

Two cases of work-related lateral epicondylopathy treated with Graston Technique® and conservative rehabilitation

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Objective: *To chronicle the conservative treatment and management of two work-related cases of lateral elbow pain diagnosed as lateral epicondylopathy.*

Clinical features:

Patient 1: A 48-year old female presented with gradual onset of right lateral elbow pain over the course of six weeks related to work activities of repetitive flexion/extension movements of the wrist and finger keying.

Patient 2: A 47-year old female presented with gradual onset of left lateral elbow pain over the course of four weeks related to work activities of repetitive squeezing and gripping.

Intervention and outcome: *The conservative treatment approach consisted of activity modification, bracing, medical acupuncture with electrical stimulation, Graston Technique®, and rehabilitative exercise prescription. Outcome measures included verbal pain rating scale (VPRS), QuickDASH Work Module Score (QDWMS), and a return to regular work activities. Both patients attained resolution of their complaints, and at eight month follow-up reported no recurrence of symptoms.*

Conclusion: *A combination of conservative rehabilitation strategies may be used by chiropractors to treat work-related lateral epicondylopathy and allow*

Objectif : *Documenter le traitement conservateur et la gestion de deux cas de douleur au coude latéral liée au travail, diagnostiquée comme épicondylopathie latérale.*

Caractéristiques cliniques :

Patiente 1 : Une femme de 48 ans présente une douleur latérale du coude droit à apparition graduelle sur six semaines. La douleur est liée au travail et due aux mouvements répétitifs de flexion/extension du poignet et de saisie au clavier.

Patiente 2 : Une femme de 47 ans présente une douleur latérale du coude gauche à apparition graduelle sur quatre semaines. La douleur est liée au travail et due aux mouvements répétitifs de serrement et de préhension.

Intervention et résultat : *L'approche adoptée pour le traitement conservateur comprenait la modification de l'activité, l'appareillage, l'acupuncture médicale avec stimulation électrique, la technique Graston^{MD} et la prescription d'exercices de réadaptation. Les résultats ont notamment été mesurés au moyen d'une échelle verbale de notation de la douleur (VPRS), du QuickDash Work Module Score (QDWMS) et du retour aux activités de travail régulières. Les deux patientes ont réglé la source de leurs plaintes, et pendant le rendez-vous de suivi, huit mois plus tard, elles n'ont signalé aucune récurrence des symptômes.*

Conclusion : *Les chiropraticiens peuvent employer une combinaison de stratégies de réadaptation conservatrices afin de traiter l'épicondylopathie latérale*

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for individuals to minimize lost time related to this condition.

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KEY WORDS: tennis elbow, lateral epicondylopathy, Graston Technique®, epicondylitis, epicondylagia

liée au travail et de permettre aux personnes de réduire à un minimum le temps perdu en raison de ce trouble.

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MOTS CLÉS : épicondylite, épicondylopathie latérale, technique Graston^{MD}, épicondylite, épicondylalgie

Introduction:

Lateral elbow and proximal forearm extensor pain is a musculoskeletal disorder historically known as tennis elbow, lateral epicondylagia, or lateral epicondylitis. In a seminal 1999 study by Nirschl et al., histopathological examination of over 600 cases of chronic epicondylagia revealed a degenerative process consisting of fibroblastic tissue, vascular hyperplasia, disorganized and unstructured collagen, and a lack of inflammatory cells associated with these cases.¹ The researchers concluded that a more appropriate term for this condition should be “lateral elbow tendinosis”. Present-day use of the term tendinosis or tendinopathy implies the absence of inflammatory markers², with the latter name being used to describe overuse injuries without histopathological confirmation.

Recent data suggests that the prevalence of lateral epicondylopathy (LE) in the general population is approximately 1.0% to 1.3% in men and 1.1% to 4.0% in women.³ Prevalence rates as high as 2% to 23% have been reported within occupational populations.⁴⁻⁶ The scientific literature has attempted to identify risk factors associated with LE and the working population (Table 1). The highest prevalence of LE has been reported among subjects 40 to 60 years of age.^{3,5,8} LE appears to occur more frequently than medial-sided elbow pain, with documented ratios ranging from 4:1 to 7:1.⁹ The natural history of symptomatic LE can range from six to twenty-four months.¹⁰

With the dominant arm commonly affected^{4,11,12}, LE can lead to pain and functional limitations with activities such as gripping, carrying, and lifting. As a result, LE has been linked to reduced productivity, lost time from work, and residual disability.^{13,14,15} In the province of Ontario, the Workplace Safety and Insurance Board (WSIB) identified 2576 workers with LE who were treated in the Upper Extremity Program of Care by chiropractors and

Table 1 Work-related Risk Factors associated with Lateral Epicondylopathy⁷

Hands bent with precision movements during a part of the working day	Low job control (i.e. little influence on planning, pacing of work, variation, modification)
Handling loads >20 kg at least 10 times/day	Low social support
Handling tools >1 kg	Arms lifted in front of the body
Repetitive hand/arm movements >2 hours/day	

physiotherapists between 2005 and 2008. Thirty-two percent (832) of these cases were classified as having lost time from work.¹⁵ Workers compensation board statistics from the province of Quebec indicate the average length and amount of compensation for cases of LE was 87.8 days and \$5860 respectively in 2008.¹⁶

According to the National Board of Chiropractic Examiners 2005 Job Analysis of Chiropractic, the chief presenting complaint on initial visit of 8.3% of chiropractic patients in 2003 was in an upper extremity.¹⁷ Chronic tendon pathology is a soft tissue condition commonly seen in chiropractic practice¹⁸, and chiropractors often provide a number of conservative interventions used to treat tendinopathy.¹⁹ This case study was conducted to chronicle the treatment and management of two work-related cases of lateral elbow pain diagnosed as LE.

Case report:

Case 1: A 48-year old, right hand dominant female pre-

Table 2 Physical Examination results for Case #1 and Case #2

PHYSICAL EXAMINATION PARAMETER	CASE #1 (RIGHT ELBOW)	CASE #2 (LEFT ELBOW)
Inspection: Elbow, forearm, wrist regions	• Unremarkable	• Unremarkable
Cervical Spine Screen: ROM and Orthopaedic testing	• Within normal limits (WNLs)	• WNLs
Upper Extremity Neurological Screen: (reflex, sensory, motor testing)	• WNLs	• WNLs
Elbow Examination	• Valgus and Varus testing unremarkable • Radiohumeral, proximal radioulnar and ulnohumeral joint play WNLs	• Valgus and Varus testing unremarkable • Radiohumeral, proximal radioulnar and ulnohumeral joint play WNLs
Elbow and Wrist ROM testing	• Active elbow ROM WNLs • Active wrist flexion and extension limited by pain; passive wrist flexion painful	• Active elbow ROM WNLs • Active wrist flexion and extension uncomfortable at end ranges; passive wrist flexion painful
Resisted testing	• Resisted forearm supination, wrist extension, and middle finger extension produced significant pain at the lateral epicondyle and in the forearm	• Resisted forearm supination, wrist extension, and middle finger extension reproduced pain at the lateral epicondyle
Palpation	• Tenderness with accompanying lumpy tissue texture in the extensor carpi radialis brevis (ECRB), extensor digitorum (ED), and at common extensor origin • Tenderness only in the brachioradialis, extensor carpi radialis longus (ECRL), and distal tricep brachii	• Tenderness with accompanying lumpy tissue texture in the ECRB, ED, and at common extensor origin • Tenderness only in the brachioradialis and ECRL

sented with gradual onset of right lateral elbow pain over the course of six weeks related to work activities of repetitive flexion/extension movements of the wrist, and finger keying with an electronic scanning device. She reported that her workload had recently increased and likely contributed to the onset of this complaint. Her pain had considerably worsened over the previous two weeks. She indicated that cryotherapy directed at her forearm and elbow, along with over the counter medication use (ibuprofen) provided temporary pain relief.

The patient rated her pain as 7/10 on the Verbal Pain Rating Scale (VPRS) (where 0 is “no pain” and 10 is the “worst pain that she had ever experienced”). Her Quick-DASH Work Module Score (QDWMS) was 95 out of a possible score of 100. She was primarily limited in her ability to perform lifting, squeezing, pushing, and pulling activities. Past medical history revealed carpal tunnel

syndrome on the right resolved with surgery six years prior, and no other history of significant right upper extremity injury. A systems review and family health history was unremarkable.

Physical examination findings for this case can be found in Table 2. The patient was diagnosed with LE. A functional report was provided for the employer with a request for the provision of temporary modified duties. The employee was granted modified work duties which entailed supervision responsibilities not requiring any physical use of her right arm. Treatment was initiated and consisted of medical acupuncture (points consisting of physiological tender regions within the extensor carpi radialis brevis, extensor carpi radialis longus, and extensor digitorum) with electrical stimulation (IC-1107+ at 2 Hz frequency). Graston Technique® (GT) was also administered by a certified provider using GT protocols to the

Figure 1 A-C The eccentric training protocol for lateral epicondylopathy (LE).



(A) The patient starts with the elbow extended to 180 degrees, dumbbell in hand with the wrist in the extended position.



(B) The extensor tendons are then eccentrically loaded by slowly lowering the hand over the edge of the table into a flexed position.



(C) The patient returns to the starting position using the contralateral unaffected hand to avoid concentric loading (wrist extension).

Table 3 Overview of the rehabilitative exercises prescribed for both cases of lateral epicondylopathy

EXERCISE	INSTRUCTIONS
<ul style="list-style-type: none"> Forearm flexor and extensor stretches 	<ul style="list-style-type: none"> 3 sets of 10 repetitions, 15-20 second holds for each respective stretch, 5 x/wk
<ul style="list-style-type: none"> Eccentric wrist extensor training with dumbbell Position: Extension of the elbow to 180° (Figure 1A-C) 	<ul style="list-style-type: none"> 3 sets of 10-15 repetitions 5 x/wk Assist with other hand during concentric (extension) movement phase to help in returning to the start position Increase weight of dumbbell once functional tolerance for 15 repetitions is attained
<ul style="list-style-type: none"> Concentric strengthening exercises with dumbbell: wrist extension (elbow at 90 degrees), wrist flexion, hammer curls, bicep curls, tricep extensions 	<ul style="list-style-type: none"> 2 sets of 10-15 repetitions for each respective exercise, 5 x/wk Increase weight of dumbbell once functional tolerance for 15 repetitions is attained
<ul style="list-style-type: none"> Strengthening with theraband: Forearm pronation and supination 	<ul style="list-style-type: none"> 2 sets of 10-15 repetitions for each respective exercise, 5 x/wk Increase resistance on band once functional tolerance for 15 repetitions is attained

symptomatic soft tissue structures following the acupuncture treatment. The patient was initially prescribed exercises consisting of forearm extensor and flexor stretches and eccentric wrist extensor training using a hand held dumbbell (Figure 1A-C). At the beginning of week five, additional strengthening exercises were introduced. A summary of the full rehabilitative exercise treatment protocol can be found in Table 3.

This patient was seen twice a week for two weeks and then once per week for six weeks for a total of 10 treatment visits. Gradual improvement was reported during the entire course of treatment. Medication use was discontinued in week five and a return to regular work duties occurred in week eight. At week 10, the patient reported a VPRS score of 0/10 and a QDWMS score of 0 was calculated. ROM, resisted testing, and palpatory findings were within normal limits at this time. The patient was subse-

quently discharged from active care and advised to return if her symptoms recurred. At eight month follow-up conducted via telephone, the patient reported no recurrence of symptoms.

Case 2: A 47-year-old left hand dominant female presented with gradual onset of left lateral elbow pain over a four week period related to beginning a new work activity requiring repetitive squeezing and gripping. She reports that she brought this complaint to her family physician's attention during a routine physical visit approximately two weeks prior when the symptoms were relatively mild. The physician recommended over the counter medication (acetaminophen) and an elbow bracing device. The patient indicated that the medication did not provide any significant pain relief, however, the brace did allow her to work with less pain.

The patient rated her current pain as 5/10 on the VPRS. Her QDWMS was 62.5. She reported pain while performing repetitive gripping and squeezing activities. Although she was able to continue working, she found that approximately four hours into her shift she would develop a feeling of pain in her left forearm. She denied experiencing any weakness, numbness or tingling in her hand. Past medical history, systems review and family health history were unremarkable. She did not report any other previous history of significant left upper extremity injury.

Physical examination findings for this case can be found in Table 2. A diagnosis of LE was communicated verbally to the patient. The patient did not want to pursue the possibility of modified duties, wishing instead to try and work through the pain. As with case #1, medical acupuncture with electrical stimulation and GT was initiated immediately. Unlike case #1, this patient wore a counterforce brace placed just distal to the lateral epicondyle during work activities. This patient completed the same exercise protocol as case #1. She was seen twice a week for three weeks and then once per week for six weeks for a total of 12 treatment visits. Gradual improvement was reported during the entire course of treatment. The patient was able to continue with her regular duties during the entire treatment program. At week 12, the patient reported a VPRS score of 0/10 and QDWMS score of 0 was calculated. The patient was subsequently discharged from active care and at eight month follow-up conducted via telephone she reported no recurrence of symptoms.

Discussion:

Lateral epicondylopathy (LE) is considered to primarily originate from repetitive and sustained loading of the extensor carpi radialis brevis (ECRB) musculotendinous unit^{1,9,20}, though up to one third of patients also have involvement in the origin of the extensor digitorum¹. Jafarian et al. provide an excellent referenced description on the anatomical pathogenesis of LE.²¹ The aponeurosis of the common origin of the wrist extensors at the lateral epicondyle is the area where the maximum tensile force occurs during wrist movements.^{22,23} The ECRB tendon, which is located deep to the origin of the extensor digitorum²⁴, has its insertion located proximal to the elbow axis, causing shear stress, contact stress, and abrasion against the lateral epicondyle during elbow motion.^{22,23,25} The ECRB tendon is repetitively and heavily loaded dur-

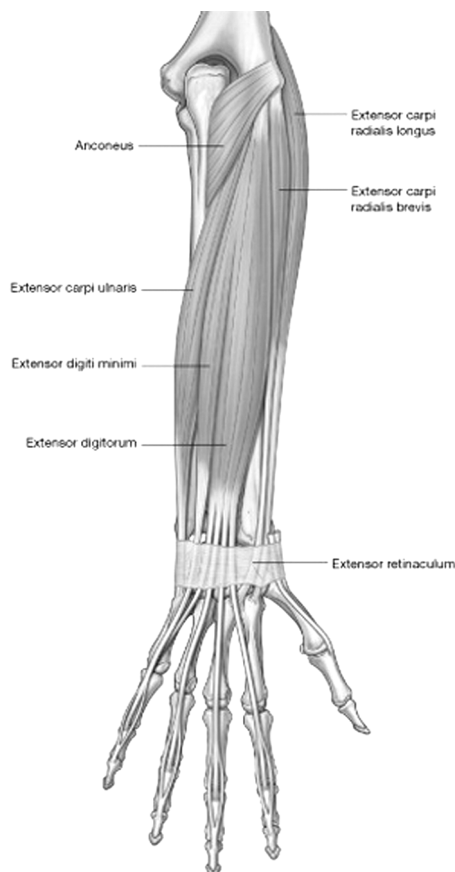


Figure 2 Extensor muscles of the forearm.²⁸

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ing many everyday upper limb activities.²¹ It functions as a stabilizer for gripping activities involving pronation and supination, and is a prime mover for wrist extension.^{26,27} The ECRB tendon is also at risk for fatigue and injury as the large volume of work it is capable of performing is not proportional to the vascular supply of the muscle.²¹ The tendon can bear large loads of up to 10 times an individual's body weight, but only receives 13% of the oxygen supply provided to the muscle.^{22,23} The relationship of the ECRB with the extensor surface of the forearm can be seen in Figure 2.

Individuals with LE often report an onset of lateral elbow pain that may coincide with a history of engaging in a new activity or increasing the intensity of an existing activity.²⁹ In the early stages of LE, pain may only be

Table 4
Differential diagnostic list for lateral elbow pain^{30,31}

C6-C7 radiculopathy	Arthrosis of the radiohumeral joint
Posterior interosseus nerve entrapment	Lateral collateral ligament incompetency
Osteochondritis dissecans	Plica synovialis
Radiocapitellar disorders	

present during activity. As the condition progresses, pain may also be present at rest, and the ability to sustain activity levels is shortened. This often correlates with functional limitations in gripping, pushing, pulling, and lifting activities of the affected upper extremity. Palpation will produce point tenderness over or just distal to the lateral epicondyle, and may also be present in the wrist extensor muscle mass. Pain may be reproduced during the physical exam by testing resisted forearm supination, wrist and middle finger extension, along with hand grip strength. Provocative manoeuvres such as Cozen's and Mill's tests may also be helpful for diagnosis.³⁰

LE is typically diagnosed during the clinical examination without the need for additional diagnostic testing.³¹ Cases resistant to conservative treatment may require further investigation. Radiographic examination, ultrasound, MRI, or electromyophysiological testing may be helpful in identifying other causes of lateral elbow pain.^{32,33} A differential diagnostic list for lateral elbow pain is included in Table 4.

Initial management of LE is focused on eliminating the offending activities that create repetitive loading on the injured soft tissue. Relative rest prevents ongoing injury, allows for healing of the tendon, and decreases pain levels.^{29,34} In clinical practice, health professionals treating LE may be challenged by workers who are unable or unwilling to comply with such instructions due to various reasons. Providing adequate pain relief from LE may be one way to keep an individual functional and able to complete modified activities without further injury. The use of "counterforce" bracing has been advocated to diminish the load on the common extensor tendon and thereby reduce pain.^{21,30,35} Acupuncture may also be used to control pain associated with LE. A 2011 systematic re-

view evaluated acupuncture on the ability to provide pain relief, global and functional improvements. This review identified several studies with evidence supporting the use of acupuncture for LE.³⁶ Medical acupuncture with electrical stimulation was utilized in the two cases presented, and was well tolerated by both patients, with no adverse affects reported.

Deep transverse friction massage (DTFM) is a soft tissue technique that has traditionally been used in the treatment of LE, and has been postulated to realign abnormal collagen fiber structure, break up adhesions and scar tissue, and increase healing with hyperaemia.³⁷ A 2002 Cochrane review determined that there was insufficient evidence to form conclusions about DTFM for the treatment of LE.³⁷ Despite the lack of evidence to support the use of DTFM, the popularity of soft tissue techniques in treating tendinopathy has grown and evolved over the years. Graston Technique® (GT) is a form of augmented soft tissue mobilization (ASTM) in which stainless steel instruments are utilized to apply controlled microtrauma to the affected soft tissues. Studies suggest that the controlled microtrauma induces healing via fibroblast proliferation³⁸, which is necessary for tendon healing^{1,38}. Previous research has explored the use of GT in the treatment of LE with promising results.^{39,40}

The soft tissue healing effect of GT may be augmented with resistance training which has been identified as beneficial in the management of chronic tendinopathy.⁴¹ Specifically, eccentric training has garnered considerable attention in the last decade with respect to the management of tendinopathy, and has shown some application in the treatment of LE. In a study by Croisier et al., 92 patients with LE were randomized to a standard physical therapy protocol with and without an eccentric strengthening program.⁴² The group completing the eccentric strengthening showed a considerable improvement in pain, strength, and function compared with the control group.⁴² Another study examining a program of eccentric exercises performed at low speed with static stretching showed reduced pain in patients with LE at the completion of the program.⁴³

Various joint manipulation techniques directed at the elbow and wrist as well as the cervical and thoracic spinal regions have been described as beneficial in the management of LE.⁴⁴ Other non-operative alternatives include therapeutic ultrasound, low level laser therapy, and elec-

trical stimulation^{36,45}, along with NSAIDS, extracorporeal shock wave therapy and corticosteroid injections^{30,36}. Although the use of corticosteroid injections for the treatment of tendinopathy has been routinely used for many years, the scientific evidence supporting their use is controversial.⁴⁶ While individuals with LE may experience dramatic short-term relief from corticosteroid injection, long-term results are poor with higher recurrence rates.^{47,48} New injection therapies utilizing polidocanol⁴⁹, autologous whole blood^{49,50} and platelet rich plasma^{50,51} have recently been gaining popularity in the treatment of LE. Surgery may be considered in cases where conservative non-operative strategies fail to relieve symptoms after 6 to 12 months.⁵²

Field practitioners are usually in agreement over the difficulty and challenges of treating long-standing chronic musculoskeletal conditions. Both case #1 and case #2 presented relatively early in the course of their conditions, four and six weeks respectively, which may have made the management of their LE more responsive to conservative interventions. Symptomatic resolution may have also occurred as a result of natural history. The treatment program for both cases was multi-modal, thus several other factors may have influenced the favourable outcomes attained. Initial management for controlling pain in the first case was achieved through a modified work program arranged with the employer, whereas the worker in the second case chose to remain at work and control her pain with the use of a counterforce brace. Additional pain management was likely attained with use of medical acupuncture points treated at every visit. This was further enhanced with the use of ASTM in the form of Graston Technique® which was useful in decreasing the soft tissue tenderness and dysfunction and theoretically aiding soft tissue healing. The active exercise conditioning protocol outlined in Table 3 also likely played an important role in the long-term resolution of symptoms in both cases. A review of the chiropractic literature identifies numerous cases involving the management of tendinopathy utilizing a combination of soft tissue therapy and rehabilitative exercise interventions.⁵³⁻⁶²

Despite the prevalence of LE and the potential substantial loss of work associated with this condition, there is surprisingly little consensus on its management.⁶³ The scientific literature identifies more than 40 treatments for LE.⁴⁵ In 2011, Biset et al. completed a systematic review

of the literature on the effectiveness of interventions used in the treatment of LE. This review concluded that there was insufficient good quality evidence to support many of the commonly utilized conservative treatments, including acupuncture, exercise, manipulation, ultrasound, and combination physical therapies.³⁶ This highlights the need for further research with larger sample sizes and controls to evaluate the short and long term efficacy of interventions that focus on returning those afflicted with LE back to work in a timely manner.

Summary:

These two cases demonstrate the management of work-related LE using conservative interventions that can be employed by chiropractic practitioners. Although favourable results were obtained, it is important to note that the nature of this investigation was that of a case study format, and therefore the treatment protocol used may not be appropriate for all individuals presenting with LE. Practitioners treating this type of injury may consider implementing the conservative treatment strategies utilized in these cases for other patients presenting with work-related LE.

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