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# Assessment and Management of Lateral Elbow Tendinopathy: A Single Case Study

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## *Abstract*

Lateral Elbow Tendinopathy (LET) leads to functional disability and is a challenging pathology to manage. The objective of this study is to present how the LET of a male patient was managed by myself in clinical practice. A 55-year-old male hunter developed LET on his left elbow two months prior, after holding a gun for five hours during a hunting trip. The patient complained of lateral elbow and forearm pain, pain that intensified upon palpation, shoulder flexion-extension, wrist dorsiflexion and hand grip. The objective assessment showed clear neurological examination and radial nerve neurodynamic test, restricted shoulder and wrist range of motion (ROM), and positive Maudsley's and Mill's special tests. The treatment plan focused on pain control, tendon healing, muscle flexibility, progressive strengthening of wrist and elbow muscles and tolerance increase of the tendon. Different modalities were used, with emphasis given on a combination of different types of exercise. The patient attended 15 sessions in 5 weeks. Considerable progress was made by the end of week 5. From the patient assessment, the derived diagnosis was left LET, and the rehabilitation plan which was evidence-based, proved to be effective.

***Keywords:*** *Lateral Elbow Tendinopathy; Physiotherapy; Exercise; Pain*

## *Introduction*

Lateral elbow tendinopathy (LET) or tennis elbow is one of the most common musculoskeletal conditions that affects the arm (Aslam et al., 2021). LET is an overuse injury of the tendon origin of the forearm extensor muscles, with the extensor carpi radialis brevis muscle being most frequently involved (Singh et al., 2022; Paraskevopoulos et al. 2023). This injury is characterised by disorganisation of collagen fibers due to a failed tendon healing response (surplus of fibroblasts and blood vessels) leading to degenerative changes of the tendon and eventually microscopic partial tears (Landesa-Piñeiro and Leirós-Rodríguez, 2021; Singh et al., 2022; Paraskevopoulos et al., 2024). Its cause can be non-specific, but it's usually correlated to work and sport related overuse of the elbow, and specifically, jobs and sports that require repetitive functional tasks such as strong gripping, forearm rotations or handling heavy loads (Bateman et al., 2018; Yan et al., 2019). The pathology's main symptoms are elbow pain related to activity, that can also radiate on the forearm, morning stiffness and decreased grip strength (Singh et al., 2022). The pain is usually localised over the lateral epicondyle, and it's reproduced with contraction of wrist extensor muscles, resisted wrist dorsiflexion or wrist gripping (Yan et al., 2019).

The rehabilitation process of LET is challenging, due to persistent symptoms that can last up to 2 years, and high probability of recurrence (Landesa-Piñeiro and Leirós-Rodríguez 2021; Aslam et al., 2021). Its prevalence in the general population is 1-3% (Yan et al., 2019). However, the prevalence rises to 19% for people between 30 and 60 years old (Singh et al., 2022). LET is a functional disability, because it affects people's ability to work, costing the UK economy £27 million in 2012 (Bateman et al., 2022). Its severity and persistence are higher in female than male patients (Maurya and Mhase, 2018). Concerning tennis players, LET appears in 50% of them, however they only consist of 10% of the total patient population (De Smedt et al., 2007).

## *Case Study Presentation*

### Patient Profile and Subjective Assessment

A 55-year-old male patient visited the physiotherapy center, complaining of left elbow pain. The patient mentioned hunting as occupation. He had visited the center in the past for physiotherapy sessions to treat a calcific tendinopathy on his right shoulder. However, no previous episodes of elbow pain were reported. He provided no imaging exams. The pain was present on the lateral aspect of the left elbow and was radiating a bit on the proximal forearm. The patient's self-palpation was localised over the lateral epicondyle and was generating pain with the slightest touch. He also demonstrated that elbow flexion-extension, wrist dorsiflexion and hand grip movements were initiating the pain. However, no cervical, upper thoracic and hand pain, or sensory symptoms such as pins and needles, were indicated.

The lateral elbow pain originated two months before, after a hunting trip. It was his first hunting trip after a long lay-off. The patient described that he spent five hours holding his hunting gun with no breaks, with his elbows in 90º flexion. He visited the doctor and was administered a cortisone injection that provided pain relief. The patient thought that his elbow was healed and went on a second hunting trip. A second cortisone injection however didn't alleviate the pain, but made it worse, as the patient described. Patients pain severity and irritability were high, with the patients reporting 8/10 pain based on the VAS scale, and pain aggravated with the slightest touch and movement. Finally, he mentioned that he had minimised the use of his left arm, affecting activities of daily life (ADLs), while his sleep had not been affected.

### Physical Examination and Diagnosis

Concerning the objective assessment, the first things that were noticed through observation, was the patient's protective posture and painful facial expressions, before detecting the presence of bruising over the lateral epicondyle of the humerus. The pain was reproduced with slight palpation and passive and active ROM of elbow flexion-extension and supination, hand grip and resisted wrist dorsiflexion. Wrist extensor muscles were tight. Then we performed a series of special tests (Appendix 1) to examine shoulder structures and to validate the diagnosing hypothesis. Despite the patient mentioning that he wasn't experiencing any neurological symptoms, we performed a neurological examination of the upper limbs (sensory, strength, reflexes) and the ULTT 2b Radial nerve neurodynamic test to exclude potential involvement of the radial nerve, and to differentiate between LET or Radial Tunnel Syndrome (RTS), since proximal forearm pain was mentioned (Coombes et al., 2015). Both pathologies can cause forearm pain, with RTS pain region being 3-5cm distal to the lateral epicondyle (Levina and Dantuluri, 2017). Compression on that region didn't reproduce the patient's pain. Additionally, the shoulders lateral collateral ligament stability was tested with the varus stress test. Finally, the special tests for LET were performed: The Maudsley's test, The Cozen's test and the Mill's Test. The results of the examination and special tests are presented on Table 1 below:

Table 1: The results of the examination and special tests.

| TESTS | RESULTS |
|---|---|
| Neurological examination | Negative |
| ULTT 2b | Negative |
| Compression of RTS pain region | Negative |
| Elbow Varus Stress Test | Negative |
| Maudsley's test | Positive |
| Cozen's test | Not clear |
| Mill's test | Positive |

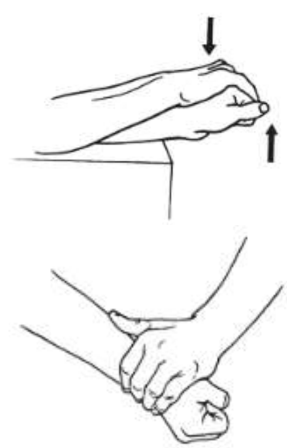
From the information acquired from the subjective and objective assessments, the initial hypothesis was confirmed. After excluding a neural component due to lack of sensory symptoms and negative neurological and neurodynamic examination, we derived the conclusion that the pain had a mechanical origin and that it was a case of LET.

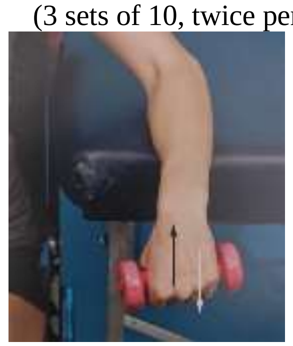
**Treatment**

After the diagnosis, we performed research and created a five-week progressive rehabilitation plan for the patient. Due to the high pain severity, the plan for the first week was conservative, aiming for pain control. The rehabilitation plan is presented in Table 2 below:

Table 2: The rehabilitation plan that was followed for the LET patient (Brukner and Khan., 2017; Day et al., 2019; Fousekis, 2015).

| WEEK | GOALS | TREATMENT METHODS | HOME INSTRUCTIONS |
|---|---|---|---|
| 1 | • Manage/Decrease pain.<br>• Collagen fiber re-alignment.<br>• Collagen synthesis.<br>• Increase of fibroblasts. | • Cryotherapy<br>• TENS<br>• Laser therapy<br>• TECAR therapy<br>• Myofascial release of wrist extensor muscles (10 minutes).<br><br>Figure 1: Myofascial release of wrist extensor muscles (Brukner and Khan, 2017).<br>• Cyriax/Deep transverse friction massage of painful tendon (2 minutes | • Rest<br>• Stop hunting activity.<br>• Ice |

| | | | |
|---|---|---|---|
| | | of massage with 1-minute breaks up to 12-15 minutes total).<br><br>Figure 2: Deep friction massage of wrist extensor muscles tendon (Fousekis, 2015). | |
| 2+3 | Same goals as week 1 plus:<br>• Increase muscle flexibility.<br>• Neuromuscular reeducation of wrist extensors. | Same treatment methods as week 1 plus:<br>• Wrist extensor muscles stretches.<br><br>Figure 3: Wrist extensors stretching (Brukner and Khan, 2017).<br>• Electrical Muscle Stimulation (EMS)<br>• Shockwave therapy.<br>• Isometric exercises for wrist extensors and elbow supinators.<br>• Slow unresisted wrist dorsiflexion's simultaneous with TECAR therapy.<br>• Week 3 introduced eccentric exercises for wrist extensors (Flex Bar). | • Wrist extensor muscles stretches (3 sets of 30 seconds hold, with 2 minutes break, twice per day).<br><br>Figure 5: Wrist extensors self-stretching (Fousekis, 2015).<br>• Isometric exercises for wrist extensors and elbow supinators with self-resistance or weight holds (3 sets of 10, twice per day, 30-60 seconds hold).<br><br>Figure 6: Self isometric exercises for wrist extensors and elbow supinators (https://ahc.aurorahealthcare.org/fywb/baycar |

| | | | |
|---|---|---|---|
| | | <br>Figure 4: Wrist extensors eccentric exercise using a flex bar (Fousekis, 2015). | e/x08620bc.pdf)<br><br>Figure 7: Isometric holds (Coombes et al., 2015).<br>• Ice after the exercises.<br>• Flex bar eccentric exercises from week 3 onwards (3 sets of 10, once per day). |
| 4 | Same goals as week 1-3 plus:<br>• Progressive strengthening of wrist extensors and elbow supinators.<br>• Increase tendon tolerance. | Same treatment methods as week 1-3 plus:<br>• Eccentric exercises with resistance.<br>• Concentric exercises without resistance.<br><br>Exercises took place by themselves, and with combination of TECAR therapy. | Same home exercises as week 2-3 plus:<br>• Eccentric exercises (use of weights or resistance band) → Patient helps during the concentric contraction with his other hand and then controls the eccentric contraction (3 sets of 10, twice per day).<br><br>Figure 8: Use of weight for wrist extensor eccentric exercises (Brukner and Khan, 2017), |
| 5 | Same goals as week 1-4 plus:<br>• Progressive strengthening of wrist extensors and elbow supinators.<br>• Strengthening of elbow flexors and extensors.<br>• Increase tendon tolerance. | Same treatment methods as week 1-4 plus:<br>• Resisted concentric and eccentric exercises (use of elastic bands, kettlebell).<br><br>Figure 9: Wrist extensors strengthening using a kettlebell (Fousekis, 2015). | Same home exercises as week 2-4 plus:<br>• Concentric-eccentric exercises with use of resistance elastic bands or weights (3 sets of 10, once per day).<br><br>Figure 10: Wrist extensors strengthening using a resistance band (Fousekis, 2015). |

During the fifteen sessions in five weeks, that the patient attended, the progression criteria to each next phase was the patient's feedback, and the reassessment of his shoulder condition (ROM, special tests, hand grip). In the third week, the patient reported normal ADLs, and reduction in pain from 8 to 3 on the VAS scale, which was only initiated by extreme shoulder flexion-extension and hand grip. Wrist dorsiflexion was no longer painful. By the end of week five, the patient had no pain, with restored painless elbow and wrist ROM and increased elbow and wrist muscle strength, however he required more strengthening and training with functional compound arm exercises.

## *Discussion*

The rehabilitation plan that was formed and applied for the management of the patient's LET was evidence based, following the instructions of the literature. The exercise programme created for the patient focused on isometric and isotonic training. A study has shown that a combination of eccentric-concentric and isometric training is more effective in reducing LET pain compared to solely eccentric or eccentric-concentric training programmes (Stasinopoulos and Stasinopoulos, 2017). Additionally, while isometric exercises do not appear to be superior than isotonic exercises for tendinopathies, they provide an analgesic effect and tendon strengthening, so they are efficient in the early phases of treatment (Stasinopoulos, 2022). In this case, the use of isometric exercises greatly reduced the patient's lateral elbow pain and allowed for isotonic exercises to be added to the training programme. The exercises were performed at a progressive rate, with increased difficulty, which is more beneficial than low-level exercises throughout the whole process (Ortega-Castillo et al., 2022).

A successful treatment method in this case was the Cyriax deep transverse friction massage that was performed, with the patient mentioning that it provided pain relief. This is supported by the literature, which has demonstrated that the Cyriax method reduces pain and functional disability, while increasing grip strength (Maurya and Mhase, 2018; Sarin and Michael, 2018; Singh et al., 2022). However, a treatment method that was omitted was manual therapy, in the form of mobilisations, such as the Mill's manipulation (with the elbow $90^o$ abducted and internally rotated, forearm pronated and wrist flexed, the therapist performs a high velocity thrust towards full shoulder extension) which is usually performed after Cyriax massage (Singh et al., 2022). Shoulder joint mobilisations are correlated with decreased pain and improved grip strength in LET patients and should have been used in this case (Lucado et al., 2018).

According to the available literature, there is a lack of consensus on the ideal rehabilitation protocol and training parameters for LET (Bateman et al., 2021; Coombes et al., 2015; Stasinopoulos, 2018). This is because of anatomical, biomechanical, and pathophysiological factors and the different nature of patients that develop LET (Coombes et al., 2015). This was observed in practice, where another patient with LET, of similar age with the 55-year-old patient, but different profession, that was on similar treatment plan, didn't ameliorate as fast. Studies demonstrate a variety of results concerning different modalities used for the management of LET (Coombes et al., 2015). Exercise programmes seem to yield the most efficient results, however according to Stasinopoulos (2018), exercise should be combined with other therapeutic modalities. Finally, more research is needed to determine the most effective exercise programme and to establish an optimal treatment protocol for LET (Stasinopoulos, 2018).

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## APPENDIX 1

| TEST | DESCRIPTION | PICTURE |
|---|---|---|
| ULTT 2b for radial nerve | 1. Shoulder girdle depression.<br>2. Shoulder internally rotated and abducted 20-30º.<br>3. Elbow extended.<br>4. Forearm pronated.<br>5. Wrists and fingers in flexion.<br>To provoke symptoms → contralateral neck flexion.<br><br>(Koulidis et al., 2019) | <br>Figure 11: The ULTT 2b for radial nerve test (Choi and Heo, 2021).<br><br>Figure 12: The ULTT 2b for radial test (Coombes et al., 2015). |
| Elbow Varus Stress Test | 1. Elbow 20-30º flexed and supinated.<br>2. Therapist holds the elbow to stabilize the humerus and the lateral side of the lower forearm.<br>3. Application of varus stress (adduction of forearm compared to the humerus)<br>Test is positive when pain is produced and uncontrolled varus movement is felt.<br>(Hattam and Smeatham, 2020) | <br>Figure 13: The Elbow Varus Stress Test (Hattam and Smeatham, 2020). |
| Cozen's Test | 1. The therapist stabilises the patients elbow with the thumb on the lateral epicondyle.<br>2. Elbow extended.<br>3. Forearm is pronated. | |

| | | |
|---|---|---|
| | 4. Wrist is flexed and radially deviated.<br>5. Patients makes a fist by flexing all fingers.<br>6. Therapist resists the patient's wrist extension.<br><br>Test is positive when pain is reproduced over the lateral epicondyle.<br>(Gupta et al., 2017) | <br>Figure 14: The Cozen's special test for LET (Kheiran et al., 2021). |
| Mill's Test | 1. Shoulder slightly abducted.<br>2. 90o elbow flexion.<br>3. Forearm pronated.<br>4. Wrist fully flexed.<br>Therapist slowly moves the elbow to full extension. Positive when pain is reproduced around the lateral epicondyle.<br>(Hattam and Smeatham, 2020) | <br><br>Figure 15: The Mill's special test for LET (Hattam and Smeatham, 2020). |
| Maudsley's Test | Extension of patient's middle finger against therapists' resistance.<br><br>Test is positive when pain is reproduced over the lateral epicondyle.<br><br>(Fousekis, 2015) | <br>Figure 16: The Maudsley's special test for LET (Fousekis, 2015). |