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Lasers in Prosthetic Dentistry

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ABSTRACT *Lasers are one of the most exciting developments of medical technology. In just one generation, lasers have moved out of the realm of fantasy and entered into everyday life. They are considered as a magic band used for advanced medical and dental care. Lasers are patient friendly and offer many advantages over more conventional means of treatment. Lasers when used efficaciously and within ethical confines provide a wonderful treatment modality for a majority of clinical conditions that dentists or dental specialists treat on a daily basis.*

INTRODUCTION

The word laser is an acronym for "Light Amplification by stimulated Emission of Radiation" which explains most of the critical physical interactions that occur within a laser generating cavity. This property of radiant energy reaction with biological tissues has been taken as the basis of laser treatment in dentistry.[1]

Lasers are infact not new in the field of dentistry. They have been in use since 1960s. They were first applied in dentistry for surgical treatment of tumors in the oral cavity. After the discovery of the first ruby lasers they were introduced in dentistry for "optical drilling" of teeth and replacement of conventional treatment methods.

LASERS IN PROSTHETIC DENTISTRY

Laser may be used to replace traditional, dental instruments for a variety of purposes. The development of dental turbines and angle pieces has proceeded rapidly in the last few decades. The high speed, multi-edged tools and fine diamond grinding pieces have led away from the classical drilling procedures, to a more or less grinding forms of tissue removal.

Despite the general advantages of the rotating tools, certain limitations in their use exist.

In 1989, experimental work by Keller and Hibst using a pulsed erbium YAG (2.940 nm) laser, demonstrated its effectiveness in cutting enamel, dentin, and bone.since 1987, the clinical persective of laser use on hard dental tissues has grown by introducing the er:YAG and er, cr: YSGG lasers, wich have the advantage of reducing thermal effects and creating a precise contour of the selection zone[2].

Lasers are now being used in a variety of procedures in prosthetic dentistry.

A.FIXED PROSTHETICS/ESTHETICS

i. Crown lengthening
ii. Soft tissue management around abutments
iii. Osseous crown lengthening
iv. Troughing
v. Formation of ovate pontic sites
vi. Altered passive eruption management
vii. Modification of soft tissue around laminates
viii. Bleaching
i x veneer removal

B. IMPLANTOLOGY

i. Second stage uncovering
ii. Implant site preparation
iii. Peri-implantitis

C. REMOVABLE PROSTHETICS

i. Tuberosity reduction
ii. Torus reduction
iii. Soft tissue modification
iv. Epulis fissurata
v. Denture stomatitis
vi. Residual ridge modification

FIXED PROSTHETICS/ESTHETICS:

One of the essential elements of success of lasers in fixed prosthodontics is the care and accuracy of the component treatment stages, and the laser often can confer minimal collateral tissue damage through proper consideration of the use of minimal laser energy of the correct wavelength[3].

Crown lengthening:

Clinical scenarios where crown lengthening procedures are indicated within esthetic zone require special consideration to achieve predictable esthetic results.

Crown lengthening procedures are indicated in following conditions.

a. Caries at gingival margin
b. Cuspal fracture extending apical to the gingival margin
c. Endodontic perforations near alveolar crest.
d. Insufficient clinical crown length.
e. Difficulty in placement of finish line coronal to the biological width.
f. Need to develop a ferrule.
g. Unesthetic gingival architecture.
h. Cosmetic enhancements.

Lasers offer unparallel precision and operator control and may be beneficial forfinely tracing incision lines and sculpting the desired gingival margin outline.

Soft tissue management around abutments:

Argon laser energy has peak absorption in hemoglobin, thus lending itself to providing excellent hemostasis and efficient coagulation and vaporization of oral tissues.

These characterisitics are beneficial for retraction and hemo-

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stasis of the gingival tissue in preparation for an impression during a crown and bridge procedure. Gingivoplasty may also be done using argon laser[3].

Modification of soft tissue around laminates:
The removal and recontouring of gingival tissues around laminates can be easily accomplished with the argon laser. The laser will remove tissue and provide hemostasis and tissues weld the wound[3].

Osseus crown lengthening :
Like teeth mineralized matrix of bone consists mainly of hydroxyapatite. 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].

Formation of ovate pontic sites:
For favourable pontic design recontouring of soft and bony tissue may be needed. Soft tissue surgery may be performed with any of the soft tissue lasers and osseus surgery may be performed with erbium family of lasers.

Altered passive eruption management:
Lasers can be used very efficaciously to manage passive eruption problems .when the patients have clinical crowns that appear too short or when they have an uneven gingival line producing an uneven smile, excessive tissue can be easily and quickly removed without the need for blade incisions, flap reflection, or suturing[3].

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 hemostatic agents. the results are predictable, efficient, minimize impingement of epithelial attachment, cause less bleeding during the subsequent impression , reduce postoperative problems, and reduce chair time[3]. It alters the biological width of gingiva. Nd:YAG laser is used

Bleaching:
Esthetics and smile has become important issues in modern society. Bleaching has become the common method for tooth whitening. Bleaching using diode lasers results in immediate shade change and less tooth sensitivity and is preferred among in office bleaching systems.

Veneer removal :
With laser technology, the restoration can now be removed without cutting it off. The laser energy passes through porcelain glass unaffected and is absorbed by the water molecules present in the adhesive. It appears that this debonding occurs at the silane– resin interface because the underlying tooth structure appears to be unaffected.

IMPLANTOLOGY:
Dental lasers are used for a variety of procedures in implantology.

Implant recovery:
Following the placement of an implant and its integration into the osseous substrate, the current method of treatment is to surgically uncover the implant, wait for the tissue to heal, and then proceed with impressions and fabrication of the restoration. The reason for the delay is to facilitate the impression - taking process. Use of lasers can greatly expedite this procedure because the implant can be uncovered and impressions can be obtained at the same appointment.

All types of lasers can be used to expose dental implants. In addition the use of laser can eliminate the trauma to the tissues of flap reflection and suture placement.

Implant site preparation:
Lasers can be used for the placement of mini implants especially in patients with potential bleeding problems, to provide essentially bloodless surgery in the bone[4].

Removal of diseased tissue around the implant:
Lasers can be used to repair ailing implants by decontaminating their surfaces with laser energy. Diode, CO2 & Er:YAG lasers can be used for this purpose. Lasers can also be used to remove granulation tissue in case there is inflammation around an already osseointegrated implant[4,5].

SINUS LIFT PROCEDURE:
Lasers can also be used in the sinus lift procedure. The procedure can be done by making the lateral osteotomy with a decreased incidence of sinus membrane perforation. The yttrium-scandium-gallium-garnet (YSGG) laser is the optimal choice for not cutting the sinus membrane.The YSGG laser can also be used to make the osteotomy for a ramal or symphyseal block graft. Bone grafts done with lasers have been demonstrated to decrease the amount of bone necrosis from the donor site and the osteotomy cuts are narrower, resulting in less postoperative pain and edema.[6]

REMOVABLE PROSTHETICS
Treatment of unsuitable alveolar ridges:
Alveolar resorption usually is uniform in vertical and lateral dimensions. To smooth the residual ridge soft tissue lasers surgery to expose the bone may be performed with any number of soft tissue wavelengths (CO2, diode, Nd:YAG,) Hard tissue surgery may be performed with the erbium family of wavelengths.

Treatment of undercut alveolar ridges:
There are many causes of undercut alveolar ridges. Naturally occurring undercuts such as those found in the lower anterior alveolus or where a prominent pre-maxilla is present may be the cause of soft tissue trauma, ulceration, and pain when prosthesis is placed on such a ridge. Soft tissue surgery may be performed with any of the soft tissue lasers. Osseous surgery may be performed with the erbium family of lasers.

Treatment of enlarged tuberosity:
The most common reason for enlarged tuberosities usually is soft tissue hyperplasia and alveolar hyperplasia accompanying the over-eruption of unopposed maxillary molar teeth.

Surplus soft tissue should be excised, allowing room for the denture bases. The soft tissue reduction may be performed with any of the soft tissue lasers. Erbium laser is the laser of choice for the osseus reduction.

Surgical treatment of tori and exostoses:
Prosthetic problems may arise if maxillary tori or exostoses are large or irregular in shape. Soft tissue lasers may be use to expose the exostoses and erbium lasers may be use for the osseous reduction. A smooth, rounded, midline torus normally does not create a prosthetic problem because the palatal acrylic may be relieved or cut away to avoid the torus.

Soft tissue lesions
Persistent trauma from a sharp denture flange or over compression of the posterior dam area may produce a fibrous tissue response. Hyperplastic fibrous tissue may be formed at the junction of the hard and soft palate as a reaction to constant trauma and irritation from the posterior dam area of the denture. The lesion may be excised with any of the soft tissue lasers and the tissue allowed to re- epithelialize[7].

Conclusion :
There are many clinical, aesthetic, and psychological reasons to use lasers in all aspects of dentistry, including the reduction or elimination of anesthetics. Patients present with varied medical histories, including allergic reactions to anesthetics, heart conditions, and extreme fear of the needles used

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for anesthetics, Because patient comfort is always a priority and painless dentistry is always a goal, with the use of lasers in the dental practice a multitude of procedures can be performed. The laser is not merely a ''hightech'' gadget: it is an extremely useful piece of equipment for the dental practice.

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