

Electrotherapeutic Interventions for Tennis Elbow or Lateral Epicondylitis: A Brief Review of the Literature

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ABSTRACT

Lateral Epicondylitis (LE) or tennis elbow is a painful and functionally limiting entity affecting the upper limb and hand. The lack of sufficient understanding regarding its pathophysiology has led to a large number of treatment approaches in physiotherapy practice including electrotherapeutic interventions. In the current review we evaluated recent trials and reviews of electrotherapeutic interventions for LE treatment for evidence supporting their use. For this purpose, a review of the literature on the effectiveness of low level laser therapy, ultrasound, phonophoresis, shortwave diathermy, electromagnetic field therapy, iontophoresis and extracorporeal shock wave therapy for LE was carried out. In conclusion, the literature to date has assessed the effect of a range of electrotherapeutic interventions on various outcomes for LE. At present, use of selected electrotherapeutic intervention with stretching/strengthening exercises are indicated. At this time, in the light of literature, none of the currently used electrotherapeutic intervention can be refuted in the treatment of LE.

Keywords: Lateral Epicondylitis, Tennis Elbow, Electrotherapy, Rehabilitation

1. INTRODUCTION

Lateral Epicondylitis (LE) or tennis elbow is a tendinopathy of the common extensor-supinator tendon of the elbow. The disorder is characterized by pain and tenderness over the lateral epicondyle of the humerus exacerbated by gripping (Andrews, 1996). LE was first described Major (1983) as a condition causing lateral elbow pain in tennis players.

The aetiology has been supposed to be over-use damage to the forearm extensor muscles. Inflammation present in the very early stages of the disease. There is little evidence of inflammation in chronic stages (Alfredson and Lorentzon, 2002). The dominant arm is more often affected than the non-dominant arm. Development of tennis elbow is usually insidious, although the onset may result from strenuous overuse relating to particular repetitive actions. The duration of LE is highly variable, ranging from 3 weeks to several years. The disorder is generally self-limiting and

symptoms seem to resolve between 8 and 24 months in most patients (Smidt *et al.*, 2006).

Despite the commonly used term 'tennis elbow', more than 95% of sufferers do not play regular predisposing sport, although up to 50% of tennis players are said to be affected at some time in their playing life (Wadsworth, 1987; Binder and Hazelman, 1983). The highest incidence is found in persons 30-60 years old. With an incidence of approximately 4-7% per 1000 patients per year in general practice and a prevalence of 2-3% of adults per year, tennis elbow is one of the most often diagnosed pathology of the upper extremity. LE occurs much more frequently than medial epicondylitis, with ratios ranging from 4:1 to 7:1. While males are more often affected than females in tennis players, the incidence is equal among men and women in the general population (Smidt *et al.*, 2006; Verhaar, 1994; Ashe *et al.*, 2004; Walker-Bone *et al.*, 2004).

The pathophysiology of LE is poorly understood. Although a few studies have demonstrated the presence

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of the neuropeptides, calcitonin related gene peptide and substance P in sensory nerve fibres supplying the extensor carpi radialis brevis (Ljung *et al.*, 1999; Fedorczyk, 2006), the others show that histologically, an angiofibroblastic proliferation is more characteristic of a failed healing response rather than of an inflammatory process. Anatomically, repetitive injury to the extensor carpi radialis brevis origin appears to be multifaceted, involving hypovascular zones, eccentric tendon stresses (Saccomanni, 2010; Erak *et al.*, 2004; Kraushaar and Nirschl, 1999; Scott *et al.*, 2004).

This lack of understanding regarding its pathophysiology has led to a large number of treatment modalities, including rest, modification of activity, splints, analgesic and anti-inflammatory drugs, different types of injection (corticosteroid and non-corticosteroid injections such as platelet-rich plasma, botulinum toxin, autologous blood, proteinases), physiotherapy including electrotherapeutic interventions and surgery have all been investigated and have found to end up with variable clinical benefit (Assendfelt *et al.*, 1996; Trudel *et al.*, 2004; Schleicher *et al.*, 2010). Up to 30% of LE patients seen in primary care are referred to physical therapy. And the electrotherapeutic interventions are mostly included in physical therapy regimens (Jones, 2009; Bisset *et al.*, 2005; Chung *et al.*, 2005). The aim of this review is to evaluate the evidence of effectiveness of electrotherapeutic interventions in the management of LE.

2. MATERIALS AND METHODS

2.1. Literature Search

A literature search was performed on Medline, Embase, Cinahl, PedRo and the Cochrane Controlled Trial Register. Randomized controlled trials and previous reviews were reviewed using the key words tennis elbow, lateral epicondylitis, lateral epicondylopathy, lateral elbow pain, elbow tendonitis, lateral epicondylalgia, extensor carpi radialis tendonitis, physical therapy, rehabilitation, physiotherapy, modality, modalities, electrotherapy, electrophtherapeutic intervention, ultrasound, ultrasound therapy, short wave diathermy, pulsed shortwave diathermy, electromagnetic therapy, electromagnetic field therapy, laser therapy, low level laser therapy, Extracorporeal Shock Wave Therapy (ESWT) either individually or in various combinations.

3. RESULTS AND DISCUSSION

3.1. Low Level Laser Therapy (LLLT)

The available material suggests that LLLT is safe and effective in the treatment of LE and that LLLT acts in a dose-dependent manner by biological mechanisms including biostimulatory effect on collagen production which modulate both tendon inflammation and tendon repair processes (Emanet *et al.*, 2010; Bjordal *et al.*, 2008). These effects of LLLT is dose-dependent (Bjordal *et al.*, 2001) and could be induced by between 630 and 1064 nm wavelengths. Pain relief, painfree grip strength and global improvement showed significantly better results after LLLT than placebo. Especially with 904 nm wavelength therapy is appearing as a safe and effective alternative to NSAIDs and corticosteroid injections in long term follow-up (Stergioulas, 2007; Lam and Cheing, 2007; Vasseljen *et al.*, 1992; Haker and Lundeberg, 1991).

3.2. Ultrasound Therapy and Phonophoresis

Ultrasound therapy (US) has been shown to be beneficial in accelerating fracture healing and has produced positive results in tendon repair (Takakura *et al.*, 2002; Cook, 2001; Heckman *et al.*, 1994). There is also evidence to support the use of ultrasound therapy in the treatment of lateral epicondylitis (Binder and Hazelman, 1983; Halle *et al.*, 1986; Davidson *et al.*, 2001). But the evidence of the effectiveness of US therapy in LE treatment seems to be less prominent than that of LLLT.

Some trials showed that using ultrasound alone and ultrasound in combination with other treatment modalities could decrease symptoms from lateral epicondylitis. The studies by Stratford *et al.* (1989); Binder *et al.* (1985); Oken *et al.* (2008) and Lundeberg *et al.* (1988) found significant short-term effects in reducing pain using ultrasound alone.

In contrast to these studies, D'Vaz *et al.* (2006) found US was no more effective for a large treatment effect than placebo for recalcitrant LE. A few studies also found that progressive exercise therapy is more beneficial than ultrasound in acute and chronic lateral epicondylitis (Pienimaki *et al.*, 1996; 1998). Two reviews by Trudel *et al.* (2004) and Smidt *et al.* (2003) found that the studies that compared ultrasound with a placebo ultrasound show statistically significant and clinically relevant differences in favor of ultrasound.

One study evaluated the efficacy of phonophoresis—that is, US with a hydrocortisone coupling gel. In that study, outcome measures after nine treatment sessions

did not support the use of hydrocortisone coupling gel, finding no added benefits over that of US alone (Stratford *et al.*, 1989). Cabak *et al.* (2005) found significant differences between phonophoresis and ultrasound therapy. Their results support the application of phonophoresis with ketoprofen in the treatment of epicondylitis.

3.3. Shortwave Diathermy or Pulsed Electromagnetic Field Therapy and Ionisation

Electromagnetic Field Therapy (EMFT) or Shortwave Diathermy (SWD) has numerous biologic effects on tissues. EMFT may increase vascular circulation and change tissue temperature, which directly results in an increase in pain threshold and a decrease in swelling and pain (Kitchen and Partridge, 1992). The effects of EMFT in increasing tissue temperature and circulation and reducing pain in patients with degenerative musculoskeletal conditions have been well documented (Jan *et al.*, 1993; Svarcova *et al.*, 1987; Kloth and Ziskin, 1996; Ibiwoye *et al.*, 2004; Trock, 2000).

But there is little evidence to support the use of EMFT in the treatment of LE. Unfortunately up to date only two studies investigated its effectiveness Vs a placebo. So there is need to more trials investigating the effect of EMFT in the treatment of LE. One of these two studies found no differences between groups at final outcome, following 8 weeks of therapy (Devereaux *et al.*, 1985). And the other found significant differences between groups in favour of EMFT group at final outcome (Uzunca *et al.*, 2007).

Within the ionisation trials, the study by Nirschl *et al.* (2003) showed no significantly difference in global improvement score between intervention group (corticosteroid solution) and placebo group. The study by Vecchini and Grossi (1984) found that ionization with diclofenac resulted in a significantly greater reduction in pain and global improvement scores compared with placebo ionization with saline. The study by Demirtas and Oner (1998) found that ionization with diclofenac for ten days followed by infrared treatment had a significantly greater reduction in pain scores compared with ionization with sodium salicylate and infrared treatment.

Grossi *et al.* (1986) compared ionisation with two dose levels of a NSAID with sham ionisation and found pain scores were significantly lower in both the high and low dose NSAID groups than in the sham group. There were no significant differences between the saline ionisation and sham groups in their study. Runeson and

Haker (2002) also compared iontophoresis with corticosteroid solution to iontophoresis with saline and found global improvement outcome at one to three months was not significant. Their results did not support the use of corticosteroid solution in iontophoresis. In summary, although this contradiction in results and the heterogeneity of interventions in the trials, there is some evidence in the majority of studies to support the use of ionisation modality in the treatment of LE.

3.4. Extracorporeal Shock Wave Therapy (ESWT)

ESWT has been used since the early 1990s for the treatment of tendinopathies. Randomized control trials on the effectiveness of ESWT on LE have been also done since 1996. Most of these studies were performed on individuals affected by LE who had had symptoms for greater than 12 months and who had previous failed therapy (Haake *et al.*, 2002; Melikyan *et al.*, 2003; Rompe *et al.*, 1996; Speed *et al.*, 2002). Both Haake *et al.* (2002) and Melikyan *et al.* (2003) showed no differences between ESWT and placebo groups for any of the measured end points. Moreover, Haake *et al.* (2002) reported significantly more side effects (transitory reddening of the skin, pain and small haematomas) in the ESWT group. Speed *et al.* (2002) documented no significant changes in pain scores in ESWT group.

Not consistent with these studies, Rompe *et al.* (1996) reported very high success rates for ESWT group in subjects with durations of symptoms of greater than 12 months, Crowther *et al.* (2002) also demonstrated a significant treatment effect for ESWT in patients with LE, although this effect was not found to be greater than that of corticosteroid injection.

From the results of study by Helbig *et al.* (2001), ESWT may be beneficial for acutely affected individuals, especially for such individuals who require pain relief within 2-4 months. However, the results of study by Chung *et al.* (2005) do not support the use of ESWT for LE in individuals who have previously been untreated for LE.

We found little evidence in this review of the literature to support the use of ESWT for the treatment of LE and is in keeping with recent systematic reviews of ESWT for LE that have drawn similar conclusions (Bisset *et al.*, 2005).

4. CONCLUSION

Although there is evidence supporting the use of several different electrotherapeutic interventions for the

treatment of LE, there is a strong need for larger, higher quality randomized controlled trials in this area. Although most studies are able to demonstrate short-term benefits of selected electrotherapeutic intervention, there is a lack of high-quality data demonstrating that these electrotherapeutic treatments have long-term benefits, particularly, with regard to functional outcomes.

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