Lateral Epicondyle Tendinopathy (LET) Toolkit

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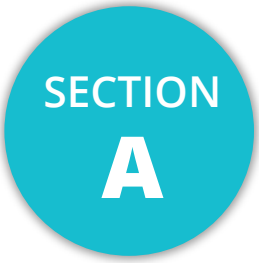
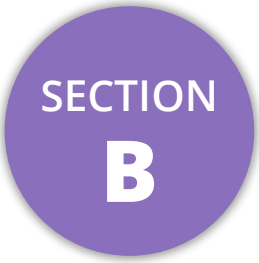


Algorithm



Clinical Assessment of LET

Outcome Measures

Summary of the Evidence

Exercise Prescription

Manual Therapy

LASER Dosage Calculation

Braces, Splints and Taping

REFERENCES

ACKNOWLEDGEMENTS

SECION A

Algorithm

Patient presents with Elbow Pain

Collect history* and perform physical assessment

Gauge acuity and severity of condition

*See Section B (Clinical Assessment)

Confirm lateral epicondyle tendinopathy

Take patient reported and/or performance-based outcome measures

*See Section C (Outcome Measures)

Baseline Treatment

Provide education, re-assurance and advice to modify aggravating activities

Demonstrate empathetic approach to circumstances such as lack of control over work-life loading demands

Begin controlled tendon loading exercise (concentric, eccentric or isometric) as tolerated, including exercises that address local and distal kinetic chain

Begin elbow joint mobilizations

Optional adjunct treatments

Consider low-level laser therapy or iontophoresis for acute lateral epicondyle tendinopathy (i.e. less than 6-week history)

Consider spinal mobilization techniques, low-level laser therapy, class IV laser therapy, extracorporeal shockwave therapy, or taping as additional treatments for chronic lateral epicondyle tendinopathy (i.e. more than 6-week history)

NOTE: Other adjunctive therapies may be considered. See 'Table of Interventions' for full list of recommendations and supporting evidence

Re-assess symptoms over 12-week period

Record changes using previously selected patient-reported or performance-based outcome measure

Symptoms improving or resolved?

YES

NO

Provide advice on ongoing management

Progress home-based exercise and sport-specific activity

Advise on secondary prevention

Encourage self management with re-assurance, and re-assess as required

Gather feedback & apply changes

Address ongoing load related or other risk factors

Revisit biomechanical exam to address kinetic-chain factors

Progress exercise treatments

Consider adding adjunctive treatments

Continue therapy

Consider biopsychosocial factors. Such as presence of fear avoidance, catastrophizing, or low expectation of recovery

Symptoms beyond 6 months

Consider request for further investigation

Consider referral for further medical evaluation if no improvement or worse at 6 months

Counsel regarding longer-term reassignment of work tasks if work-related

This algorithm should be used in conjunction with the other sections of this toolkit. To learn more about this project or Physical Therapy Knowledge Broker led-projects please visit https://physicaltherapy.med.ubc.ca/physical-therapy-knowledge-broker/

SECTION B

Clinical Assessment of LET

Potential risk factors

Non-modifiable risk factors

- **Age**

  Typically occurs > 40 yrs[1]

- **Gender**

  Weak evidence for female > male[1,2]

- **Metabolic Disorder**

  Generally, metabolic factors are weakly associated with LET compared to mechanical overuse (modifiable) factors[3]

  - **Diabetes[1,3] /Hyperglycemia[4]**
  - **Cardiovascular disease risk factors[5]**

- **Familial Disorder**

  Genetics[7] – variants in connective tissue health more likely to be susceptible to LET.

- **Systemic Inflammatory Disease**

  Spondyloarthropathy (SpA) is generally associated with enthesis disorders, more commonly in the load bearing tendons of lower limbs compared to upper limb[8].

  SpA (SCREEND'EM)[9] – acronym for a useful screening tool to assist in identifying individuals that would benefit from further medical investigation for SpA.

Modifiable risk factors

- **Lifestyle**
  - Smoking – current and past history[1]
  - ***Active Group*** – Overuse from repetitive and forceful recreational and occupational activity.

    Sport[1]:

    - Grip strength weakness
    - Equipment (eg improper tennis grip size)
    - Technique (eg poor backhand swing).

    Only 10% of LET are associated with racquet sport[6]

    Occupation[1]:

    - Repetition, Ergonomics, Tools (forceful grip, vibration)
  - ***Inactive/Sedentary Group*** – More likely to have overuse response to unaccustomed loads from ADLs, or decline in tendon load capacity (age, activity, or lifestyle factors).
- **Previous shoulder injury**

  Rotator cuff weakness ipsilateral side.[10]

SECTION B

Clinical Assessment of LET

History

Lateral elbow pain related to overuse.

Subjective symptoms

Symptoms provoked by activity. Localized to lateral elbow, or referred along extensor/supinator muscle groups of the forearm. Extensor weakness and reduced grip strength may be present and could be linked to pain provocation.

Biopsychological factors

Persistent LET pain may involve behavioral and psychosocial factors contributing to nervous system sensitivity (peripheral and central). There is evidence that psychological variables (catastrophization, signs of distress) can increase LET symptoms. In patients with psychosocial drivers, treatment programs should consider providing pain neuroscience education, as well as addressing cognitive and behavioral barriers.[11]

Objective signs

Upper Quadrant Screening Exam	Contributing Factors
Cervical	Radiculopathy, Neuropathy
Shoulder	Rotator cuff weakness MTrP, Neuropathic tender points
Elbow, forearm	Grip weakness MTrP, Neuropathic tender points
Abnormal Neural tension (neurodynamics)	Peripheral nerve – Radial bias

MTrP= myofascial trigger points

SECTION B

Clinical Assessment of LET

Objective signs *(cont.)*

Local Exam	Technique
Palpation	Primarily at ECRB tendon insertion at lateral epicondyle. May include ECRL + EDC insertion
Mills Test[12] – passive stretch of extensor group	Start position: shoulder neutral, elbow 90°, forearm pronated, wrist fully flexed. Operator gradually passively extends elbow toward 0°, maintaining forearm pronation/wrist flexion. Monitor pain over lateral elbow. https://www.youtube.com/watch?v=r_A84ox9JRM
Maudsley Test[12] – isometric resistance test for extensor group	Start position: shoulder neutral, elbow 90°, forearm pronated, wrist neutral. Resist middle finger extension. Monitor pain over lateral elbow. https://www.youtube.com/watch?v=BaxgmHT_2eQ
Cozen Test[12] – isometric resistance test for extensor group	Start position: shoulder neutral, elbow 90°, forearm pronated, wrist neutral. Combined resistance of wrist extension, radial deviation. Monitor pain over lateral elbow. https://www.youtube.com/watch?v=8K7jzDIUpLI
Thomsen Test[13] – isometric resistance test for extensor group (variation of Cozen test).	Start position: shoulder 60° flexion, elbow 0°, forearm pronated, wrist extended 30°. Isometrically resist wrist extension at dorsum of hand. Monitor pain over lateral elbow.

ECRB= extensor carpi radialis brevis; ECRL= extensor carpi radialis longus; EDC= extensor digitorum communis

Imaging

Imaging (US, MRI) may be useful, particularly for patients whose symptoms are inconsistent with LET and are not responding to conservative interventions, to ascertain whether there are structural changes in tendon consistent with LET. Imaging may also assist to 'rule out' the tendon as a source of pathology, and investigate for other intra/extra articular conditions.[1]

(see table below- differential diagnosis)

SECTION B

Clinical Assessment of LET

Differential Diagnosis

Articular

Intra-articular synovial plica of radial-capitular joint[14]

Radio-capitular arthritis[14]

Osteochondritis dessicans[14]

Instability

Posterolateral rotary instability due to laxity of collateral ligaments[14]

Neural

Radial tunnel entrapment of posterior interosseus nerve (Arcade of Froshe)[6]

Cervical radiculopathy[10]

Abnormal neural tension-neurodynamics (radial nerve bias)[10]

SECTION C

Outcome Measures

The following outcome measures are recommended for **consistency** in clinical settings.[1]

PROMs - Patient-Reported Outcome Measures

- **Population-Specific Outcome Measure**: (Designed and validated for LET)

PRTEE – Patient Rated Tennis Elbow Evaluation

15- item questionnaire
2 sub-scales: Pain (5 items); Function (10 items)
Score converted to 100% max score
MCID = 11 2 ; MDC = 9[3]

Paper version available:

https://www.ace-pt.org/wp-content/uploads/2019/10/PF-Tennis-Elbow.pdf

- **Generic Outcome Measure:** (Not designed specifically for LET)

NPRS- Numeric Pain Rating Scale (0-10)15- item questionnaire

Measures pain intensity only.
Not validated for LE, but psychometric properties are consistent across a variety of musculoskeletal disorders.[4]
MCID= 2 ; MDC= 2

Performance-Based Outcome Measure (Clinician-Reported)

- **PFGT –** Pain Free Grip Test[5]

Pain-free grip is considered more clinically relevant than maximum grip testing, as gripping is a common pain provoking functional activity associated with LET.

Measurements are with a hand-held dynamometer.

Use NRPS during PFGT to measure pain intensity, recording grip score at onset of pain. Record best of 3 trials, with up to 1 minute rest between trials.

Consider a standardized posture and arm position for clinical assessment and treatment (eg. sitting, neutral shoulder, flexed elbow 90º, neutral forearm supination/pronation) as grip score may vary according to test position.[6] Normalized data for grip strength is reported in sitting postures.

PFGT has also been described in supine lying with a neutral shoulder, elbow extended, forearm pronated.[5]

When used before/after a treatment intervention, PFGT assists in evaluating treatment effect and monitoring progress.

SECTION **D**

Summary of the Evidence for Physical Therapy Interventions

PURPOSE, **SCOPE** & **DISCLAIMER**: The purpose of this document is to provide physical therapists with a summary of the evidence for interventions commonly used to manage tendinopathy of the lateral epicondyle. This decision-making tool is evidence-informed and where there is insufficient evidence, expert-informed. It is not intended to replace the clinician's clinical reasoning skills.

'**Acute**' refers primarily to symptoms of *less than 3 months* duration and '**chronic**' to *greater than 3 months*. For studies which (1) included participants with symptoms that encompassed both acute and chronic stages or (2) did not clarify the duration of symptoms, the results have been reported within the 'chronic' stage.

Abbreviations

LET — Lateral epicondyle tendinopathy

LLLT — Low level laser therapy

MA — Meta-analysis

NSAID — Non-steroidal anti-inflammatory drug

RCT — Randomized controlled trial

SR — Systematic review

US — Ultrasound

WALT — World Association of Laser Therapy

DN — Dry Needling

MWM — Mobilization with movement

SWT — Shock wave therapy

AP — Acupuncture

Explanation of Clinical Implications

Strongly consider

Credible evidence from well conducted systematic review(s) or multiple (>2) randomized controlled trials to suggest that intervention should be included in treatment

Consider

Evidence from one well conducted clinical trial, or multiple (>2) trials/cohort studies that intervention should be included in treatment

May consider

1-2 trials or observational studies that support use of the intervention, AND/OR supported by expert opinion AND/OR sound physiological rationale of potential treatment effects. Option that this could be included in treatment.

Consider NOT

Evidence of harm, or credible evidence of no effect outweighs evidence for benefits associated with intervention.

No Recommendation

No evidence to support or reject the use of treatment in this clinical population.

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Manual Therapy Elbow joint mobilizations	Acute	1 SR	Yes	There is minimal clinical evidence to support or refute the use of elbow mobilization in the acute stage.	**May consider** using MWM or Mill's Manipulation in the management of acute LET.
	Chronic	9 SR 2 RCT	Yes	There is a large amount of clinical evidence supporting the use of elbow mobilizations, (MWM and Mill's Manipulation). Moderate effect sizes are demonstrated across all timeframes (immediate, short and long term). MWM shows favorable outcomes for pain, grip strength and function. Mill's manipulation demonstrated effectiveness for pain but not pain free grip strength. The use of Mill's manipulation for improved function is unclear. Some clinical evidence supports the use of radial head mobilization and neural tension techniques. There is weak support for the use of wrist-specific MWM to treat LET.	**Strongly consider** using mobilization/manipulation of the elbow, particularly MWM in the treatment of chronic LET. The effects should be apparent within the first few treatments. Effects appear to be enhanced by the addition of exercise. *(See **Section F** for details)* **May consider** using radial head mobilization and neural tension techniques. **May consider** using MWM of the wrist
Spinal mobilization techniques	Acute	1 SR	Yes	There is minimal clinical evidence or expert opinion on the use of spinal mobilization/manipulation for patients with acute LET.	**May consider** using spinal mobilization (cervical and/or thoracic) for patients with acute LET.

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Manual Therapy *(cont.)* Spinal mobilization techniques *(cont.)*	Chronic	1 SR 6 RCT	Yes	Credible clinical evidence supports the use of cervical and thoracic mobilization/manipulation into the treatment of LET for improved pain, increased PPT, grip strength and function in the short-term. In one study a stronger effect was produced when delivered with a supportive and empathetic approach. Neuromobilization techniques (radial nerve) have been shown to have a positive effect on pain	**Consider** using cervical/thoracic mobilization/manipulation/ neuromobilization techniques in those with cervical and/or thoracic signs even if they do not report spinal symptoms in addition to local treatment to the elbow including exercise. *(See **Section F** for details)*
Soft tissue techniques	Acute	1 SR	Yes	Limited clinical evidence supports the use of soft tissue techniques as a stand alone treatment.	**May consider** using deep and superficial massage for immediate pain relieving effect in acute LET.
	Chronic	2 SR 3 RCT	Yes	There is weak clinical evidence to support the use of soft tissue techniques such as frictions, in combination with other treatment modalities. *Note: most of the studies which examined the effect of frictions included the use of Mill's manipulation +/- exercise.*	**May consider** using soft tissue techniques (such as deep transverse friction massage) as part of a multimodal treatment regime for chronic LET. *(See **Section F** for details)*

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Exercise	Acute	1N-RCT	Yes	There is a small amount of clinical evidence to support the use of exercise (strength, stretching, general fitness) in the acute stage.	**May consider** using exercise in the management of acute LET.
	Chronic	4 SR 4 RCT	Yes	There is a large amount of clinical evidence to support the use of exercise (strengthening and stretching) in the chronic stage. Almost all exercise studies showed improvement whether it was concentric, eccentric or isometric strengthening. While there is some evidence that commencing with eccentric exercises may provide superior pain relief, providing an exercise that the patient can tolerate (isometric, concentric or eccentric) is likely more important than the type of exercise. There is some evidence that stretching may provide pain relief. There is mixed evidence that in-person sessions or supervised home exercise programs are superior to unsupervised programs in providing positive outcomes.	**Strongly consider** using local and upper limb kinetic chain exercise in the chronic stage as per clinical assessment findings. No single type of exercise appears to be superior to another for LET rehab **May consider** the use of pain-free as opposed to painful exercise interventions in more irritable or severe cases.

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Acupuncture (AP)*	Acute	1 SR	No	There are a lack of studies to support Acupuncture specifically with acute lateral epicondyle tendinopathy. What does exist is weak and inconclusive. What evidence does exist suggests benefits offered are for pain specifically.	**May consider** acupuncture in acute LET for short term pain improvement
	Chronic	3 SRs 1 RCT	Yes	Available evidence focuses on a Western Acupuncture approach for the diagnosis and treatment of LET. Study designs are heterogeneous with no consistency on acu-point selection or technique. Acupuncture is suggested as efficacious at reducing pain. All follow-ups were in the short term, with no description of benefit for lasting effect.	**May consider** acupuncture for short-term pain management in patients with chronic LET.
Dry Needling (DN)**	Acute	1 other	Yes	Lack of studies identified that are explicit to acute LET. There is physiological rationale for delaying DN in the inflammatory phase of injury if the tissue irritability is high.	**May consider** DN in acute LET for short term benefit of pain and function.
	Chronic	1 SR	Yes	Clinical evidence provides low-moderate support for the use of DN for short-term benefits for pain, function and grip strength.	**May consider** DN in chronic LET for short term benefit of pain, function and grip strength.

***Definition of acupuncture**: May include Traditional Chinese Medicine approach, or Western medical-anatomical approach for acupoint selection. AP is differentiated from Dry Needling, although the same fine filament needle is employed, and there may be areas of crossover in point selection and technique.

****Definition of dry needling**: Intervention using thin filament needles to penetrate the skin that stimulates myofascial trigger points (MTrP), muscular, neural and connective tissue for management of neuromusculoskeletal disorders.

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Low level laser therapy (LLLT)	Acute	2 RCT	Yes	Laser at 905 nm may be effective when used in accordance with the WALT guidelines, with some studies showing benefit when used in combination with exercise.	**Consider** using laser (LLLT) at 905 nm with dosage as recommended by WALT guidelines. *(See **Section G** for details for details)*
	Chronic	8 SR 2RCT	Yes	Laser at 904 nm and possibly 832 nm or 830 nm may be effective when used in accordance with the WALT guidelines. Many of the studies demonstrate efficacy when used in combination with other treatments. Dosage is essential to effective treatment.	**Consider** using laser (LLLT) at 904 nm with dosage as recommended by WALT guidelines. *(See **Section G** for details)*
High intensity laser (class IV)	Acute		No	Lack of studies identified that are explicit to acute lateral epicondyle tendinopathy	**No Recommendation**
	Chronic	3 RCT, 1 other		Class IV Laser (12W, 1,064 nm) at 100 - 150J per treatment may be effective in reducing pain, increasing hand grip strength and improving QDASH score.	**Consider** using HILT with dosage as recommended. 9 or 10 treatments over 3 weeks.

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Ultrasound (US)	Acute	2 RCT		Weak evidence exists to support the effectiveness of US in the management of acute LET. 1 MHz or 3 MHz, 0.5 – 1.0 W/cm2 5-10 minutes (pulsed 1:2-1:4 suggested).	**May consider** using US in the management of acute LET.
	Chronic	6 SR 8 RCT		Weak evidence for effectiveness of US in the management of chronic LET. 1 MHz or 3 MHz, 1.0 – 2.0 W/cm2 5-12 minutes. The total number of treatments used in many of the studies is greater than might be economically viable in real-world therapeutic settings (many studies used more than 10 sessions).	**May consider** using US in the management of chronic LET.

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Extracorporeal shock wave therapy (SWT)* Focused and Radial	Acute	2 RCT	Yes	There is a small amount of support for the use of SWT in the acute phase. In the acute phase, physiological rationale suggests SWT may be effective for short term pain modulation.	**May Consider** using SWT for acute LET for short term pain modulation.
	Chronic	5 SR 2 RCT 1 other	Yes	SWT is a treatment option for chronic LET that has failed to respond to other physical interventions. Dosage may be arbitrarily categorized as low energy <0.2 mJ/mm2 (approx. 4 Bars max); high energy >0.2 mJ/mm2. Low energy protocols apply to both radial and focused SWT devices and may be better tolerated with outcomes similar to high energy focused devices. Systematic reviews with meta-analyses of SWT have pooled heterogeneous study designs. As a result, the evidence remains conflicting regarding the effectiveness of SWT for LET.	**Consider** using radial or focused, low energy SWT for chronic LET for subjects that have failed to respond to other conservative treatment. Dosage intensity should be based on patient tolerance. Recommended dosage: 0.06-0.2 mJ/mm2 (approx. 1-4 Bars) 4-20 Hz 1500-2500 shocks 3-5 weekly sessions SWT should be used in conjunction with exercise interventions. Follow-up should be delayed until 3-6 months after completing treatment to allow for a tissue- based treatment response.

*Electric generation of SWT is measured as Energy Flux Density (EFD) in mJ/mm²; Pneumatic (pulsed-pressure) SWT is measured in Bars.

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Iontophoresis	Acute	1 RCT		Single study supports the delivery of corticosteroid (Dexamethasone) by iontophoresis to treat acute lateral elbow pain for short term pain reduction, allowing the subject to participate in an earlier increase in exercise activity or return to work. Iontophoresis may have advantages over injection (less pain, decreased trophic changes in tissue), but may not be as cost effective.	**Consider** a trial of iontophoresis with Dexamethasone for short-term pain control for acute LET. Recommended dosage: 0.4% Dexamethasone Sodium Phosphate (aqueous) 40-80 mA-min 4-6 sessions, alternate days **Physician prescription required.
	Chronic	1 SR		Evidence regarding the potential efficacy for chronic LE of iontophoresis (with dexamethasone, prednisolone, diclofenac, lidocaine or salicylate) is insufficient to base a clinical recommendation.	**No Recommendation**

SECTION D

Summary of the Evidence for Physical Therapy Interventions

Intervention	State of Pathology	Clinical Research Evidence	Peer-Reviewed Published Expert Opinion	Take Home Message	Clinical Implication
Orthotic devices	Acute	2 SR		There is weak evidence (1SR) that orthotic devices (brace, sleeve or splint) may reduce immediate pain compared to placebo. There is weak evidence (1SR) that a counterforce brace may reduce pain in the short term (<6 weeks).	**May consider** the use of an orthotic for patients with LET. Counterforce braces appear to offer some benefit, especially in the early phase of rehabilitation.
	Chronic	2 SR		A placebo-controlled RCT showed that addition of a counterforce brace to exercise-based rehabilitation may result in improved pain and function in the short and long terms.	**May consider** the use of an orthotic for patients with LET. Counterforce braces appear to offer some benefit, especially in the early phase of rehabilitation.
Taping	Acute		Yes		**May consider** taping as an adjunct to other treatments in the acute management of LE
	Chronic	2 RCT 1 N-RCT	Yes	Two placebo controlled trials, and two experimental studies have demonstrated efficacy of taping for providing immediate pain relief. Taping has not been consistently shown to benefit strength. Studies have often been conducted alongside an exercise intervention.	**Consider** a trial of taping for patients with chronic LET to reduce pain.

SECTION **E**

Exercise Prescription

Exercises for lateral epicondyle tendinopathy (LET) should be chosen according to patient preference, and the clinical evaluation.

There is a large volume of clinical evidence that consistently supports the use of exercise for management of chronic LET. Studies evaluating strength-based exercise have demonstrated improvement in symptoms regardless of the muscle contraction-type (e.g. concentric, eccentric or isometric). Some evidence suggests that eccentric exercises may provide superior pain relief, but providing an exercise that the patient can tolerate (isometric, concentric or eccentric) is the most important consideration.

Our summary of interventions suggests (see section D) that clinicians **strongly consider** using local and upper limb kinetic chain exercises to support patients suffering from chronic LET.

The following are examples of exercises to consider based upon the available literature.

The videos we use in this section have been provided by **Physitrack®**. The videos are the copyright material of Physitrack and are only to be used in conjunction with this toolkit. Click on the desired image to watch the video description of the exercise.

Note that some video examples differ in the prescribed contraction time. It is the responsibility of the prescribing therapist to ensure the correct repetitions, sets, and sessions per week are provided.

Concentric/Eccentric Home Exercise Program

(See Peterson et al. 2011)

Frequency: Daily, for 3-months

Intensity: Resistance will be dictated by patient's current capacity (e.g. 1 Repetition Maximum - RM)

Time: Aim is to complete 3 sets of 15 reps (approx. 65% of 1RM) once per day.

Water can be used as resistance if you do not have weights available. 1 litre of water = approx' 1kg.

An option is to increase resistance by 0.1 kg (100ml water) weekly or as tolerated by the patient.

Click on the images to watch the video

Forearm should be supported in pronation with elbow in some flexion.

Lift the weight by extending the wrist, then lower. Keep your forearm in contact with the surface at all times.

SECTION
E

Exercise Prescription

Isometric Home Exercise Program

(See Vuvan et al, 2020)

Frequency: Once daily for 8-weeks

Intensity: Start at 20% Maximum Voluntary Contraction (MVC) progressively adding 5% every two weeks

Time: 30 seconds for 4 repetitions per day (30 secs rest between reps)

In the protocol the reps reduced to 3 but the contraction time increased to 45 seconds on alternating weeks. This was to generate a slow progression in the time-under-tension placed upon the lateral epicondyle tendon.

See the full study below for detailed protocol.

Vuvan, V; Vicenzino, B; Mellor, R; et al. Unsupervised Isometric Exercise versus Wait-and-See for Lateral Elbow Tendinopathy, Medicine & Science in Sports & Exercise: February 2020 - Volume 52 - Issue 2 - p 287-295 doi:10.1249/MSS.0000000000002128

Click on the images to watch the video

Forearm should be supported in pronation with elbow flexed to 90°, wrist in 30° extension. Use your unaffected hand to place the weight in the affected hand.

Participant is instructed to hold the position for the allotted amount of time, before again removing the weight with the unaffected hand.

Note the video shows a shorter hold time than the prescribed number. The authors of this toolkit advise adherence to the recommended prescription parameters.

SECTION
E

Exercise Prescription

Eccentric-only Home Exercise Program

(See Stasinopoulos et al. 2006)

Frequency: 3 times per week, for 4-weeks

Intensity: Unclear

Time: 30s lowering phase for each repetition. Repeated for 10 repetitions and 3 sets. Take 1 minute between sets.

Patients were instructed to raise the wrist as high as possible, using the opposite hand to support into the top position before performing a slow lowering (eccentric) contraction.

Note, the prescription outlined would create 300-seconds of time-under-tension per set of exercise.

Patients were also advised that this should elicit some mild pain, and to increase the level of resistance once the pain had gone, therefore maintaining mild pain for the 4-week intervention. They were to cease exercise if the pain became disabling.

Note: *in the original this was combined with passive stretching of the extensor carpi radialis brevis (ECRB), performed by a therapist 3-times before, and 3-times post the eccentric loading exercise. The forearm was pronated, with the elbow extended and wrist held in ulnar deviation for 30-45 seconds with 30 seconds rest between stretching bouts.*

Holding a weight on the affected side, extend the wrist using the unaffected hand.

Allow the wrist to slowly flex (eccentric contraction of wrist extensors).

***Note the video shows a shorter contraction time than the prescribed number. The authors of this toolkit advise adherence to the recommended prescription parameters.*

Click on the images to watch the video

SECTION **E**

Exercise Prescription

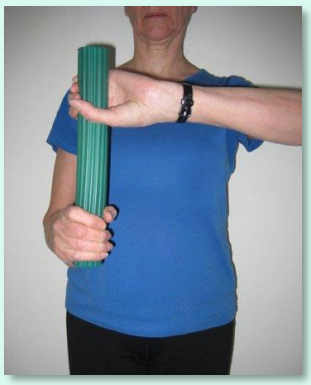
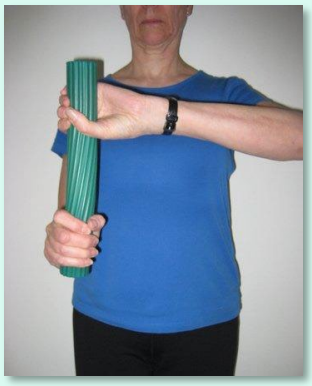
The "Tyler Twist" Eccentric Wrist Extensor Exercise

(See Tyler et al. 2010)

Frequency: Daily, approximately 6 weeks.

Intensity: Increase resistance by using a thicker bar when the exercise is pain-free.

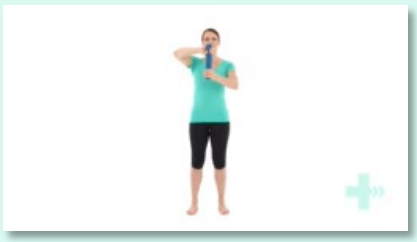
Time: Each rep should consist of around 4 seconds in the final phase of holding the wrist in a flexed position. This should be repeated for 3 sets of 15 once daily. 30 second rest between sets.

Steps in the Tyler-twist

i. Hold the bar in the hand of the affected arm with the unaffected arm above (as shown
ii. With the affected wrist in full extension, twist the bar with the unaffected hand.
iii. Stretch both arms out so the elbows are fully extended
iv. Slowly allow the affected wrist to bend into flexion, allowing for an eccentric load of the wrist extensors.

An alternative version of this exercise using the Therabar is shown in the video below. Repetitions and contraction time should be maintained regardless of which method you utilise to load the extensor tendons. **Click on the images to watch the video**



SECTION
F

Manual Therapy

Cyriax-type Physiotherapy Treatment

(Viswas et al., 2012)

Deep Transverse Friction Massage (DTFM)

Patient's elbow is supported in a 90 degrees flexion, fully supinated position.

DTFM is applied with the thumb at the common extensor tendon just anterior to the epicondyle.

Frictions were applied for 10 minutes prior to the Mill's manipulation.

Mill's Manipulation

Patient is in sitting with arm in abduction, internal rotation such that the olecranon faces upwards, forearm fully pronated and wrist in flexion. Therapist's one hand supports the wrist flexion, the other hand placed on the other side of the olecranon

Maintaining this position, the therapist applies a high velocity, low amplitude thrust at the level of the olecranon.

Elbow Mobilization with Movement (MWM)

Patient is in supine with their arm by their side, elbow extended and forearm pronated.

A lateral glide is applied to the radius and ulna with the therapist's hands or using a belt around the therapist's shoulders.

The patient then either grips or extends the wrist against resistance as long as this is now pain pain-free.

6-10 repetitions are performed in a single treatment session.

SECTION F

Manual Therapy

Spinal Mobilization/Manipulation

Lateral Glide Mobilization (Vicenzino, 1996)

Mobilizing hand wraps around the head and neck to the level of the

C5/6 segment segment.

A Grade III lateral glide is applied contralateral to the effected side.

A depression force is applied to the ipsilateral shoulder girdle girdle.

Cervical Manipulative Thrust* (Fernandez Fernandez-Carnero et al., 2008)

Cervical spine is locked using side flexion towards and rotation a way from the side to be manipulated.

The high velocity, low amplitude thrust was directed superior and medially towards the opposite eye.

**This technique should only be used by those who have been instructed in its use, and only following a complete assessment of the cervical arterial system.*

Passive Intervertebral Mobilization (Cleland et al., 2005)

Passive Physiological Mobilization

Grade III or IV mobilization of hypomobile segment found on assessment.

Passive Accessory Mobilization

Grade III or IV mobilization of the hypomobile segment found on assessment

SECTION G

LASER Dosage Calculation

Current recommendations specify that LLLT dosage be provided in **Joules** (J, total energy), rather than the previous recommended Joules/cm cm2 (J/cm cm2, energy density). Use Joules rather than Joules/cm cm2 to specify how much energy is delivered in a treatment.

In Laser devices that do not calculate Joules automatically, dose can be determined in seconds of exposure required to give the desired Joules by using the following calculation:

Joules = watts.seconds

hence, Seconds = Joules/watts

Example

For a 50 mW Laser (= 0.050 Watts), with a required dose = 2 J per point...
Seconds exposure = 2 / 0.05 = 40 secs.

The recommendation to **use Jules instead of Joules/cm^2 is important clinically** as the use of the previously recommended Joules/cm^2 resulted in confusion when comparing dosages between protocols. The resultant dose in Joules/cm^2 could be the consequence of a number of different treatment options.

Example

4 J/cm2 could be delivered by:

Option 1: a 20 mW Laser with a beam cross-section of 0.5 cm^2 in 100 seconds i.e., 4 = (0.02/0.5 x 100)

Option 2: a 10 mW Laser with a beam cross-section of 0.25 cm^2 in 100 seconds i.e., 4 = (0.01/0.25 x 100)

In Option 1, the *total energy delivered would be **2 J***

In Option 2, the *total energy would be **1 J***

This example illustrates that using Joules/cm^2 resulted in ne patient receiving twice the total amount of energy that is received by the other patient.

Therefore, it is recommended that Physical Therapists using LLLT should deliver dosages in Joules rather than Joules/cm^2. Using Joules rather than Joules/cm^2 will enable better standardization of dosage and permit comparison across different treatment regimes.

The World Association of Laser Therapy (WALT) provides dosage guidelines using Joules for various conditions. These dosage guidelines are based upon the best evidence from the literature in conjunction with expert opinion.

Physical therapists are encouraged to set LLLT dose according to the WALT guidelines found at https://waltpbm.org/documentation-links/recommendations/

Note: The WALT guidelines are given for surface exposure.

SECTION
H

Braces, Splints and Taping

Counterforce Brace

- Counterforce braces are often used for pain relief in LET.
- They are thought to diffuse the load through the tendon to less sensitive areas, thereby decreasing the stress on the area of pathology

Wrist Splint

- Counterforce braces are often used for pain relief in LET.
- They are thought to diffuse the load through the tendon to less sensitive areas, thereby decreasing the stress on the area of pathology.

Diamond Taping Technique

- This taping technique consists of four tape strips, repeated twice.
- The tape is laid in a diamond shape while pulling the soft tissues centrally towards the lateral epicondyle.
- The goal is to decrease tension at the epicondyle attachment.

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