Journal of Novel Physiotherapies

Dimitrios, J Nov Physiother 2015, 5:1
http://dx.doi.org/10.4172/2165-7025.1000238

Case Report Open Access

The Effectiveness of Isometric Contractions Combined with Eccentric Contractions and Stretching Exercises on Pain and Disability in Lateral Elbow Tendinopathy. A Case Report

Stasinopoulos Dimitrios*

Physiotherapy Program, Department of Health Sciences, School of Sciences, Nicosia, Cyprus

***Corresponding author:** Stasinopoulos Dimitrios, Physiotherapy Program, Department of Health Sciences, School of Sciences, 6, Diogenes Str. Engomi, P.O.Box 22006, 1516, Nicosia, Cyprus, Tel: 35722713044; E-mail: D.Stassinopoulos@euc.ac.cy

Received date: November 14, 2014; **Accepted date:** December 28, 2014; **Published date:** January 05, 2015

Abstract

Background: Eccentric and static stretching exercises have shown good clinical results in Lateral Elbow Tendinopathy (LET). However, eccentric and stretching exercises are not enough for all patients with tendinopathy. Isometric muscle contractions reduce tendon pain. No studies have been investigated the effectiveness of these two kinds of contractions and stretching exercises for the management of LET. The aim of the present case report is to present the effect of eccentric training combined with isometric contraction and static stretching exercises on pain and disability in a patient experiencing LET.

Case report: A patient with unilateral LET for 8 months was included in the present report. The patient followed an exercise programme consisted of slow progressive eccentric exercises of wrist extensors, isometric contractions of wrist extensors and static stretching of the extensor muscles of the wrist five times per week for 4 weeks. The programme was individualized on the basis of the patient's description of pain experienced during the procedure. Outcome measures were pain, using a visual analogue scale, and function, using a visual analogue scale and the pain-free grip strength. The patients was evaluated at baseline, at the end of treatment (week 4), and 1 month (week 8) after the end of treatment.

Results: At the end of the treatment and at the follow – up there was a decline in pain and a rise in function.

Conclusions: The results of the present trial suggest that the combination of eccentric training of wrist extensors with isometric contractions of wrist extensors and static stretching exercises of wrist extensors can produce significant improvements in terms of pain and disability in LET.

Keywords: Tennis elbow, Lateral epicondylitis, Eccentric, Isometric, Exercise programme, Stretching exercises

Introduction

Lateral elbow tendinopathy (LET) is the most appropriate term to use in clinical practice because all the other terms such as lateral epicondylitis, lateral epicondylalgia, lateral epicondylosis and/or tennis elbow make reference to inappropriate aetiological, anatomical and pathophysiological terms [1]. LET is one of the most common lesions of the arm work-related or sport-related pain disorder. The condition is usually defined as a syndrome of pain in the area of the lateral epicondyle [2-4], that may be degenerative or failed healing tendon response rather than inflammatory [5]. Hence, the increased presence of fibroblasts, vascular hyperplasia, proteoglycans and glycosaminoglycans together with disorganized and immature collagen may all take place in the absence of inflammatory cells 5. The most commonly affected structure is the origin of the extensor carpi radialis brevis (ECRB) [5]. The dominant arm is commonly affected, the peak prevalence of LET is between 30 and 60 years of age [2,6] and the disorder appears to be of longer duration and severity in women [2,6,7].

The main complaints of patients with LET are pain and decreased function [2,8-12] both of which may affect daily activities. Diagnosis is simple, and a therapist should be able to reproduce this pain in at least one of three ways: (1) digital palpation on the facet of the lateral epicondyle, (2) resisted wrist extension and/or resisted middle-finger extension with the elbow in extension, and (3) by getting the patient to grip an object [8-10].

Although the signs and symptoms of LET are clear and its diagnosis is easy, to date, no ideal treatment has emerged. Many clinicians advocate a conservative approach as the treatment of choice for LET [2,8-11]. Physiotherapy is a conservative treatment that is usually recommended for LET patients [1,13,14]. A wide array of physiotherapy treatments have been recommended for the management of LET [1,15-17]. These treatments have different theoretical mechanisms of action, but all have the same aim, to reduce pain and improve function. Such a variety of treatment options suggests that the optimal treatment strategy is not known, and more research is needed to discover the most effective treatment in patients with LET [1,18-20].

One of the most common physiotherapy treatments for LET is an exercise programme [8,13-21]. One consisting of eccentric and static stretching exercises has shown good clinical results in LET [21-23] as well as in conditions similar to LET in clinical behaviour and

histopathological appearance, such as patellar [24-28] and Achilles tendinopathy [29-35]. Such an exercise programme is used as the first treatment option for our patients with LET [36].

Eccentric training is not enough for all patients with tendinopathy [37]. Our research team believes there is a component in the rehabilitation, supplement to eccentric training that decrease pain and improve function more than eccentric training alone in patients with tendinopathy. Isometric muscle contractions reduce tendon pain [38]. Perhaps if the eccentric training combines to isometric contractions the success rate in the management of tendinopathy will be higher.

To our knowledge, there have been no studies to investigate the effectiveness of these two kinds of contractions and static stretching exercises for the management of LET. Therefore, the aim of the present case report is to present the effect of eccentric training combined with isometric contraction and static stretching exercises on pain and disability in a patient experiencing LET.

Case Report

History

Mrs. X., a 55- year-old female who sewed five hours per day, complained of pain in the lateral aspect of her right elbow, of her dominant hand and with her finger pointed the site of pain, which was about two cm distally to the lateral epicondyle of the humerus on the facet of the lateral epicondyle. The pain was mainly there, but sometimes spread down until the middle of the forearm. She was not able to describe any particular movements to explain why the pain spread down until that point. At the beginning, she experienced pain after sewing, which she could tolerate. Later, she had pain during her activity, which she could not tolerate and had to stop her job. Once she had stopped, the pain subsided within two hours. She visited her GP, who prescribed NSAIDs. She had a little improvement and her GP referred her to a course of physiotherapy. She had this kind of pain for about eight months. She could sleep, but sometimes she felt a mild pain in gripping objects. During gripping, she was able to tolerate the pain. She did not complain of crepitus, stiffness, paraesthesia, swelling, locking or cervical pain. She did not have any previous problems in the spine or the peripheral joints. She did not have cancer, diabetes or epilepsy and none in her family did. She did not have any operation in the past and did not take any medications at the time of assessment.

Examination findings

Her face, posture and gait were noted in observation. She was calm and slept without having any pain disturbing her. Her posture as well as her gait was normal. The overall posture was assessed in search of body deformity. The position of the head, the cervical lordosis and the position of both shoulders were normal. The carrying angle was normal in comparison with the other side and there were not colour changes, muscles wasting or swelling. Signs of inflammatory activity like heat, swelling and synovial thickening were not found.

The movements of the neck and shoulder were pain free, with full range of motion and full power.

The movements of the elbow joint, which were tested, were flexion and extension both passively and under resistance. The passive movements were pain free with full range of motion and normal end feel. The resisted movements were pain free with full power, meaning 5 on the Oxford scale.

The movements of the proximal radioulnar, which were tested, were supination and pronation. These movements were tested both passively and under resistance. The passive movements were pain free with full range of motion and normal end feel and the resisted movements were pain free with full power, meaning 5 on the Oxford scale.

The movements of the wrist joint which were tested were flexion and extension. These movements were tested both passively and under resistance.

Passive movements: The extension of the wrist with the elbow in extension was pain free, with full range of motion and normal end feel. The wrist flexion with the elbow in extension was slightly painful on the facet of the lateral epicondyle, but it involved full range of motion with normal end feel.

Resisted movements: The flexion of the wrist with the elbow in extension was pain free and with normal power, meaning 5 on the Oxford scale. In the extension of the wrist with the elbow in extension there was pain over the facet of the lateral epicondyle of the humerus, 8/10 on the VAS and the power was 4(-) on the Oxford scale.

Resisted extension of the middle finger was painful (8/10 on the VAS) on the facet but the power was normal, meaning 5 on the Oxford scale.

The patient reported pain (8/10 on the VAS) with the handgrip dynamometer test.

There was pain over the common extensor tendon on the facet of the lateral epicondyle of the humerus by palpation.

Procedure

The patient followed a supervised exercise programme consisting of slow progressive eccentric exercises of the wrist extensors, isometric exercises of the wrist extensors and static stretching exercises of the extensors muscles of the wrist. Eccentric exercises of the wrist extensors were performed with the elbow on the bed in full extension, the forearm in pronation, the wrist in an extended position (as high as possible), and the hand hanging over the edge of the bed [21-23]. From this position, patient flexed her wrist slowly while counting to 30, then returned to the starting position with the help of the other hand [21-23]. In the starting position, the patient performed an isometric contraction of wrist extensors for 10 seconds. When the isometric contraction completed the patient performed the eccentric contraction and so on. Three sets of 10 repetitions of slow progressive exercises (eccentric and isometric) of the wrist extensors at each treatment session were performed, with 1-min rest interval between each set. Patient was told to continue with the exercise even if she experienced mild pain. However, she was told to stop the exercise if the pain became disabling. When patient was able to perform the exercises without experiencing any minor pain or discomfort, the load was increased using free weights. Static stretching exercises of the wrist extensors were repeated six times at each treatment session, three times before and three times after the exercises (eccentric and isometric), with a 30 second rest interval between each repetition. Static stretching exercises of the wrist extensors were performed with the help of the other hand. The patient's elbow was placed in full extension, the forearm in full pronation, and the wrist in flexion and ulnar deviation according to the patient's tolerance. This position was held for 30–45 seconds each time and then released [21-23].

Supervised exercise programme was given five times a week for 4 weeks and was individualized on the basis of the patient's description of pain experienced during the procedure. The patient was instructed to use her arm during the course of the study but to avoid activities that irritated the elbow such as grasping, lifting, knitting, handwriting, driving a car and using a screwdriver. She was also told to refrain from taking anti-inflammatory drugs throughout the course of the study. Patient compliance with this request was monitored using a treatment diary.

Communication and interaction (verbal and non-verbal) between the therapist and patient was kept to a minimum, and behaviours sometimes used by therapists to facilitate positive treatment outcomes were purposefully avoided. For example, patients were given no indication of the potentially beneficial effects of the treatments or any feedback on their performance in the pre-application and post-application measurements [39].

Pain and function were measured in the present study. The patient was evaluated at the baseline (week 0), at the end of treatment (week 4) and at 1 month (week 8) after the end of treatment.

Pain was measured on a visual analogue scale (VAS), where 0 (cm) was "least pain imaginable" and 10 (cm) was "worst pain imaginable". The pain VAS was used to measure the patient's worst level of pain over the previous 24 h before each evaluation, and this approach has been shown to be valid and sensitive of the VAS [40].

Function was measured using a VAS, in which 0 (cm) was taken as "no function" and 10 (cm) as "full function". Patients were instructed to report their overall level of elbow function over the previous 24 h before each evaluation, and this approach has been shown to be valid and sensitive of the VAS [40].

In addition, function was measured by pain-free grip strength. Pain-free grip strength is defined as the amount of force each patient is able to generate with an isometric gripping action before eliciting pain [39] Force was measured in pounds with a Jamar hand dynamometer that had adjustable handles to accommodate different hand sizes. The arm was placed in a standardised position of elbow extension, forearm pronation and internal rotation of the upper limb such that the palmar aspect of the hand faced posteriorly with the upper limb placed by the patient's side. Patient was then instructed to squeeze the dynamometer handles until she first experienced pain and then to release her grip [39]. The attained grip force was subsequently recorded, and the reading was not visible to the patient. Three measures of pain-free grip strength were recorded with a 30 s rest interval between each measurement, and the mean value of these repetitions was calculated.

Results

Pain on VAS was 8, function on VAS was 4 and pain-free grip strength was 26 lb at the initial evaluation. At the end of the treatment (week 4), there was a decline in pain on VAS of 5 units, a rise in function on VAS of 4 units and a rise in pain-free grip strength of 35 units. At week 8, the pain on VAS was 2, function on VAS was 9 and the pain-free grip strength was 64 lb (Table 1).

	Pain (cm)	Function (cm)	Pain-free grip strength (lb)
Week 0	8	4	26
Week 4	3	8	61
Week 8	2	9	64

Table 1: Pain, function and pain-free grip strength over the 24 h before each evaluation

Discussion

The present study has looked at the effect of eccentric training of extensors of the wrist combined with isometric training of extensors and static stretching exercises of wrist extensors in a patient experiencing LET and its findings have demonstrated significant improvements in terms of pain and disability. The results obtained from this case report are novel; as to date, similar studies have not been conducted.

Although a home exercise programme can be performed any time during the day without requiring supervision from a therapist, our clinical experience has shown that patients fail to comply with the regimen of home exercise programmes [21]. Although many ways can be recommended to improve the compliance of patients with the home exercise programme such as phone calls, exercise monitors and better self-management education, it is believed that this problem can be really solved by the supervised exercise programmes performed in a clinical setting under the supervision of a therapist. It is believed because our experience has shown that many patients stopped the home exercise programme without giving explanations, whereas patients completed the supervised programme. One possible reason why they continue the supervised exercise programme could be the cost. In the supervised exercise programme, the patients visit the therapist more times than the home exercise programme, and this is more expensive. A future study will combine the both types of exercise programmes in order to maximize the compliance of the patients.

Previous trials have found that eccentric and static stretching exercises reduced the pain in patellar [24-28] and Achilles [29-34] tendinopathy. However, many patients with tendinopathies do not respond to this prescription alone [37]. Isometric contractions reduce pain in tendon disorders [38], increasing the strength at the angle of contraction without producing inflammatory signs. Therefore, it was hypothesized that the simultaneous use of these two kinds of contractions and static stretching exercises will further enhance the analgesic effect of contractions in the treatment of LET, increasing the arm function.

Eccentric and static stretching exercises appears to reduce the pain and improve function, reversing the pathology of LET, [41-44] as supported by experimental studies on animals [45]. The way that eccentric training achieves the goals remains uncertain, as there is a lack of good quality evidence to confirm that physiological effects translate into clinically meaningful outcomes and vice versa. It is

unknown if the isometric contractions can reverse the pathology of the tendinopathy and in this case the pathology of LET.

The load of eccentric and static stretching exercises was increased according to the patients' symptoms because the opposite has shown poor results [46]. Eccentric exercises were performed at a low speed in every treatment session because this allows tissue healing [5,29]. Isometric contractions were performed without causing pain.

Even though the positive effects of such an exercise programme in LET have been reported in the present report, its study design limits the generalization of these findings. Future well-designed clinical trials are needed to confirm the positive results of this case study establishing the effectiveness of such an exercise program in the management of LET. In addition, structural changes in the tendons related to the treatment interventions and the long-term effects (6 months or more after the end of treatment) of these treatments are needed to investigate. Further research is needed to establish the possible mechanism of action of this treatment approach, and the cost-effectiveness of such treatment, because reduced cost is an important issue for the recommendation of any given treatment.

Conclusion

The exercise programme, consisting of eccentric, static stretching and isometric exercises of the wrist extensors, had reduced the pain and improved the function in a patient with LET at the end of the treatment and at one month follow-up. Further well-designed trials are needed to confirm the results of the present case report.

What are the new findings?

The present study showed that isometric contractions of the wrist extensors as a supplement to eccentric and static exercises of wrist extensors is an effective treatment approach, reducing pain and improving function, in a patient with LET.

How might it impact on clinical practice in the near future?

Eccentric and static stretching exercises are not enough for all patients with tendinopathy. If the eccentric and static stretching exercises combine to isometric contractions the success rate in the management of tendinopathy will be higher.

References

1. Haker E (1993) Lateral epicondylalgia: diagnosis, treatment and evaluation. Critical Reviews in Physical and Rehabilitation Medicine 5: 129-154.
2. Vicenzino B, Wright A(1996) Lateral epicondylalgia I: epidemiology, pathophysiology, aetiology and natural history. Physical Therapy Reviews 1: 23-34.
3. Stasinopoulos D, Johnson MI (2006) 'Lateral elbow tendinopathy' is the most appropriate diagnostic term for the condition commonly referred to as lateral epicondylitis. Med Hypotheses 67: 1400-1402.
4. Assendelft W, Green S, Buchbinder R, Struijs P, Smidt N, et al. (2003) Tennis elbow. BMJ 327: 329.
5. Kraushaar BS, Nirschl R (1999). Current concepts review—tendinosis of the elbow (tennis elbow). Clinical features and fi ndings of histological immunohistochemical and electron microscopy studies. J Bone Joint Surg Am 81:259-285.
6. Verhaar JA (1994) Tennis elbow, Anatomical, epidemiological and therapeutic aspects. Int Orthop 18: 263-267.
7. Waugh EJ, Jaglal SB, Davis AM, Tomlinson G, Verrier MC, et al. (2004) Factors associated with prognosis of lateral epicondylitis after 8 weeks of physical therapy. Arch Phys Med Rehabil 85: 308-318.
8. Noteboom T, Cruver R, Keller J, Kellogg B, Nitz AJ, et al. (1994) Tennis elbow: a review. J Orthop Sports Phys Ther 19: 357-366.
9. Plancher KD, Halbrecht J, Lourie GM (1996) Medial and lateral epicondylitis in the athlete. Clin Sports Med 15: 283-305.
10. Peters T, Baker CL (2001) Lateral epicondylitis. Clin Sports Med 20: 549-563.
11. Trudel D, Duley J, Zastrow I, Kerr EW, Davidson R, et al. (2004) Rehabilitation for patients with lateral epicondylitis: a systematic review. J Hand Ther 17: 243-266.
12. Hong QN, Durand MJ, Loisel P (2004) Treatment of lateral epicondylitis: where is the evidence? Joint Bone Spine 71: 369-373.
13. Selvier T, Wilson J (2000) Methods utilized in treating lateral epicondylitis. Phys Ther Rev 5: 117–24.
14. Stasinopoulos D, Johnson MI (2004) Physiotherapy and tennis elbow/ lateral epicondylitis.
15. Smidt N, Assendelft WJ, Arola H, Malmivaara A, Greens S, et al. (2003) Effectiveness of physiotherapy for lateral epicondylitis: a systematic review. Ann Med 35: 51-62.
16. Trinh KV, Phillips SD, Ho E, Damsma K (2004) Acupuncture for the alleviation of lateral epicondyle pain: a systematic review. Rheumatology (Oxford) 43: 1085-1090.
17. Stasinopoulos D, Johnson MI (2005) Effectiveness of extracorporeal shock wave therapy for tennis elbow (lateral epicondylitis). Br J Sports Med 39: 132-136.
18. Labelle H, Guibert R, Joncas J, Newman N, Fallaha M, et al. (1992) Lack of scientific evidence for the treatment of lateral epicondylitis of the elbow. An attempted meta-analysis. J Bone Joint Surg Br 74: 646-651.
19. Bisset L, Paungmali A, Vicenzino B, Beller E (2005) A systematic review and meta-analysis of clinical trials on physical interventions for lateral epicondylalgia. Br J Sports Med 39: 411-422.
20. Wright A, Vicenzino B. Lateral epicondylalgia (1997). Therapeutic management. Phys Ther Rev 2: 39–48.
21. Manias P, Stasinopoulos D (2006) A controlled clinical pilot trial to study the effectiveness of ice as a supplement to the exercise programme for the management of lateral elbow tendinopathy. Br J Sports Med 40: 81-85.
22. Stasinopoulos D, Stasinopoulos I (2006) Comparison of effects of Cyriax physiotherapy, a supervised exercise programme and polarized polychromatic non-coherent light (Bioptron light) for the treatment of lateral epicondylitis. Clin Rehabil 20: 12-23.
23. Stasinopoulos D, Manias P (2013) Comparing Two Exercise Programmes for the Management of Lateral Elbow Tendinopathy (Tennis Elbow/ Lateral Epicondylitis)—A Controlled Clinical Trial. The Open Access Journal of Science and Technology 1: 8.
24. Purdam CR, Jonsson P, Alfredson H, Lorentzon R, Cook JL, et al. (2004) A pilot study of the eccentric decline squat in the management of painful chronic patellar tendinopathy. Br J Sports Med 38: 395-397.
25. Stasinopoulos D, Stasinopoulos I (2004) Comparison of effects of exercise programme, pulsed ultrasound and transverse friction in the treatment of chronic patellar tendinopathy. Clin Rehabil 18: 347-352.
26. Jonsson P, Alfredson H (2005) Superior results with eccentric compared to concentric quadriceps training in patients with jumper's knee: a prospective randomised study. Br J Sports Med 39: 847-850.
27. Young MA, Cook JL, Purdam CR, Kiss ZS, Alfredson H, et al. (2005) Eccentric decline squat protocol offers superior results at 12 months compared with traditional eccentric protocol for patellar tendinopathy in volleyball players. Br J Sports Med 39: 102-105.
28. Bahr R, Fossan B, Løken S, Engebretsen L (2006) Surgical treatment compared with eccentric training for patellar tendinopathy (Jumper's Knee). A randomized, controlled trial. J Bone Joint Surg Am 88: 1689-1698.
29. Alfredson H, Pietila T, Jonsson P, Lorentzon R (1998) Heavy-load eccentric calf muscle training for the treatment of chronic Achilles tendinosis. Am J Sports Med 26: 360-366.
30. Mafi N, Lorentzon R, Alfredson H (2001). Superior short-term results with eccentric calf muscle training compared to concentric training in a

randomized prospective multicenter study on patients with chronic Achilles tendinosis. Knee Surg Sports Traumatol Arthrosc 9: 42-47.

31. Niesen-Vertommen SL, Taunton JE, Clement DB (1992) The effect of eccentric versus concentric exercise in the management of Achilles tendonitis. Clin J Sports Med 2: 109-113.
32. Ohberg L, Lorentzon R, Alfredson H (2004) Eccentric training in patients with chronic Achilles tendinosis: normalised tendon structure and decreased thickness at follow up. Br J Sports Med 38: 8-11.
33. Roos EM, Engstrom M, Lagerquist A, Soderberg B (2004) Clinical improvement after 6 weeks of eccentric exercise in patients with mid-portion Achilles tendinopathy -- a randomized trial with 1-year follow-up. Scand J Med Sci Sports 14: 286-295.
34. Silbernagel KG, Thomee R, Thomee P, Karlsson J (2001) Eccentric overload training for patients with chronic Achilles tendon pain--a randomised controlled study with reliability testing of the evaluation methods. Scand J Med Sci Sports 11: 197-206.
35. Stasinopoulos D, Manias P (2013) Comparing two eccentric exercise programmes for the management of Achilles tendinopathy. A pilot trial. J Bodyw Mov Ther 17: 309-315.
36. Stasinopoulos D, Johnson MI (2004). Treatment/management for tendinopathy .
37. Cannell LJ, Taunton JE, Clement DB, Smith C, Khan KM, et al. (2001) A randomised clinical trial of the efficacy of drop squats or leg extension/leg curl exercises to treat clinically diagnosed jumper's knee in athletes: pilot study. Br J Sports Med 35: 60-64.
38. Rio E Kidgell DJ, Mosely L, Pearce AJ, Gaida J, Cook J, et al. (2013) Exercise to reduce tendon pain: A comparison of isometric and isotonic muscle contractions and effects on pain, cortical inhibition and muscle strength (conference abstract) Journal of Science and Medicine in Sport 16:30.
39. Vicenzino B, Collins D, Wright A (1996) The initial effects of a cervical spine manipulative physiotherapy treatment on the pain and dysfunction of lateral epicondylalgia. Pain 68: 69-74.
40. Stratford P, Levy D, Gauldie S (1987) Extensor carpi radialis tendonitis: a validation of selected outcome measures. Physiother Can 39: 250-255.
41. Hawary R, Stanish WD, Curwin SL (1997) Rehabilitation of tendon injuries in sport. Sports Med 24: 347-358.
42. Khan KM, Cook JL, Kannus P, Maffulli N, Bonar SF, et al. (2002) Time to abandon the "tendinitis" myth. BMJ 324: 626-627.
43. Khan KM, Cook JL, Taunton JE, Bonar F (2000) Overuse tendinosis, not tendinitis part 1: a new paradigm for a difficult clinical problem. Phys Sportsmed 28: 38-48.
44. Ohberg L, Lorentzon R, Alfredson H (2001) Neovascularisation in Achilles tendons with painful tendinosis but not in normal tendons: an ultrasonographic investigation. Knee Surg Sports Traumatol Arthrosc 9: 233–238.
45. Vilarta R, Vidal Bde C (1989) Anisotropic and biomechanical properties of tendons modified by exercise and denervation: aggregation and macromolecular order in collagen bundles. Matrix 9: 55-61.
46. Jensen K, Di Fabio RP (1989) Evaluation of eccentric exercise in treatment of patellar tendinitis. Phys Ther 69: 211-216.