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Effect of Manual therapy Approaches in Management of Tennis Elbow: A Review

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ABSTRACT

Tennis elbow also known as lateral epicondylitis, is a frequent musculoskeletal disorder that results from repetitive overuse, leading to microtrauma and degeneration of the common extensor tendon. The condition manifests as pain and tenderness around lateral epicondyle and aggravated by wrist extension and gripping motion. Despite its name, tennis elbow affects individuals beyond athletes, impacting 1% to 3% of adults annually, primarily in their dominant arm. Symptoms can last more than a year in 20% of cases, necessitating effective management strategies. This review examines the effects of manual approaches that include Mulligan Mobilization with Movement (MWM) and neural mobilization techniques, Deep transverse friction massage (DTFM), Muscle energy technique (MET) and stretching Exercises for wrist extensors, on reducing pain, enhancing grip strength, and function in subjects with lateral epicondylitis. The literature suggests that Manual approaches significantly minimize pain and improve grip strength in subjects with lateral epicondylitis. Manual therapy, in combination with rehabilitation exercises, is an effective approach to improving joint mechanics, restoring normal movement patterns, reducing compensatory muscle activity and decreasing inflammation.

Keywords: *Tennis Elbow, Hand Grip Strength, Mulligan Mobilization with Movement, Deep friction Massage, neural mobilization*.

Introduction

Tennis elbow is mainly a degeneration process result from overuse of the common extensor tendon, especially extensor carpi radialis brevis (ECRB) tendon. It is related with activities impose intense, repetitive strain on the muscles and tendons of the lateral forearm and elbow (Ahmad Z et al., 2013). Despite what its name suggests, this disorder can impact anyone who frequently engages their forearm muscles, especially during tasks that involve gripping and twisting motions. Clinically, subjects complain from lateral elbow pain worsen by activities involving wrist extension and gripping, frequently accompanied by diminished grip strength (Shiri R, Viikari -Juntura E 2011). It occurs when repetitive use or excessive strain result in inflammation or damage of the tendons attached to the lateral epicondyle, the prominent bone on the outer part of the elbow (Lenoir H et al .,2019). Epidemiological data indicate that tennis elbow affect approximately 1% to 3% of the adult population every year, with a higher prevalence occurred in the dominant arm (Verhaar JA 1994). The condition most commonly occur between the ages of 30 and 50., with no significant gender predisposition (Smidt N, van der Windt DA 2006). While the condition is generally self-limiting, symptoms can last beyond one year in up to 20% of cases, highlighting the importance of effective treatment strategies (Ahmad Z 2013). Repeated stress on the ECRB tendon results in the formation of cross-linking and collagen buildup (Buchanan BK, Varacallo M 2023). When the stretching force exceeds the tendon's capacity, it causes several microtears, and the tendon's response to these repeated micro-injuries eventually leads to tendinosis (Ahmad Z et al., 2013) .However, recent researches suggest that conservative management may be able to control this tendinosis (Jain C et al., 2024).

Other correlated anatomical component that causes lateral elbow pain is the radial nerve due to Due to the close anatomical relationship between this nerve trunk and the ECRB muscle tendon, it lies within 4.5 mm of the ECRB as it travels through the arcade of Frohse (also known as the supinator arch) (Arias-Buría JL et al ., 2019). Reduced nerve mobility because of its compression under ECRB can lead to changed mechanosensitivity appearing as compromised blood supply, pain and inflammation (Jain C et al., 2024) .

Physical therapy is a cornerstone in treatment of tennis elbow, or lateral epicondylitis, focusing on pain reduction, functional recovery, and prevention of recurrence (Smidt N, et al ., 2006). Effective interventions include manual therapy and eccentric strength training, which have demonstrated significant effects (Bisset L, Vicenzino B.2015). Other techniques such as electrical stimulation, ultrasound therapy, phonophoresis, joint manipulation, soft tissue mobilization and augmented soft tissue mobilization (ASTM) are also used (Ahmad Z et al., 2013). The choice of specific therapies should be tailored to subject's needs, taking into account factors like symptom severity and functional goals (Coombes BK,2009) &(Shiri R, et al ., 2011)

Manual therapy plays a significant role in rehabilitation by targeting joint dysfunction, `muscle tightness, and neural mobility. This review focuses on five manual techniques: Mulligan Technique (MWM) and radial nerve tensioning Technique, Deep friction massage, muscle energy technique and Stretching Exercises for wrist extensors evaluating their effectiveness in pain control and improving function and grip strength in subjects with tennis elbow

1.**Neural mobilization for radial nerve**

Radial nerve tensioning techniques, usually referred to as neural mobilization or neurodynamic techniques, are utilized for management of lateral epicondylitis, or tennis elbow. These techniques aim to alleviate symptoms by addressing potential neural component involvement, particularly focusing on the radial nerve, which travels through lateral aspect of the elbow (Butler DS 2000).

1.1 Mechanism of Action of Neural Mobilization for the Radial Nerve:

Radial nerve tensioning in tennis elbow targets neural contributions to musculoskeletal pain by decreasing mechanosensitivity, promoting nerve gliding, and alleviating symptoms (Shacklock M 2005& Schmid AB et al ., 2009). Due to close connection to the extensor tendons, radial nerve entrapment may exacerbate symptoms, and mobilization techniques help reduce intraneural pressure, improve vascularity, and enhance axoplasmic transport, leading to pain relief and improved function (Arias-Buría J et al ., 2019). The application of radial nerve tensioning techniques involves particular positioning and movements designed to selectively tension the radial nerve. By performing shoulder depression, elbow extension, forearm pronation, wrist flexion, and finger flexion, which together stretch the radial nerve (Shacklock M 2005), these movements are executed within the patient's comfort level. ensuring that the mobilization does not cause excessive discomfort (Schmid AB et al ., 2009).

1.2 Previous Studies on the Effect of Neural Mobilization

Several studies have investigated the effects of neurodynamic treatment on pain, disability, and grip strength in subjects with tennis elbow. Heedman reported that neurodynamic mobilization combined with home exercises improved upper limb tension test (ULNTT2b) range of motion (ROM), pain, disability (DASH, PRTEE), and grip strength in 3 out of 5 subjects in an A-B-A design study (Heedman L.2021). Another study demonstrated that radial nerve mobilization combined with radial head mobilization resulted in statistically notable improvements in pain, pressure pain threshold, pain-free grip strength, , and PRTEE scores when compared with an exercise group only (Dabholkar AS 2013). Additionally, Arumugam et al. found that a one session of radial nerve mobilization in IT employees led to immediate pain reduction, highlighting the potential benefits of neural mobilization and the requirement for additional long-term researches (Arumugam V et al., 2014).

Similarly, Yilmaz et al. compared neural mobilization plus exercises with exercises alone and found a notable decrease in pain (VAS) and an improvement in the ulnar deviation angle were observed in the neural mobilization group, although no significant changes were found in grip strength or DASH scores (Yilmaz K, et al ., 2022). However, certain studies have not demonstrated significant improvements in all functional outcomes. Although neurodynamic techniques have been shown to alleviate pain, their impact on grip strength and disability has been inconsistent across different studies (Tedeschi R et al., 2024). Nevertheless, Jain et al. recommended incorporating neural mobilization into treatment plans for subjects with tennis elbow, as it has been shown to enhance pain relief and mobility when used alone or in combination with other therapeutic modalities (Jain C, et al ., 2024).

2. Mulligan Mobilization with Movement (MWM*)*

Mulligan Mobilization with Movement (MWM*)* frequently related to Mulligan Concept, is a therapeutic technique employed in treatment of tennis elbow.

2.1. Mechanism of Action of Mulligan Technique

MWM for elbow joint includes the application of a sustained lateral glide to the ulna while the subject performs pain-free gripping movement (Mulligan BR. 2010). The technique aims to relieve pain and improve grip strength by addressing joint positional faults and enhancing normal joint mechanics (Bisset L,2015). It improves elbow joint function by correcting minor positional faults, reducing nociceptive input, and facilitating neuromuscular control (Barker S et al ., 2013).

It reduces pain by stimulating mechanoreceptors, thereby modulating pain sensitivity and restoring joint mobility by focusing on restrictions in the joint capsule and surrounding tissues (Mulligan BR. 2010).). Furthermore, MWM enhances grip strength in tennis elbow subjects through pain reduction, improved joint mechanics, and restored muscle function, allowing for better muscle activation, optimized motor control, and increased force production during gripping tasks (Nazir R, et al ., 2024).

2.2. Previous Studies on Mulligan Mobilization with Movement

Several studies have assessed the effect of MWM on pain, disability, and grip strength in subjects with lateral epicondylitis. Nazir et al compared MWM with Progressive Resistive Exercises in 33 subjects and found that MWM was more effective in alleviating pain and enhancing functional status (Nazir R, et al ., 2024). Similarly, Patel & Contractor reported that MWM combined with conventional therapy led to more improvements in pain (VAS), maximum isometric grip strength, and functional disability when compared to wrist manipulation alone (Patel J, Contractor A., 2023). Another study by Reyhan et al demonstrated that MWM when combined with exercise and cold therapy resulted in notable improvement in elbow pain, functional ability, and pain-free maximum grip strength (Reyhan A et al., 2020).

3. **Deep transverse friction massage (DTFM)**

Deep transverse friction massage (DTFM), a technique introduced by Dr. James Cyriax, is commonly used to reduce pain and inflammation in musculoskeletal disorders. The technique involves applying massage transverse to the fiber direction of the affected tissue, with the pressure being deep enough to affect the deeper layers (Loew LM, 2014).

3.1. Mechanism of Action of Deep transverse friction massage

Deep transverse friction massage is commonly used to treat various musculoskeletal conditions. This technique aims to prevent or break down abnormal fibrous adhesions (cross-links or cross-bridges) by applying stress in transverse direction across the remodeling collagen in the tissue, which helps soften the adhesion. In doing so, DTFM also enhances the quality of scar tissue by realigning collagen fibers in a normal longitudinal arrangement. Studies have shown that DTFM promotes the normal healing process and helps prevent abnormal scarring (Loew LM, 2014).

Its mechanical effect stimulates hyperemia referred to increased blood flow to the affected area. (26) by improving the flow of oxygen and nutrients necessary for tissue repair. Enhanced blood flow can also aid in the removal of metabolic waste products from the affected area. Additionally**,** DTFM activates mechanoreceptors and nociceptors in the involved tissues, which result in the release of endogenous opioids and stimulation of descending inhibitory pathways, thereby decreasing pain perception (Joseph MF et al., 2012).

Deep friction massage was performed on the ECRB muscle in a transverse direction for 5 minutes, with the subject in a relaxed position on the bed, elbow flexed, and forearm in a pronated position (Çakır Ş et al ., 2022).

3.2. Previous Studies on Deep transverse friction massage

A randomized clinical trial compared radial nerve self-mobilization (RNSM) alone, DTFM combined with RNSM, and extracorporeal shock wave therapy (ESWT) combined with RNSM in subjects with tennis elbow. After three weeks, the DTFM group showed better results in pain reduction, maximum grip strength, and overall satisfaction compared to both the ESWT and RNSM-only groups. The study concluded that DTFM combined with RNSM is an effective treatment for lateral epicondylitis, especially in pain relief and grip strength in the short term (Çakır Ş et al ., 2022)

Similarly, Yi R, et al compared DFM combined with lidocaine injection to cortisone injections and a control group receiving splinting and stretching. The early follow-up (6-12 weeks) revealed that all groups showed marked pain reduction. However, at the 6-month follow-up, only the DFM group demonstrated sustained improvements in pain, function by [DASH] score, and grip strength. The study concluded that DFM is a successful treatment for lateral epicondylitis, especially for subjects who have not responded to other nonsurgical treatments like cortisone injections (Yi R et al ., 2018).

4. Muscle energy techniques (METs)

A reliable treatment approach that ensures a safe, quick, and lasting recovery LE is required. Recently, muscle energy techniques (METs) have gained popularity in addressing many musculoskeletal conditions. These techniques serve multiple purposes, such as lengthening shortened or tight muscles and improving the range of motion in restricted joints. (Küçükşen S, et al ., 2013).

4.1.Mechanism of Action of Muscle energy technique

Muscle energy technique (MET) primarily focus on mobilizing of soft tissue . MET strengthens weak muscles by allowing shortened, contracted or spastic muscles to return to their original length, and decrease swelling by activating the lymphatic system. Additionally, it enhances the joints mobility with restricted range of motion.

The therapist applied MET by stabilizing the subject's arm with the left hand and forearm slightly flexed. Using the right hand, the therapist applied resistance while instructing the subject to exert 75% of their maximum force (about 75% of a maximal isometric contraction) and hold for 7 seconds. Afterward, the subject was asked to relax. Following this, the therapist gently and gradually stretched the ECRB muscle for 30 seconds.

4.2. Previous Studies on Muscle energy technique

Bagcaci et al. conducted a study comparing the impact of mobilization with movement (MWM) and muscle energy technique (MET) on pain, grip strength, and functionality in subjects with lateral elbow tendinopathy (LET). Both the MWM and MET groups showed significantly marked improvements in pain, grip strength, finger strength, and functional ability compared to the control group ($p < 0.05$). However, there was no statistically significant difference between the MWM and MET groups ($p > 0.05$). The study concluded that both interventions, when paired with home exercise programs, were effective in enhancing outcomes for patients with LET.

Additionally, Küçükşen et al compared MET with injection of corticosteroid for managing chronic tennis elbow. The study found that both treatments improved pain, hand grip strength, and function. Notably, the MET group exhibited better outcomes in pain-free grip strength and pain scores (VAS) at the 52-week follow-up when compared with corticosteroid injections ((Küçükşen S, et al ., 2013).).

5.Stretching exercise the wrist extensor muscles:

Static stretching is referred to passively stretching a specific muscle-tendon unit by slowly putting it in a maximal stretched position and maintaining it there for an extended amount of time. This maximal lengthened position is defined by the moderate discomfort and/or pain that the subject feels. (Khandaker MN et al., 2014). They can either be done actively by the subject himself. Or passively by physiotherapist or subject partner

5.1. Mechanism of action of stretching exercise the wrist extensor muscles

Stretching exercise can reduce tension of the wrist extensor muscles and improve the circulation which lowers metabolites concentration. thus, reducing pain. Additionally, it assisted in regaining extensor muscles length which in turn allowed wrist flexors to exert their maximum contraction, and thereby decreased overload of the wrist extensors. The tension generated from lengthening or stretching allows synthesis of new fibrous tissue at the musculotendinous unit which increase their resistance to damage. Additional theories for beneficial effects on tendonitis include "lengthening" of the muscle-tendon unit, which might lead to less strain during elbow joint motion, or "loading" of the muscle-tendon unit, which may raise the tensile strength of the tendon and induce hypertrophy of the muscle belly (Hassan S et al., 2016) .

5.1. Previous Studies on wrist Extensor Stretching Exercises:

Hassan, S. et al compared the effects of wrist extensor stretching and deep transverse friction massage (DTFM) on pain, grip strength, and functional disability in subjects with lateral epicondylitis. Marked improvements were observed in both the stretching and DFTM groups compared to the conventional group ($p < 0.05$); however, no statistically significant difference was observed between the stretching and DFM groups ($p > 0.05$). The research determined that both interventions are effective in reducing symptoms and enhancing function when incorporated into treatment for lateral epicondylitis (Hassan S et al., 2016)

Additionally, Khandaker, Md et al. compared the effectiveness of stretching exercises combined with ultrasound therapy, NSAIDs, and activity modification against a control group receiving ultrasound therapy, NSAIDs, and advice alone in managing lateral epicondylitis. The study found that both groups experienced improvements in pain, tenderness, and pain frequency over a 6-week period. Notably, the stretching exercise group showed earlier improvements, with significant pain relief and reduced pain frequency observed by the 2nd week, compared to the 4th week in the control group. These findings suggest that incorporating stretching exercises may accelerate recovery in patients with lateral epicondylitis (Khandaker MN et al., 2014) .

Conclusion

The review emphasizes the role of Manual therapy approaches in the management of tennis elbow including Mulligan technique (MWM) and neural mobilization techniques, Deep transverse friction massage (DTFM), Muscle energy technique (MET) and stretching Exercises for wrist extensors have shown promise in reducing pain, promoting function, and grip strength by Addressing positional faults of elbow joint thus increased mobility of elbow joint , Reducing neural compression at ECRB which in turn promoting nerve glide and mobility. Accelerating the repair of damaged tissue and enhance flexibility for ECRB.

Disclosure

The authors report no conflicts of interest in this work

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