



## LASERS IN DENTISTRY: A BRIEF REVIEW

## Dental Sciences

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## ABSTRACT

Lasers were introduced in dentistry in the 1960s, by Maiman, which led to a continuous research in the various applications of lasers in dental practice. On account of the ease, efficiency, specificity, comfort, and cost over the conventional modalities, lasers are indicated for a wide variety of procedures in dental practice. The aim of this article is to briefly review the applications of lasers in dentistry.

## KEYWORDS

Soft tissue laser, Hard Tissue Laser

Lasers were introduced in dentistry in the 1960s, by Maiman [1], which led to a continuous research in the various applications of lasers in dental practice. Lasers can be classified as ; hard tissue lasers, such as, Carbon dioxide (CO<sub>2</sub>), Neodymium Yttrium Aluminum Garnet (Nd:YAG), and Er:YAG, which offer both hard tissue and soft tissue applications [2,3] and on the other hand as cold or soft tissue lasers, based on the semiconductor diode devices, which are compact, low cost devices used predominantly for applications, are broadly termed as low level laser therapy (LLLT) or 'biostimulation'. [4]. On account of the ease, efficiency, specificity, comfort, and cost over the conventional modalities, lasers are indicated for a wide variety of procedures in dental practice[5]. The aim of this article is to briefly review the applications of lasers in dentistry.

## Brief introduction to various types of lasers:-

## Carbon dioxide Laser:

The CO<sub>2</sub> laser wavelength has a very high affinity for water, resulting in rapid soft tissue removal and hemostasis with a very shallow depth of penetration. Although it possesses the highest [11] absorbance of any laser, disadvantages of the CO<sub>2</sub> laser are its high cost and hard tissue destructive interactions.

## Nd: YAG Laser:

The Nd:YAG wavelength is highly absorbed by the pigmented tissue, making it a very effective surgical laser for cutting and coagulating dental soft tissues, with good hemostasis. It has many surgical applications.

## Erbium YAG Laser:

The erbium wavelengths have a high affinity for hydroxyapatite and the highest absorption of water in any dental laser wavelengths. Consequently, it is the laser of choice for treatment of dental hard tissues[7]. This can also be used for soft tissue ablation [8].

## Diode Laser:

All diode wavelengths are absorbed primarily by tissue pigment (melanin) and hemoglobin. Specific procedures include aesthetic gingival recontouring, soft tissue crown lengthening, exposure of soft tissue impacted teeth, removal of inflamed and hypertrophic tissue, frenectomies, and photostimulation of the aphthous and herpetic lesions. [9]

## Use of Lasers in Various Dental Specialties:

## Oral Surgery

In oral surgery the lasers can be used for the management various types of abscesses, Aphthous ulcer, Hemostasis, Curettage, Epulis, Irritation fibroma, Granuloma, Haemangioma, Removal of hyperplastic tissue, Bacterial reduction, Operculectomy, Flap surgery, Excisional biopsy, Retention cyst, Exposure of impacted teeth, Seeping haemorrhage, Sulcus preparation, Vestibuloplasty, Root end resection, Ankyloglossia[10]

## Periodontics

In periodontology lasers can be used in following : Flap surgery, Frenectomy, Gingival contouring/ Gingivectomy, Pocket treatment, Bacterial reduction, Curettage, Pocket reduction, Operculectomy,

Decontaminate membrane, Internal bevel incision[5]

## Orthodontics

Use of lasers in orthodontics are as follows: Bracket curing, Post orthodontic removal of residual cement, Exposure of impacted tooth

## Pedodontics

In pedodontics, lasers can be used for : Removal of caries in deciduous teeth, Pulpotomy and Pulpectomy procedure

## Endodontics

Bleaching, Caries removal, Canal irrigation, Curing of cement, Removal of fractured restorations, Etching of the tooth, Root resection (Apicoectomy).

## Prosthodontics

Sulcus deepening, Vestibuloplasty, Crown contouring, Crown lengthening, Smile design.

## OTHER USES

## Analgesic effect of the laser

In vivo studies of the analgesic effect of low level laser therapy (LLLT) on nerves supplying the oral cavity have shown that LLLT decreases the firing frequency of the nociceptors, with a threshold effect seen in terms of the irradiance required to exert maximal suppression [12]. Local CO<sub>2</sub> laser irradiation will reduce the pain associated with orthodontic force application, without interfering with tooth movement. [13]

## Nerve repair and regeneration

Low level laser therapy has been seen to reduce the production of inflammatory mediators of the arachadonic acid family from injured nerves, and to promote neuronal maturation and regeneration following injury. [14]

## Post surgical pain

A single episode of LLLT (irradiance 0.9-2.7 J) is 100% effective for apical periodontitis following root canal treatment and post-extraction pain. There are conflicting results with regard to pain reduction post extraction by LLLT verses placebo controls.

## Medicolegal considerations

Conservative soft tissue surgery with a dental laser is considered within the scope of accepted dental practice and typically considered a covered procedure under most professional liability insurance policies designed for dental specialists. Informed consent must be routine and is best handled as part of the general consent form that all patients read and sign prior to the initiation of dental treatment. It is highly recommended that each clinician take a course from a reputable provider.

## Advantages

1. No anesthesia, no drill
2. Less blood loss, less pain hemostatic, analgesic effect.
3. Reduce post-operative edema
4. Less post-op scarring.

5. Initial healing, rapid regeneration, reduce post sensitivity in restorations
6. Dressing & suturing is not required for wound closer.
7. Less chances of metastasis
8. Sterilization of treatment site.

#### Disadvantages

1. Laser beam could harm the patient or operator by direct beam or reflected light, causing retinal burns
2. Laser - more expensive
3. Need qualified professionals to operate.

#### Hazard Control and Safety Measures

1. The small flexible fiber optic , hand pieces or tip must be steam sterilized in sterilizing pouches
2. Practice of protective wear
3. Use of screen & curtains should be promoted
4. Use of proper clothing
5. Use of anti-fire explosive
6. Proper training and courses
7. Use of laser filtration masks prevents air borne contamination.

#### CONCLUSION

Although lasers cannot replace all the conventional procedures in dentistry, it's use enables some procedures to be performed differently than the conventional procedure and its development in the field of dentistry continues to expand further enabling greater patient care.

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