Efficacy of polarized, polychromatic, non-coherent light in the treatment of chronic musculoskeletal neck and shoulder pain
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INTRODUCTION

- Polychromatic light from low-power lasers and non-laser devices has been used as a non-invasive therapy in the treatment of various musculoskeletal disorders, acceleration of wound healing, and treatment of pain.
- Although polarized light is known to have numerous photobiomodulatory effects (including cell proliferation, enhanced collagen synthesis, changes in the circulatory system, and anti-inflammatory actions), the precise mechanism of action remains unclear.

The non-laser optical device used in this study, BIOPTRON Compact II, emits a wide beam of polarized, non-coherent, low energy light containing wavelengths from the visible spectrum (460-700 nm) and infrared radiation (760-840 nm); this range provides optimal penetration and stimulation of the tissues without the risk of DNA damage — see Figure 1 & Table 1

PATIENTS & METHODS

- **Ethics**
  - This study complied with all national and international ethical standards, and adhered to the Declaration of Helsinki and good clinical practice guidelines.

- **Study population**
  - 150 adults (aged 18-65 years) were recruited into the study.
  - The main inclusion criteria were:
    - Musculoskeletal pain >60 days duration in the neck (right or left lateral or posterior surface) and/or in the shoulder region
    - Degree of pain rating (0-10 scale) at least 50 on the 100 mm visual analogue scale (VAS)
    - Participants were not permitted to use any analgesic medication in the period lasting 48 hours before treatment, or to use any form of heat, cold, or vibration.

- **Study design and Patient evaluation**
  - Multivariate, randomized, double-blind, placebo-controlled study to compare efficacy and safety of active light therapy versus placebo light therapy over a three-day period.
  - Participants were randomized (1:1) to receive either active treatment with the optical device (test group) or placebo treatment with an inactive version of the device (placebo group).
  - Primary efficacy outcome was assessed via self-reported degree of pain via 100 mm VAS.
  - Secondary outcomes were assessed via linear range of motion (ROM) in neck/shoulder regions and via subject satisfaction of perceived change in pain level (five-point scale) following final treatment.

- **Details of the efficacy assessment schedule are displayed in Table 2**

- **Treatment protocol**
  - The light therapy protocol was as follows:
    - Upper back and neck muscles (posterior and lateral) were treated prior to light therapy
    - The optical device was held at right angles to the skin surface at a distance of 10 cm from the treatment area.
    - The treatment area was then painted with light for 10 minutes.
    - Treatment was given at intervals of 24 hours over three consecutive days.
    - An inactive version of the optical device was used to provide placebo light therapy, where required.

- **Physical parameters of the light output from the optical device were**
  - Wavelength 460-700 nm
  - Light spot size 18 cm²
  - Average power density 40 W/cm²
  - Active light therapy provided a dose (energy density) of 2.4 J/cm² per minute

- **Statistical analysis**
  - Statistical analysis was performed using the two sample t-test and the chi-square test.
  - Patients who discontinued therapy before the end of the treatment period were not included in the analysis.

- **RESULTS**
  - **Patient disposition & baseline demographics**
    - 119 participants completed the study.
    - 50 people in the test group received active light therapy with the optical device.
    - 50 people in the placebo group received placebo light therapy.
    - There were no statistically significant differences in demographic or baseline characteristics among the two treatment groups at entry see Table 3.
  - **Location of pain**
    - Test group (N=50)
    - Placebo group (N=50)
    - Neck
      - N=19
      - N=19
    - Upper Back
      - N=18
      - N=17
    - Shoulder
      - N=14
      - N=16
      - No.
      - No.
  - **Incidence & location of pain for test versus placebo groups**
    - There were no statistically significant differences in demographic or baseline characteristics among the two treatment groups at entry see Table 3.

- **CONCLUSIONS**
  - Participants who received active light therapy with the BIOPTRON optical device showed statistically significant improvements in efficacy parameters (reduction of pain level, increased movement, increased satisfaction with level of pain & greater levels of physical activity).
  - The data presented here support the positive effects of polarized, polychromatic, non-coherent light therapy in treating patients with chronic musculoskeletal pain in the neck/shoulder region.
  - As patient numbers were small, these results merit further investigation in a larger scale prospective study.

REFERENCES