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PUBLISHED PAPER'S TITLE : Lasers in Prosthodontics a New Hope - An Overview

Authors :

1. **DR RAJUL VIVEK , Affiliation - PhD Research scholar, faculty of dental sciences, IMS, BHU, Varanasi.**

2. **DR ROMESH SONI , Affiliation - Assistant professor, Department of Prosthodontics, faculty of dental sciences, IMS, BHU, Varanasi.**

Corresponding Author – DR ROMESH SONI , Affiliation - Assistant professor, Department of Prosthodontics, faculty of dental sciences, IMS, BHU, Varanasi.

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Research Paper

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Lasers in Prosthodontics a New Hope - An Overview

Dr Rajul Vivek 1 Dr Romesh Soni 2

Declaration

The Declaration of the author for publication of Research Paper in Asian Journal of Modern and Ayurvedic Medical Science (ISSN 2279-0772) Dr Rajul Vivek 1 Dr Romesh Soni 2 the authors of the research paper entitled Lasers in Prosthodontics a New Hope - An Overview declare that ,we take the responsibility of the content and material of my paper as we ourself have written it and also have read the manuscript of our paper carefully. Also, we hereby give our consent to publish our paper in ajmams , This research paper is our original work and no part of it or it's similar version is published or has been sent for publication anywhere else.we authorise the Editorial Board of the Journal to modify and edit the manuscript. we also give our consent to the publisher of ajmams to own the copyright of our research paper.

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Abstract –

Laser dental care is possible in prosthodontics procedures. The public has an expectation that their prosthodontist should be up to date and wants the most modern, advanced care possible. The future of lasers in prosthodontics is promising, and new applications and procedures are being developed. The public is made aware of this by various media, and the word "laser" has power because patients want and trust the doctors who offer advanced technology The speciality of Prosthodontics takes all concepts of dentistry and integrates effective comprehensive treatment planning. The practice will necessarily include a wide variety of patients seeking a diverse range of care. These include individuals who are highly fearful of dentistry and have long-term neglected care and those who have complex medical histories and require more specialized, advanced procedures. Lasers have become an integral part of treatment for these patients.

Key words- Laser, Fixed Prosthesis, Implant Dentistry,

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Introduction –

Lasers were introduced into the field of prosthodontics with the hope of overcoming some of the drawbacks posed by the conventional methods of dental procedures. Laser is the acronym for "Light Amplification by stimulated emission of radiation" named by GORDON GOULD in 1957 .[1] The first laser was introduced into the fields of medicine and dentistry during the 1960s, since then, this science has progressed rapidly. In this modern era of high-tech devices, the prosthodontist is being offered many sophisticated products designed to improve the quality of treatment rendered to patient.

In prosthodontics, there is a growing awareness of the usefulness of lasers in the armamentarium of the modern dental practice, where they can be used as an adjunct or alternative to traditional approaches.[2]The purpose of this review is to provide an overview of various laser applications in Prosthodontics, and to discuss in more detail several key clinical applications.

Laser-Tissue Interaction –

The most desired interaction 3-5 is the absorption of the laser energy by the intended tissue. The amount of energy that is absorbed by the tissue depends on the tissue characteristics, such as pigmentation and water content, and on the laser wavelength and emission mode. In general, the shorter wavelengths (from about 500- 1000nm) are readily absorbed in pigmented tissue and blood elements. Argon is highly attenuated by haemoglobin. Diode and Nd: YAG has a high affinity for melanin and less interaction with haemoglobin. The longer wavelengths are more interactive with water and hydroxyapatite. The largest absorption peak for water is just below 3000 nm, which is at the Er: YAG wavelength. Erbium is also well absorbed by hydroxyapatite. CO2 at 10,600 nm is well absorbed by water and has the greatest affinity for tooth structure.

Advantages of Laser over other techniques[6]

I. It is painless; bloodless that results in clean surgical field, and fine incision with precision is possible.
II. There is no need for anaesthesia if at all anaesthesia has to be administered, then it needs to be used minimally only.
III. The risk of infection is reduced as a more sterilized environment is created as the laser kills bacteria.
IV. No postoperative discomfort, minimal pain and swelling, generally doesn't require medication.
V. Superior and faster healing, offers better patient compliance.

Disadvantages of Lasers[6]

I. Lasers cannot be used to remove defective crowns or silver fillings, or to prepare teeth for bridges.
II. Lasers can't be used on teeth with filling already in place.
III. Lasers don't completely eliminate the need for anaesthesia.
IV. Lasers treatment is more expensive as the cost of the laser equipment itself is much higher.

Use of Lasers in Prosthodontics -

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

A. Fixed Prosthetics/Esthetics

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

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

D. Laser Applications in the Dental Laboratory

Fixed Prosthetics/Esthetics

Crown lengthening:

Clinical scenarios where crown lengthening procedures are indicated within aesthetic zone require special consideration to achieve predictable aesthetic results. 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. it is argued that lasers do not work well for

crown lengthening procedures and there are no studies indicating a lack of damage to the bone from a laser and that adequate correction is achieved only with conventional flap surgery with ostectomy and osteoplasty to reduce the bone level and thickness to a normal form around each tooth .[7]

Soft tissue management around abutments:

Argon laser energy has peak absorption in haemoglobin, thus lending itself to providing excellent haemostasis and efficient coagulation and vaporization of oral tissues. These characteristics are beneficial for retraction and haemostasis of the gingival tissue in preparation for an impression during a crown and bridge procedure. Argon laser with 300 um fiber, and a power setting of 1.0W, continuous wave delivery and the fiber is inserted into the sulcus in contact with the tissue. In a sweeping motion, the fiber is moved around the tooth. It is important to contact the fiber tip with the bleeding vessels. Provide suction and water spray in the field. Gingivoplasty may also be done using argon laser.8

Modification of soft tissue around laminates:

The removal and re-contouring of gingival tissues around laminates can be easily accomplished with the argon laser. The laser can be used as a primary surgical instrument to remove excessive gingival tissue, whether diseased, secondary to drug therapy, or orthodontic treatment. The laser will remove tissue and provide haemostasis and tissues weld the wound.

Osseous 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.

Formation of ovate pontic sites:

There are many causes of unsuitable pontic site. Two of the most common causes are insufficient compression of alveolar plates after an extraction and non replacement of a fractured alveolar plate. Unsuitable pontic site results in un esthetic and non self cleansing pontic design. For favourable pontic design re-contouring of soft and bony tissue may be needed.

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. The results are predictable, efficient, minimize impingement of epithelial attachment, cause less bleeding during the subsequent impression, reduce postoperative problems, and reduce chair time.[9]

Implantology:

Dental lasers are used for a variety of procedures in implantology like implant recovery, implant site preparation and removal of diseased tissue around the implant.

Implant recovery:

Following the placement of 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. Uses of lasers can greatly expedite this procedure because the implant can be uncovered and impressions can be obtained at the same appointment4. All types of lasers can be used toexpose dental implants. One advantage of use of lasers in implantology is that impressions can be taken immediately after second stage surgery because there is little blood contamination in the field due to the haemostatic effects of the lasers. There also is minimal tissue shrinkage after laser surgery, which

assures that the tissue margins will remain at the same level after healing as they are immediately after surgery.[10]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. [9]

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.[11]

Removable prosthetics:

The successful construction of removable full and partial dentures mainly depends on the preoperative evaluation of the supporting hard and soft tissue structures and their proper preparation.[12, 13] Lasers may now be used to perform most pre-prosthetic surgeries. These procedures include hard and soft tissue tuberosity reduction, torus removal, and treatment of unsuitable residual ridges including undercut and irregularly resorbed ridges, treatment of unsupported soft tissues, and other hard and soft tissue abnormalities. Lasers also may be used to treat the problems of hype plastic tissue and nicotinic stomatitis under the palate of a full or partial denture and ease the discomfort of epulis, denture stomatitis, and other problems associated with long term wear of ill fitting dentures. Stability, retention, function, and aesthetics of removable prostheses may be enhanced by proper laser manipulation of the soft tissues and underlying osseous structure.

Treatment of unsuitable alveolar ridges:

Alveolar resorption usually is uniform in vertical and lateral dimensions. On occasion, irregular resorption occurs in one of the dimensions, producing an unsuitable ridge.

Treatment of undercut alveolar ridges:

There are many causes of undercut alveolar ridges. Two of the most common causes are dilated tooth sockets that result from insufficient compression of the alveolar plates after an extraction and non replacement of a fractured alveolar plate. 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.

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. The enlarge tuberosities may prevent the posterior extension of the upper and lower dentures, thereby reducing their efficiency for mastication and their stability. The soft tissue reduction may be performed with any of the soft tissue lasers. If undercuts are present, then osseous reduction may be required. Erbium laser is the laser of choice for the osseous reduction.[14, 15]

Surgical treatment of tori and exostoses:

Prosthetic problems may arise if maxillary tori or exostoses are large or irregular in shape. Tori and exostoses are formed mainly of compact bone. They may cause ulceration of oral mucosa. These bony protuberances also may interfere with lingual bars or flanges of mandibular prostheses. 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. Hyper plastic 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 re-reepithelialised.

Laser applications in the Prosthetic laboratory:

There is a range of laboratory-based laser applications. Laser holographic imaging is a well established method for storing topographic information, such as crown preparations, occlusal tables, and facial forms. The use of two laser beams allows more complex surface detail to be mapped using interferometry.[16]while conventional diffraction gratings and interference patterns are used to generate holograms and contour profiles.[17-20]Laser scanning of casts can be linked to computerized milling equipment for fabrication of restorations from porcelain and other materials. An alternative fabrication strategy is to sinter ceramic materials, to create a solid restoration from a powder of alumina or hydroxyapatite. The same approach can be used to form complex shapes from dental wax and other materials which can be sintered, such that these can then be used in conventional 'lost wax' casting.

Conclusion –

Lasers have become a ray of hope in a prosthodontics. When used effectively and ethically, lasers are an exceptional modality of treatment for many clinical conditions that dentists treat on a daily basis. But lasers has never been the "magic wand" that many people have hoped for. It has got its own limitations. If a clinician decides to use a laser for a dental procedure, he or she needs to fully understand the character of the wavelength being used, and the thermal implications & limitations of the optical energy. However, the future of the dental laser is bright with some of the newest ongoing research. From all branches of dentistry including, prosthetics to cosmetics and implantology, Lasers have made a tremendous impact on the delivery of dental care in the 21st century and will continue to do so as the technology continues to improve and evolve.

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