

## ECCENTRIC EXERCISE IN TENNIS ELBOW – AN EVIDENCE BASED PRACTICE

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### **ABSTRACT**

*Tendinopathy can result from overuse and is experienced in the affected tendon as pain with activity, focal tenderness to palpation, and decreased ability to tolerate tension, which results in decreased functional strength. Research has shown that an eccentric exercise program can be effective in the treatment of tendinopathies. The earliest studied was the Achilles tendon, and subsequent studies have shown benefits using eccentric exercises on other body regions including the patellar tendon, proximal lateral elbow, and rotator cuff.*

**KEYWORDS:** Tennis elbow; eccentric exercise.

### **INTRODUCTION**

Upper limb plays an important role in everyone's daily life and hand is the effectors organ of the upper limb which supports it mechanically and allows it to adopt the optional position for any given action from the functional point of view.

Tennis elbow is characterized by pain at the lateral aspect of the elbow, commonly associated with resisted wrist or finger extension and gripping activities. Lateral epicondylitis is also known as: lateral epicondylalgia, lateral epicondylosis, Lateral epicondylitis, or tendonitis of the associated forearm extensor muscles (e.g. extensor carpi radialis brevis tendonitis). It is a condition with complex etiological and pathophysiological factor<sup>1</sup>.

The first description of symptoms indicating a painful condition in the Common Extensor Origin was given in 1873 by Runge, who called the condition writer's cramp<sup>2</sup>.

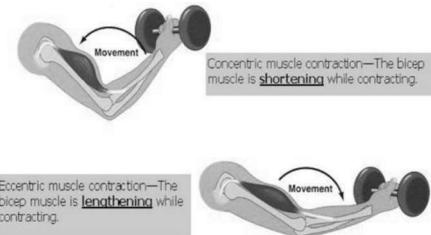
Tennis elbow is one of the most common lesions of the arm. This injury is a major challenge, as it is difficult to treat, prone to recurrence and may last for several weeks or months, with an average duration of a typical episode which has been reported to be between six months to two years<sup>3</sup>.

The dominant arm is more commonly affected and the incidence of tennis elbow in practice is approximately 4 to 7 per 1000 patients per year with the annual incidence of 1-3% in the general population which increases to 19% in 30-60 years old population specifically and appears to be more long standing and severe in women<sup>3</sup>.

Exercise program incorporating

eccentric muscle activity are becoming increasingly popular as they are considered to provide a more effective treatment than other forms of exercise therapy. Some studies proposed the used of eccentric training for promoting collagen fiber cross-linkage formation within the tendon, thereby facilitating tendon remodeling.

Eccentric muscle contractions are defined as contractions in which an active muscle is stretched. Muscles tend to shorten upon activation, eccentric contractions occur when the external forces acting on a muscle are greater than the forces produced by the muscle. Rather than working to pull a joint in the direction of the muscle contraction, the muscle acts to decelerate the joint at the end of a movement or otherwise control the repositioning of a load. (As shown in figure 1)



**Figure 1: Eccentric Muscle Contraction**

The three principles of eccentric exercises are: (i) load (resistance); (ii) speed (velocity); and (iii) frequency of contractions<sup>4</sup>.

**Load (resistance):** One of the main principles of eccentric exercises is increasing the load (resistance) on the tendon. Increasing the load clearly subjects the tendon to greater stress and forms the basis for the progression of the program. Indeed, this principle of progressive overloading forms the basis of all physical training programs. Therapists believe that the load of eccentric exercises should be increased

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according to the patient's symptoms; otherwise the possibility of re-injury is high<sup>4</sup>.

**Speed (velocity):** Another basic principle of successful eccentric exercises is the speed (velocity) of contractions. The speed of eccentric training should be increased in every treatment session, thus increasing the load on the tendon to better simulate the mechanism of injury, which usually occurs at relatively high velocities. However, other therapists claim that eccentric contractions should be performed at a slow velocity to avoid the possibility of re-injury<sup>4</sup>.

**Frequency of contractions:** The third principle of eccentric exercises is the frequency of contractions. Sets and repetitions can vary in the literature, but therapists claim that three sets of ten repetitions, with the elbow in full extension, forearm in pronation and with the arm supported, can normally be performed without overloading the injured tendon, as determined by the patient's tolerance<sup>4</sup>.

Many eccentric exercise are available for tennis elbow like wrist Flexion & Extension Exercise (as shown in figure 2), Ball Squeeze Exercise (as shown in figure 3),Flex Bar

Exercise (as shown in figure 4),Wrist curls Exercise(as shown in figure 5),Supination Pronation With Weight Exercise (as shown in figure 6),Wrist Extension With Broom Handle Exercise(as shown in figure 7),Radial Deviation With Weight Exercise(as shown in figure 8).



Figure 2: Wrist Flexion & Extension



Figure 3: Ball Squeeze Exercise



Figure 4: Flex Bar Exercise



Figure 5: Wrist Curls Exercise

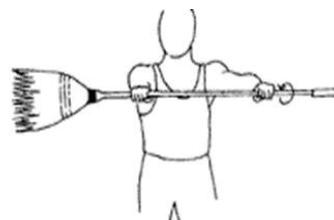


Figure 7: Wrist Extension with Broom Handle

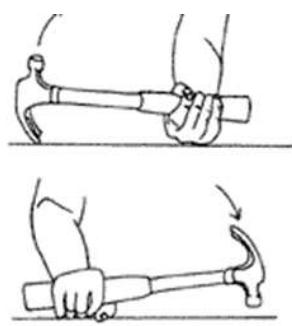


Figure 6: Supination & Pronation Exercise



Figure 8: Radial Deviation with Weight Exercise

## METHODOLOGY

Proponents of an evidence-based approach define evidence very broadly as any empirical observation about the apparent relation between events. Thus, sources of evidence can range from unsystematic clinical observations of individual clinicians to systematic reviews of multiple randomized clinical trials (RCT).

The different forms of evidence may each provide recommendations that result in good outcomes for patients, but it is clear that some forms of evidence are more reliable than others in giving guidance to clinicians and their patients.

Organizations and authors have used various systems to grade the levels of evidence and strength of recommendations, Oxford Centre

## DISCUSSION

### LEVEL OF EVIDENCE

No	Author	Title of study	Review of articles	Type of study	Level of evidence
1	Frances L Cullinane et al.,(2014)	Is eccentric exercise an effective treatment for lateral epicondylitis?	Eccentric exercise as part of a multimodal therapy programme for improved outcomes in patients with lateral epicondylitis.	Systematic review	Level -1- Systemic review of RCT of study that substantially agree
2	Miguel Ortega-Castillo et al.(2014)	Evaluate the Effectiveness of the Eccentric Training in Symptomatic Upper Limb Tendinopathies	Eccentric training may reduce pain and improve strength in upper limb tendinopathies.	Systematic review	Level -1- Systemic review of RCT of study that substantially agree
3	Bryan Murtaugh et al., (2013)	Eccentric Training for the Treatment of Tendinopathies	Eccentric exercises have been shown to be effective in the treatment of tendinopathies at various locations of the body	Systematic review	Level -1- Systemic review of RCT of study that substantially agree
4	Dennis Wen et al;(2011)	Eccentric Strengthening for Chronic Lateral Epicondylitis.	No effective result	Randomized Study	Level -2- Individual RCT with narrow confidence window Observational study with dramatic effect
5	Timothy Tyler et al;(2010)	Addition of isolated wrist extensor eccentric exercise to standard treatment for chronic lateral epicondylitis	Markedly improved with the addition of an eccentric wrist extensor exercise to standard physical therapy	Randomized Study	Level -2- Individual RCT with narrow confidence window Observational study with dramatic effect

In 2014, Frances L Cullinane et al., did a systemic review on Is eccentric exercise an effective treatment for lateral epicondylitis? To establish the effectiveness of eccentric exercise as a treatment intervention for lateral epicondylitis. Studies were included incorporated eccentric exercise, either in isolation or as part of a multimodal treatment protocol, assessed at least one functional or disability outcome measure, and the patients had undergone diagnostic testing. This study concluded that the majority of consistent findings support the inclusion of eccentric exercise as part of a multimodal therapy program for improved outcomes in patients with lateral epicondylitis.<sup>6</sup>

In 2014, Miguel Ortega-Castillo et al., did a systematic, critical review of the literature to find out the Effectiveness of the Eccentric Training in Symptomatic Upper Limb

for Evidence-based Medicine Grades of Recommendations as well as the GRADE system of recommendations<sup>5</sup>.

### Level of evidence for treatment effectiveness<sup>5</sup>

Level-1	Systemic review of RCT of study that substantially agree.
Level-2	Individual RCT with narrow confidence window Observational study with dramatic effect
Level-3	Nonrandomized controlled cohort study
Level-4	Case control, case series, or historically studies
Level-5	Mechanism-based reasoning

The articles were taken from Clinical Rehabilitation Journal, Yoga & Physical Therapy Journal, the American College of Sports Medicine, Sports Physical Therapy Journal, Journal of Shoulder and Elbow Surgery Board of Trustees, Br J Sports Med.

Tendinopathies. After selection 12 studies satisfied the eligibility criteria. In 11 studies, pain decreased significantly with eccentric exercise. Strength was assessed in 9 studies; within-group evaluations show that strength significantly improved in the eccentric-group in 7 studies, whereas inter-group changes were only significantly better in the eccentric-group in 3 studies for all the parameters and in 2 studies for some of the parameters and concluded that eccentric training may reduce pain and improve strength in upper limb tendinopathies<sup>7</sup>.

In 2013, Bryan Murtaugh et al., conducted review study on Eccentric Training for the Treatment of Tendinopathies. This study concluded that Eccentric exercises have been shown to be effective in the treatment of tendinopathies at various locations of the body<sup>8</sup>.

In 2011, Dennis Y. Wen et al., did a prospective randomized study on Eccentric Strengthening for Chronic Lateral Epicondylitis to compare a wrist extensor eccentric strengthening exercise program with a wrist extensor stretching/modality program for the treatment of chronic lateral epicondylitis on 28 adult subjects with chronic lateral epicondylitis. Pain scores with visual analog scale from 0 to 100 were obtained at baseline and then at 4, 8, 12, 16, and 20 weeks after the start of the exercise program. This study concluded that despite previous reports documenting favorable results with eccentric exercises for other tendinopathy, the authors were unable to show any statistical advantage to eccentric exercises for lateral epicondylitis during these periods compared with local modalities and stretching exercises.<sup>9</sup>

In 2010, Timothy F. Tyler et al., did a prospective randomized trial on Addition of isolated wrist extensor eccentric exercise to standard treatment for chronic lateral epicondylitis on Twenty-one patients with chronic unilateral lateral epicondylitis were randomized into an eccentric training group and a Standard Treatment Group. DASH questionnaire, VAS, tenderness measurement, and wrist and middle finger extension were recorded at baseline and after the treatment period and then concluded that all outcome measures for chronic lateral epicondylitis were markedly improved with the addition of an eccentric wrist extensor exercise to standard physical therapy<sup>10</sup>.

## CONCLUSION FROM EVIDENCES

Eccentric exercise have been shown that the effective in the treatment of tennis elbow along with the other conventional treatment. Also reduce the chance of the re-occurrence of condition because in eccentric exercise muscle get strengthen.

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## CONFLICT OF INTEREST

There was no personal or institutional conflict of interest for this study.

## SOURCE OF FUNDING

No fund was needed.

## ETHICAL CLEARANCE

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