



Treating shoulder pain in hemiplegic and spinal cord injured patients

The purpose of a recent study to test the efficacy of the TerraQuant medical device on shoulder pain resulting from inflammation (eg, osteoarthritis, tendonitis and bursitis) is presented here by a lead researcher

HIGHLIGHTS

- Low level pulse laser therapy, which has been shown to be safe and effective, has as a primary effect, a local time response to direct irradiation
- A statistically greater improvement was seen in those patients receiving TerraQuant, over and above conventional treatment
- Larger trials are now needed to confirm data

Shoulder pain is a common complication in hemiplegic and spinal cord injured patients. It usually starts during the acute rehabilitation phase leading to further activity limitations. The contributing factors to shoulder pain in the both hemiplegics and spinal cord injured patients are related to the neurological and musculoskeletal lesions: muscle weakness, loss of sensitivity, spasticity, impingement and rotator cuff tear. Upper extremity overuse has been proposed as an aggravating factor in the aetiology of shoulder pain in this population. Obesity, age and mental stress are further risk factors.¹

Medications

Subacromial or intra-articular injections, ultrasound, local heating and ice application, functional electrical stimulation, exercises or rest, and surgical tendon repair are some of the various interventions proposed for treating the shoulder pain.^{2,3} Clinical, not randomised, placebo trials report acupuncture, electromagnetic field, and laser possible pain effectiveness.⁴

TerraQuant (TQ) is a unique device which combines low level pulse laser therapy (LLLT), pulsating infrared radiation, visible red light and static magnetic fields, providing their synergic therapeutic effect (see Table 1).

A randomised double-blind controlled trial was designed to test whether TQ is more effective than a sham device among hemiplegic and spinal cord

injured patients with shoulder pain and reduced range of motion (ROM) resulting from inflammation (osteoarthritis, tendonitis, bursitis)

Methods

Research design The study is a randomised double-blind controlled trial with pre- and post-measures. Two identical unmarked TQ devices were used, with one being deactivated. Both the active and sham TQ emitted a flashing red light during treatment sessions. Given that LLLT, infrared and static fields are non visible, it was impossible to detect which TQ was active and which was sham. A convenience sample of 18 subjects fulfilling eligibility criteria participated in the study. Eligible subjects were randomly allocated to either the experimental group (Active TQ) or to the control group (Sham TQ).

Interventions The TQ treatment consisted of eight sessions, (five minutes per zone) and were performed every second day. The device was applied on the most painful areas as detected by the therapist. One TQ was active with LLLT at 50Hz frequency (Active TQ), while one TQ was deactivated (Sham TQ). In addition, both groups received similar standard conventional therapy: a 30 minute physical therapy treatment according to the diagnosis included one or several of the following: manual therapy, soft tissue manipulation, active ROM and strengthening.

Subjects Twenty eligible subjects with moderate



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SHOULDER PAIN

Table 1. TerraQuant technical characteristics

Average Power

Total radiation: 60-90 mW
Laser radiation: 25,000 mW
Infrared radiation: 30-90 mW
Red LEDs: 2-10 mW

Permanent Magnet Induction

Wavelength

Laser radiation: 900±50 nm
Infrared radiation: 860-960 nm
Red radiation: 600-740 nm

Class II Equipment Applied Part Type BF

Laser class: 1M (IEC 60825-1)
Supply ratings: 13.5 Vdc, max. 0.7A
Weight: 1.5 kg
Dimensions: 24 cm x 22 cm x 9 cm

References

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(VAS) anchored at “no pain” and “worst pain ever experienced”. The total possible score on the scale ranged from 0–10. The same PT and MD assessed all subjects again after completion of the series of eight TQ treatment sessions.

Shoulder pain may lead to movement restriction, loss of flexibility and function and causes important quality of life restrictions

Results

Eighteen patients completed the study (mean age 46+15.5, 15 men and three women). Two patients stopped participation because of a lack of time. Twelve subjects suffered from spinal cord injury (SCI), four from paraplegia and eight from tetraplegia. Six subjects had hemiplegia post cerebrovascular accident (CVA). Ten subjects received the Active TQ, and eight received the Sham TQ.

Range of movement Subjects in the Active TQ group experienced a statistically significant greater improvement in shoulder ROM ($p=0.001$) than those in the Sham TQ.

Pain Twelve subjects (six active TQ, six sham TQ) had pre- and post-VAS evaluations. They experienced a tendency for greater pain reduction (VAS) however not achieving statistical significance ($p=0.1$). The remaining six patients did not complete the VAS evaluation because of technical reasons.

Discussion and conclusions

Shoulder pain is a major and frequent complication for individuals with hemiplegia and spinal cord injury. Shoulder pain may lead to movement restriction, loss of flexibility and function and causes important quality of life restrictions. Many interventions to treat this condition have been reported, yet their effectiveness is questionable.

We report the results of a randomised double-blind controlled clinical trial to test the efficacy of LLLT, pulsating infrared radiation, visible red light and static magnetic fields.

The primary effect of LLLT is a local time response to direct irradiation and includes vasodilatation with increased circulatory flow; increased macrophages and fibroblast activity and improved metabolic function of depressed or damaged cells. Delayed response consists of a systemic effect caused by circulating photoproducts of irradiation

to severe shoulder pain were recruited within a period of one month from inpatients and outpatients of one of the departments of neurological rehabilitation affiliated to Tel Aviv University. Eligibility criteria consisted of:

- Shoulder pain of a musculoskeletal benign nature such as inflammation, arthritis, muscle trigger point overuse, impingement, and degenerative changes.
- Referral from a physician after a full physical evaluation including radiography.
- Onset of shoulder pain between two weeks and three months prior to inclusion in the study.
- No other additional medical conditions which could account for shoulder pain.
- No perceptual or cognitive impairment and medically stable.
- Signed informed consent. The study protocol was approved by the Ethics and Investigation Committee of the Chaim Sheba Medical Center.

Procedure The subjects were assessed by a physician (MD) and by a physical therapist (PT) prior to the beginning of experimentation. The assessments included the medical history, examination of shoulder soft tissues, evaluation of ROM of the glenohumeral joint (GHJ) using a goniometer attached to the chest and the involved arm, and evaluation of pain using a Visual Analog Scale



in the blood and lymphatic systems. Increased plasma concentrations of certain types of prostaglandins and endorphins have all been identified and play a major role in the mechanism of pain attenuation. LLLT has been shown to be safe and effective.⁵⁻⁸ The mechanism of action of static magnetic therapy is not completely understood. Possible explanations of its beneficial effect on the body include:

- Static magnetic fields can decrease the firing rate of the c-type chronic pain neuron.s
- Change the rate of enzyme mediated reactions which may play a role in inflammatory cascades and free radical generation.
- Modulate intracellular signaling by affecting the functioning of calcium channels in cell membranes.
- Cause small changes in blood flow. ⁹

Our study has several limitations, the main one being the relatively small number of participants, especially for the pain reduction evaluation.

In conclusion, the TQ treatment proved to have greater efficacy than sham treatment in patients with decreased shoulder ROM over and beyond conventional treatment. No side-effects were observed. There was also a positive evolution trend in alleying the shoulder pain; yet because of the small sample it did not reach statistical significance.

The results of this study confirm the existing scientific literature on the efficacy of LLLT and static magnet therapy and suggest that that TQ may be an effective and economical tool in the treatment of pain and reduced range of motion in people with shoulder problems following CVA or SCI.

These results are of great potential significance to the patients because of the burden and limitations of function due to shoulder pain aggravating their usually limited functionality in daily life. Larger and randomised trials are needed in order to confirm this preliminary data. ■

References

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