



A Randomized Controlled Trial for Therapeutic Class IV Laser Treatment: 3 Month Follow Up



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Introduction

There is little consensus regarding effective treatments for tendinosis. Characteristic findings include necrosis, poor vascularity (Kahn et al 1999), edema, pain, weakness and impaired function (Jozsa and Kanus, 1997). While tendon injuries are sometimes acute, they are often chronic in nature, resulting in significant restriction of activity and lost work-time. Most cases resolve themselves within 12 months of rest, however, approximately 15-20% are persistent, with reoccurrence of symptoms when activity is resumed.

Low level laser therapy (LLLT) has been shown to be effective at the cellular level, increasing cytochrome C Oxidase production and reversing the effects of cellular inhibitors of respiration (Hu et al, 2007), Decreased prostaglandin E₂ levels (Bjordal et al 2006) and increased collagen production (Lopes-Martins et al, 2007) have also been demonstrated in a dose dependent manner (Hourel and Abrahamse 2008) following LLLT. More recently, Samoilova et al (2008) found that Nitric Oxide Synthase was also activated. Given that tendinopathies have been shown to be associated with matrix degeneration, these combined effects would be likely to have an influence in improved healing of damaged tendon (Bjordal et al 2008). Previous studies on LLLT have used class III lasers (output less than 0.5W), however, recently a dual wave-length (980/808 nm) class IV laser has been developed for use in LLLT (power output 10W). These instruments can deliver 8-10 J/cm², achieving a photochemical biomodulatory dose, in only minutes.

Here we report the 3 month post-treatment findings for a new class IV laser as a treatment for the pain and dysfunction associated with chronic lateral epicondylitis.

Methods

- 16 subjects with lateral elbow pain were randomized into sham or LLLT groups (double blinded)

- Sport Medicine Fellows completed clinical examinations and ultrasonography to confirm tendinopathy of the extensor carpi radialis brevis tendon. Pain, range of motion, strength and function were assessed



Figure 1. The LiteCure LLT 1000 and sham instruments

Methods Continued

- Ultrasonograms were evaluated by radiologist for the anterior/posterior dimensions of the tendon, as well as the dimensions of any areas of hypoechogenicity or anechogenicity
- A trained technician administered eight 5.5 min treatments (10 J/cm²) over 18 days using either the LCT 1000 or an identical instrument with a red incandescent light source
- Subjects were re-evaluated following final treatment and again at 3, and 6 mo post-treatment

Results

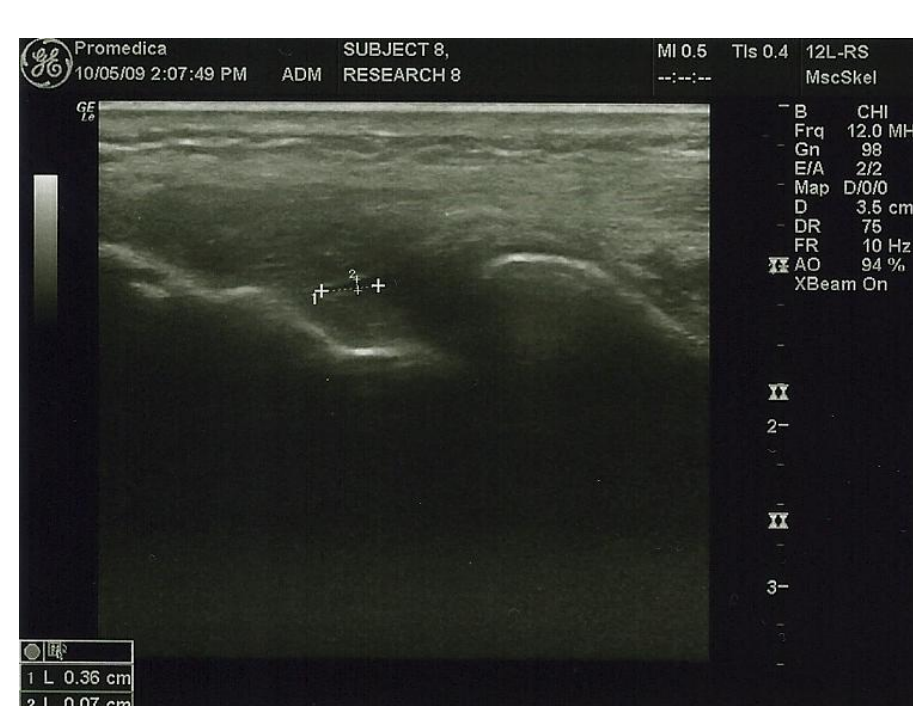


Figure 2. An example of a pre-treatment sonogram

Clinical exams and ultrasonography confirmed chronic tendinosis of the extensor carpi radialis brevis tendon in all subjects. Tendons were observed to be thickened, with heterogenous areas including hypoechoic and anechoic regions (Fig. 2). In some cases proximal calcifications were also visible. Prior to treatment no differences in any of the assessed measures were noted between the LLLT and sham groups

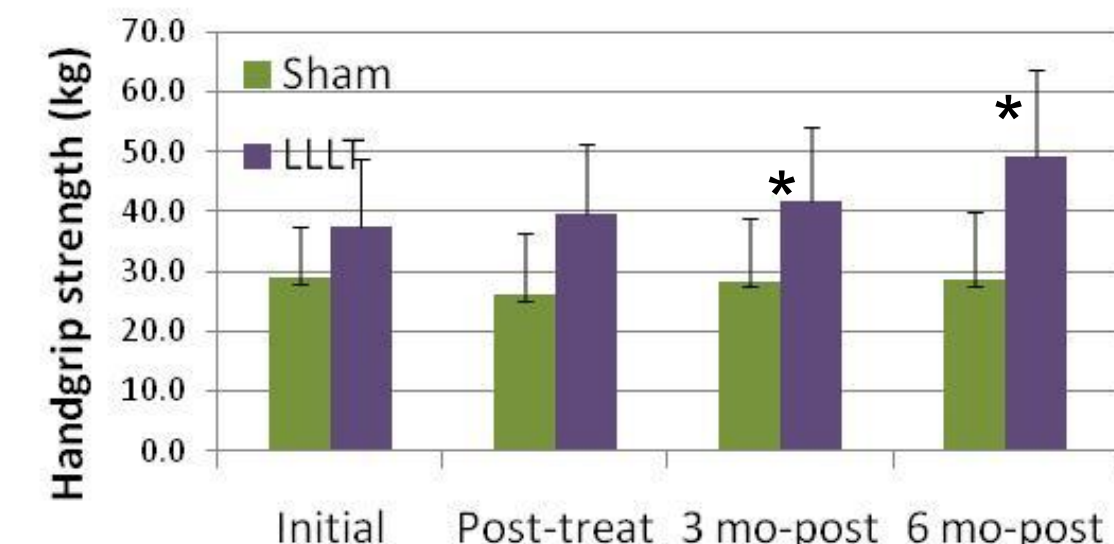


Figure 3. Handgrip strength affected arm
*Significantly greater than pre-treatment

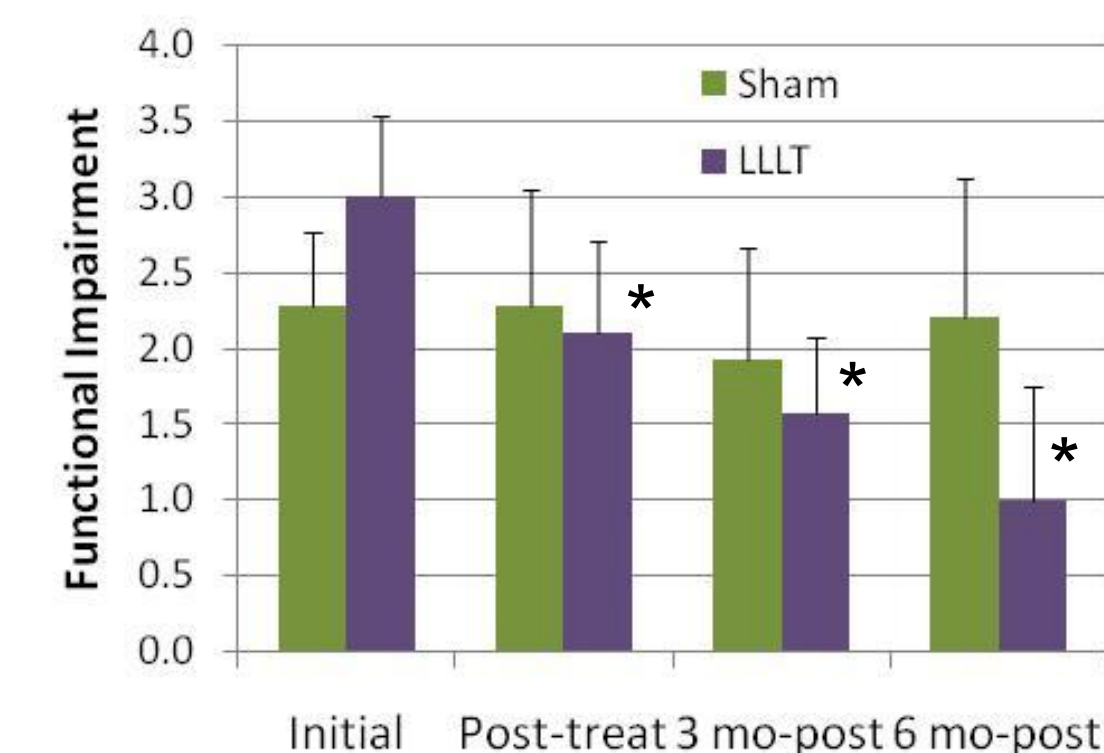
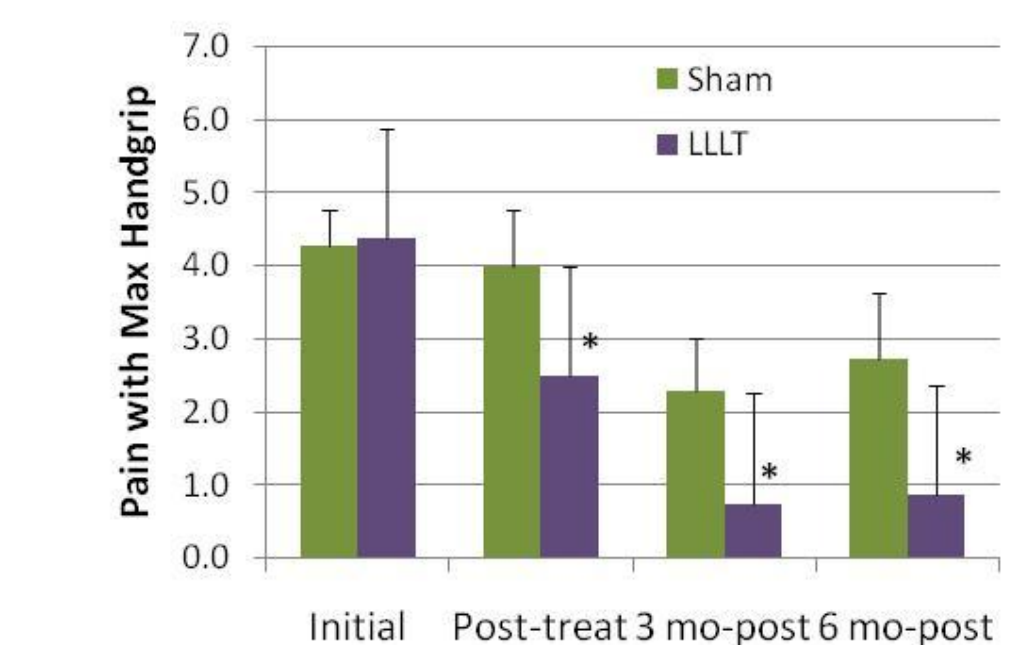


Figure 5. Pain With Grip (VAS1-10).
*Significantly different from pre-treatment and from sham group

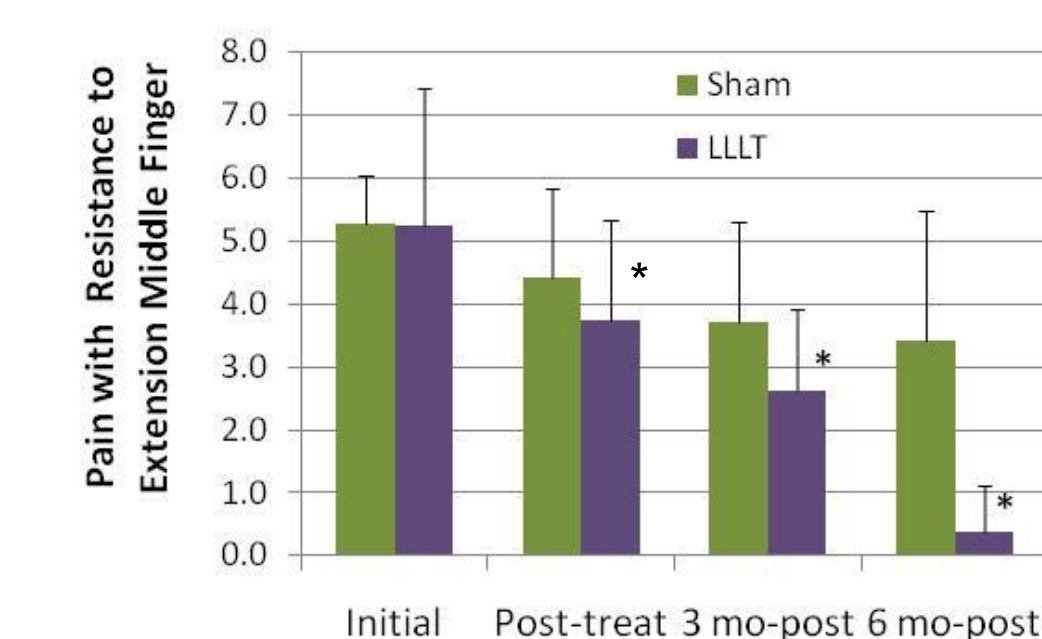


Figure 6. Pain Resistance to Extension Middle Finger (VAS1-10). *Significantly different from pre-treatment and from sham group

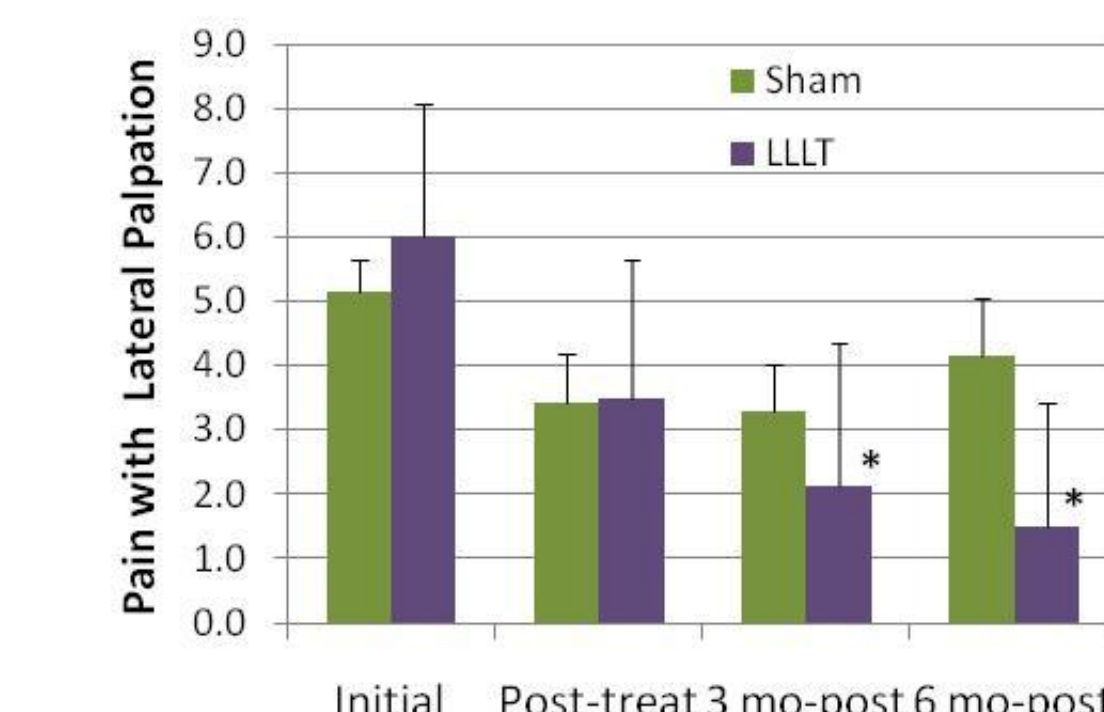


Figure 7. Pain With Lateral Palpation (VAS1-10). *Significantly different from pre-treatment and from sham group

Discussion

The findings of this double blinded randomized clinical trial support the use of LLLT as an efficacious treatment for the reduction of pain and loss of strength and function associated with tendinosis. Following eight treatments of 3300 J each by the class IV laser we observed an improvement in functional impairment and pain associated with palpation of the extensor carpi radialis brevis tendon, resistance to extension of the third finger, and pain with maximal handgrip. Furthermore, at 3 months post-treatment when the subjects had resumed activity, the difference between the sham and true treatment groups was even more pronounced with the treatment group continuing to improve and the sham group reporting continued dysfunction. A significant improvement was also observed in handgrip strength at this time in the true treatment group. The treatment group continued to report decreased symptoms and increased function at 6 months.

All subjects tolerated the treatments well, reporting that the treatment itself was soothing. Only one subject withdrew before treatment due to a misunderstanding regarding the random nature of assignment and possibility of receiving the sham treatment.

Sonography has been used successfully to diagnose the exact location, degree and type of alteration in both peritendon and intratendonous structures (Connell et al 2000). However, comparison of pre and post treatment images was difficult, and quantification of the degree of heterogeneity, hypoechogenicity and anechogenicity was not possible. This was likely due to technique and further investigation of the method is warranted.

Conclusions

LLLT using a class IV solid state diode dual wave-length (980/808 nm) laser with a dose of 8 treatments of 10 J/cm² over 18 days was found to be efficacious for the reduction of pain and loss of strength and function seen with chronic tendinopathy of the extensor carpi radialis brevis tendon. The potential for a fast, safe and effective treatment warrants further investigation.



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