

# The Benefits of Ultrasound, Eccentric Exercise, and Neuromuscular Taping in Reducing Elbow Pain Caused by Tennis Elbow

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## Abstract

Tennis elbow, commonly known as lateral epicondylitis, is a problem in the tendons around the elbow, which act as a driving force for the extensor muscles of the hand. Apart from tennis players, this case also often occurs in workers who use heavy equipment or perform repetitive and excessive gripping tasks, lifting, or circular arms movements. Tennis elbow is a prevalent thing for patients who seek medical help because of pain in the elbow. Tennis elbow is caused by muscle contractions in the elbow joint that occur repeatedly in sports activities such as playing badminton, doing daily activities, or other work, which gives repeated loads to the forearm muscles resulting in the appearance of pain on the outside of the elbow. This case study aims to discover the benefits of providing physiotherapy interventions in the form of Ultrasound (US), Eccentric Exercise, and Neuromuscular Taping in conditions of elbow pain due to tennis elbow. The research method used is a case study. The respondent in the study was a 23-year-old patient who was a badminton player at the Badminton UKM Muhammadiyah University of Surakarta. This research was conducted six times for two weeks. Patients were evaluated using the Visual Analogue Scale (VAS). The results of physiotherapy intervention in the form of Ultrasound (US), Eccentric Exercise and Neuromuscular Taping showed a decrease in tenderness in the lateral epicondyle of the right elbow joint from 7 VAS to 3 VAS and movement pain from 7 VAS to 2 VAS. In conclusion, by providing physiotherapeutic interventions in the form of Ultrasound (US), Eccentric Exercise, and Neuromuscular Taping, there are benefits in reducing pain on the outside of the elbow against the condition of the tennis elbow.

**Keywords:** *Tennis Elbow, Ultrasound, Eccentric Exercise, NMT.*



## A. INTRODUCTION

Basically, in everyday life, humans cannot be separated from all activities that use the whole body, both when doing activities and when working. Especially the hands are a part of the body that is often used both in activities and at work. The hands have a very complex role in the body's movement system. Many jobs and daily activities depend heavily on hand skills, such as athletes, painters, construction workers and housewives. Involvement of musculoskeletal problems in the arm or elbow area, one of the most common problems is a condition known as "Tennis Elbow".

Lateral Epicondylosis (LE) was first identified by the German physician Runge in 1873 as writer's cramp or tennis elbow. Although the etiology is not clearly known, Cyriax identified 26 possible mechanisms and grouped them into neuro-irritative processes, recurrent pain, and tendon injury (Yurdakul, 2018).

Tennis elbow (TE) is the most common cause of lateral elbow pain. The TE designation is not completely appropriate for such conditions, but is still widely used.

Only 50% of all tennis players will have a TE episode during their career, but playing tennis only contributes to 5% of all cases (Eygendaal, 2018).

The exact etiology of LE has not been well identified. However, it is commonly associated with repetitive microtrauma from excessive grip or wrist extension, radial deviation, and/or forearm supination. The extensor carpi radialis brevis (ECRB) is a muscle that is often injured. The pronator and other extensor carpal muscles are also frequently affected. In addition to excessive mechanical force factors, the unique origin of the ECRB on the lateral aspect of the capitellum places the tendon at risk of recurrent lower surface abrasion during elbow extension and flexion. LE was initially considered an inflammatory process, especially in the early phase. Repeated microtrauma due to overuse or overuse can cause collagen fibril rupture and activation of the innate immune system (Ma & Wang, 2020).

Tennis elbow is common in the general population with a prevalence of 1% to 3%, and is associated with patients of working age, from 20 to 65 years, with a peak incidence between 40 and 50 years. The incidence of TE does not appear to depend on gender or ethnic background. Among working populations, the incidence in prospective studies varies between 0.9 and 4.9 per 100 years of work. The social impact is high due to absence from work and use of health care.<sup>3</sup> The three sectors with the highest incidence of TE classified as occupational diseases are construction, manufacturing industry, and wholesale/retail (Eygendaal, 2018).

The incidence of tennis elbow throughout the world varies between 1% and 3% of the population, with an average age ranging from 35 to 54 years (Landesa-Martínez & Leirós-Rodríguez, 2021). In America, cases of tennis elbow reach 3.4 per 1000 population per year, in men with an average age of 40-49 years and in women with an average age of 50 to 59 years (Degen et al., 2018). In the UK, cases of tennis elbow reach 2.45 per 1000 population per year, with the most age range of sufferers ranging from 40 to 60 years (Bateman et al., 2019). Meanwhile, in Indonesia itself, cases of tennis elbow occur more frequently at ages ranging from 26 to 40 years, with a proportion of around 80% of sufferers, that is, it tends to be more common in women, around 60%, while in men it is around 40% (Herliyana et al., 2021).

Tennis elbow is a disorder of joint mobility, muscle performance, impaired joint range of motion which is associated with inflammation of the tendonosis of the wrist extensor tendon which attaches to the lateral epicondyle so that it can cause pain and disability. As many as 40% of people experience tennis elbow, on average it occurs in men and women aged 35 to 54 years. Apart from that, around 50% of tennis players also experience pain in the elbow with 75-80% of them being the result of tennis elbow. Many tennis players experience tennis elbow because of the twisting and repetitive movements that often occur in this sport (Nazihah, Z 2022).

In tennis elbow, the extensor carpi radialis brevis (ECRB) tendon is involved in more than 95% of all cases. Sometimes the extensor digitorum, extensor digiti minimi, and extensor carpi ulnaris are also involved. In most cases, tennis elbow is a self-limiting condition; 80% recover within six months and 90% recover after one year with a wait-and-see policy and avoidance of aggravating activities. In the long term, the

natural course of tennis elbow is not fully known, but the symptoms are (Eygendaal, 2018).

Neuromuscular Tapping (NMT) is a technique that uses an elastic plaster that is placed on the surface of the skin to provide a therapeutic effect in certain areas or directly. When placed correctly, it can minimize pain sensations and facilitate lymphatic drainage through folds in the skin area. The mechanism of action of NMT is that the skin receives many stimuli (mechanical, heat and pain), which are activated by mechanisms that activate specific receptors (mechanoreceptors, proprioceptors, thermoreceptors and nociceptors). When pain and a mechanical stimulus (such as a neuromuscular tapping mechanism) are transmitted simultaneously, pain transmission will be reduced due to the excitation mechanism of the A-delta fibers. It is hypothesized that this will inhibit the body's sending of pain signals so that the patient feels comfortable (Sudjatmoko, 2021).

Eccentric contraction is a type of dynamic muscle contraction, caused by the movement of joints and body segments, while the muscle contracts and relaxes the muscle in a tense state. Giving eccentric exercises can be used to minimize pain in tennis elbow by providing progressive exercises in the area where the extensor carpi radialis brevis (ECRB) muscle is located. This encourages dense collagen production in the injured area, which in turn reduces pain (Fauzi et al., 2014).

The use of ultrasound (US) has the effect of reducing pain sensations by increasing local blood flow through the heat effect generated by ultrasound. Ultrasound (US) is a sound or sound wave that involves mechanical vibrations and has a longitudinal wave form. These waves propagate through a certain medium with various frequencies. The heat effect of ultrasound helps reduce the inflammatory process that occurs (Fauzi et al., 2014).

## **B. METHOD**

This research was designed to use physiotherapy interventions using Ultrasound (US), Eccentric Exercise and Neuromuscular Tapping (NMT). A 23 year old woman complained of pain on the outside of the elbow when the patient lifted weights and was disturbed when the patient did other activities, then the patient had a hobby of exercising, especially badminton, the patient played badminton almost every day. In March, while playing badminton, Ms. L suddenly felt pain on the outside of her elbow, then Ms. L did a cold compress but the pain only subsided for a few moments. The aim is to reduce the intensity of pain in patients, as well as help increase muscle mass and optimize functional activities.

A basic physical examination includes measuring vital signs, visually (inspection) and tactilely (palpation). Based on the results obtained, in the form of a static inspection, Ms. L's elbow looked normal between the right and left, then a dynamic inspection, Ms. and there is spasm in the muscles in the elbow.

The results of measuring vital signs show normal conditions in all components including blood pressure, respiratory rate, respiratory rate, heart rate and temperature. Then physiotherapy provides specific measurements to diagnose tennis

elbow using the Mill's test and Cozen test methods. The results of both specific examinations showed positive results with pain in the lateral epicondyle of the humerus.

Basic movement measurements are carried out by measuring passive movement, active movement and resistance. Active movement measurements by actively flexing and extending the elbow and supinating and pronation the patient can do this with minimal pain. Examination of the detainee showed that he was able to do this and was accompanied by pain. Measuring the level of pain is done using the Visual Analogue Scale (VAS). This instrument will give the patient the opportunity to express the recommended level of pain which consists of movement pain, silent pain and tenderness.

### C. RESULT AND DISCUSSION

From the results of the pain evaluation using the Visual Analogue Scale (VAS), the following results were obtained: at meetings 1 to 3, the results were pressure pain with a value of 7, silent pain with a result of 0 and movement pain with a result of 7, then at the 4th meeting there began to be a decrease Pain values, with a pressure pain value of 7, silent pain 0, movement pain 5 and at the last meeting, pain values, pressure pain 3, silent pain 0, and movement pain 2.

The use of ultrasound has led to a reduction in pain by sending waves into the body. When these waves penetrate the tissue with the frequency of the ultrasound machine, it causes stretching of the tissue and creates changes in pressure within it. Changes in pressure trigger a mechanical response or what is often called "micro massage," which produces a feeling of heat in the tissue. This effect in turn improves blood circulation, results in muscle relaxation, and minimizes pain.

By doing eccentric exercises, pain can be seen to decrease. This decrease is caused by the fact that eccentric exercise reduces muscle acceleration, which plays a role in maintaining and absorbing pressure during activities with high muscle loads. So, the risk of injury is reduced.

Giving neuromuscular taping has a positive effect in reducing pain because it optimizes the blood circulation system and lymph glands in the body, reduces excess heat, and restores tissue. This therapy is also able to reduce inflammation and reduce the sensitivity of pain receptors. Neuromuscular tapping is a biomechanical therapy method that focuses on the principle of stimulation through release (decompression) or pressure (compression) which has a positive impact on the musculoskeletal, neurological, blood vessel and lymphatic systems.

Neuromuscular taping applies the principle of decompression which results in folds or wrinkles in the area where the NMT is placed, this results in an open gap between the skin and the underlying tissue. With this gap, blood flow becomes smoother and lymphatic circulation increases, which ultimately reduces pain. By reducing pain in the lateral humeral epicondyle from ultrasound, eccentric exercise and neuromuscular taping, it can restore and improve functional ability and movement in the elbow joint.

In this research case, the diagnosis was tennis elbow and physiotherapy problems in the form of tenderness and movement on the outside of the right elbow. The results of the patient's elbow and wrist joint range of motion were normal LGS and there was tenderness in the epicondyle and movement pain when lifting weights and resisting resistance, after being given physiotherapy treatment 6 times in 2 weeks using ultrasound, eccentric exercise and neuromuscular modalities. taping.

Physiotherapy is carried out on patients as long as the patient carries out all the therapy. Patients visit the physiotherapy clinic with the aim of carrying out therapy. The interventions used aim to reduce the sensation of pain they feel, increase the patient's sensory response, strengthen muscle strength, and optimize the patient's functional abilities.

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This results in a reduction in pain by administering ultrasound. When the ultrasound waves penetrate the tissue, stretching occurs according to the frequency of the ultrasound, then in the tissue it produces changes in pressure. This variation creates a mechanical effect often called "micro massage" which causes a feeling of heat in the tissue, which will improve blood circulation, relax muscles, and minimize pain.

Then giving eccentric exercise resulted in reduced pain, this is because eccentric exercise can reduce muscle acceleration. This allows the muscles to function to withstand and absorb pressure during activities with pressure on the muscles, thereby reducing the risk of injury.

Giving neuromuscular taping (NMT) has the effect of reducing pain because it improves blood flow and lymph glands by overcoming blockages in body fluids. Apart from that, neuromuscular taping can help reduce excess heat and restore tissue homeostasis, reducing inflammation and hypersensitivity of pain receptors. Neuromuscular taping (NMT) is a biomechanical therapy method with the principle of compression and decompression which will achieve a positive impact on the musculoskeletal system, neurology, blood vessels and lymphatic system. Then this method can also influence joint movement (arthrokinematics), as well as reactions in the muscles and the mechanical condition of the fascia and receptors, then changes can be found in the muscle's ability and its effect on the joints.

Neuromuscular taping, using the decompression method, will cause folds (wrinkles) at the place where the NMT is placed, resulting in an open cavity between the skin and tissue. By opening the cavity, it increases blood flow and optimizes lymphatics and reduces pain. By reducing pain in the lateral humeral epicondyle from ultrasound, eccentric exercise and neuromuscular taping, it can restore and improve functional ability and movement at the elbow joint.

## D. CONCLUSION

Research based on this case study shows that the benefits of ultrasound (US), eccentric exercise, and neuromuscular taping (NMT) interventions in reducing elbow pain due to tennis elbow can reduce the pain in the elbow that patients complain about.

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