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 (e.g., 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).

**Subjects** Twenty eligible subjects with moderate...
SHOULDER PAIN

Table 1. TerraQuant technical characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Power</strong></td>
<td>Total radiation: 60-90 mW Laser radiation: 0.4 – 1.4 mW Infrared radiation: 30-90 mW Red LEDs: 2-10 mW</td>
</tr>
<tr>
<td><strong>Permanent Magnet Induction</strong></td>
<td>25-45 mT</td>
</tr>
<tr>
<td><strong>Wavelength</strong></td>
<td>Laser radiation: 900±50 nm Infrared radiation: 860-960 nm Red radiation: 600-740 nm</td>
</tr>
<tr>
<td><strong>Class II Equipment Applied Part Type BF</strong></td>
<td>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</td>
</tr>
</tbody>
</table>

References

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 limited increase of metabolic function of depressed or damaged cells. LLLT stimulates macrophages and fibroblast activity and improved inflammatory reaction of depressed or damaged cells. Delayed response consists of a systemic effect caused by circulating photoproducts of irradiation.
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 alleviating the shoulder pain; yet because of the small sample it did not reach statistically significance.

The results of this study confirm the existing scientific literature on the efficacy of LLLT and static magnet therapy and suggest 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