
Case Reports

Helium-Neon Laser as an Adjunctive Modality for Wound Healing

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High energy lasers have extensive applications in the field of surgery, ophthalmology, dermatology, medicine and oncology. The utility of low energy lasers for biostimulation, immune response mediation and wound healing is of relatively recent interest. The current communication illustrates our experience with low energy laser (He-Ne laser) as an adjunct to the conventional modes of treatment for wound healing.

Case Report

A 40 weeks gestation, male, born to nonconsanguineous parents after an uneventful pregnancy and delivery was admitted at the age of 12 days with the complaints of fever, scalp swelling and poor feeding of three days duration. There were no associated symptoms like vomiting, seizures, cough, respiratory distress, trauma, boils, bleed or excessive cry while passing urine or stool.

Examination revealed a 3.5 kg, sick

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looking, lethargic neonate. Vital signs revealed a heart rate of 140/min, respiratory rate of 36/min, and rectal temperature of 36.5°C. General examination showed a normal anterior fontanelle, mild peripheral cyanosis and scalp cellulitis. This extended over the occipital area, and over 3-4 days formed a huge abscess, oozing pus and necrotic debris, exposing the skull bone. The left side of the wound measured 6 x 7 cm approximately. A smaller lesion was present over the right parietal area, the underlying bone was visible through this lesion. This was surrounded by large ulcerative skin lesion almost confluent with the occipital lesion. The parital lesions were separated by a lesion over the occiput which revealed slough and blackish necrotic debris. The total wound area covered almost two thirds of the total scalp surface of the neonate (*Fig. 1*). The wound details are indicated in *Table I*. Systemic examination was normal and a provisional diagnosis of scalp cellulitis with septicemia was made.

Investigations revealed hemoglobin-13.7g/dl; TLC - 4700 cells/cu mm; DLC-N60 and L40; absolute neutrophil count-2820 cell/cu mm; μ ESR - 16 mm; and adequate platelets. Peripheral smear revealed toxic granules and mild leucopenia. The CSF was acellular with normal biochemistry and sterile on culture. Urine microscopy and cultures were negative. Blood culture was sterile. Chest X-ray was normal while Skull X-ray revealed osteomyelitis of parietal bone. Nitroblue tetrazolium test revealed very small, stained intracellular granules in about 30% of the cells (within normal limits).

Pus culture and sensitivity was performed at weekly intervals which yielded



Fig. 1. Pre-treatment photograph of wound showing irregular margins, necrotic tissue and pus discharge.

TABLE 1-*Morphology of the Wounds Before and After Therapy*

	Left		Right	
	Prior to Therapy	End of Therapy	Prior to Therapy	End of Therapy
Margin	Irregular indurated	Regular	Irregular beveled	Regular healthy
Floor	Unhealthy, Necrotic Oozing Tissue	Healthy granulation tissue	Unhealthy	Healthy granulation tissue
Base	Skull bone Exposed	Clear granulation tissue	Skull bone exposed	Clear granulation tissue
Surrounding skin	Inflamed	Healthy	Inflamed	Healthy
Discharge	Oozing pus	No discharge	Serous discharge	No discharge

Acinetobacter initially. Subsequent cultures showed *Staphylococcus aureus* and *Citrobacter* species. Appropriate antibiotics were given throughout the hospital stay including intravenous cloxacillin (100 mg/kg/day) and amikacin (15 mg/kg/day) for 25 days. Antibiotics were subsequently changed to netilmycin (6 mg/kg/day) and cefotaxime (100 mg/kg/day) for 10 days duration. Daily cleaning and dressing of scalp was done with betadine.

After 2 weeks of treatment; the child's general condition remained same and the wound did not show any improvement. At this stage, a baseline photograph of the wound was taken and He-Ne laser therapy was started.

Laser Therapy Schedule

Low energy He-Ne laser provides infrared rays in the wave length of around 630 nm by continuous mode. An average power of 5-8 mw was provided through a fiber optic delivery system around the wound margin for about 8-10 min at each point at a distance of one cm. Since the left side ulcer was big, it was decided to give laser therapy for this side (*Fig. 1*) keeping the right side ulcer as control.

At the end of one week there was a marked improvement in laser irradiated side with respect to ulcer size and wound margin and there was no pus discharge after five exposures (*Table I*). A healthy granulation tissue was noted. *Fig. 2* reveals the post laser therapy ulcer on day 14. At this stage, the right side ulcer was still unhealthy and without significant signs of healing. It was decided to irradiate the right ulcer also with the same therapy regimen. There was a significant improvement after 5 days with the modality. The child made good progress and is now awaiting a split skin graft to provide a scalp cover over the large wound.

Discussion

Our patient demonstrated a significant benefit of Helium-Neon laser for rapid healing of skin wound. The comparison between the laser and conventionally treated wounds on opposite sides clearly highlighted that despite uniformity of host factors, local factors and systemic state, the wound healing process was stimulated on the laser exposed side.

Healing of wounds is an important problem faced by Pediatricians. The possible biostimulatory role of laser light in wound healing is of recent interest(1). Small subdestructive repetitive doses of laser light are claimed to be useful for trophic ulcers and indolent wounds(2). The proposed mechanisms of action include local leucocyte proliferation[^], neovascularization, fibroblastic proliferation and rapid epithelialization(4,5). All these mechanisms possibly lead to more rapid closure of wounds and stronger scar formation. In an experimental study, wounds treated with Helium-Neon laser revealed significantly more granulation tissue. The collagen hydroxyproline concentration of scar tissue was also significantly higher on the 17th post operative day. This study established the biostimulatory effects of low intensity laser radiation(6). Many reports now indicate benefit to non healing wounds and trophic ulcers by low-intensity laser irradiation. Out of 351 patients thus treated, 236 showed complete epithelialisation of the wound surface(7). Twelve intractable venous ulcerations were treated by vascular surgeons in Ireland. A 44% increase in healthy granulation tissue was observed, 2/12 ulcers healed completely while 27% revealed reduction in size of the remaining ulcers indicating considerable benefit(8).

Nussbaum *et al.*(9) in a study compared the effect of ultraviolet-C and laser for treatment of pressure ulcers in adults with



Fig. 2. Post laser treatment photograph on day 14 showing healthy granulation tissue healing at margins. The pus discharge has subsided.

spinal cord injury. They used 660-980 nm wave length light at an energy density of 4 J/cm². Weekly percentage changes in wound area were compared. The authors concluded exposure to UV-C decreased healing time and allowed faster return to rehabilitation programs. The UV-C light was better than the laser(9). Another nonrandomized study of laser and UV lamp on chronic skin ulcers suggested that wounds which fail to respond to topical treatments benefit from either modality(10). Evaluation of different approaches to wound healing are complicated by the large number of factors that influence wound healing. Although there are anecdotal reports of successful therapy, there are few well controlled studies.

The use of lasers for healing wounds is becoming increasingly attractive to physi-

cal therapists. A number of animal and *in vitro* studies(11,12) have demonstrated that laser irradiation has a significant effect on components of tissue repair.

In conclusion, the present report highlights the possible utility of Helium-Neon laser as an adjunctive modality for wound healing in Pediatric practice.

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Retrobulbar Pseudotumor as a Manifestation of Staphylococcal Pyemia

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Staphylococcal infection leading to periorbital complication is known but is rare. Various complications including cavernous sinus thrombosis and extension to the ethmoid sinus can occur. Rapid recov-

ery is always possible with correct diagnosis and treatment. The case presented emphasizes this point.

Case Report

A four-year-old girl was referred to us

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