Original Article

Effects of Deep Friction Massage versus Stretching and Strengthening Exercise in the Management of Lateral Epicondylitis

Khandaker MN,[1] Shoma FK,[2] Islam T,[3] Ahmed B,[4] Rob SB,[5] *Nurunnabi M[6]

Abstract

Background: Lateral epicondylitis (LE) is a common cause of elbow pain, often leading to reduced wrist function and handgrip strength. Conservative interventions, including exercise and manual therapy, are widely used, but comparative effectiveness remains under investigation.

Objective: To find out the effects of deep friction massage, stretching and strengthening exercise in the management of LE of elbow.

Methods: A prospective intervention study was conducted from July 2018 to June 2019 at BSMMU, Dhaka. A total 60 patients aged 20–80 years with LE were randomly assigned to Group A (stretching and strengthening exercises, ultrasonic therapy, wrist splinting, activity modification) or Group B (deep friction massage, ultrasonic therapy, wrist splinting, activity modification). Both interventions were applied three times per week for six weeks, and all participants received Naproxen 250 mg twice daily with Omeprazole 20mg for two weeks. Outcomes included pain (VAS), wrist ROM (goniometer), and grip strength (sphygmomanometer), assessed at baseline, 2nd, 4th, and 6th weeks.

Results: Baseline characteristics were comparable between groups. Both interventions significantly reduced pain after six weeks (Group A: VAS 7.27±0.69 to 1.47±0.51; Group B: 7.30±0.65 to 2.27±0.58; p<0.001). Group A achieved faster and greater pain relief at 4 and 6 weeks compared to Group B (p=0.029 and p<0.001, respectively). Wrist flexion and extension improved significantly in both groups (p<0.001), with greater gains in Group A. Handgrip strength increased markedly in Group A (27.05±3.84 to 45.50±6.20 mmHg; p<0.001) but not in Group B (26.75±3.65 to 29.10±4.05 mmHg; p=0.082).

Conclusion: Stretching and strengthening exercises provided superior pain relief, improved wrist ROM, and enhanced handgrip strength compared to deep friction massage in patients with lateral epicondylitis.

[Dinajpur Medical College Journal, 2026 Jan; 19 (1):111-117]
[Former M Abdur Rahim Medical College Journal]
DOI: https://www.doi.org/10.69861/djmcj.2026.19.1.14

Keywords: Lateral epicondylitis, tennis elbow, stretching exercises, strengthening exercises, deep friction massage, pain, wrist range of motion, handgrip strength.

1. *Dr. Md. Nuruzzaman Khandaker, Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University, Dhaka, Bangladesh. nuruzzamankhandaker07@gmail.com ORCID: https://orchid.org/0000-0002-6924-456X*
2. *Dr. Farzana Khan Shoma, Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University, Dhaka, Bangladesh. farzanadmck53@gmail.com, ORCID: https://orcid.org/0000-0002-5355-490X*
3. *Dr. Tariqul Islam, Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University, Dhaka, Bangladesh. badrunahmed123@gmail.com ORCID: https://orcid.org/0000-0003-0269-8687*
4. *Dr. Badrunnesa Ahmed, Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University, Dhaka, Bangladesh. badrunahmed123@gmail.com ORCID: https://orcid.org/0000-0003-0269-8687*
5. *Dr. Saosun Binta Rob, Assistant Professor, Department of Paediatric Dentistry and Public Health, Dhaka Community Medical College and Hospital, Dhaka, Bangladesh. saosunbonna@gmail.com. ORCID: https://orcid.org/0009-0003-5861-8524*
6. **Dr. Mohammad Nurunnabi, Assistant Professor, Department of Community Medicine and Public Health, Sylhet Women's Medical College, Sylhet, Bangladesh. nur.somch@gmail.com. ORCID: https://orcid.org/0000-0001-9472-9369*

**For correspondence*

Introduction

The elbow joint is an ordinarily used joint essential for daily activities. Elbow pain, particularly over the lateral epicondyle, is a common complaint among individuals performing repetitive wrist extension, not just tennis players.[1] Lateral epicondylitis (LE), or "tennis elbow," is a painful tendinopathy of the lateral elbow caused by microtears in the extensor aponeurosis due to repeated resisted contractions, commonly seen in activities such as hammering, wood chopping, or other repetitive tasks.[2] The condition is caused by microtears in the extensor aponeurosis due to repeated resisted contractions, commonly seen in activities like hammering, wood chopping, or other repetitive household tasks.[3-5]

LE is a common tendinopathy characterized by pain and tenderness over the lateral epicondyle of the humerus[6,7]. Recent studies report a prevalence of 1–3% in the general population, with higher rates among individuals aged 35-54 years, and note that recurrent symptoms can lead to prolonged disability and increased healthcare costs.[6,8] The condition primarily results from overuse and eccentric loading of the common extensor tendon, causing microtears and degenerative changes at the tenoperiosteal junction, rather than inflammation[9]. Clinically, LE often follows a chronic course lasting 6 months to 2 years, with periods of exacerbation and remission before spontaneous recovery.[10] The need for early diagnosis and effective management to relieve pain and restore function.

Treatment for LE focuses on pain relief and functional recovery through rest, NSAIDs, corticosteroid injections, and physical therapy modalities such as ultrasound, TENS, stretching, and strengthening exercises.[11,12] Recent evidence suggests that dry needling combined with eccentric exercise provides greater improvement in pain and function compared to NSAID-based treatment with exercise over 30 days.[13] In extracorporeal shockwave therapy (ESWT) and corticosteroid injections produced more sustained benefits at 3- and 6-month follow-ups compared to local massage alone[14]. Similarly, comparing mobilization with movement (MWM) and muscle energy technique (MET) found both interventions, when combined with home exercises, significantly improved pain, grip strength, and function compared to exercise alone.[15] Physiotherapy approaches such as shockwave therapy, manual therapy, and therapeutic exercises are generally effective, though further high-quality studies are warranted.[8]

Physical therapy particularly deep frictions massage, stretching, and strengthening exercises remains essential for restoring flexibility and strength while preventing recurrence. However, few studies have directly compared their relative effectiveness. The present study aims to evaluate the outcomes of deep friction massage versus stretching and strengthening exercises in managing lateral epicondylitis.

Methods

This prospective intervention study was conducted from July 2018 to June 2019 at the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. Patients aged 20–80 years diagnosed with lateral epicondylitis, experiencing pain for more than one month, tenderness over the lateral epicondyle, and pain on resisted wrist extension were included. Exclusion criteria were systemic illnesses, infection, malignancy, cervical radiculopathy, polyarthritis, or concomitant enthesitis at other sites.

A total of 60 patients were purposively selected and randomly allocated into two groups. Group A (n= 30) received stretching and strengthening exercises for forearm extensors, ultrasonic therapy, wrist splinting, and activity modification guidance. Stretching exercises included wrist extensor stretch, reverse prayer stretch, and thumb stretch, performed twice daily for five repetitions. Strengthening exercises included finger extension with a rubber band, ball squeeze, and wrist extension/flexion with 1 lb weight, three sessions per week. Group B (n= 30) received deep transverse friction massage (5 minutes over the lateral epicondyle), ultrasonic therapy, wrist splinting, and activity modification guidance, also three sessions per week for six weeks. All participants received Naproxen 250 mg twice daily with Omeprazole 20 mg for two weeks.

Outcome measures included pain assessed by Visual Analogue Scale (VAS), wrist range of motion (ROM) measured with a universal goniometer, and grip strength using a sphygmomanometer. Assessments were performed at baseline, 2nd, 4th, and 6th weeks. Data were collected through structured questionnaires covering demographics, clinical history, and treatment outcomes.

Data were coded, tabulated, and analyzed using SPSS version 26. Descriptive statistics (mean, SD, percentages) summarized the data. Between-group comparisons were conducted using Chi-square and independent t-tests, while repeated measures ANOVA assessed changes over time. A p-value <0.05 at a 95% confidence interval was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Review Board of BSMMU, Dhaka, Bangladesh (Reference: BSMMU/2017/12638), and written informed consent was obtained from all participants. All procedures were conducted in accordance with the principles of the Declaration of Helsinki (2013).

Results

The comparison of baseline characteristics between Group A and Group B (Table I) revealed no statistically significant differences. The mean age of participants was 43.73±13.62 years in Group A and 40.83±11.03 years in Group B (p= 0.349). Gender distribution was also comparable, with 60.0% males and 40.0% females in Group A, and 46.4% males and 53.6% females in Group B (p= 0.450).

Both treatment groups demonstrated significant reductions in VAS scores after six weeks (Table II). In Group A, pain scores decreased from 7.27±0.69 to 1.47±0.51, while Group B showed a reduction from 7.30±0.65 to 2.27±0.58. The improvements in both groups were statistically significant (p<0.001), confirming the effectiveness of each intervention in reducing pain.

Between-group comparisons of VAS scores over time (Table III) showed no difference at baseline (p=0.848). However, by the 4th week, Group A demonstrated significantly greater pain reduction (5.07±0.64) compared to Group B (5.43±0.63; p=0.029). This difference widened by the 6th week, with Group A achieving lower VAS scores (1.47±0.51) than Group B (2.27±0.58; p<0.001).

Both groups also exhibited significant improvements in wrist range of motion (ROM) after six weeks of treatment (Table IV). In Group A, wrist flexion improved from 60.3±5.25 to 73.2±4.00, and wrist extension from 42.0±5.23 to 58.0±4.39 (p<0.001). Group B showed similar improvements, with wrist flexion rising from 56.5±4.50 to

65.5±3.50 and extension from 40.5±5.45 to 52.45±4.50 (p<0.001).

Handgrip strength outcomes (Table V) demonstrated a marked improvement in Group A, increasing from 27.05±3.84 mmHg to 45.50±6.20 mmHg (p<0.001). In contrast, Group B showed a smaller increase from 26.75±3.65 mmHg to 29.10±4.05 mmHg, which was not statistically significant (p=0.082).

Table I: Comparison of Patient Profile (N=60)

Variable	Group A (n=30)	Group B (n=30)	p-value
Age (years)			
Mean ± SD	43.73±13.62	40.83±11.03	0.349
Gender			
Male	18 (60.0%)	14 (46.4%)	0.450
Female	12 (40.0%)	16 (53.6%)	

Independent samples t-test and Chi-squared test done, p<0.5 considered as a significant value

Table II: Comparison of VAS scores before and after **six weeks** treatment (N=60)

VAS score	VAS Score		*p-value*
	Pre-treatment (Mean ± SD)	Post-treatment (Mean ± SD)	
Group A	7.27±0.69	1.47±0.51	<0.001
Group B	7.30±0.65	2.27 0.58	<0.001

Paired samples t-test done, p<0.5 considered as a significant value

Table III. Comparison of VAS scores between two groups over time (N=60)

Time point	Group A (n=30) Mean ± SD	Group B (n=28) Mean ± SD	*p-value*
Baseline	7.27±0.69	7.30±0.65	0.848
4th Week	5.07±0.64	5.43±0.63	0.029
6th Week	1.47±0.51	2.27±0.58	<0.001

Independent samples t-test done, p<0.5 considered as a significant value

Table IV. Comparison of range of motion (ROM) before and after treatment (N=60)

Group	Range of motion (ROM)			*p-value*
	Movement	Pre-treatment (Mean ± SD)	Post-treatment (Mean ± SD)	
Group A	Wrist Flexion	60.3±5.25	73.2±4.00	<0.001
	Wrist Extension	42.0±5.23	58.0±4.39	<0.001
Group B	Wrist Flexion	56.5±4.50	65.5±3.50	<0.001
	Wrist Extension	40.5±5.45	52.45±4.50	<0.001

Paired samples t-test done, p<0.5 considered as a significant value

Table V. Comparison of handgrip strength between two groups (N=60)

Group	Mean Pressure (mmHg)		*p-value*
	Pre-treatment (Mean ± SD)	Post-treatment (Mean ± SD)	
Group A	27.05±3.84	45.50±6.20	<0.001
Group B	26.75±3.65	29.10±4.05	0.082

Paired samples t-test done, p<0.5 considered as a significant value

Discussion

In this study, baseline characteristics such as age and gender were comparable between Group A and Group B, indicating that both groups were demographically well matched and reducing the probability of confounding effects. Similar demographic balance has been recommended in prior clinical trials evaluating treatments for lateral epicondylitis.[16,17]

Both treatment groups demonstrated significant reductions in VAS scores after six weeks. Group A showed a decrease from 7.27±0.69 to 1.47±0.51, while Group B showed a decrease from 7.30±0.65 to 2.27±0.58 (p<0.001 for both). These results are consistent with earlier studies reporting that deep friction massage and exercise-based treatments can significantly reduce pain in lateral epicondylitis[18-20]. Between-group comparisons revealed that Group A achieved significantly greater pain reduction by the 4th and 6th weeks, indicating superior and faster pain improvement. This aligns with systematic reviews that highlight stretching and strengthening exercises particularly eccentric loading as the most effective conservative treatment modality for lateral elbow tendinopathy.[21-24]

Regarding the significant improvements in wrist range of motion the greater gains in wrist flexion and extension observed in Group A may reflect the physiological benefits of active stretching and strengthening on muscle flexibility and tendon mobility. Similar improvements in ROM following exercise-based protocols have been described in previous clinical studies.[25,26]

Handgrip strength improved markedly in Group A (27.05±3.84 to 45.50±6.20 mmHg; p<0.001), whereas improvement in Group B was modest and not statistically significant (p=0.082). Prior research supports that strengthening exercises more effectively restore grip strength compared with friction massage alone, as muscle loading promotes tendon remodeling and functional recovery.[27,28] Although deep friction massage has been shown to improve early grip strength in some trials[19], its effect is generally smaller than that achieved through structured strengthening programs.

The findings of this study indicate that both interventions are beneficial for pain and ROM improvements; however, stretching and strengthening exercises provide superior outcomes, particularly for pain relief and grip strength. This supports earlier recommendations that exercise therapy should be considered the primary conservative treatment for lateral epicondylitis, with manual therapy used as an adjunct when necessary.[29,30]

Conclusion

This study demonstrates that both deep friction massage and stretching with strengthening exercises are effective in reducing pain and improving wrist range of motion in patients with lateral epicondylitis. However, stretching and strengthening exercises were superior, providing faster and greater pain relief, larger gains in wrist flexion and extension, and significant improvement in handgrip strength compared to deep friction massage. These findings indicate that active rehabilitation involving targeted stretching and strengthening of the wrist extensor muscles is more beneficial than passive deep friction massage for the management of lateral epicondylitis.

Conflict of interest: No conflicts of interest.

Funding: Not applicable.

References

1. Solomon L, Warwick D, Nayagam S. Apley and Solomon's Concise System of Orthopaedics and Trauma. 5th Edition. CRC Press; Arnold, London. 2014:310.
2. Haker E, Lundeberg T. Pulsed ultrasound treatment in lateral epicondylalgia. Scandinavian Journal of Rehabilitation Medicine. 1991;23(3):115-8.
3. Fauci AS, Braunwald E, Isselbacher KJ, Wilson JD, Martin JB, Kasper DL, et al. Harrison's Principles of Internal Medicine. 14th Edition. New York: McGraw-Hill; 1998.
4. Kottke FJ. Krusen's Handbook of Physical Medicine and Rehabilitation. 4th Edition. Philadelphia: Saunders; 1990:329.
5. Cyriax J. Text book of Orthopedic Medicine. 8th Edition, Bailliere Tindall, 12:176.
6. Vaquero-Picado A, Barco R, Antuna SA. Lateral epicondylitis of the elbow. EFORT open reviews. 2016;1(11):391-7.
7. Whaley AL, Baker CL. Lateral epicondylitis. Clinics in sports medicine. 2004 Oct 1;23(4):677-91.
8. Landesa-Pineiro L, Leirós-Rodríguez R. Physiotherapy treatment of lateral epicondylitis: A systematic review. Journal of back and musculoskeletal rehabilitation. 2022;35(3):463-77.
9. Buchanan BK, Varacallo MA. Lateral Epicondylitis (Tennis Elbow). In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
10. Tosti R, Jennings J, Sewards JM. Lateral epicondylitis of the elbow. The American journal of medicine. 2013;126(4):357-e1.
11. Staples MP, Forbes A, Ptasznik R, Gordon J, Buchbinder R. A randomized controlled trial of extracorporeal shock wave therapy for lateral epicondylitis (tennis elbow). The journal of Rheumatology. 2008;35(10):2038-46.
12. Palmer K, Walker-Bone K, Linaker C, Reading I, Kellingray S, Coggon D, Cooper C. The Southampton examination schedule for the diagnosis of musculoskeletal disorders of the upper limb. Annals of the rheumatic diseases. 2000;59(1):5-11.
13. Sanchez-Milá Z, Abuin-Porras V, Fidalgo-Gomez H, Mínguez-Esteban I, Almazan-Polo J, Velazquez-Saornil J. Efficacy of Dry Needling Combined with Eccentric Exercise Versus Oral and Topical NSAID Treatment in Patients with Tennis Elbow: A Randomized Controlled Trial. Journal of evidence-based integrative medicine. 2025;30:2515690X251355017.
14. Cetin BV, Sepetci O, Yazar I, Kaptan AY, Orhan O, Demir M, Altay MA. Comparison of local massage, steroid injection, and extracorporeal shock wave therapy efficacy in the treatment of lateral epicondylitis. Joint Diseases and Related Surgery. 2024;35(2):386.
15. Bagcaci S, Unuvar BS, Gercek H, Ugurlu I, Sert OA, Yilmaz K. A randomized controlled trial on pain, grip strength, and functionality in lateral elbow pain: Mulligan vs muscle energy techniques. Journal of Back and Musculoskeletal Rehabilitation. 2023;36(2):419-27.
16. Coombes BK, Bisset L, Vicenzino B. Management of lateral elbow

tendinopathy: one size does not fit all. journal of orthopaedic & sports physical therapy. 2015;45(11):938-49.

17. Taylor SA, Hannafin JA. Evaluation and management of elbow tendinopathy. Sports health. 2012;4(5):384-93.
18. Stasinopoulos D, Stasinopoulos I, Pantelis M, Stasinopoulou K. Comparison of effects of a home exercise programme and a supervised exercise programme for the management of lateral elbow tendinopathy. British journal of sports medicine. 2010 ;44(8):579-83.
19. Yi R, Bratchenko WW, Tan V. Deep friction massage versus steroid injection in the treatment of lateral epicondylitis. Hand. 2018;13(1):56-9.
20. Kumar A, Sandeep K, Ramkumar SD, Ravi A, Subash Y, Ramkumar A. Efficacy of corticosteroid injection vs deep friction massage in lateral epicondylitis. International Journal of Orthopaedics Sciences. 2023;9:115-8.
21. O'Neill S, Watson PJ, Barry S. Why are eccentric exercises effective for achilles tendinopathy?. International journal of sports physical therapy. 2015;10(4):552.
22. Prudencio DA, Maffulli N, Migliorini F, Serafim TT, Nunes LF, Sanada LS, Okubo R. Eccentric exercise is more effective than other exercises in the treatment of mid-portion Achilles tendinopathy: systematic review and meta-analysis. BMC Sports Science, Medicine and Rehabilitation. 2023;15(1):9.
23. Jayaseelan DJ, Mischke JJ, Strazzulla RL. Eccentric exercise for Achilles tendinopathy: A narrative review and clinical decision-making considerations. Journal of Functional Morphology and Kinesiology. 2019 ;4(2):34.
24. Frizziero A, Vittadini F, Fusco A, Giombini A, Gasparre G, Masiero S. Efficacy of eccentric exercise for lower limb tendinopathies in athletes. Journal Of Sports Medicine and Physical Fitness. 2016;56(11):1352-8.
25. Derebery VJ, Devenport JN, Giang GM, Fogarty WT. The effects of splinting on outcomes for epicondylitis. Archives of physical medicine and rehabilitation. 2005;86(6):1081-8.
26. Altan LA, Kanat E. Conservative treatment of lateral epicondylitis: comparison of two different orthotic devices. Clinical Rheumatology. 2008;27(8):1015-9.
27. Viswas R, Ramachandran R, Korde Anantkumar P. Comparison of effectiveness of supervised exercise program and Cyriax physiotherapy in patients with tennis elbow (lateral epicondylitis): a randomized clinical trial. The scientific world journal. 2012;2012(1):939645.
28. Parmar BA, Shukla YU. Effect of eccentric versus concentric exercise on pain, grip strength and function in lateral epicondylitis-a comparative study. International Journal of Health Sciences and Research. 2020;5(2):98-109.
29. Hoogvliet P, Randsdorp MS, Dingemanse R, Koes BW, Huisstede BM. Does effectiveness of exercise therapy and mobilisation techniques offer guidance for the treatment of lateral and medial epicondylitis? A systematic review. British journal of sports medicine. 2013;47(17):1112-9.
30. Vicenzino B, Smith D, Cleland J, Bisset L. Development of a clinical prediction rule to identify initial responders to mobilisation with movement and exercise for lateral epicondylalgia. Manual therapy. 2009;14(5):550-4.