 = most pain" It is a valid, reliable, sensitive, and most strong statistically strong scale with a very high test-retest reliability for acute pain [16]. All patients were asked to rate the pain intensity in the involved elbow on this scale.

**Pain-Free Grip Strength (PFGS):** A baseline hydraulic hand dynamometer (200 lb.90 kg Capacity, model number W54652, was used to calculate the PFGS. It has validity and reliability for assessing the strength of the upper extremity [17-18]. The patient was in a prone lying position with the verified elbow in a comfy extension position with the forearm pronated [19-20]. All patients were trained to press the dynamometer with full force and stop instantly when feels pain. The average was calculated after three attempts, with a rest of 20 seconds between each attempt.

**Patient-Rated Tennis Elbow Evaluation (PRTEE):** It is used to evaluate TE as it is made up of of two subscales: pain subscale consists of five items ranging from 0=no pain to 10= the worst pain and functional subscale which consist of specific activities (6 items) and usual activities (4 items). All subjects were asked to set their pain and functional disability levels from 0 to 10, then the total score (Sum of pain and function scores) was measured on a scale of 100 [21]. It is highly test-retest reliability and validity in lateral epicondylitis [22].

**Treatment Stretching exercise:** Mild passive stretching exercises were useful to wrist flexors and extensors while the patient was sit down with the elbow extended to increase the stretching force. The stretch was applied for 30 seconds and repeat ten times in the session.

**Strengthening exercises:** Fingers extension with a rubber band: The rubber band was placed around the five fingertips, in which the patient was asked to spread fingers 15 repetitions for three sets. For progression in the 2nd, 3rd, and 4th week, another band was added, increasing two sets each week.

**Ball squeeze:** A rubber ball was placed in the palm, and the patient was asked to squeeze 15 repetitions for three sets with increasing two sets each week.

**Wrist extension and flexion with free weight:** For wrist extension, 0.5 kg was placed in the hand with the palm pronated and the forearm supported on the knee. The patient was asked to raise the wrist slowly and down slowly. For wrist flexion, 0.5 kg was placed in the hand with the palm supinated and the forearm supported on the knee. The patient was asked to raise the wrist slowly and then down slowly. The exercise was repeated for ten repetitions with adding 0.5 kg in each session.

**Wrist supination and pronation with grasping a hammer:** While seated, the patient was asked to grasp a hammer with the forearm supported on the knee and rotate the hand to palm up and down ten repetitions for three sets with increasing two sets in each week.

**Wrist roller:** The subjects were sitting down with the elbows flexed slightly. The forearms pronated where they were asked to hold each end of a short rod and turn with an alternating wrist, causing the cord 3 feet tied in the middle of the rod with a weight of 0.5 kg) to wind around the rod and elevate the weight, then the weight was lowered with a reverse motion. The exercise was repeated ten times with a rest of 30 seconds and progressed with increasing 0.5 kg in each session.

**Friction massage:** The friction massage consisted of deep, circular motions over the maximum tenderness areas around the CEO by using the fingertips for 5 minutes with the elbow flexed about 30 degrees.

**Dry Needling**: Sterilized disposable stainless steel needles were used with three sizes: 0.13 mm x 25 mm, 0.25 mm x 25 mm, 0.25 mm x 40 mm. The lateral epicondyle of were cleaned with alcohol swab. The depth of needle insertion ranged from 13 mm to 40 mm depending on the point selected (intramuscular, periosteal, perineural) and the patient's body parts (i.e.size and bone depth, muscle and/or connective tissue thickness). Succeeding insert, dry needles were manipulated bi-directionally to elicit a sensation of aching, tingling, deep pressure, heaviness or warmth.[23, 24] The needles were then left in situ for 5 mins[25, 24, 23,27] with electric stimulation (DRY Needling Stimulator.) in pairs to all 2 of the obligatory needles using a low frequency. Bi-phasic continuous waveform at an intensity described by the patient as "mild to moderate"[25, 26]

**Figure 1st is Electro-Dry Needling, 2nd is IASTM, 3rd is Cupping on Tennis Elbow**

**Table 1. Physical Characteristics**

| Mean ± SD | Group A | Group B | Group C | GroupD | |
|---|---|---|---|---|---|
| | Mean ± SD | Mean ± SD | Mean ± SD | p-value | |
| Age (years) | 38.23 ± 6.07 | 38.73 ± 6.57 | 38.6 ± 7.34 | 38.43 ± 6.47 | 0.41 |
| Weight (kg) | 83.53 ± 1.65 | 83.26 ± 1.48 | 83.76 ± 1.65 | 83.13 ± 1.71 | 0.22 |
| Height (cm) | 167.83±1.53 | 168.06 ± 1.41 | 168.33±1.47 | 168.5 ± 1.28 | 0.15 |
| BMI (kg/m²) | 29.66± 0.87 | 29.48 ± 0.75 | 29.57 ± 0.88 | 29.28± 0.6 | 0.81 |
| Affected side | Dominant | 18 | 20 | 17 | 20 | 0.81 |
| | Non-dominant | 12 | 10 | 13 | 10 | |

SD, standard deviation; p-value, level of significance (p< 0.05)

**Table 2. Mean VAS, PFGS, PRTEE score (pain and functional disability),pre and post- treatment of groups A, B, C, and D**

| VAS | Pre-treatment mean ± SD | Post- treatment mean ± SD | MD(95% CI) | % of change | P- value |
|---|---|---|---|---|---|
| Group A | 6.56 ± 0.77 | 4.26 ± 0.94 | 2.3 (2.06: 2.53) | 35.06 | 0.001 |
| Group B | 6.9 ± 0.88 | 2.26 ± 0.58 | 4.64 (4.38:4.88) | 67.25 | 0.001 |
| Group C | 6.7 ± 0.79 | 3.3 ± 0.75 | 3.4 (3.16: 3.63) | 50.75 | 0.001 |
| Group D | 6.93 ± 0.74 | 1.36 ± 0.49 | 5.57 (5.33:5.79) | 80.38 | 0.001 |
| | *P = 0.24* | *P = 0.001* | | | |
| PFGS(Kg) | | | | | |
| Group A | 14.8 ± 2 | 21.5 ± 2.67 | -6.7 (-7.29:-6.1) | 45.27 | 0.001 |
| Group B | 15.1 ± 1.64 | 27.2 ± 1.8 | -12.1(-12.69:-11.5) | 80.13 | 0.001 |
| Group C | 15.33 ± 1.62 | 24.6 ± 1.24 | -9.27 (-9.86:-8.66) | 60.47 | 0.001 |
| Group D | 15.06 ± 1.92 | 29.13 ± 1.79 | -14.07(-14.66:-13.46) | 93.43 | 0.001 |
| | *P = 0.72* | *P = 0.001* | | | |
| Pain | | | | | |
| Group A | 31.33 ± 1.32 | 25.16 ± 1.34 | 6.17 (5.56:6.76) | 19.69 | 0.001 |
| Group B | 31.63 ± 1.54 | 17.06 ± 0.98 | 14.57(13.96:15.16) | 46.06 | 0.001 |
| Group C | 30.76 ± 1.77 | 20.7 ± 1.55 | 10.06(9.46:10.67) | 32.70 | 0.001 |
| Group D | 31.26 ± 1.17 | 12.26 ± 1.59 | 19 (18.39:19.6) | 60.78 | 0.001 |
| | *P = 0.15* | *P = 0.001* | | | |
| Functional disability | | | | | |
| Group A | 15.53 ± 1.52 | 10 ± 1.61 | 5.53 (5: 6.07) | 35.61 | 0.001 |
| Group B | 15.93 ± 1.61 | 5.4 ± 1.03 | 10.53(10: 11.07) | 66.10 | 0.001 |
| Group C | 15.13 ± 1.54 | 7.1 ± 1.06 | 8.03 (7.49:8.57) | 53.07 | 0.001 |
| Group D | 15.33 ± 1.39 | 3.1 ± 0.75 | 12.23 (11.69:12.77) | 79.78 | 0.001 |
| | *P = 0.21* | *P = 0.001* | | | |

SD, Standard deviation; MD, Mean difference; CI, Confidence interval; p-value, Level of significance (p < 0.05)

**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.

**Cupping therapy:** The patient was seated in a chair with the elbow flexed on the plinth to relax the forearm muscles. The area around the elbow joint was cleaned with alcohol to remove any foreign bodies from the treated area. Five suction cups were used; two medium cups were placed on the lateral side of elbow and forarm (were placed after two weeks on the posterior and lateral aspects of the arm above the elbow joint) after 10 min. the area was then cleaned by alcohol. Sterile cups were used for each patient during the treatment, with safe and final disposal at the end of the session to prevent infection.

**Statistical Analysis:** Descriptive analysis and ANOVA tests were used to compare the patient's characteristics between groups using the Shapiro-Wilk test to check the normal distribution of the data. The Levine test was also used to test the homogeneity between groups.

As for the comparison within and between the effects of the groups and subsequent multiple comparisons, mixed MANOVA and Bonferroni were used, respectively. The Statistical Package for Social Studies (SPSS) was used for statistical analyses (IBM SPSS, Chicago, IL, USA).

# RESULTS

**Physical characteristics:** Table (1) demonstrates the general characteristics of the four groups. There was no significant difference between groups in age, weight, height, BMI, and affected side distribution ($p > 0.05$).

**Effect of treatment on VAS, PFGS, and PRTEE score (pain and Functional disability):** There was a significant interaction of treatment and time ($F = 46.41$, $p = 0.001$). There was a significant main effect of time ($F = 3919.58$, $p = 0.001$). There was a significant main effect of treatment ($F = 26.39$, $p = 0.001$).

**Within-group comparison:** There was a significant reduction in VAS, PRTEE score (pain and functional disability) post-treatment compared with that pretreatment in groups A, B, C, and D ($p < 0.001$). The percentage of decrease in VAS, pain, and functional disability for group A was 35.06, 19.69%, and 35.61, respectively, and the percentage for group B was 67.25, 46.06, and 66.1 respectively, while in group C it was 50.75, 32.7, and 53.07, respectively. Group D showed the highest improvement in VAS, pain, and functional disability with 80.38, 60.78%, and 79.78, respectively. There was a significant increase in PFGS post-treatment compared with that pretreatment in groups A, B, C, and D ($p < 0.001$). The percent increase in PFGS of groups A, B, C, and D was 45.27, 80.13, 60.47, 93.43, respectively (Table 2, Figures).

**Between groups comparison:** There was a significant reduction in VAS, PRTEE score (pain and functional disability) of group D compared to groups A, B, and C post-treatment ($p < 0.001$) and a significant decrease in VAS, pain, and functional disability of group B compared to groups A and C ($p < 0.001$). In addition, there was a significant reduction in group C's VAS, pain, and functional disability compared to group A and post-treatment ($p < 0.001$). There was a significant increase in pain-free grip strength of group D compared with groups A, B, and C post- treatment ($p < 0.001$) and a significant increase in PFGS of group B compared to groups A and C post-treatment ($p<0.001$). In addition, there was a significant increase in PFGS of group C compared to group A and post-treatment ($p < 0.001$). (Table 2)

# DISCUSSION

TE is a musculoskeletal condition disturbing the soft tissues around the Common Extensor Origin that is characterized by micro-trauma, degeneration of collagen, and angioblastic proliferation of the soft tissue in this area which, in turn, affect [28] the muscle fiber type composition and lead to muscle- tendon stiffness and blood stagnation, which makes the pain persistent with weak grip strength during gripping activities [29]. Therefore, these studies aimed to investigate the effect IASTM, electro Dry Needling and cupping therapy in TE treatment. This study showed a significant reduction in VAS, PRTEE score (pain and functional disability), and improvement in PFGS among the four groups in favor of group D, who received IASTM, electro dry Needling and cupping therapy along with conventional therapy for four weeks. All these changes affect tissue function due to a decrease in blood flow and tenoblastic activity. Also, Kannus and Józsa, 1991 [30] stated that with increasing age, the energy in the metabolic pathways changes from aerobic to anaerobic, tissues are more vulnerable to stress. This may explain why all 50-year-old patients in the four groups (8 patients in group A and C, 9 patients in group B, and 6 patients in group D) record a pain score of 7-8 on VAS and 18 points on the PRTEE scale (functional disability).

Regarding the effect of conventional therapy on the treatment of TE, Pienimaki et al. 1996 [25] found that stretching exercises has a positive effect on pain but not maximal grip strength in patients with TE after eight weeks, and it was concluded that progressive exercise therapy was more effective than ultrasound in the treatment of TE. In another study, the exercise group represented less pain and functional impairment after three years of follow-up [26]. another study, Svenlov and Adolf sons, 2001 [31] found that eccentric exercise has a significant improvement in pain scores and grip strength with complete symptom resolution in 86% of this group compared to the stretching group after three months of rehabilitation. Another study that compared strengthening exercises with a standard rehabilitation program showed that pain and grip deficit decreased at the end of the program [32]. Even if massage is an important element in the rehabilitation plan, few studies have proved the effect of deep friction massage, which Cyriax, 1996 [33] initially advocated. Verhar et al. 1996 [34] stated that strengthening exercises with friction massage was more effective in reducing pain and disability than using brace only in patients TE in the short term and that the grouping between strengthening exercises with friction and brace was more in effect than brace only after six weeks of follow-up. heatham et al (35), measured the effects of IASTM in several different ways including range of motion (ROM), pain, balance, pressure sensitivity, strength, and self-reported functional outcomes. They found weak evidence for IASTM, due in part to the considerable heterogeneity in outcome measures in the evaluated papers. Our review aimed to assess the treatment effectiveness of IASTM solely on pain intensity.

Six studies (36) were included in our review but different in their research populations, methods, and outcome methods, thus precluding direct evaluations between studies. Five studies (37) reported statistically and clinically insignificant decreases in pain within the IASTM groups. There are so many a numbers of important factors to consider regarding the treatment interventions when understanding treatment results. First, only 1 study (38) monitored the recommended Graston® treatment protocol, which includes examination, warm-up, IASTM treatment, post treatment stretching, strengthening, and ice. In this study, wet cupping was used twice during the study period. Two middle cups were placed for 10 minutes. This matches with Stephens et al. 2020 [39] study, which resolved that the 10-minute cupping therapy efficiently decreases pain and rises total hemoglobin level instantly in cases of nonspecific neck pain in one session. Also, Cramer et al. 2011[40] stated that applying cupping therapy for 10 minutes decrease pain and enhanced function after 14 days in patients with neck pain. Chen, 2009 [41] mentioned that wet cupping therapy enhanced shoulder joint mobility and reduced pain intensity in patients with scapula humeral periarthritis after 60 days. Also, Wei et al. 2013 [42] showed that blood circulation increased immediately to the surface of the skin following the removal of the cups in healthy participants at acupuncture points. The improvement in pain and function following the cupping therapy may be due to vasodilatation and stimulation of blood circulation that increases metabolism and accelerates the removal of waste and toxins from the body, improving physical function [43] and affects blood pressure. Also, due to the negative pressure that is applied by the cups to the surface of the skin, this results in bruising around the suction area, which attracts macrophages that action on the phagocytosis of the red blood cells and activate them to produce heme oxygenase-1 for the heme metabolism it contains. Heme Oxygenase-1 breaks down heme into carbon monoxide, biliverdin/bilirubin, and iron, which in turn aids in antioxidant, inflammatory, and antiproliferative activities.

**Limitation(s):** There are some limitations in this study; first, the small sample size. Second, the short-term effect of the study on tennis patients and the inability to compel some cases to rest during the study period may have an impact on the completion of the tissue healing.

**Recommendations:** Future studies should investigate the long-term effect of IASTM, electro dry Needling and cupping therapy on a large sample size in patients with TE to generalize their effects.

**Conclusion(S):** The combination of IASTM, electro dry Needling and cupping therapy is more beneficial in reducing pain and functional impairment with increasing handgrip strength in patients with TE than conventional therapy, IASTM, electro dry Needling stimulation, and cupping therapy separately.

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