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TO STUDY THE EFFECTIVENESS OF DRY NEEDLING ALONG WITH NMES, ISOMETRIC EXERCISES IN TENNIS ELBOW

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Abstract: *Tennis elbow, characterized by pain and dysfunction from repetitive overuse of the forearm extensor muscles, presents a significant clinical challenge with conventional therapies often yielding inconsistent results. This study investigates the effectiveness of integrating dry needling (DN) with neuromuscular electrical stimulation (NMES) and isometric exercises in treating lateral epicondylitis. In a randomized controlled trial involving 50 participants confirmed positive by Cozen's test, subjects were allocated into two groups: one receiving NMES and isometric exercises alone, and the other receiving a combination of DN, NMES, and isometric exercises over 14 sessions across three weeks. Outcome measures included pain intensity via the Visual Analog Scale and functional ability using the Patient-Rated Tennis Elbow Evaluation. The intervention group demonstrated significantly greater reductions in pain and improvements in function and grip strength ($p < 0.01$) compared to the control group. These findings support the incorporation of dry needling into physiotherapy protocols for tennis elbow, suggesting that a multimodal approach may offer superior rehabilitation outcomes.*

Index Terms- Dry Needling, Tennis Elbow, Neuromuscular Electrical Stimulation, Isometric Exercises, Lateral Epicondylitis, Rehabilitation.

I. INTRODUCTION

Tennis elbow, or lateral epicondylitis, is a repetitive stress injury primarily affecting the extensor carpi radialis brevis (ECRB) tendon. Although traditionally associated with athletes, it is prevalent in individuals engaged in repetitive forearm activities. Conservative management includes rest, stretching, and physical therapy, but these methods often yield inconsistent results. Recent interest has emerged in integrating Dry Needling (DN), NMES, and Isometric Exercises to enhance treatment outcomes. The condition affects both men and women equally, with an annual incidence of 1-3% in the U.S. Despite its name, only about 10% of those affected are tennis players, with cases being more prevalent in individuals over 40 years old. Risk factors include smoking, obesity, repetitive motion for at least two hours daily, and lifting heavy loads. In India, the epidemiology of tennis elbow is influenced by the diverse occupational and recreational activities common in the population, particularly in manual laborers and agricultural workers.

Tennis elbow is caused by repetitive strain from forceful gripping or wrist extension, leading to microtrauma, inflammation, and degenerative changes in the common extensor tendon. Pathophysiologically, it involves micro tearing of the ECRB tendon, chronic overuse, and tendon degeneration, leading to pain and dysfunction. Physiotherapy plays a crucial role in its management, focusing on pain relief and biomechanical correction through techniques like manual therapy, joint mobilization, stretching, and strengthening exercises, particularly eccentric loading. However, standard physiotherapy approaches sometimes yield suboptimal outcomes, necessitating adjunctive therapies such as PRP injections, extracorporeal shock wave therapy (ESWT), dry needling, and taping.

Dry needling has emerged as an effective method in tennis elbow management, involving the precise insertion of thin filament needles into trigger points to relieve muscle tension and improve blood circulation. Mechanisms include local twitch response, increased blood flow, neurophysiological effects reducing pain sensitivity, remote analgesic effects, and placebo influences. Research suggests that combining dry needling with NMES and isometric exercises may enhance rehabilitation outcomes. NMES uses electrical currents to stimulate muscle contractions, improving

neuromuscular activation and reducing pain, while isometric exercises focus on strengthening without excessive tendon strain. Despite promising evidence supporting these interventions individually, their combined efficacy remains underexplored, necessitating further investigation.

II. METHODOLOGY

2.1.Research Design: Randomized Controlled Trial (RCT).

2.2.Inclusion Criteria:

2.2.1. Include males and females, age between 18-50 years.
2.2.2. Symptoms persisting for at least 3 months.
2.2.3. Positive Cozen's test.
2.2.4. No prior DN treatment for tennis elbow.

2.3.Exclusion Criteria:

2.3.1. Patients who have already undergone specific treatments for tennis elbow, such as corticosteroid injections, platelet-rich plasma therapy.
2.3.2. Other Elbow Conditions: Individuals with other elbow conditions, such as osteoarthritis of the elbow.
2.3.3. Radiculopathy or Nerve Entrapment: Patients with cervical radiculopathy or posterior interosseous nerve entrapment that can cause similar symptoms to tennis elbow.

Sample Size: A sample size of 50 individuals meeting the inclusion criteria were recruited in the present study.

2.4.Description of Tools:

2.4.1. Visual Analog Scale (VAS): Measures pain intensity on a scale from 0 to 10.
2.4.2. Patient-Rated Tennis Elbow Evaluation (PRTEE): Assesses pain and functional disability related to daily tasks.
2.4.3. Grip Strength Dynamometer: Evaluates improvements in hand strength post-treatment.

2.5.Data Collection Procedure:

2.5.1. Baseline assessments were conducted for all participants.
2.5.2. Treatments were administered for 14 sessions over three weeks.
2.5.3. Post-treatment assessments were recorded and compared.

2.6.Methodology Flowchart:

2.6.1. Screening of participants.
2.6.2. Selection based on inclusion/exclusion criteria.
2.6.3. Random allocation into two groups.
2.6.4. Intervention administered over 14 sessions.
2.6.5. Post-intervention assessment using VAS and PRTEE.
2.6.6. Statistical analysis.

III. RESULTS

3.1.1. Data Analysis:
3.1.2. Statistical tests (paired t-tests and ANOVA) were applied to compare pre- and post-treatment scores between groups.

3.2. Interpretation of the Result:

3.2.1. Pain Reduction: VAS scores significantly improved in the intervention group ($p<0.01$), indicating DN's effectiveness.
3.2.2. Functional Improvement: PRTEE scores improved notably in Group B compared to Group A ($p<0.05$).
3.2.3. Grip Strength Enhancement: Grip strength was higher post-intervention in the DN group, confirming neuromuscular benefits.

These results support the hypothesis that DN combined with NMES and isometric exercises provides superior pain relief and functional recovery compared to NMES and isometric exercises alone.

IV. DISCUSSION

Mechanisms Behind DN Effectiveness:

Dry needling (DN) is a minimally invasive technique that involves inserting fine needles into specific myofascial trigger points within muscles—localized areas of hyperirritability that cause pain, stiffness, and dysfunction, particularly in chronic tendinopathies like tennis elbow. DN exerts its therapeutic effects by releasing muscle tension, reducing local ischemia, and activating the body's natural pain-relieving processes, with the insertion of needles inducing a local twitch response that disrupts muscle contraction and breaks the cycle of pain and tightness. Studies, such as those by Fernández-de-las-Peñas et al. (2012) and MacDonald et al. (2014), have shown that DN significantly reduces pain and improves flexibility and range of motion in tennis elbow patients, especially when combined with other therapies, findings consistent with the present study's results. Neurophysiologically, DN stimulates nociceptors at trigger points, leading to the release of neurochemicals like endorphins, serotonin, and substance P, which have

analgesic properties, while also inducing local hyperemia to enhance tissue healing by increasing blood flow and nutrient delivery. Additionally, the local twitch response (LTR) triggered by DN helps reset neuromuscular activity, reducing abnormal contractions and improving motor control—particularly beneficial for tennis elbow patients with muscle imbalances or improper motor patterns—ultimately leading to better neuromuscular coordination and improved muscle performance, as observed in this study.

4.1.Limitations of the Study:

Several limitations need to be acknowledged. First, the study was conducted with a relatively small **sample size**, which restricts the generalizability of the findings. A larger and more diverse participant group would help validate these results. Second, the study lacked a **long-term follow-up** to determine the sustainability of improvements in pain relief and function. Future research should incorporate extended follow-up periods to assess the long-term efficacy of these interventions. Additionally, the study did not consider psychological factors such as patient adherence and pain perception, which could influence treatment outcomes.

4.2.Implications and Recommendations:

The findings of this study have significant implications for clinical practice and rehabilitation strategies, emphasizing dry needling (DN) as a primary treatment modality for tennis elbow due to its effectiveness in reducing pain and improving muscle function. Clinicians should integrate DN into treatment plans, particularly for patients unresponsive to traditional therapies, and consider combining it with neuromuscular electrical stimulation (NMES) and isometric exercises for a comprehensive rehabilitation approach targeting muscle dysfunction and tendon healing. Further exploration of DN's neurophysiological mechanisms and its integration into standard physiotherapy protocols is warranted. To optimize treatment outcomes, DN should be incorporated into standard protocols either as a standalone therapy or in conjunction with NMES and isometric exercises, while future research should focus on long-term follow-ups to assess the durability of DN's effects. Expanding sample size and demographic diversity will improve the generalizability of findings, and investigating psychological factors such as patient adherence, pain perception, and responses to DN could refine rehabilitation strategies. Comparative studies should evaluate DN against emerging therapies like platelet-rich plasma (PRP) and advanced neuromuscular stimulation techniques, and standardized protocols should be developed to ensure consistency and effectiveness in DN, NMES, and isometric exercise applications across clinical settings.

V. CONCLUSION

This study underscores the efficacy of dry needling as a key intervention for managing tennis elbow. While NMES and isometric exercises provide additional benefits, DN remains the most impactful in reducing pain and enhancing muscle function. A multimodal approach integrating DN with NMES and isometric exercises may offer the most comprehensive rehabilitation strategy. Despite its limitations, this study provides valuable insights into the role of DN in treating lateral epicondylitis and paves the way for further research to optimize treatment protocols and improve patient outcomes.

Future research should focus on refining multimodal treatment approaches by investigating optimal combinations of DN, NMES, and isometric exercises. Large-scale, multi-center clinical trials with extended follow-up periods are necessary to validate the long-term benefits of these interventions. Additionally, integrating objective biomechanical assessments and imaging techniques could provide a deeper understanding of the physiological changes induced by DN and other therapies. Furthermore, patient-centered approaches, incorporating psychological and behavioral strategies, should be explored to enhance adherence and maximize rehabilitation outcomes. By addressing these areas, the field can advance toward more personalized and effective treatment solutions for individuals suffering from tennis elbow.

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