

The use of low level laser therapy as a treatment for chronic wounds

Lydia Jack is Tissue Viability Nurse Specialist, Inverclyde Royal Hospital, Greenock, Scotland



Figure 1. A stage 4 pressure sore in a 49-year-old male before commencing laser therapy.



Figure 2. The 49-year-old male is fully healed following 7 months of treatment.

Laser therapy is the application of a narrow spectral-width light over injuries or lesions to stimulate healing. It has been found to improve wound-healing rates, and reduce pain and the risk of infection (Gupta et al, 1998). Laser therapy has been used to treat arterial and venous leg ulcers, pressure ulcers, and burns, as well as infected, traumatic and postoperative wounds that are failing to heal (Kleinman et al, 1996).

The effects of laser therapy are photochemical and not thermal. The suggested mechanism of action is that photons or light cells from a laser treatment probe are absorbed into the cell mitochondria. The absorption of the

photonic energy leads to the stimulation of cellular metabolism. The absorbed energy is then transferred to other molecules, causing chemical reactions in the surrounding tissues (Dyson et al, 2002).

Small amounts of singlet oxygen build up as a result of the absorption of photons. Singlet oxygen is a biochemical intermediate that influences the formation of adenosine triphosphate (ATP). Cell membrane permeability is affected and proton gradients are formed, affecting calcium, sodium, and potassium ions, and allowing ATP to be synthesised and deoxyribonucleic acid (DNA) to be produced. This process also increases photo-acceptor activity on the cell

membrane. This cascade of events results in faster resolution of the inflammatory response, reduction of pain and increased tensile strength, leading to improved tissue repair (Dyson, 2002).

Case study I

Mr X is a 49-year-old man with multiple sclerosis. He is wheelchair bound but enjoys a good quality of life. He was referred to the tissue viability service by a consultant surgeon for dressing advice on a stage 4 pressure ulcer. He had had the ulcer, which was on his buttock, for over 2 years and was being treated by the district nurses.

On examination, the pressure ulcer was approximately 4 x 6 cm at the wound surface but with a cavity extending for 6 cm (Figure 1). The district nurses had been packing the cavity, and dressing the wound with appropriate conventional dressings; Aquacel (ConvaTec, Middlesex) and Tielle Plus (Johnson and Johnson Wound Management, Ascot). Mr X had been supplied with a pressure-relieving mattress that was adequate for his needs. The only change to his care package initiated on his referral related to his seating regime; his current cushion was renewed and upgraded. Given that his existing care was appropriate, yet his ulcer hadn't healed, the decision was taken to add laser therapy to his treatment regime.

Mr X attended the outpatient clinic twice weekly for laser therapy and dressing changes. Laser therapy was commenced using a size 69 LED cluster probe (Thor International Ltd, Amersham, Buckinghamshire). First, it was necessary to promote granulation in the cavity. This was done in line with the manufacturer's recommendations to treat the area immediately above the cavity at skin level. The treatment time was one minute per cluster at a frequency of 20 Hz. This initially took a total of 3 minutes, needing less time as the wound healed and thus the area needing treatment diminished.

Within 5 weeks of treatment the tracking area had decreased to 3 cm. Once the tracking area had granulated the entrance of the wound was then treated by applying the cluster probe directly on to the wound. The pressure ulcer was fully healed after 7 months of treatment (Figure 2) and has remained so.

Case study 2

Mr Y is a 56-year-old man with a complex medical history, including hypertension. He is also an overweight non-insulin-dependent diabetic with peripheral neuropathy, and an ex-smoker, having previously smoked 40 cigarettes per day.

Mr Y had leg ulcers for a period of 16 years. Following a vascular review he was commenced on compression therapy. This treatment continued until he had a bilateral skin graft. However, approximately 5 months post-surgery, he developed two ulcerated areas on one leg (Figure 3). The district nurses treated him for several months with a conventional, appropriate dressing regimen, until he was re-referred to the vascular clinic and again commenced on compression therapy.

Following an angiogram, it was suggested that a revascularisation procedure would be necessary; however, in view of his weight, it was decided to continue with conservative treatment. At this point the vascular nurse referred him to the tissue viability service for laser therapy.

On examination, Mr Y was found to have two ulcerated areas on his right leg, one being 1.5 x 1 cm and the other 0.5 x 0.5 cm; both were granular in nature. The dressing regime of Allevyn (Smith and Nephew, Hull) was not changed as it was considered to be providing the warm, moist environment necessary for wound healing (Winter, 1962). Another reason for not changing his current treatment was to assess

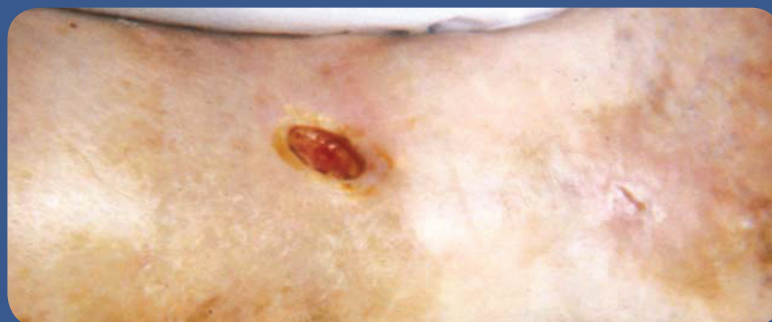


Figure 3. A venous leg ulcer in a 56-year-old man with diabetes before laser treatment.



Figure 4. A venous leg ulcer following 11 treatments with laser therapy.

whether the laser therapy had any effect on the ulcers.

Laser therapy was commenced, using a size 69 LED cluster probe. In order to treat the ulcers and the surrounding skin, the standard regime of one cluster to each ulcerated area, for a treatment time of one minute at a frequency of 20 Hz, was begun.

Following four treatments over 4 weeks, the smaller ulcer was fully healed (Figure 4) and the patient was advised to apply simple moisturiser to ensure that the skin remained in good condition.

By 11 treatments, just under 6 weeks, the remaining ulcer had decreased in size and was measuring 0.6 x 0.4 cm. The ulcer continued to improve and by treatment 17 (17 weeks) the ulcer was healed. Both ulcers have remained healed.

Conclusion

Before the introduction of laser therapy to their plan of care, the above two

patients were having optimal conventional treatment with minimal success. Following the addition of laser therapy to the existing conventional treatment, the wounds of both patients progressed to full healing. The author is now running a successful laser clinic and has successfully treated a variety of chronic wounds including venous and arterial leg ulcers, pressure ulcers, pilonidal sinuses, traumatic wounds and burns. The laser is simple to use and very cost-effective in terms of finance and time, but more importantly, improves the quality of life for some patients. **WUK**

Dyson M, Agailby A, Ghali L (2002) *Lasers Med Sci* 17(4): A22

Gupta AK, Filonenko N, Salansky N, Sauder DN (1998) The use of low energy photon therapy (LEPT) in venous leg ulcers: a double-blind, placebo-controlled study. *Dermatol Surg* 24(12): 1383-6

Kleinman Y, Simmer S, Braksma Y et al (1996) Low level laser therapy in patients with diabetic foot ulcers: early and long term outcome. *Laser Ther* 8: 205-8

Winter GC (1962) Formation of scab and the rate of epithelialisation of superficial wounds of the young domestic pig. *Nature* 193: 293-4