Laser therapy in dentistry

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[PICTURE: ©PIXEL EMBARGO]

_Introduction

The Therapeutic laser is a new tool which can be a boon to the dental practice. Laser Therapy is also known as Photo-Biomodulation. It is based on the concept that certain low level doses of specific coherent wavelengths can turn on or turn off certain cellular components or functions. Administering laser therapy to patients helps in healing, reducing pain, swelling and controlling oral infections.

The wavelengths used for Laser Therapy have poor absorption in water and thus penetrate soft and hard tissues from 3 mm up to 15 mm. Therapeutic lasers generally operate in the visible and the infrared spectrum, 600–900 nm wavelength. The energy used is indicated in Joule (J), which is the number of milliwatts x the number of seconds of irradiation. High power surgical lasers can be defocused and arranged to give energy densities of the same values as the former. Thus, a therapeutic laser could be defined as a laser using energy densities below the threshold where irreversible changes in cells occur.

_Mechanism of action

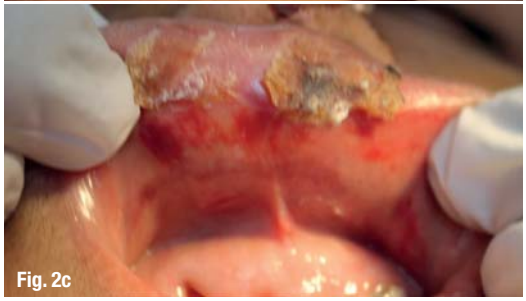
The principle of using laser therapy is to supply direct biostimulative light energy to the body's cells. Cellular photoreceptors can absorb low-level laser light and pass it on to mitochondria, which promptly produce the cell's fuel, ATP. The most beneficial effect of laser therapy is wound healing. Studies have shown the evidence of accumulated collagen fibrils and electron dense vesicles intracytoplasmatically within the

Fig. 1_Bio stimulation headpiece used for Intra-Oral therapy.
Fig. 2_Preoperative (a), laser-assisted biostimulation (b), after three days (c), after one week (d).


Fig. 1


Fig. 2a


Fig. 2b


Fig. 2c





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laser stimulated fibroblasts as compared with untreated areas. Increased microcirculation can be observed with the increased redness around the wound area.

The analgesic effects can be understood with some evidence suggesting that laser therapy may have significant neuropharmalogic effects on the synthesis, release and metabolism of a range of neurochemicals, including serotonin and acetylcholine at the central level and histamine and prostaglandin at the peripheral level.

_Common indications for laser therapy in dentistry

Alveolitis

Laser phototherapy (LPT) directly after extraction helps to prevent alveolitis. If it is already established, 4–5 J before and after the alveolus is debrided and plugged with medication is recommended. Irradiate the alveolus and its surrounding area directly. If the alveolitis is very painful, then 15–20J can be used.

Anaesthetics

Some patients are difficult to anaesthetize. By administering 2–3 J over the apex, circulation is increased and the anaesthetic is more quickly absorbed. This also means that the duration is reduced. The duration of numbness in the lip after anaesthesia can therefore be reduced by LPT. This can be advantageous in paediatrics.

Bleeding

A laser is useful in the treatment of postoperative bleeding. Although the mechanism is unclear, literature shows that LPT brings about initial vasoconstriction that is followed by vasodilatation.

Pulpal analgesia

In selected patients, using the 660-nm laser probe can achieve adequate pulpal analgesia. Successful analgesia may allow a dentist to use a high speed drill to prepare a class II restoration without the need for any local anaesthesia.

Treatment consists of placing the laser probe on the occlusal surface of a primary molar for one to two minutes. In permanent teeth, placing the probe for one minute next to gingival tissue over the roots of the treated tooth also contributes to successful analgesia.

Trauma

Trauma to a primary anterior tooth may compromise the tooth's vitality and result in requiring either a pulpotomy or extraction in a four- to six-week period.

A tooth or teeth which have been significantly displaced may respond positively if treatment is begun within a few hours of trauma. Treatment consists of placing the laser over the injured tooth for a period of one minute on the facial root area and one minute on the lingual or palatal root area. An additional treatment in 24 to 36 hours may improve the chance of successfully healing the tooth.

Healing of soft tissue trauma

Patients who fall and receive facial lacerations and swelling benefit from placing the laser/light-emitting diode (LED) unit over the area for approximately three minutes and placing the 660-nm or 808-nm probe over the most injured area for one to two minutes, helping to heal the lesions more quickly and with less post trauma discomfort. Additional treatment 24 to 36 hours later may be needed to reduce the discomfort and improve healing.


Fig. 2d

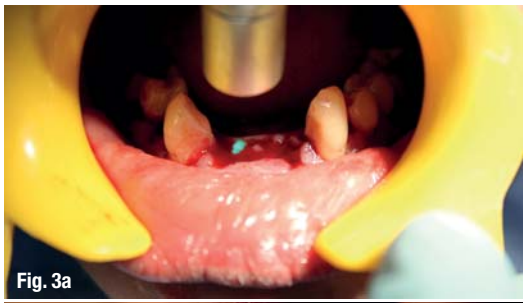

Fig. 3a


Fig. 3b


Fig. 3c

Fig. 3_Laser-assited haemostasis (a), after first session of laser therapy (b), after one week (c), immediately after extraction (d).


Fig. 4a


Fig. 4b

Fig. 4_Extraoral biostimulation (TMJ) – with high power laser therapy (a), extraoral biostimulation (TMJ) – with a biostimulation hand piece (b).

Post extraction and bone healing therapy

It is useful to irradiate the area before and after an extraction. Irradiating before the extraction with 1 J at the injection site and 2 J right below the apices induces a transient but useful effect. After extraction, an additional 2 J/cm^2 on the alveolar and gingival tissues is needed to control the swelling and inflammation. Less postoperative pain and better healing can be expected.

Apthous ulcer

Laser therapy for the treatment of apthae can be recommended for its pain relieving effect and the shortened healing time. The treatment dosage is the same for herpes and apthae; 2 J/cm^2 applied near contact. This is repeated the following day.

Mucositis

Patients undergoing radiation therapy or chemotherapy develop mucositis. Mucositis is painful and may force the oncologist to reduce the dosage or number of sessions. Red laser light has been shown to reduce the severity of mucositis and can be used prophylactically before radiation.

Trigeminal neuralgia

Laser phototherapy has been documented to have a pain relieving effect on trigeminal neuralgia. Studies have shown that patients treated with low level therapy are more likely to be relieved of pain by the end of the first year.

Tempromandibular joint dysfunction

Problems in the tempromandibular joint region are quite suitable for laser therapy. For arthritic cases, the treatment is concentrated to the joint area, in myogenic cases the muscular insertions and trigger points are treated. Laser therapy should always be used in combination with conventional treatment but will improve the outcome of the treatment. Tempromandibular joint-pain biostimulation of the TMJ and masseter muscles is effective for pain relief, especially in situations of acute locking.

Periodontitis

The use of laser therapy helps to control the symptoms and conditions of periodontitis. The anti-inflammatory effect slows or stops the deterioration of periodontal tissues and reduces the swelling to facilitate the hygiene in conjunction with scaling, root planning, curettage or surgical treatment. As a result, there is an accelerated healing and less post operative discomfort.

_Laser therapy in medically compromised patients

Pacemaker

As pacemakers are electronic and cased in metal they are not influenced by light. Hence, low level laser therapy on patients with pacemakers should not be considered a total contraindication.

Cancer

Laser phototherapy can provide palliative treatment to cancer patients. LPT is a viable option for pain control and general stimulation in these patients.

Epilepsy

Pulsed visible light, particularly at pulse frequencies in the 5–10 Hz range can cause epileptic attacks, one should obviously be careful with instruments that use flashing visible light. However, it is rare for therapeutic lasers to have pulsing visible light.

_Conclusion

LPT has been found to accelerate wound healing and reduce pain, by stimulating oxidative phosphorylation in mitochondria and modulating inflammatory responses. The enhanced cell metabolic functions seen after laser therapy are the result of activation of photoreceptors within the electron transport chain of mitochondria. Because of the many advantages laser therapy provides, it is gaining momentum as an irreplaceable treatment modality in modern dental practice._

_contact laser

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