

Review Article

Lasers in Prosthodontics: A Review

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ABSTRACT:

Lasers have a wide range of applications in the field of dentistry and also became a boon to dentists from all over the world. Lasers are being used for general surgical procedures since long time but now it was introduced in dentistry to overcome the difficulties that occur due to conventional methods. Interaction of lasers to soft tissue allow bloodless surgery, least post-operative pain and scarring; since the laser incision is more broad and irregular so it blends better with the surrounding tissue while healing. The introduction of the lasers to the specialties of dentistry like Prosthodontics, Surgery, Periodontics and Endodontics has brought a revolution in the treatment delivery with increased precision of procedures and comfort for the patients. Lasers for hard tissues encourage efficient diagnosis of caries and improve the resistance of dental enamel to caries, etching of enamel, cavity preparations, photopolymerization of composite resin and sterilization of the root canal system. This review article describe the uses of lasers in Prosthodontics for treatment of Fixed And Removable Prosthesis, Implantology.

Keywords: Lasers, Prosthodontics, Implantology.

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INTRODUCTION:

The word LASER “Light Amplification by Stimulated Emission of Radiation” was used for the first time by an American Physicist, Gordon Gould in 1957 while recording his ideas with a title “Some rough calculations on the feasibility of a LASER”.¹⁻³ After years of work on lasers Miaman foresaw the use of the device for bloodless surgical tool for treatment of cancers and as dental equipment.⁴ A laser is a device that changes electrical or chemical energy into a very fine, intense beam of light energy that alters light of several frequencies into an

intense, small, and nearly non-divergent beam of monochromatic radiation, within the visible range.⁵ Two major types of lasers were introduced in terms of clinical applications; hard lasers such as carbon dioxide (CO₂), neodymium–yttrium aluminum garnet), and erbium–yttrium aluminum garnet (Er:YAG) with both hard and soft tissue usages. Because of high cost and a potential for thermal tissue damage, hard lasers have some limitations.^{6,7} On the other hand, soft or cold lasers have been predominantly used for biostimulation or low level laser therapy (LLLT).⁸ Lasers are used in various disciplines in

dentistry such as restorative dentistry where they are used for diagnosis of caries, improving the resistance of dental enamel, and photopolymerization of composite resin;^{9,10} endodontics for bactericidal cleansing of root canal;¹¹ periodontics for gingivectomy, gingivoplasty, frenectomy, and vestibuloplasty;¹² pedodontics to prepare tooth surfaces for sealant application;¹³ and oral and maxillofacial surgery to treat vascular malformation.^{14,15} Dental lasers are classified with regard to the lasting medium used such as gas laser or solid laser, application in different tissues such as soft tissue or hard tissue lasers, the range of wavelength, and the risk of laser usage.¹⁶ This review article describes the uses of lasers in Prosthodontics for treatment of Fixed And Removable Prosthesis, Implantology.

LASERS IN PROSTHODONTICS:

Lasers in prosthodontics can be used in fixed or removable prosthesis, implantology and in case of maxillofacial rehabilitation.

LASERS IN IMPLANTOLOGY:

Implantology: Dental lasers can be used in implantology in procedures like implant recovery, implant site preparation and removal of diseased tissue around the implant.

1. **Implant recovery:** Use of lasers in implantology is that because the implant can be exposed, impressions can be taken immediately after second stage surgery because there is little blood contamination in the field. There also is minimal tissue shrinkage after laser surgery, which will ensure that the tissue margins will remain at the same level after healing as they are immediately after the surgery.^{17,18}
2. **Implant site preparation:** Lasers can be used for the placement of mini implants in cases of patients with potential bleeding problems, to make bloodless surgery in the bone.¹⁸
3. **Removal of diseased tissue around the implant:** Lasers can be used. The Diode lasers alone or with CO₂ & Er: YAG lasers can be used to restore implants by sterilizing their surfaces with laser energy by removing granulation tissue in case there is inflammation around an Osseointegrated implant.^{18,19}

REMOVABLE PROSTHETICS

Lasers may now be used to perform most pre-prosthetic surgeries. These methods involve hard and soft tissue tuberosity reduction, torus removal, and treatment of inappropriate residual ridges involving undercut and irregularly resorbed ridges, treatment of unsupported soft tissues, and hard and soft tissue malformation. Lasers may

be used to treat the problem of hyperplastic tissue and nicotinic stomatitis under the palate of a full or partial denture and ease the irritation of epulis, denture stomatitis, and other problems related with long term wear of ill-fitting dentures.

1. **Treatment of unsuitable alveolar ridges:** To remove sharp bony projections and to smooth the residual ridge soft tissue lasers surgery to uncover the bone may be produced with any number of soft tissue wavelengths (CO₂, diode, Nd:YAG,) Hard tissue surgery can be produced with the erbium family of wavelengths.²⁰
2. **Treatment of undercut alveolar ridges:** Osseous surgery may be performed with the erbium family of lasers.²⁰
3. **Treatment of enlarged tuberosity:** The expanded soft tissue can be reduced with any of the soft tissue lasers. Erbium laser is the laser of choice for the osseous reduction.²⁰
4. **Surgical treatment of tori and exostoses:** Soft tissue lasers may be used to expose the exostoses and erbium lasers may be used for the osseous reduction.²⁰

Laser can be used as an adjunct to removable prosthetic care for many different procedures, including the following:

1. **Epulis fissuratum reduction:** Many researchers have reported the usage of CO₂ lasers in treatment of epulis fissuratum with much more satisfactory results than conventional scalpel.²¹⁻²⁴
2. **Vestibuloplasty:** Neckel has found that there is less post-operative pain in patients treated with lasers for vestibuloplasty. Many other researchers have reported the same results of less post-operative pain and no relapse without any complications.²¹⁻²²

USE OF LASERS IN FIXED PARTIAL DENTURE PROSTHODONTICS:

1. **Crown lengthening:** It refers to the surgical exposure of longer gingivoincisor length. It can be done by excising either soft tissue or hard tissue or at times both. Erbium lasers provide to be a master tool for bone removal without raising a flap.²⁷⁻²⁸ Lasers have an advantage in crown lengthening regard as they cut only at the tip and can be held parallel to long axis of the tooth to remove bone immediately adjacent to cementum without damaging it. Also, using lasers is less complicated and achieves maximum patient comfort.²⁹
2. **Soft tissue management around abutments:** Argon laser energy provides excellent haemostasis and efficient coagulation and vaporization of oral tissues. These characteristics are helpful in retraction and haemostasis of the gingival tissue in

- preparation for an impression during a crown and bridge procedure.³⁰
3. **Modification of soft tissue around laminates:** The removal and re-contouring of gingival tissues around laminates can be easily done with the argon laser.³⁰
 4. **Osseous crown lengthening:** The water content and hydroxyapatite are responsible for the high absorption of the Er: YAG laser light in the bone. Er: YAG laser has very promising potential for bone ablation.³
 5. **Laser troughing:** Lasers can be used to create a trough around a tooth before impression taking. This can entirely replace the need for retraction cord, electrocautery, and the use of haemostatic agents.³⁰
 6. **Bleaching:** Bleaching using diode lasers results in immediate shade change and less tooth sensitivity and is preferred among in office bleaching systems.³¹
 7. **Veneer removal :** Lasers like Er:YAG and Er Cr:YSGG can be used remove failed veneers.³²
 8. **Crown fractures at the gingival margins:** Er:YAG or Er, Cr:YSGG lasers can be used to allow correct exposure of the fracture margin.³³
 9. **Formation of ovate pontic sites:.** This is easily formed with the use of an laser.³⁴
 10. **Pigmented Gingiva:** Diode, Nd:YAG, CO2 and erbium lasers prove to be usage of choice for depigmentation procedures.³⁵⁻³⁹

LASERS IN MAXILLOFACIAL REHABILITATION

The use of lasers in the maxillofacial prosthetics is mainly for the initial work up of three dimensional attainment of optical data of the extraoral defects. Laser technology has proved to be particularly helpful for planning the shape and position of the prostheses. With the help of lasers the need for conventional impression techniques and associated disadvantages like deformation of the soft tissue and discomfort to patients can be eliminated. Lasers have advantage of 3D CT and MRI reconstruction as the patient is not exposed to considerable radiation and any stress.³²

LASER APPLICATIONS IN THE DENTAL LABORATORY

Lasers are used for deposition of hydroxyapatite (HA) thin films on titanium implants. Pulsed laser deposition (PLD) has proven to be a sure method to produce pure, crystalline and adherent HA coatings which show no dissolution in a simulated body fluid.³²

Lasers can be used for surface treatment of titanium castings for ceramic bonding and have shown improved bond strength when compared to acid etching techniques. Lasers can also be used for welding.⁴⁰

CONCLUSION:

Lasers become the technology that replaced the conventional methods. Advances in the use of laser devices in prosthodontics will continue. To use lasers safely in a clinic, the practitioner should have precise knowledge of each laser system & their applications, their uses and their adverse effects. The risks can increase in magnitude due to lack of knowledge about lasers.

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