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Effectiveness of Mulligan Mobilization with Movement Versus Eccentric Strengthening Exercises in Patients with Lateral Epicondylitis

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Abstract: Lateral epicondylitis is a degenerative condition affecting the common extensor tendon origin, particularly the ECR. It results from repetitive overuse and microtrauma, leading to pain, tenderness, and reduced grip strength.
To compare the effectiveness of Mulligan Mobilization with Movement (MWM) versus Eccentric Strengthening Exercises in patients with lateral epicondylitis.
Fifty-six patients with lateral epicondylitis were randomly divided into two groups. Group A (n=28) received Mulligan Mobilization with Movement for 4 weeks, and Group B (n=28) received eccentric strengthening exercises for 4 weeks. Outcome measures included Numeric Pain Rating Scale (NPRS), Hand-Held Dynamometer (grip strength), and Patient-Rated Tennis Elbow Questionnaire (PRTEE).
Both groups showed statistically significant improvements ($p < 0.001$). Group A demonstrated superior outcomes: NPRS reduced from 7.86 to 1.82 (mean change: 6.04), grip strength improved from 18.75 to 31.68 kg (mean change: +12.9kg), and PRTEE improved from 78.57 to 35.86 (mean change: 42.71 points). Group B showed lesser improvements across all measures.
Mulligan Mobilization with Movement demonstrated statistically significant and clinically superior outcomes compared to eccentric strengthening exercises in reducing pain, improving grip strength, and enhancing functional performance in patients with lateral epicondylitis.

Keywords: Lateral epicondylitis, Mulligan mobilization with movement, Eccentric strengthening exercises, Numeric Pain Rating Scale (NPRS), Hand-Held Dynamometer, Patient-Rated Tennis Elbow Questionnaire (PRTEE)

INTRODUCTION

Tennis elbow, a common musculoskeletal problem at the elbow, has been known since Runge reported on writer's cramp in 1873. Morris coined the term “tennis elbow” way back in 1882. Nowadays, folks also call it lateral elbow tendinopathy; it’s super common among upper-limb issues. This issue usually happens because of lots of stress on the forearm muscles, causing pain near the elbow that hurts more when you try to grip things or move your wrist against resistance.

For ages, people thought tennis elbow was just plain old tendinitis, meaning there was a bunch of inflammation. But after checking chronic cases, doctors found not so much actual inflammation. So, they started using terms like tendinosis and tendinopathy, which fit better with the degeneration actually seen in the tendons. The spot where the Extensor Carpi Radialis Brevis (ECRB) tendon attaches to the arm bone is typically where all this degeneration shows up, making it pretty sore and problematic.

Both Males and Females get tennis elbow equally, but mostly in their 30s to 50s. Plus, it tends to hit the dominant arm harder. Looking at the numbers, around 4 to 7 out of every 1,000 people may experience this each year, based on what health care providers see. Your job can make you more likely to get tennis elbow also. It’s often tied to roles needing lots of repetitive hand movements or heavy use of the forearm muscles. Now, for treating this, a current study looks into two non-surgical options. The first is Mulligan Mobilization with Movement (MWM), where the elbow gets gently glided by a therapist while the patient does some active moves to help ease the pain and boost movement. The other method centres on eccentric strengthening exercises. This approach puts steady pulling pressure on the injured tendon to help it adapt and heal. While both ways can be

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helpful, Mulligan Mobilization with Movement (MWM) has Greater improvement Compare to Eccentric Strengthening Exercises (ES).

MATERIALS AND METHODS

Study Design: Comparative study

Study Location: Malla Reddy University, schools of Allied and health care science, MRU Health City, and Narayana Multi-Speciality Hospital, Hyderabad, Telangana, India

Study Population: Patients diagnosed with lateral epicondylitis.

Sample Size: 56 subjects (28 per group), calculated using G*Power (effect size d = 0.9, α = 0.05, power = 0.95).

Study Period: 10 months. Treatment duration: 4 weeks per participant.

Sampling Technique: Purposive sampling with convenient random allocation into two groups

Inclusion Criteria:

- Patients with pain during gripping
- Patients with pain on resisted wrist extension
- Patients with pain on passive wrist flexion with elbow extension
- Tenderness on palpation over the lateral epicondyle of the humerus
- Both male and female

Exclusion Criteria:

- Previous surgery to the elbow region
- Peripheral nerve entrapment
- Cervical radiculopathy
- Corticosteroid injections within 6 months
- Neurological impairments
- Cardiovascular diseases

OUTCOME MEASURES

Primary**:** Numeric Pain Rating Scale (NPRS), Hand-Held Dynamometer (grip strength).

Secondary: Patient-Rated Tennis Elbow Questionnaire (PRTEE).

Intervention Protocol:

Group A – Mulligan Mobilization with Movement (MWM)**:** A lateral glide was applied to the proximal forearm while the other hand glided the distal end of the humerus. The glide was sustained for 5–10 seconds during pain-free gripping. Dosage: 12 repetitions per session, 2 days per week for 4 weeks.

Group B – Eccentric Strengthening Exercises**:** The patient's forearm was placed on the edge of a table with wrist and elbow extended. The wrist was actively extended against resistance for 6–8 seconds. Dosage: 3 sets of 15 repetitions daily, 5 days per week for 4 weeks.

Statistical Analysis:

Data were analysed using SPSS IBM version 21. Paired t-tests assessed within-group changes; independent t-tests compared between-group differences. Significance level: $p \leq 0.001$. Cohen's d was calculated for effect size.

RESULTS

Fifty-six participants completed the study (Group A: 28; Group B: 28). Descriptive statistics (mean ± SD) for all outcome measures are presented in the tables below.

Table 1: Comparison of All Outcome Measures (Pre and Post Intervention)

Group	N	Pre (Mean ± SD)	Post (Mean ± SD)	Mean Change	Direction
Group A (MWM)	28	7.86 ± 0.89	1.82 ± 0.77	+6.04	Decrease = Better
Group B (Eccentric)	28	8.04 ± 0.74	3.96 ± 0.88	+4.07	Decrease = Better
Group A (MWM)	28	18.75 ± 2.03	31.68 ± 2.55	+12.93	Increase = Better
Group B (Eccentric)	28	19.04 ± 2.20	25.57 ± 3.07	+6.54	Increase = Better
Group A (MWM)	28	78.57 ± 4.85	35.86 ± 7.91	+42.71	Decrease = Better
Group B (Eccentric)	28	78.14 ± 4.37	55.18 ± 5.65	+22.96	Decrease = Better

Table 2: Within-Group Analysis (Paired t-test)

Outcome	Group	T-value	df	p-value	Cohen's d	Effect Size
NPRS	Group A (MWM)	25.318	27	<0.001	4.78	Very Large
NPRS	Group B (Eccentric)	18.194	27	<0.001	3.44	Very Large
Grip Strength	Group A (MWM)	37.090	27	<0.001	7.01	Very Large
Grip Strength	Group B (Eccentric)	24.692	27	<0.001	4.67	Very Large
PRTEE	Group A (MWM)	39.687	27	<0.001	7.50	Very Large
PRTEE	Group B (Eccentric)	36.890	27	<0.001	6.97	Very Large

Both groups showed statistically significant within-group improvements across all three outcome measures ($p < 0.001$), with very large effect sizes.

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Table 3: Between-Group Comparative Analysis (Independent t-test)

Outcome	Group A Mean Change	Group B Mean Change	T-value	df	p-value	Cohen's d	Result
NPRS (Pain)	6.04	4.07	6.008	54	<0.001	1.61	Group A: Superior
Grip Strength (kg)	+12.93	+6.54	14.606	54	<0.001	3.90	Group A: Superior
PRTEE Score	42.71	22.96	15.885	54	<0.001	4.25	Group A: Superior

Between-group analysis confirmed statistically significant superiority of Group A (MWM) over Group B (Eccentric) across all outcome measures. 100% of Group A participants achieved clinically meaningful improvement in NPRS (≥3 pts), grip strength (≥5 kg), and PRTEE (≥15 pts), compared to 92.9%, 85.7%, and 100%, respectively, in Group B.

Graphical presentation- pre vs post intervention

The following bar charts illustrate mean pre- and post-intervention scores for both groups across all three outcome measures. Dark bars represent post-intervention values, demonstrating improvement in both groups.

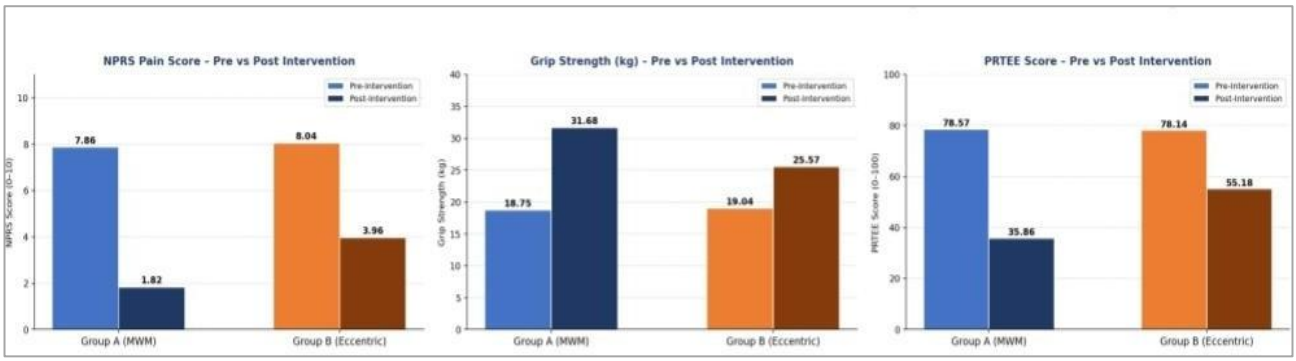

Figure 1: Pre- and Post-Intervention Mean Scores for NPRS (Pain), Grip Strength, and PRTEE – Group A vs Group B

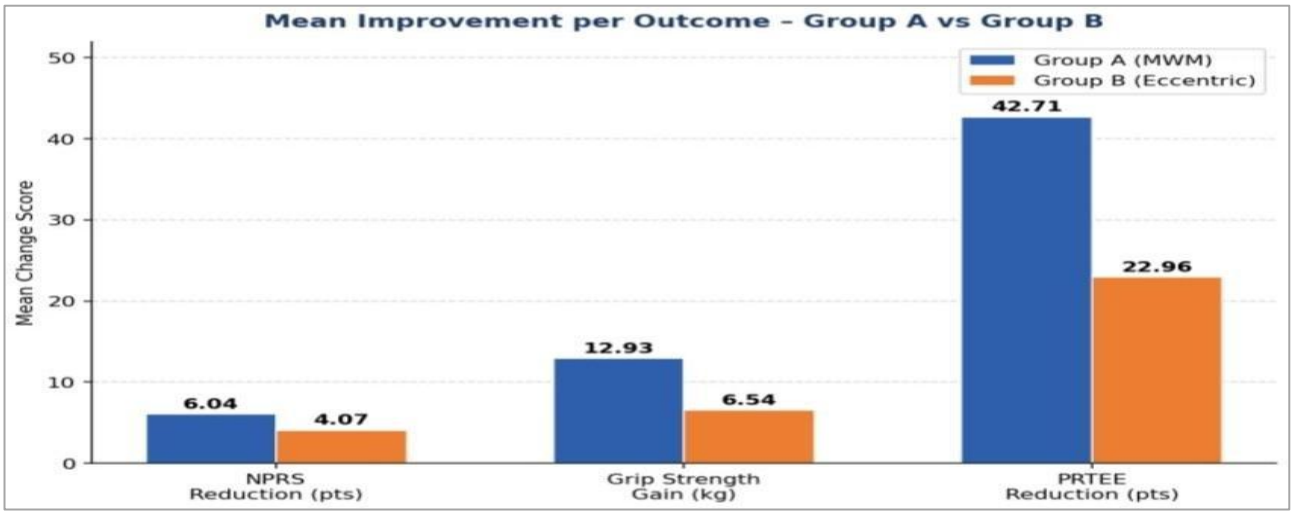

Figure 2: Mean Improvement per Outcome Measure – Group A (MWM) vs Group B (Eccentric Strengthening)

EFFECT SIZE ANALYSIS

Cohen's d was calculated for each outcome measure to quantify the magnitude of change within each group. All values fall in the "Very Large" category (d > 0.8), confirming the clinical and statistical significance of both interventions. Group A consistently achieved higher effect sizes across all measures.

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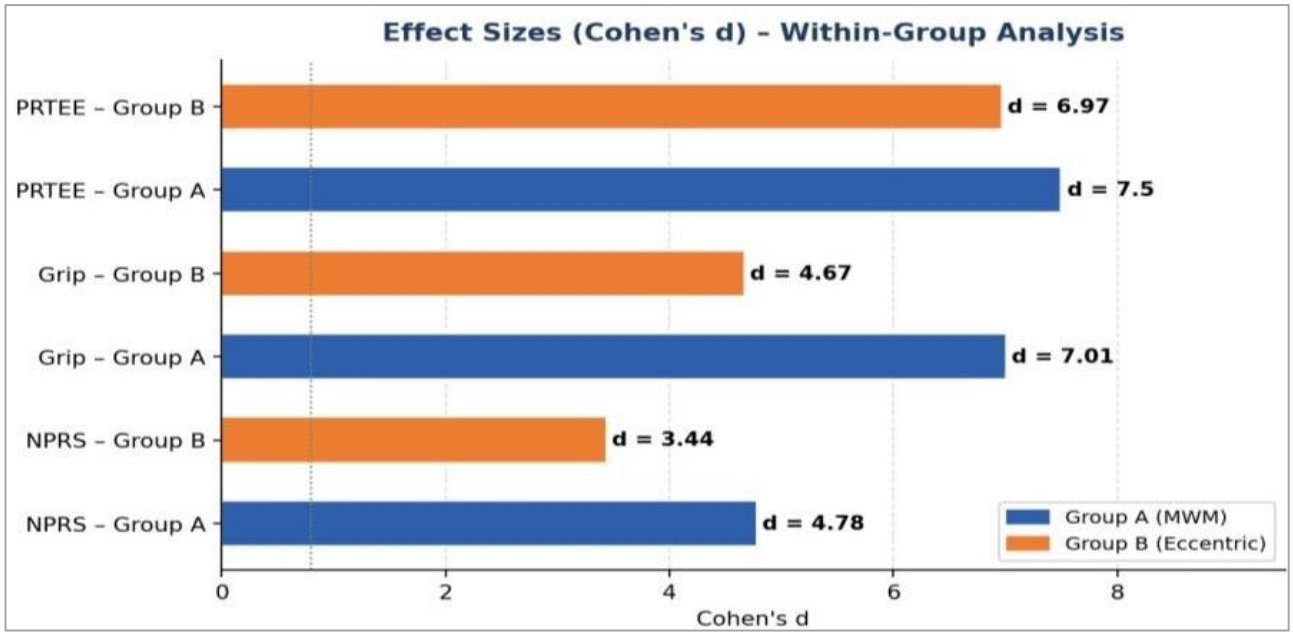

Figure 3: Cohen's d Effect Sizes – Within-Group Analysis for Group A (MWM) and Group B (Eccentric Strengthening)

Clinically Meaningful Improvement Analysis

Outcome	Threshold	Group A Responders	Group A %	Group B Responders	Group B%
NPRS(Pain)	≥ 3 pt reduction	28/28	100.0%	26/28	92.9%
Grip strength	≥ 5 kg increase	28/28	100.0%	24/28	85.7%
PRTEE score	≥ 15 pt reduction	28/28	100.0%	28/28	100.0%

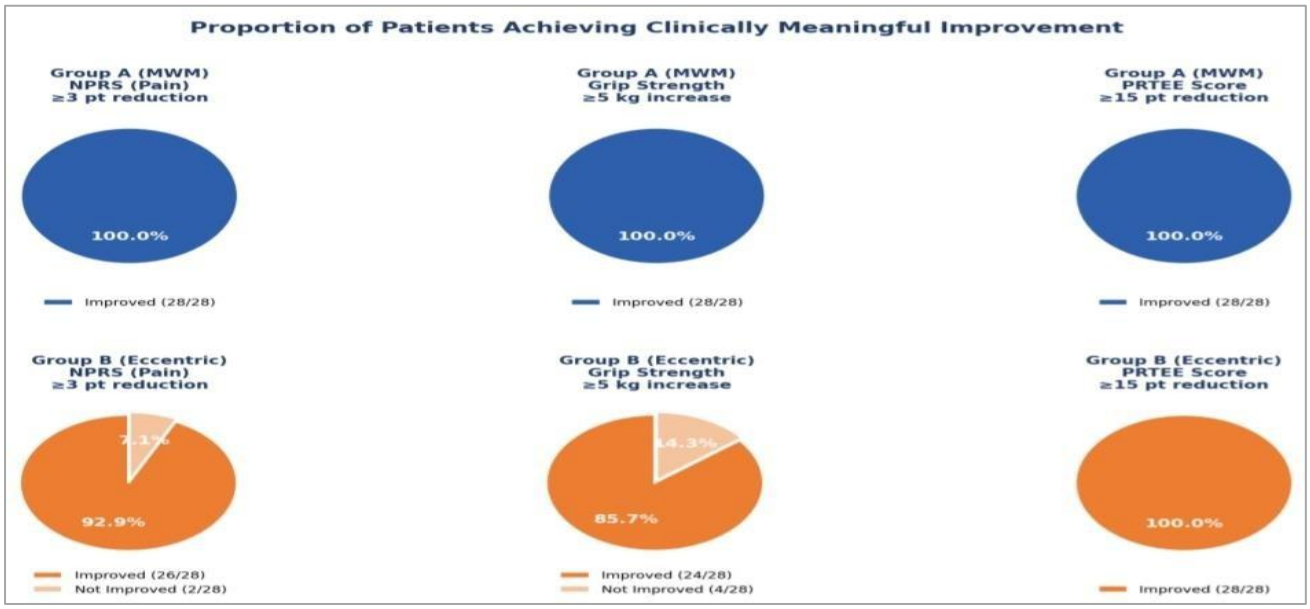

Figure 4: Proportion of Patients Achieving Clinically Meaningful Improvement – Group A (top row) vs Group B (bottom row) for NPRS, Grip Strength, and PRTEE

DISCUSSION

The present study compared the effectiveness of Mulligan Mobilization with Movement (MWM) and eccentric strengthening exercises in patients with lateral epicondylitis. Both interventions produced statistically significant improvements; however, MWM showed superior outcomes across all measured variables.

In terms of pain reduction (NPRS), Group A reduced from 7.86 ± 0.89 to 1.82 ± 0.77 (mean change: 6.04), while Group B reduced from 8.04 ± 0.74 to 3.96 ± 0.88 (mean change: 4.07). The between-group difference was statistically significant ($t = 6.008$, $p < 0.001$, Cohen's $d = 1.61$). These findings align with published literature demonstrating the superior analgesic effect of MWM through neurophysiological mechanisms.

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Regarding grip strength, Group A improved from 18.75 ± 2.03 kg to 31.68 ± 2.55 kg (+12.93 kg), while Group B improved from 19.04 ± 2.20 kg to 25.57 ± 3.07 kg (+6.54 kg). This difference was statistically significant ($t = 14.606$, $p < 0.001$, Cohen's $d = 3.90$), demonstrating that MWM produced nearly double the improvement in grip strength compared to eccentric exercises.

For functional outcomes (PRTEE), Group A improved by 42.71 points compared to Group B's 22.96 points ($t = 15.885$, $p < 0.001$, Cohen's $d = 4.25$). The enhanced outcomes with MWM can be attributed to its ability to produce pain-free joint mobilization, correction of positional faults, and immediate neurophysiological effects. Eccentric strengthening primarily facilitates gradual tendon adaptation, which may explain comparatively lesser short-term improvements.

CONCLUSION

Both Mulligan Mobilization with Movement and eccentric strengthening exercises are effective interventions for lateral epicondylitis. However, Mulligan Mobilization with Movement demonstrated statistically significant and clinically superior outcomes in reducing pain, improving grip strength, and enhancing functional performance. MWM can be considered a more effective first-line treatment approach for patients with lateral epicondylitis.

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