

## APPENDIX G Treatment of Lateral Elbow Tendinopathy: Medical and Surgical Interventions

The purpose of this document is to provide information for physiotherapists of common medical and surgical interventions used by physicians in the management of lateral elbow tendinopathy strategies (see “*Lateral Elbow Tendinopathy: Summary of the Evidence for Physical Therapy Interventions*”).

### Pharmacological Approaches

Intervention	Method	Proposed Mechanism	Benefit: Pros/Cons	Take Home Message Implications for Physiotherapy
NSAIDs	Oral or topical application	Interrupts the main pathway of inflammation by inhibiting the action of cyclooxygenases, providing temporary pain relief.	<p><i>PROS:</i></p> <ul style="list-style-type: none"> <li>• Inexpensive, easily accessible.</li> </ul>	General knowledge of commonly used NSAIDs is important for treatment planning. NSAIDs are not curative for this condition and there is no evidence of sustained benefit in the long term.
			<p><i>CONS:</i></p> <ul style="list-style-type: none"> <li>• Precautions and contra-indications that accompany specific medications.</li> <li>• Increased risk of gastrointestinal complications.</li> </ul>	
<p><b>References:</b> Green et al. Non-steroidal anti-inflammatory drugs (NSAIDs) for treating lateral elbow pain in adults. <i>Cochrane Database Syst Rev.</i> 2002;(2):CD003686.</p>				
Glycerol Trinitrate (GTN)	Nitro-glycerine patches (1.25mg/24 hrs) applied over tendon to enhance healing.	Nitric oxide may stimulate repair by enhancing collagen synthesis in tenocytes.	<p><i>PROS:</i></p> <ul style="list-style-type: none"> <li>• GTN + exercise improve outcomes compared to exercise alone.</li> <li>• Increased compliance because of ease of application. Self-applied.</li> <li>• Non-invasive.</li> </ul>	Use of GTN may enhance exercise outcomes. If prescribed by a physician, it may be applied by a physiotherapist and used in conjunction with a multimodal exercise program.
			<p><i>CONS:</i></p> <ul style="list-style-type: none"> <li>• Requires repeated applications over 12 weeks.</li> <li>• Potential headache as a side-effect of nitro patch.</li> </ul>	
<p><b>References:</b> Paoloni et al. Randomised, double-blind, placebo-controlled clinical trial of a new topical glyceryl trinitrate patch for chronic lateral epicondylitis. <i>Br J Sports Med.</i> 2009;43:299-302. Paoloni et al. Topical nitric oxide application in the treatment of chronic extensor tendinosis at the elbow: a randomized double-blinded placebo controlled trial. <i>Am J Sports Med.</i> 31: 915-20. 2003.</p>				

## Injection Therapies

Injection therapies may be performed with or without US-guided localization. US-guided technique permits localization to a specific target site. However, injections without US imaging may also be effective.

Intervention	Method	Proposed Mechanism	Benefit: Pros/Cons	Take Home Message Implications for Physiotherapy
<b>Corticosteroid (injection)</b>	Peritendinous injections	Applied locally to interrupt the inflammatory process. Reduces tendon blood flow and tissue thickening.	<b>PROS:</b> <ul style="list-style-type: none"> <li>Easily accessible.</li> <li>Careful administration outside the structure of the tendon is considered 'safe' i.e., in the paratendon sheath.</li> </ul>	Corticosteroid injections provide short-term relief but are associated with worse long-term outcomes and a high rate of recurrence.
			<b>CONS:</b> <ul style="list-style-type: none"> <li>Destructive; impairs tissue repair mechanism.</li> <li>Skin depigmentation.</li> <li>Sub-cutaneous atrophy.</li> </ul>	
<b>References:</b> <p>Coombes B et al. Efficiency and safety of corticosteroid injections and other injections for management of tendinopathy: a systematic review of RCTs. <i>LANCET</i>. 376(9754): 1751-67. Nov 2010.</p> <p>Snyder K, Evans T. Effectiveness of corticosteroids in treatment of lateral epicondylitis. <i>Jour Sports Rehab</i>. 21(1): 83-88. Feb 2012.</p> <p>Coombes B et al. Effect of corticosteroid injection, physiotherapy, or both on clinical outcomes in patients with unilateral lateral epicondylalgia: a randomized controlled trial. <i>JAMA</i>. 2013 Feb 6;309(5):461-9.</p> <p>Krogh et al. Treatment of Lateral Epicondylitis With Platelet-Rich Plasma, Glucocorticoid, or Saline: A Randomized, Double-Blind, Placebo-Controlled Trial. <i>AJSM e-pub</i>. March 4, 2013.</p> <p>Olaussen, M., et al. Corticosteroid Or Placebo Injection Combined with Deep Transverse Friction Massage, Mills Manipulation, Stretching and Eccentric Exercise for Acute Lateral Epicondylitis: A Randomised, Controlled Trial. <i>BMC Musculoskeletal Disorders</i>16 (2015): 122</p> <p>Sims, Susan E. G., et al. Non-Surgical Treatment of Lateral Epicondylitis: A Systematic Review of Randomized Controlled Trials. <i>Hand (New York, N.Y.)</i> 9.4 (2014): 419-46.</p> <p>Krogh, TP, et al. An Injection of Platelet-Rich Plasma, Glucocorticoid, Or Saline Solution Produced Similar Pain and Disability Results in Lateral Epicondylitis. <i>Journal of Bone and Joint Surgery American Volume</i> 95A.22 (2013): 2059.</p>				
<b>Polidocanol</b>	Originally developed as an anaesthetic and widely used as a sclerosing agent in the treatment of varicose veins.	Ablation of neurovascular proliferation in painful tendon.	<b>PROS:</b> <ul style="list-style-type: none"> <li>May be less damaging than corticosteroid injections.</li> </ul>	Not widely used in many countries.
			<b>CONS:</b> <ul style="list-style-type: none"> <li>Evidence suggests lack of efficacy.</li> </ul>	
<b>References:</b> <p>Zeisig et al. Pain relief after intratendinous injections in patients with tennis elbow: results of a randomised study. <i>Br J Sports Med</i>. 2008;42:267-271.</p> <p>Krogh et al. Comparative Effectiveness of Injection Therapies in Lateral Epicondylitis: A Systematic Review and Network Meta-analysis of Randomized Controlled Trials. <i>Am J Sports Med. E pub</i>. 2012 Sep 12.</p>				

<b>Prolotherapy</b>	Most common injectant is hyperosmolar dextrose with small amount of anaesthetic to induce a 'pro-inflammatory' proliferative cell response to assist in tissue repair.	New viable tissue is hypothesized to result from the local release of cell growth factors.  Medical dextrose also has a weak sclerosing effect on vessels	<b>PROS:</b>	Prolotherapy may enhance outcomes compared to using exercise alone.
			<ul style="list-style-type: none"> <li>• Non-surgical option for recalcitrant cases.</li> </ul>	
			<b>CONS:</b>	
			<ul style="list-style-type: none"> <li>• May not be covered by medical plans; usually requires a private fee that reflects the expertise of the practitioner.</li> <li>• Requires three or more repeated treatments, similar to other injection therapies.</li> </ul>	

**References:**

Scarpone et al. The efficacy of prolotherapy for lateral epicondylitis: a pilot study. *Clin J Sport Med.* 2008;18: 248-254.

Krogh et al. Comparative Effectiveness of Injection Therapies in Lateral Epicondylitis: A Systematic Review and Network Meta-analysis of Randomized Controlled Trials. *Am J Sports Med. E pub.* 2012 Sep 12.

Sims, Susan E. G., et al. Non-Surgical Treatment of Lateral Epicondylitis: A Systematic Review of Randomized Controlled Trials. *Hand (New York, N.Y.)* 9.4 (2014): 419-46.

<b>Platelet Rich Plasma (PRP)</b>	Centrifuge of autologous blood to collect a concentrate of the platelets and plasma. This is then injected back into the patient's tendon.	Cellular and humoral (blood) mediators promote healing in areas of tendon degeneration.	<b>PROS:</b>	Current evidence base is controversial and limited by low quality studies with high potential for bias.
			<ul style="list-style-type: none"> <li>• Non-surgical option.</li> </ul>	
			<b>CONS:</b>	
			<ul style="list-style-type: none"> <li>• Requires expensive blood processing equipment and centrifuge. Also, it is typically an US-guided technique requiring sonography and an experienced operator.</li> <li>• Efficacy has not been established</li> </ul>	

**References:**

Krogh et al. Comparative Effectiveness of Injection Therapies in Lateral Epicondylitis: A Systematic Review and Network Meta-analysis of Randomized Controlled Trials. *Am J Sports Med. E pub.* 2012 Sep 12.

Creaney L et al. Growth factor-based therapies provide additional benefit beyond physical therapy in resistant elbow tendinopathy: a prospective, single-blind, randomised trial of autologous blood injections versus platelet-rich plasma injections. *Br J Sports Med.* 2011;45: 966-971.

Peerbooms JC et al. Positive effect of an autologous platelet concentrate in lateral epicondylitis in a double-blind randomized controlled trial: platelet-rich plasma versus corticosteroid injection with a 1-year follow-up. *Am J Sports Med.* 2010;38: 255-262.

Krogh et al. Treatment of Lateral Epicondylitis With Platelet-Rich Plasma, Glucocorticoid, or Saline: A Randomized, Double-Blind, Placebo-Controlled Trial. *AJSM e-pub.* March 4, 2013.

Sims, Susan E. G., et al. Non-Surgical Treatment of Lateral Epicondylitis: A Systematic Review of Randomized Controlled Trials. *Hand (New York, N.Y.)* 9.4 (2014): 419-46.

Krogh, TP, et al. An Injection of Platelet-Rich Plasma, Glucocorticoid, Or Saline Solution Produced Similar Pain and Disability Results in Lateral Epicondylitis. *Journal of Bone and Joint Surgery American Volume* 95A.22 (2013): 2059.

Mishra, Allan K., et al. Efficacy of Platelet-Rich Plasma for Chronic Tennis Elbow: A Double-Blind, Prospective, Multicenter, Randomized Controlled Trial of 230 Patients. *The American Journal of Sports Medicine* 42.2 (2014): 463-71.

Montalvan, B., et al. Inefficacy of Ultrasound-Guided Local Injections of Autologous Conditioned Plasma for Recent Epicondylitis: Results of a Double-Blind Placebo-Controlled Randomized Clinical Trial with One-Year Follow-Up. *Rheumatology* 55.2 (2016): 279-85.

De Vos, RJ, J. Windt, and A. Weir. Strong Evidence Against Platelet-Rich Plasma Injections for Chronic Lateral Epicondylar Tendinopathy: A Systematic Review. *British Journal of Sports Medicine* 48.12 (2014): 952.

<b>Botox (Botulinum toxin A)</b>	Injection of botox into the wrist extensors	Paralysis of the extensor muscles causes a period of unloading, reducing the irritation of injured tendon tissue and allowing healing to proceed.	<b>PROS:</b>	Provides another treatment option when conservative treatment has been unsatisfactory.
			<ul style="list-style-type: none"> <li>• Non-surgical option.</li> </ul>	
			<b>CONS:</b>	
			<ul style="list-style-type: none"> <li>• Can cause paralysis with loss of finger extension.</li> <li>• Efficacy has not been established</li> </ul>	

**References:**

Lin YC et al. Comparison between botulinum toxin and corticosteroid injection in the treatment of acute and subacute tennis elbow a prospective, randomized, double-blind, active drug-controlled pilot study. *Am J Phys Med Rehabil.* 2010;89: 653-659.

Placzek R et al. Treatment of chronic radial epicondylitis with botulinum toxin A: a double-blind, placebo-controlled, randomized multicenter study. *J Bone Joint Surg Am.* 2007;89: 255-260.

Sims, Susan E. G., et al. Non-Surgical Treatment of Lateral Epicondylitis: A Systematic Review of Randomized Controlled Trials. *Hand (New York, N.Y.)* 9.4 (2014): 419-46.

**Surgical Approaches**

<b>Intervention</b>	<b>Method</b>	<b>Proposed Mechanism</b>	<b>Benefit: Pros/Cons</b>	<b>Take Home Message Implications for Physiotherapy</b>
<b>Denervation</b>	Open incision and resection of posterior cutaneous nerve of the forearm.	Interrupts pain transmission and potential influence of nerves on failed healing response in the tendon (neurogenic inflammation)	<b>PROS:</b>	PT may be involved in the post-op rehabilitation following surgery.
			<ul style="list-style-type: none"> <li>• Short recovery compared to more invasive surgery.</li> <li>• Faster return to work.</li> <li>• Improved pain relief compared to surgical debridement.</li> </ul>	
			<b>CONS:</b>	
			<ul style="list-style-type: none"> <li>• Risk of infection.</li> </ul>	

**References:**

Berry et al. Epicondylectomy versus denervation for lateral humeral epicondylitis. *Hand (N Y).* 2011 Jun;6(2): 174-8.

<b>Surgical Debridement</b>	Incision to expose the tendon, with excision of disorganized and fibrotic tendon tissue and adhesions.	Surgery creates granulation and repair, and removes fibrotic tissue.	<b>PROS:</b>	PT may be involved in the post-op rehabilitation following surgery.
			<ul style="list-style-type: none"> <li>• High success rates reported by some centres.</li> </ul>	
			<b>CONS:</b>	
			<ul style="list-style-type: none"> <li>• Risk of infection.</li> <li>• Long post-op recovery of 3-6 months.</li> <li>• Limited data on outcomes with this procedure.</li> </ul>	

**References:**

Dunn et al. Ten- to 14-year follow-up of the Nirschl surgical technique for lateral epicondylitis. *Am J Sports Med.* 2008 Feb;36(2): 261-6.

<p><b>Percutaneous ultrasonic tenotomy for chronic elbow tendinosis</b></p>	<p>Ultrasonic energy rapidly oscillates tip of needle at the pathology site in order to emulsify the tissue.</p>	<p>Surgery removes degenerated tissue in order to stimulate a healing response.</p>	<p><i>PROS:</i></p> <ul style="list-style-type: none"> <li>• Technique involves precise removal of tissue.</li> <li>• Can be performed in a variety of practice settings.</li> <li>• Well tolerated and significantly lowers pain.</li> <li>• Equally applicable to both medial and lateral tendinopathy.</li> </ul>	<p>Appears to be a safe and suitable treatment for individuals with tendinopathy.</p>
			<p><i>CONS:</i></p> <ul style="list-style-type: none"> <li>• Currently research cannot provide relative efficacy in comparison to other interventions.</li> <li>• Therapeutic mechanism of treatment is unclear.</li> <li>• Further research should be conducted on a more diverse population.</li> </ul>	

**References:**

Barnes, DE, JM Beckley, and J. Smith. Percutaneous Ultrasonic Tenotomy for Chronic Elbow Tendinosis: A Prospective Study. *Journal of Shoulder and Elbow Surgery* 24.1.