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Mulligan Mobilization Vs. Instrument-Assisted Soft Tissue Mobilization in The Treatment of Chronic Lateral Epicondylitis: A RandomizeControlled Clinical Trial.

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Abstract

Objective: *This study aimed to investigate the effect of Mulligan Mobilization with movement (MWM) and instrument assisted soft tissue mobilization (IASTM) on pain, range of motion (ROM), hand grip strength, and upper limb disability in individuals diagnosed with chronic lateral epicondylitis (CLE).*

Design: *A randomized controlled study.*

Settings: *Outpatient clinic of AL-Qenayat Central Hospital between March 25, 2023, and June 30, 2023.*

Participants: *Sixty patients with chronic lateral epicondylitis were randomized into 3 equal groups.*

Intervention: *Group A recieved (MWM), Group B recieved (IASTM), and Group C recieved (conventional treatment). The interventions were administered three times weekly for four weeks, in addition to the standard treatment protocol.*

Main Outcome Measures: *Visual analogue scale (VAS) for measurement of pain intensity, Universal Goniometer for wrist ROM, Digital Hand-Held Dynamometer for hand grip strength, and the Quick DASH questionnaire for hand activities assessment were measured at baseline and following four weeks of intervention.*

Results: *There were statistically significant differences between the impact of MWM and IASTM post treatment in patients with CLE (P<0.05) in terms of pain intensity, ROM, hand grip strength, as well as hand function.*

Conclusion: *The results of the study suggest that MWM may be more beneficial than IASTM in addressing pain, improving ROM, enhancing hand grip strength, and reducing upper limb extremity in individuals with chronic lateral epicondylitis. Further research is warranted to validate and generalize these results.*

Key words: *Chronic Lateral Epicondylitis; Mulligan Mobilization with Movement; Instrument Assisted Soft Tissue Mobilization; Physical Therapy; Randomized Controlled Trial..*

Introduction

Among the several elbow disorders, lateral epicondylitis (LE) impacts approximately 1% to 3% of the general population. It results in a significant number of lost workdays and continuing disabilities. Despite an abundance of therapeutic options, only few have been validated by scientific research, and no one approach has emerged as clearly superior to all of them. The limited body of research on LE treatments could be due to a number of causes, such as the fact that the condition is likely self-limiting, there is a dearth of pathophysiological data, the studies that have been conducted have had errors in methodology, and there are many factors that can affect the results. (1)

Tennis elbow, LE, or Lateral Elbow Tendinopathy (LET) is a common skin disease on the arm. Morris first used the term "Lawn Tennis Arm" in 1882 to describe this injury. Tendinopathy is a medical umbrella word encompassing a spectrum of conditions affecting the tendons as a result of prolonged, repetitive stress (2).

Our current understanding of the damage that causes LE is limited to the microscopic level. Research on surgically removed tissues has revealed the presence of mucopolysaccharides, the formation of bone, and an increase in blood vessel density. Immature fibroblasts as well as nonfunctional vascular buds penetrate the normal tissue of the extensor carpi radialis brevis (ECRB) tendon, causing the neighboring tissue to be disordered and hypercellular. (3)

Localized pain at the front of the lateral epicondyle is a typical physical symptom. Typically, the pain is worsened when you try to extend your wrist while your elbow is extended. A forearm extensor muscle atrophy, edema, or weakness may also be detected during a physical examination (4)

A new approach for treating LE, MWM was created by Mulligan. Physiological movement and a persistent lateral glide to the elbow joint are the components of manual treatment known as MWM. Fixing an improperly positioned elbow joint is a common goal of this mobilization technique. The main treatment for correcting what Miller described as a "positional fault of the elbow joint" was the utilization of the MWM for LE, as documented in Miller's (2000) case report (5).

A technique recently detailed by Mulligan involves the therapist applying and maintaining a passive glide mobilization to a patient's affected joint (often an accessory motion) as the patient uses their affected limbs to carry out a physical activity. The methods, which are referred to as MWM, are asserted to alleviate pain and increase function right after they are used in a clinical setting. However, there is a shortage of published experimental data supporting these ideas (6).

In order to alleviate discomfort, improve grip strength, and enhance activities of daily living, Mulligan treatments used movement and tape for mobilization. (7)

Stainless steel devices are used to administer controlled microtrauma to the injured soft tissues is instrument assisted soft tissue mobilization (IASTM), a type of augmented soft tissue mobilization. Research indicates that tendon healing is facilitated by controlled microtrauma, namely by inducing fibroblast proliferation. Previous studies have investigated its potential for treating LE, and the findings have been encouraging (8).

One common method for releasing myofascial restrictions is IASTM, or instrumentally aided soft tissue mobilization. Through the use of specialized tools, IASTM is able to mobilize scar tissue and myofascial adhesions. The Graston® technique is one of several accessible instruments and methods from IASTM. As of right now, there is a dearth of systematic evaluations that have evaluated IASTM for its therapeutic or ROM-enhancing potential. Although the exact way IASTM works as a treatment is still unknown, current evidence suggests it may aid in scar tissue destruction and absorption, fascia mobilization, promoting better tissue repair. At this time, no systematic reviews have examined at how IASTM affects the severity of pain associated with soft tissue disorders. (9)

The available Literatures showed no studies done to compare between MWM and IASTM in the available literature. So, the study helped to identify the difference between MWM and IASTM mobilization in dealing with cases of chronic lateral epicondylitis.

There are recently no established criteria, despite advances in CLE therapy (10). The goal of this study was to find out whether IASTM or topical MWM was more effective in relieving pain and improving mobility as well as functional capacities in individuals with CLE.

Subjects and Methods:

Study Design

The current study was a randomized controlled trial. The study took place from March 25, 2023, to June 30, 2023, at AL-Qenayat Central Hospital. Every individual who took part in this study gave their written agreement by signing an informed consent form. Cairo University's faculty of physical therapy research ethical committee gave their approval to the study, which has the registration number (P. TREC/012/004235). Subject: NCT05780528, according to ClinicalTrials.gov.

Participants:

Sixty male and female patients with CLE were recruited from the outpatient clinic of AL-Qenayat Central Hospital to take part in this research. The orthopedist made a diagnosis and referral after examining the patients' radiographs and clinical records. The duration of pain was longer than three months, and their ages varied from eighteen to eighty. The subjects were all in a stable medical condition and did not take any medication, including analgesics, that might have influenced the results. Every participant was randomly assigned to one of three equivalent groups.

Group A (the first experimental group):

Twenty patients underwent conventional treatment three times weekly for four weeks, which included a hot pack, deep transverse friction massage, conventional ultrasound, stretching and strengthening exercises, and elbow support, in addition to mulligan mobilization with movement.

Group B (the second experimental group):

Twenty patients underwent standard treatment—a hot pack, deep transverse friction massage, conventional ultrasound, stretching and strengthening exercises, and elbow support—plus instrument-assisted soft tissue mobilization.

Group C (the control group):

Twenty patients had a series of treatments that included a hot pack, a deep transverse friction massage, five minutes of ultrasound therapy (basic gel 3 MHz, 1 W/cm2 continuous mode), strengthening and stretching exercises, and elbow support three times weekly for a duration of four weeks.

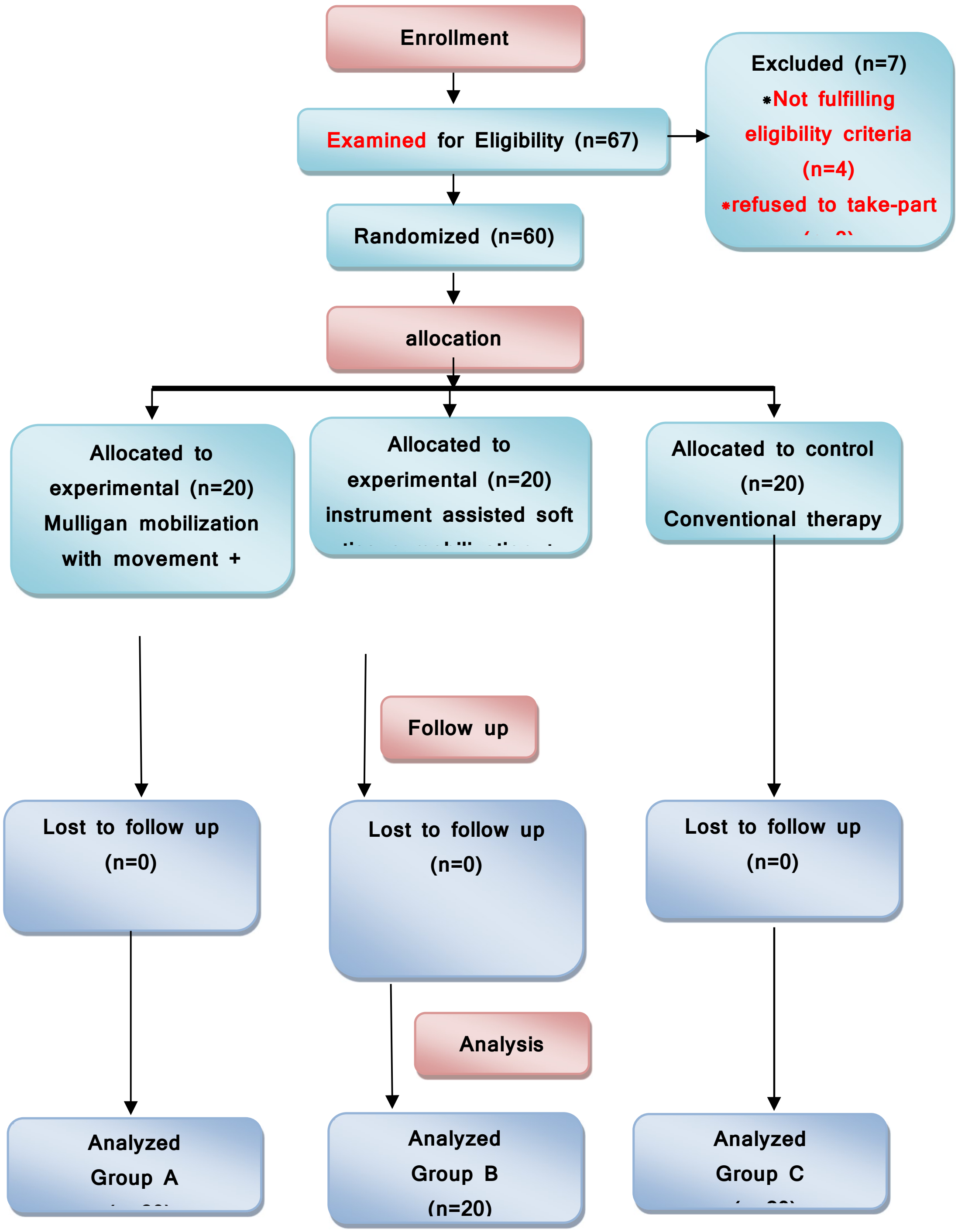
Inclusion criteria:

The study involved patients who fulfilled the following criteria: Both sexes were found to have CLE. Orthopedists made the diagnosis and referred patients who suffered from CLE. Every patient had a positive clinical manifestation. The ages of the patients ranged from eighteen to eighty-one (11). It was over three months before the pain began. The subjects were all in a stable medical condition and did not take any medication, including analgesics, that might have affected the results.

Exclusion Criteria:
We excluded patients who met any of the following requirements. Individuals who have elbow instability, have had elbow surgery, or have fractures in their elbows, shoulders, or both The radial nerve being entrapped, elbow effusion, skin injuries, open wounds on the elbow area, intra-articular injections lasting less than three months, during pregnancy, a history of malignancy, Rheumatoid arthritis, diabetes, and Reiter's syndrome are examples of systemic disorders. Serious medical along with neurological or psychological diseases.

Sample size calculation
Based on the findings in Amro et al, (5), the researchers used a visual analog scale (VAS) to quantify pain. They used an F-test MANOVA within and between interaction effects to determine that the effect size was 0.435, with 80% power at an $\alpha = 0.05$ level, 2 measurements per group. There should have been at least 55 individuals, however there were 5 (10%) dropouts, bringing the total to 60 people (20 in each group). We used G*Power (version 3.0.10) to determine the sample size.

Randomization:
The author who was responsible for designing the randomization was not involved in collecting the data. In order to reduce group variability and remove potential sources of bias, it was built using computer-generated blocks of 6, 9, and 12 sizes. We used sealed, opaque, and group-based treatment protocols to keep participant allocation a secret. The blind assessor to groups allocation collected data at baseline and after 4 weeks of intervention.



Flow Chart of the Study

Outcome measures:

The Visual Analogue Scale (VAS) was used for measurement of pain severity, a goniometer for measurement of elbow extension ROM, the Quick Disabilities of Arm, Shoulder, and Hand (QuickDASH) to quantify hand activities, as well as a hand-held dynamometer for measurement of grip strength. Data gathered from each group both before and after treatment.

Assessment procedure

1.Visual analogue scale:

Was a 100 mm long horizontal line with word descriptions at both ends. As a representation of their current state of mind, the patient placed a mark on the line. To get the VAS score, we measured the distance in millimeters between the patient's marked spot and the left end of the line. Its purpose was to measure the degree of discomfort. One way to assess pain is via the VAS. We named the two ends of the line "worst agony" and "no pain" respectively. The researchers had each participant highlight the spot on the graph that represented their level of discomfort.

2.Universal Goniometer:

As a wrist Motion amplitude. The goniometer was a plain old transparent plastic measuring instrument, measuring 31.75 by 4.445 cm. It had a 360° scale with 1° increments and a bubble level at the end to make sure it was level vertically and horizontally. (12).

3.Digital hand-held dynamometer:

On a regular basis, we checked the grip strength of our hands using a handheld dynamometer (13).

In clinical settings, a handheld dynamometer is an efficient and effective instrument for ensuring quantifiable strength assessment. If you want to know how strong your wrist muscles are, it's a genuine and dependable instrument to use.

4.Quick DASH Questionnaire for hand activities:

The Abbreviated Disability Assessment for the Upper Extremities (Daily) in Arabic: The Arabic version of the DASH is a condensed version of the full-length DASH that asks 11 questions on the patient's health state. Its questions include how much pain and tingling you're experiencing, how much trouble you're having with certain upper-extremity physical activities, and how much your condition is interfering with your social life, job, in addition to sleep. Each item on the DASH has 5 possible responses, varying from 0 (no symptoms) to 5 (unable to accomplish). In order to convert the raw scores to a scale from 0 to 100, it is necessary to finish at least 10 out of the 11 tasks. A higher score indicates a more severe impairment. Just with the DASH, this research did not include the two optional work and sports scales (14)

Treatment procedures:

For the first experimental group(A): patients received MWM addition to conventional therapy. applied the MWM lateral glide technique with the patient supine and their forearm bent at an angle, she had each patient close their fist—a provocative but painless gesture—three times for a total of ten repetitions. To provide this treatment, the physiotherapist would use one hand to glide laterally across the proximal ulna and radius while the other hand to stabilize the distal part of the humerus on the lateral aspect, just proximal to the elbow joint line. The lateral glide was performed by the hand located on the medial aspect of the ulna, a small distance away from the elbow joint line. The subject had no discomfort while they applied and maintained the glide for around six seconds, all while engaging in a painless grasping motion. We kept the gliding pressure going until the subject let go of the grasp entirely. In a 2003 study, Paungmali et al. (6). The treatment was done over three sessions per week for 4 weeks.

For the second experimental group (B): was given IASTM in addition to conventional therapy. The subject sat in a relaxed posture for IASTM. A table supported the elbow of the subject. Before the procedure, we cleaned the blade with an alcohol pad and put Vaseline to the area surrounding the elbow to prevent any potential irritation. Finding the precise regions of limitation in the common extensor origin was the first step in using the blade. The next step was to utilize the M2T blade in treatment planes 1, 2, and 3. Along the muscle, from its origin to its insertion, using a sweeping method, slowly and painlessly for around three minutes. We did this for four weeks straight, three times each week.

For the control group (c): was given traditional therapy three sessions per week for four weeks, which consisted of using an ultrasonic hot pack, stretching and strengthening exercises of the joint and elbow extensor and flexor muscles in addition to LE support.

Ultrasound applied by Medison device was be used in treatment. The parameters of ultrasound, (15): Frequency 3 MHz, Treatment time 5 min.

Use a moist heat pack for twenty minutes. The patient was placed in a comfortable position and the affected elbow was heated with a pad for 20 minutes. It was useful for relaxing tight muscles and ligaments before exercise, which assisted recovery from tennis elbow or helped alleviate the effects of chronic illness training following a long day.

Stretching exercise: The forearm extensors were stretched statically for thirty seconds six times, with a break of thirty seconds in between each one. The patient was lying on their back with their elbow on the bed and their wrists resting freely on the edge of the bed. While stretching the extensor muscles of the forearm, the therapist used one hand to hold the elbow joint.

Strengthening exercise: The patient was instructed to slowly extend their wrists while maintaining their position. Starting with two or three sets of ten repetitions of an active wrist extension while keeping the elbow flexed at a 90-degree angle, and increasing to five sets of ten repetitions as felt was appropriate. After one pound of weight had been introduced and three sets of ten repetitions were completed without the individual compensating with other muscles, the weight was increased to five sets.

Elbow support: The patient put it for four weeks following the physiotherapy session.

Statistical Analysis

The collected data will be statistically analyzed using:

Standard deviations and means are examples of descriptive statistics.

We compared the three groups' participants' characteristics using inferential statistics; specifically, analysis of variance (ANOVA). We utilized MANOVA to compare all dependent variables within and across groups.

We used SPSS for Windows, version 20, from SPSS, Inc. in Chicago, IL, to undertake the statistical analysis. Statistical significance was established when the p-value was lower than 0.05.

If we wanted to compare how different groups' subjects were, we used an ANOVA test.

We compared the gender distributions of the groups using a chi-squared test.

We used a mixed-effects MANOVA to look at how VAS, wrist extension ROM, hand grip strength, and Quick DASH mean values changed over time, both before and after treatment, and how different groups fared in relation to one another. Afterwards, we compared the results many times using post hoc tests that included the Bonferroni correction.

The significance level for all statistical tests was set at $p < 0.05$.

For this study, we used SPSS 25 for Windows to carry-out all of our statistical analyses.

Results:

Subject characteristics:
Table (1) showed the individuals' age, weight, height, and body mass index (BMI) compared across the three groups, we found no statistically significant differences ($p > 0.05$).

Comparison of age, weight, height as well as BMI between group A, B and C.

	Group A	Group B	Group C	F-value	p-value	Sig
	$\bar{X}$±SD	$\bar{X}$±SD	$\bar{X}$±SD			
Age(years)	41.65±4.80	40.05±6.13	42.90±5.99	1.26	0.28	NS
Weight (kg)	84±8.67	82.85±10.60	84.65±10.62	0.16	0.84	NS
Height (cm)	174.50±9.17	175.85±12.07	176±10.24	0.12	0.88	NS
BMI (kg/m²)	27.69±3.16	26.85±2.93	27.39±3.17	0.37	0.68	NS

$\bar{X}$: Mean SD: Standard deviation p value: Probability value NS: Non significant

Sex distribution:
There were 9 females as well as 11 males (45%) in group A, 12 females as well as 8 males (40%) in group B, and 11 females and 9 males (45%) in group C, according to the sex distribution. The sex distribution was not significantly different across the groups ($p = 0.63$). second table.

Comparison of gender distribution among group A, B and C.

	Group A	Group B	Group C	χ2 value	p-value	Sig
Females	9 (445%)	12 (60%)	11 (55%)	0.93	0.63	NS
Males	11 (55%)	8 (40%)	9 (45%)			

χ2 : Chi squared value p value: Probability value NS: Non significant

Impact of treatment on VAS, Quick DASH, elbow extension and flexion ROM as well as hand grip:
Treatment effects on VAS, ROM of wrist extension, grip strength, and Quick DASH were investigated using mixed MANOVA. Treatment and time interacted significantly ($p = 0.001$). A major impact of time was statistically significant ($p = 0.001$). The therapy had a statistically significant main impact (p 0.001). Table 3.

Mixed MANOVA for the impact of treatment on VAS, wrist extension ROM, hand grip strength, and Quick DASH:

	Mixed MANOVA			
	Wilks' Lambda	F-value	p-value	Partial Eta Squared
Interaction effect (treatment * time)	0.04	48.83	0.001	0.78
Effect of time	0.003	4527.13	0.001	0.99
Effect of treatment (group effect)	0.15	21.05	0.001	0.61

I- Effect of treatment on VAS:
Comparison between groups

Pre treatment

When comparing the three groups before treatment, no statistically significant change was observed in VAS ($p > 0.05$). Fig. 34, included in Table 4.

Post treatment

Statistically, compared to group B, VAS was significantly reduced in group A ($p = 0.001$). Group A's VAS was significantly reduced compared to group C's ($p = 0.001$). Group B's VAS was significantly reduced compared to group C's ($p = 0.001$). Presented in the Table 4.

Impact of treatment on VAS.

VAS					
Group A		Group B		Group C	
$\bar{X}$± SD		$\bar{X}$± SD		$\bar{X}$± SD	
Pre	Post	Pre	Post	Pre	Post
85.50±4.27	20.70±3.85	84.40±3.93	31.85±4.79	86.30±5.06	45.80±4.45

Mixed ANOVA		
	F value	p- value
Interaction effect	214.35	0.001
Time effect	12059.25	0.001
Group effect	53.07	0.001

Within group comparison (time effect)					
		MD	% of change	p-value	Sig
Pre vs post	Group A	64.8	75.79	0.001	S
	Group B	52.55	62.26	0.001	S
	Group C	40.5	46.93	0.001	S

Between group comparison (group effect)				
		MD	p- value	Sig
Pre	Group A vs Group B	1.1	0.72	NS
	Group A vs Group C	-0.8	0.83	NS
	Group B vs Group C	-1.9	0.37	NS
Post	Group A vs Group B	-11.15	0.001	S
	Group A vs	-25.1	0.001	S

	Group C			
	Group B vs Group C	-13.95	0.001	S

$\bar{X}$: Mean
SD: Standard deviation
MD: Mean difference
p value: Probability value
S: Significant
NS: Non significant

II- impact of treatment on wrist extension ROM:
Comparison between groups
Pre treatment
Pretreatment wrist extension ROM wasn't significantly different within the 3 groups (p > 0.05).
Post treatment
The ROM for wrist extensions was significantly greater in group A compared to group B (p = 0.001).
The ROM for wrist extensions was significantly greater in group A compared to group C (p = 0.001).
Group B had a significantly greater ROM for wrist extensions than group C (p = 0.001). (Table 5).

Impact of treatment on wrist extension ROM.

Wrist extension ROM (degrees)					
Group A		Group B		Group C	
$\bar{X}$ ± SD		$\bar{X}$ ± SD		$\bar{X}$ ± SD	
Pre	Post	Pre	Post	Pre	Post
41.70±3.18	64.95±2.48	43.15±3.85	59.90±3.06	42.50±4.32	56.05±3.66

Mixed ANOVA		
	F value	p- value
Interaction effect	93.94	0.001
Time effect	3675.79	0.001
Group effect	7.62	0.001

Within group comparison (time effect)					
		MD	% of change	p-value	Sig
Pre vs post	Group A	-23.25	55.76	0.001	S
	Group B	-16.75	38.82	0.001	S
	Group C	-13.55	31.88	0.001	S

Between group comparison (group effect)				
		MD	p- value	Sig
Pre	Group A vs Group B	-1.45	0.45	NS
	Group A vs Group C	-0.8	0.78	NS
	Group B vs Group C	0.65	0.85	NS
Post	Group A vs Group	5.05	0.001	S

	B			
	Group A vs Group C	8.9	0.001	S
	Group B vs Group C	3.85	0.001	S

$\bar{x}$: Mean	SD: Standard deviation	MD: Mean difference
p value: Probability value	S: Significant	NS: Non significant

III- Impact of treatment on hand grip strength:
Comparison between groups
Pre treatment
The grip strength of all 3 groups was not significantly different before treatment (p > 0.05). (Table 6).
Post treatment
The hand grip strength of group A was significantly greater than that of group B (p = 0.003). The hand grip strength of group A was significantly greater than that of group C (p = 0.001). Compared to group C, group B had significantly greater hand grips (p = 0.01). (Table 6).

Impact of treatment on hand grip strength.

Hand grip strength (lb)					
Group A		Group B		Group C	
$\bar{X}$± SD		$\bar{X}$± SD		$\bar{X}$± SD	
Pre	Post	Pre	Post	Pre	Post
44.30±8.09	67.55±8.94	43.20±9.18	58±9.60	42.85±8.43	49.45±8.02

Mixed ANOVA		
	F value	p- value
Interaction effect	63.63	0.001
Time effect	610.08	0.001
Group effect	6.76	0.002

Within group comparison (time effect)					
		MD	% of change	p- value	Sig
Pre vs post	Group A	-23.25	52.48	0.001	S
	Group B	-14.8	34.26	0.001	S
	Group C	-6.6	15.40	0.001	S

Between group comparison (group effect)				
		MD	p- value	Sig
Pre	Group A vs Group B	1.1	0.91	NS

	Group A vs Group C	1.45	0.85	NS
	Group B vs Group C	0.35	0.99	NS
Post	Group A vs Group B	9.55	0.003	S
	Group A vs Group C	18.1	0.001	S
	Group B vs Group C	8.55	0.01	S

$\overline{x}$: Mean SD: Standard deviation MD: Mean difference

p value: Probability value S: Significant NS: Non significant

IV- Effect of treatment on Quick DASH:
Comparison between groups
Pre treatment
Quick DASH scores did not vary significantly (p > 0.05) across the three groups before to treatment. Table 7
Post treatment
The hand grip strength of group A was significantly greater than that of group B (p = 0.003). The hand grip strength of group A was significantly greater than that of group C (p = 0.001). Compared to group C, group B had significantly greater hand grips (p = 0.01). Table 7.

Impact of treatment on Quick DASH.

Quick DASH					
Group A		Group B		Group C	
$\overline{X}$± SD		$\overline{X}$± SD		$\overline{X}$± SD	
Pre	Post	Pre	Post	Pre	Post
80.15±4.69	24.80±3.48	81.65±6.05	39.25±4.48	83.45±6.17	57.8±5.03
Mixed ANOVA					
		F value		p- value	
Interaction effect		157.59		0.001	
Time effect		3607.75		0.001	

Group effect		88.66		0.001	
Within group comparison (time effect)					
		MD	% of change	p-value	Sig
Pre vs post	Group A	55.35	69.06	0.001	S
	Group B	42.4	51.93	0.001	S
	Group C	25.65	30.74	0.001	S
Between group comparison (group effect)					
		MD		p- value	Sig
Pre	Group A vs Group B	-1.5		0.68	NS
	Group A vs Group C	-3.3		0.16	NS
	Group B vs Group C	-1.8		0.57	NS
Post	Group A vs Group B	-14.45		0.0001	S
	Group A vs Group C	-33		0.001	S
	Group B vs Group C	-18.55		0.001	S

$\bar{x}$: Mean SD: Standard deviation MD: Mean difference

p value: Probability value S: Significant NS: Non significant

Discussion

This study determined how well two techniques for treating chronic lateral epicondylitis—Mulligan MWM and IASTM—affected pain, ROM, grip strength in the hands, and impairment in the upper limbs.

The findings of the current study revealed:

1. Among the groups studied, group (A) showed the largest improvement in pain levels, wrist extension, grip strength, and hand functions after MWM helped restore joint alignment.
2. The utilization of IASTM to enhance blood flow and hasten the healing effect resulted in a significant decrease in discomfort, wrist extension, hand grip strength, as well as hand functions in group (B).
3. Group (c), where traditional treatment focused on local inflammation rather than malalignment, showed the lowest improvements in discomfort, wrist extension, grip strength, and hand functioning.

MWM and Pain:

Statistical analysis revealed that MWM had a substantial impact on pain intensity while treating chronic lateral epicondylitis (P=0.000) in this research.

There are a number of proposed physiological reasons that explain why mobilization with movement (MWM) is so successful in reducing pain. One of them is that it stimulates mechanoreceptors, which in turn suppress nociceptive (pain) signals via descending inhibitory pathways. Additionally, MWM is a kind of movement therapy that focuses on controlled motions to improve mobility and restore normal joint mechanics. This may alleviate discomfort by reducing tension on the afflicted tissues. (16)

MWM and ROM:

Statistical analysis revealed that MWM had a substantial impact on range of motion (ROM) while treating chronic lateral epicondylitis (P=0.000) in the present research.

To alleviate mobility limits brought on by soft tissue restrictions or joint dysfunctions, MWM applies regulated force to the afflicted joint and its surrounding tissues. Through the execution of these deliberate motions, MWM modifies the nervous system's regulation of muscle activity and joint function by altering the proprioceptive feedback systems. As a result, this procedure is useful for improving the range of motion and functioning of the joints. The increased circulation of synovial fluid that MWM induces may also help restore tissue suppleness and reduce inflammatory reactions. When it comes to chronic lateral epicondylitis, the combination of joint mobilization and patient-induced movements within MWM greatly aids in rehabilitation and functional recovery by positively impacting range of motion (17; 18).

MWM and hand grip strength:

Additionally, when it came to treating chronic lateral epicondylitis, the present investigation found that MWM had a statistically significant impact on hand grip strength (P=0.000).

For the purpose of enhancing the biomechanics and function of the affected elbow joint, MWM focuses on that specific joint. This method employs controlled mobility to alleviate discomfort and tension on the tissues around the lateral elbow while restoring proper alignment. As a result, this method is useful for enhancing the patterns of neuromuscular control and muscle activation that are unique to gripping tasks. Over time, you'll notice a significant improvement in your hand grip strength, thanks to the improved joint mechanics and reduced tissue irritation. Additionally, MWM promotes enhanced nutrition supply and blood flow to the injured region, which helps mend tissues and restores function (19).

MWM and upper limb disability:

Statistical analysis revealed that MWM significantly reduced upper limb impairment in patients treated for chronic lateral epicondylitis (P=0.000) in the present investigation.

MWM allows for improved tissue extensibility and biomechanical changes. By increasing blood flow to specific areas, this method speeds up the healing process and reduces the likelihood of fibrous adhesions forming in injured tissues. In addition, MWM helps the brain adapt by improving motor control and coordination via its focused activities, which are crucial for regaining the upper limb's functional capability (20).

IASTM and pain:

In this study, researchers found that while treating chronic lateral epicondylitis with IASTM significantly reduced pain intensity (P=0.000).

By applying regulated mechanical stress to the injured region, IASTM promotes the lysis of adhesions and defective scar tissue that has built up around the lateral epicondyle. Tendon flexibility and tensile strength are both improved by this process, which also encourages collagen fiber remodeling and helps new tissue align. In addition to alleviating local inflammation and edema, IASTM helps regulate inflammatory mediators. This method has the potential to reduce the nociceptive input that causes pain by reducing the inflammatory response (21).

IASTM and ROM:

When it came to treating chronic lateral epicondylitis, the present investigation found that IASTM had a statistically significant impact on range of motion (ROM) (P=0.000). Impact on tissue remodeling and healing are the main physiological factors that explain why IASTM is so good at increasing ROM. Using controlled microtrauma to stimulate tissues, IASTM sets off a series of reactions in the body. This action initiates the secretion of growth factors, which in turn increase blood flow, which aids in the regeneration and repair of tissues. (22).

IASTM and hand grip strength:
When treating chronic lateral epicondylitis, the present research found that IASTM had a statistically significant impact on hand grip strength (P=0.000). IASTM may stimulate the body's natural opioid release pathway, which in turn reduces the pain and suffering caused by chronic lateral epicondylitis. In addition, this method probably affects neuromuscular adaptations by changing the excitability of motor neurons and modifying the activity of muscle spindles, which leads to a rapid and long-lasting improvement in grip strength (23).

IASTM and upper limb disability:
Statistical analysis revealed that IASTM significantly reduced upper limb impairment in patients treated for chronic lateral epicondylitis (P=0.000) in this research. In order to promote tissue healing and remodeling, IASTM works by focusing on these adhesions and helping to realign collagen fibers. On top of that, IASTM's mechanical stimulation improves local blood circulation, which makes for a better setting for tissue healing. In addition to lowering local inflammation and increasing the release of endogenous chemicals that alleviate pain, this intervention is believed to alter pain perception. Restoring functional mobility, decreasing discomfort, and improving the overall impairment associated with CLE are thought to represent the cumulative impacts of these physiological processes (24).

Conclusion

Ultimately, this research sheds light on the relative merits of two techniques for treating chronic lateral epicondylitis: Mulligan MWM and IASTM. Patients suffering from CLE revealed statistically significant improvements in pain levels, mobility, grip strength, as well as hand function after receiving MWM treatment compared to IASTM. Accordingly, MWM has the potential to be a more efficient strategy for enhancing results in people with this diagnosis.

Recommendations:

Further researches are needed to:

- Examine the long-term effects of Mulligan MWM on CLE and recurrence compared to alternative physiotherapy therapies.
- Determining how MWM impacts pain, mobility, grip strength, and hand function requires investigation.
- Researchers should include larger samples in future studies if they want their findings to be relevant to a wider population.

References:

[1] Hong, Q. N., Durand, M.-J., & Loisel, P. (2004). Treatment of lateral epicondylitis: Where is the evidence? Joint Bone Spine, 71(5), 369–373.

[2] Uttamchandani, S., & Phansopkar, P. (2021). Efficacy of powerball versus mulligan mobilization with movement on pain and function in patients with lateral epicondylitis: A randomised control trial [Preprint]. Protocol Exchange. https://doi.org/10.21203/rs.3.pex-1495/v1.

[3] Faro, F., & Wolf, J. M. (2007). Lateral Epicondylitis: Review and Current Concepts. The Journal of Hand Surgery, 32(8), 1271–1279. https://doi.org/10.1016/j.jhsa.2007.07.019.
[4] Cohen M, and Geraldo D. Lateral epicondylitis of elbow, Rev Bras Orthop; 2012, 47(4): 414:420.
[5] Amro, A., Diener, I., Bdair, W. O., Hameda, I. M., Shalabi, A. I., & Ilyyan, D. I. (2010a). The effects of Mulligan mobilisation with movement and taping techniques on pain, grip strength, and function in patients with lateral epicondylitis. Hong Kong Physiotherapy Journal, 28(1), 19–23.
[6] Paungmali, A., O'Leary, S., Souvlis, T., & Vicenzino, B. (2003). Hypoalgesic and Sympathoexcitatory Effects of Mobilization with Movement for Lateral Epicondylalgia. Physical Therapy, 83(4), 374–383.
[7] Amro, A., Diener, I., Bdair, W. O., Hameda, I. M., Shalabi, A. I., & Ilyyan, D. I. (2010b). The effects of Mulligan mobilisation with movement and taping techniques on pain, grip strength, and function in patients with lateral epicondylitis. Hong Kong Physiotherapy Journal, 28(1), 19–23.
[8] Papa, J. A. (2012). Two cases of work-related lateral epicondylopathy treated with Graston Technique® and conservative rehabilitation. The Journal of the Canadian Chiropractic Association, 56(3), 192–200.
[9] Karmali, A., Walizada, A., & Stuber, K. (2019). The efficacy of instrument-assisted soft tissue mobilization for musculoskeletal pain: A systematic review. Journal of Contemporary Chiropractic, 2(1), 25-33.
[10] Reyhan, A. C., Sindel, D., & Dereli, E. E. (2020). The effects of Mulligan's mobilization with movement technique in patients with lateral epicondylitis. Journal of back and musculoskeletal rehabilitation, 33(1), 99-107.
[11] D'vaz, A. P., Ostor, A. J., Speed, C. A., Jenner, J. R., Bradley, M., Prevost, A. T., & Hazleman, B. L. (2006). Pulsed low-intensity ultrasound therapy for chronic lateral epicondylitis: a randomized controlled trial. Rheumatology, 45(5), 566-570.
[12] Roach, S., San Juan, J. G., Suprak, D. N., & Lyda, M. (2013). concurrent validity of digital inclinometer and universal goniometer in assessing passive hip mobility in healthy subjects. International Journal of Sports Physical Therapy, 8(5), 680–688.
[13] Lee, M., Cheatham, S. W., Cain, M., & Baker, R. (2016a). The efficace of instrument assiste soft tissue mobilisation: A systematic review. The Journal of the Canadian Chiropractic Association, 60(3), 200–211.
[14] Alnahdi AH. Validity and reliability of the Arabic quick disabilities of the arm, Shoulder and Hand (QuickDASH-Arabic). Musculoskelet Sci Pract. 2021 Jun; 53:102372.
[15] Hoppenrath, M., & Leander, B. S. (2006). Ebriid phylogeny and the expansion of the Cercozoa. Protist, 157(3), 279-290.
[16] Stecca, T. M., Da Silva, E. L. D., Rocha, F. A., De Souza, F. M., Da Silveira, P. F. A., Júnior, R. F. V., & Gehhlen, S. H. J. (2022, December 1). Lateral epicondylitis treatment using mesenchymal stem cells: a narrative review. Research, Society and Development. https://doi.org/10.33448/rsd-v11i16.37965
[17] Hootman, J. M., Dick, R., & Agel, J. (2007). Epidemiology of collegiate injuries for 15 sports: summary and recommendations for injury prevention initiatives. Journal of athletic training, 42(2), 311–319.
[18] Gutiérrez-Espinoza, H., Estrella-Flores, E., Cuyul-Vásquez, I., Jorquera-Aguilera, R., López-Gil, J. F., & Araya-Quintanilla, F. (2024). Effects of a Conventional Treatment Plus Scapular Exercises Program in Patients with Chronic Lateral Elbow Tendinopathy: A Pre− Post Single-Group Study. Journal of Sport Rehabilitation, 1(aop), 1-8.
[19] Speed, C. (2001, December 1). Therapeutic ultrasound in soft tissue lesions. British

Journal of Rheumatology. https://doi.org/10.1093/rheumatology/40.12.1331
[20] Petersen, S., & de Las Peñas, C. F. (2022). Upper extremity special issue. Journal of Manual & Manipulative Therapy, 30(1), 1-2.
[21] Balasuburamaniam, A., & Kandasamy, M. (2016, September 8). Effect of Myofascial Release Therapy and Active Stretching on Pain and Grip Strength in Lateral Epicondylitis. ResearchGate. https://www.researchgate.net/publication/308165428_Effect_of_Myofascial_Release_Therapy_and_Active_Stretching_on_Pain_and_Grip_Strength_in_Lateral_Epicondylitis
[22] Kim, J., Sung, D. J., & Lee, J. (2017). Therapeutic effectiveness of instrument-assisted soft tissue mobilization for soft tissue injury: mechanisms and practical application. Journal of exercise rehabilitation, 13(1), 12–22. https://doi.org/10.12965/jer.1732824.412
[23] Osailan, A., Jamaan, A., Talha, K., & Alhndi, M. (2021, July 1). Instrument assisted soft tissue mobilization (IASTM) versus stretching: A comparison in effectiveness on hip active range of motion, muscle torque and power in people with hamstring tightness. Journal of Bodywork and Movement Therapies. https://doi.org/10.1016/j.jbmt.2021.03.001
[24] Hoppenrat T Ciccone CD. Is there evidence that phonophoresis is more effective than ultrasound in treating pain associated with lateral epicondylitis? Phy Ther 2006;86: 136-140.
[25] Lambert, A. W., Pattabiraman, D. R., & Weinberg, R. A. (2017). Emerging biological principles of metastasis. Cell, 168(4), 670-691.