

Effectiveness of Mill's Manipulation combined with class IV high-intensity laser therapy in improving pain and rom in older women with tennis elbow: A rehabilitation approach

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Abstract

Background: Lateral epicondylitis (LE), commonly known as tennis elbow, is a degenerative tendinopathy of the common extensor origin characterized by pain, reduced grip strength, and functional disability. The condition is especially prolonged in older adults due to age-related tendon degeneration, reduced vascularity, and slower collagen turnover. Manual therapy techniques such as Mill's manipulation aim to restore tendon mobility, while Class IV high-intensity laser therapy (HILT) provides deeper photobiomodulatory effects that may accelerate tendon healing.

Objective: To evaluate the combined effects of Mill's manipulation and Class IV HILT on pain, range of motion (ROM), grip strength, and functional outcomes in an older woman diagnosed with chronic lateral epicondylitis.

Methodology: This single-case, pre–post intervention study involved a 66-year-old woman with 7-month chronic right lateral epicondylitis. The intervention included Mill's manipulation (3 sessions/week), Class IV HILT (3 sessions/week), wrist extensor stretching, progressive eccentric loading, isometric strengthening, grip training, and ergonomic retraining over four weeks. Outcome measures included the Visual Analog Scale (VAS), active wrist ROM, and grip strength assessed at baseline and week 4.

Results: After 4 weeks, the patient demonstrated substantial improvement: VAS pain reduced from 8/10 to 2/10; wrist extension improved from 35° to 70°; wrist flexion increased from 55° to 75°; and grip strength improved from 9 kg to 18 kg. Functionally, she returned to daily household tasks with minimal discomfort.

Conclusion: Combining Mill's manipulation with Class IV HILT produced meaningful short-term improvements in pain, ROM, and grip strength. The multimodal protocol appeared particularly beneficial in addressing both mechanical restrictions and biological healing limitations common in older adults. Further controlled trials are necessary to validate these findings.

Keywords: Lateral epicondylitis, Mill's Manipulation, high-intensity laser therapy, class IV laser, eccentric, physiotherapy, older women, photo biomodulation

Introduction

One of the most prevalent upper-limb tendinopathies affecting adults between the ages of 40 and 70 is lateral epicondylitis (LE). Pain over the lateral elbow and decreased function during repetitive wrist extension, lifting, and gripping tasks are its hallmarks. LE is now recognized as a degenerative tendinopathy involving failed collagen repair, neovascularization, disorganized collagen fibers, and disrupted tendon structure, despite its historical designation as an inflammatory disorder. The chronicity of symptoms in older adults is greatly increased by age-related tendon changes, such as decreased collagen synthesis, decreased fibroblast activity, and decreased vascularity (Pellegrino R, *et al.* 2022) [4].

Conservative physiotherapy remains the first-line treatment. Evidence-based management includes eccentric strengthening, stretching, grip training, and ergonomic modification. Manual therapy approaches such as Mill's manipulation or Mulligan Mobilization-With-Movement (MWM) have shown benefits in reducing pain and improving grip strength. A randomized controlled trial by (Syed *et al.* 2024) [3] demonstrated enhanced clinical outcomes when manual therapy techniques were combined with eccentric loading. Similarly, other studies highlight immediate pain modulation effects of manual mobilization through neurophysiological mechanisms.

Compared to low-level laser therapy (LLLT), class IV high-intensity laser therapy (HILT) has become more popular

because of its stronger photobiomodulation and deeper tissue penetration (Saleh MS, *et al.* 2024) [2]. HILT improves mitochondrial ATP production, stimulates fibroblast proliferation, increases microcirculation, and modulates nociceptors—mechanisms that are especially important for older degenerative tendons. Using a high-power laser in lateral epicondylitis, (Marotta *et al.* 2024) [1] showed clinically significant improvements in tendon elasticity and pain. According to other systematic reviews, HILT may be more effective than LLLT in reducing pain and improving function in the short term.

Because manual therapy provides mechanical mobilization and HILT promotes biological healing, these complementary mechanisms may result in synergistic benefits. This case study describes an integrated 4-week rehabilitation program for a 66-year-old woman with chronic LE that included Class IV HILT and Mill's manipulation.

Case Presentation

The patient was a 66-year-old retired schoolteacher who was right-handed dominant. She had been experiencing increasingly severe pain in the lateral aspect of her right elbow for the past seven months. The symptoms started out as mild discomfort during household tasks like cooking, cleaning, and lifting small utensils. They were subtle, with no obvious traumatic event. Her symptoms progressively worsened over the next few months, making it difficult for

her to perform simple daily tasks like writing, opening jars, turning doorknobs, wringing cloths, and grasping small objects. She reported feeling more pain when lifting grocery bags, doing repetitive gripping tasks, and working in the kitchen for extended periods of time. During resisted wrist extension and gripping, the pain was described as sharp; at rest, it was described as dull or aching. Night pain was also present, occasionally disturbing sleep.

Her prior medical history was unremarkable, with the exception of medication-managed, well-controlled hypertension. She denied having inflammatory arthropathies, cervical radiculopathy, upper-limb fractures, elbow pain, or recent changes in her level of physical activity. None of the self-management techniques she had tried—such as rest, over-the-counter analgesic gels, and sporadic forearm massage—produced significant or long-lasting relief.

Upon physical examination, no obvious deformity or swelling was found. The proximal wrist extensor muscles and lateral epicondyle were palpably tender. Her typical

pain was replicated by Cozen's test, Mill's test, and the resisted wrist extension test. Wrist flexion measured 55°, somewhat constrained by discomfort, and active wrist extension was restricted to 35° with pain at the end range. In comparison to her contralateral side, which measured 18 kg, her pain-free grip strength, measured with a handheld dynamometer, was significantly lower at 9 kg. Dermatomes, myotomes, and reflexes were all found to be normal in the upper limb neurological screening.

A diagnosis of chronic lateral epicondylitis (degenerative lateral elbow tendinopathy) was made based on her clinical presentation, examination results, and duration of chronic symptoms. She was deemed a suitable candidate for a multimodal physiotherapy intervention that included Class IV high-intensity laser therapy (HILT), Mill's manipulation, therapeutic exercises, and ergonomic adjustments due to her age-related tendon changes, diminished healing capacity, and functional limitations.

Physiotherapy Management

Table 1: Physiotherapy plan

Modality / Exercise	Frequency	Intensity	Time	Types
Class IV High-Intensity Laser Therapy (HILT)	3 sessions/week	Device-dependent (typically 8–12 J/cm ²)	8–10 minutes per session	Deep photo biomodulation targeting lateral epicondyle & extensor mass
Mill's Manipulation	3 sessions/week	3–4 repetitions, controlled end-range force	5–7 minutes per session	Manual therapy: traction + elbow extension + wrist flexion + pronation to mobilize tendon adhesions
Isometric Wrist Extensor Strengthening	Daily	6–8 second holds; pain-free	3 sets × 10 reps	Tendon loading initiation to reduce pain & improve tolerance
Eccentric Wrist Extensor Loading	Daily	Light dumbbell or TheraBand; progressive resistance	3 sets × 12 reps	Evidence-based tendon remodelling exercise
Grip Strengthening	Alternate days	Soft ball or hand grip device	3 sets × 15 reps	Improves functional gripping ability

Exercises



Fig 1: Class IV (HILT)



Fig 2: Isometric wrist extensor strengthening



Fig 3: Eccentric Wrist flexor



Fig 4: Grip Strengthening

Results

Table 2: Measures of Results following Four Weeks of Traditional Physiotherapy

Measure	Before Treatment	After Treatment
VAS Score	8/10	2/10
Wrist Extension	35°	70°
Wrist Flexion	55°	75°
Grip Strength	9 kg	18 kg
Function	Difficulty lifting, typing, and gripping	Normal daily activity with minimal discomfort
MMT		
Wrist Extension	Grade 3 (right)	Grade 5 (right)
Wrist Flexion	Grade 3 (right)	Grade 5 (right)

Discussion

This case demonstrates that combining Mill's manipulation with Class IV HILT can significantly improve clinical outcomes in older adults with chronic lateral epicondylitis. Individually, both modalities are supported by contemporary evidence, but together they appear to address both the mechanical and biological components of chronic tendinopathy.

Manual therapy approaches such as Mill's manipulation modulate pain through neurophysiological pathways while improving tendon glide and reducing soft-tissue stiffness. A randomized controlled trial by (Syed *et al.* 2024) ^[3] reported that adding Mulligan techniques to eccentric training significantly enhanced outcomes in lateral elbow tendinopathy. Furthermore, other studies suggest that manual mobilization may facilitate immediate increases in grip strength and pain-free ROM by normalizing joint mechanics.

High-intensity laser therapy (HILT) provides deeper photobiomodulation via thermal and non-thermal mechanisms. The 2024 clinical study by (Marotta *et al.* 2024) ^[1] demonstrated significant improvements in pain, tendon elasticity, and function following HILT in LE patients. Likewise, systematic reviews—such as the 2024 Musculoskeletal Laser Review (Saleh MS, *et al.* 2024) ^[2]—report that HILT yields greater short-term improvements compared to low-level lasers.

The patient's age is the most crucial factor in this situation. The fibroblast response is slower and tendon vascularity is reduced in older adults. Because of its special ability to promote microcirculation, collagen synthesis, and mitochondrial activity, HILT may be able to overcome biological constraints associated with aging. The combined effect of progressive loading and manual therapy may be better than either intervention alone (Arroyo-Fernández R, *et al.* 2023) ^[8].

Limitations include the uncontrolled design, potential placebo effects, and the inability to separate the contribution of each modality, even though the current case exhibits encouraging improvements. However, the results of the treatment are consistent with current research that supports multimodal physiotherapy for chronic lateral epicondylitis.

Conclusion

For the treatment of chronic lateral epicondylitis in older women, this case supports the use of a combined rehabilitation program that includes Class IV HILT and Mill's manipulation. The patient showed notable improvements in wrist range of motion, nearly doubled grip strength, and significant pain reductions over the course of four weeks, all of which improved performance in day-to-day activities. The combination of HILT and manual therapy probably helps older adults achieve the biological and mechanical changes required for successful tendon healing.

Pain was lessened, joint extensibility was increased, and the tendon was ready for efficient loading thanks to Mill's manipulation. By enhancing microcirculation and encouraging cellular regeneration in degenerated tendon fibres, Class IV HILT improved tissue repair. Functional recovery was further aided by eccentric loading and ergonomic retraining.

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