

Lasers in Prosthodontics: A Review

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Abstract

The discovery of lasers in the early 1960s has opened up a new era in the field of dentistry. Developments in laser technology have led to an increased acceptance of this technology by both practitioners and the general public. There are many clinical, aesthetic and psychological reasons to use lasers in all aspects of dentistry. Patient comfort is a priority and painless dentistry, the ultimate goal. The use of lasers achieves both the above goals while permitting its use in a multitude of dental procedures. This review article describes the uses of lasers in Prosthodontics for treatment of Complete denture Prosthodontics, Removable Partial Prosthodontics, Fixed prosthodontics, Implantology, Maxillofacial prosthodontics and temporomandibular disease.

Keywords: Laser, Prosthodontics, Implantology, TMD, Maxillofacial prosthodontics.

Introduction

Laser is an acronym which stands for “Light Amplification by Stimulated Emission of Radiation”. A laser is an instrument that produces a very narrow, intense beam of light energy (electromagnetic radiation) through a process called stimulated emission. Albert Einstein is usually credited for the development of the laser theory. He was the first one to coin the term “Stimulated Emission” in his publication “Zur Quantentheorie der Strahlung”, published in 1917 in the “Physikalische Zeitschrift”.¹ With dentistry in the high tech era, we are fortunate to have many technological innovations to enhance treatment, including intraoral video cameras,

CAD-CAM units, RVGs and air-abrasive units. However, no instrument is more representative of the term high-tech than, the laser. Dental procedures performed today with the laser are so effective that they should set a new standard of care.

Classification of Lasers²

Lasers used in dental practice can be classified by various methods:

1. Based on active medium

- A. Solid
- B. Liquid
- C. Gas

2. Based on Application

- A. Soft tissue lasers
- B. Hard Tissue lasers

3. Based on wavelength

- A. Excimer 195-350nm
- B. Alexandrite 337nm
- C. Argon 455-515nm
- D. He-Ne 637nm
- E. Diode 655-980nm
- F. Nd: YAG 1064nm
- G. Hoyas 2100nm
- H. Er, Cr: YSGG 2780nm
- I. Er: YSGG 2790nm
- J. Er: YAG 2940nm
- K. CO2 10600nm

Lasers Used In Various Treatments in Prosthodontics

- Complete Denture Prosthodontics
- Removable Partial Denture
- Fixed Partial Denture
- Implant Dentistry
- Maxillofacial Prosthodontics
- Treatment of TMD

I) Complete Denture Prosthodontics

i. Vestibuloplasty

Ill-fitting dentures due to high muscle attachments can be corrected through laser assisted vestibuloplasty.³

ii. Edentulous ridge

Removal of excess tissue for preprosthetic surgery.³

iii. Epulis fissuratum

Various researchers have reported the usage of CO2 lasers in treatment of epulis fissuratum with much more satisfactory results than conventional scalpel.³

iv. Frenectomy

Labial and lingual Frenectomy for relief of excess muscle tension.³

v. Hyperplastic tissue

Removal of any type of hyperplastic tissue.³

vi. Torus/exostosis reduction

vii. Tuberosity reduction

Large tuberosities can be a challenge for a prosthodontist in regarding the prosthetic rehabilitation.³

viii. Treatment for denture stomatitis

Laser therapy as an adjunctive management could improve the prospects of successful treatment.⁴

ix. Accuracy of impression by laser scanner

A 3D view is always better than a 2D model. The laser scanner which has 3D Digitizer without contacting the objects. Thus, a precise data are recorded and stored.⁵

II) Removable Partial Denture

i. Laser welding

One of the modern methods of removable partial dentures defect repairs uses the pulsed laser with relative low average out power. This is known as a precise and rapid joining method, but its success depends on the control of many parameters. Eg: For Co-Cr alloy frameworks.⁶

III) Fixed Partial Denture

i. Gingivectomy prior to impression or cad cam crown

Excess tissue needing removal prior to crown impression, cosmetic recontouring.³

ii. For crown Preparation

Er, Cr: YSGG laser is used most commonly now. It uses hydrokinetic technology (laser-energized water to cut or ablate soft and hard tissue).⁸

iii. For treating pigmented gingiva

Lasers prove to be usage of choice for depigmented gingiva.⁷

iv. Formation of oval pontic sites

For a good design of the pontic sites, the use of lasers can be indicated for soft tissue and bone remodeling.⁹

v. Removal of ceramic veneers

The use of lasers when removing veneers allows the practitioner to avoid cutting out the bonded elements, it also improves the patient's comfort and reduces the time in chair-side.⁹

IV) Implant Dentistry

Use of lasers can be divided among four phases:¹⁰

1 Pre-surgical

2 Surgical

3 Post-surgical

4 Prosthetic.

1 Pre-surgical

i. Preparation of surgical site

This is the first step of implant surgery which includes disinfection of surgical site and degranulation of extraction sockets.¹⁰

ii. Lateral window sinus lift

Lasers can be used to create incision without compromising the bone integrity.¹¹

2 Surgical

i. Surgical Flap incision

Dental lasers provide advantages of soft-tissue ablation, hemostasis and thus can also be used to make soft-tissue incisions. In comparison to surgical blade, it provides great hemostasis.¹⁰

ii. Osteotomy

Erbium lasers can be used electively in bone ablation as well, therefore, are elective in producing osteotomies. Use of drills causes anxiety and discomfort to patients, so lasers can be of advantage.¹²

3 Post-surgical

i. Uncovering the implants

Using the laser for uncovering implants have advantages such as sterilization, depolarization of nerves, analgesia, and hemostasis.¹⁰

4 Prosthetic

Recontouring of soft tissues around implants may be required after surgery for prosthesis to fit in, for this all tissue erbium lasers, this can assist in both initial placements of final prosthesis and recementation.¹³

5. Used in treatment of peri-implantitis

Peri-implantitis is multifactorial in nature, which affects both hard and soft tissues around it. It can be managed in either surgical or nonsurgical manner. Non-surgical treatment includes the use of lasers to decontaminate the implant surfaces and then treating peri-implantitis.¹⁰

V) Maxillofacial Prosthodontics

i. It mainly provides a three dimensional (3D) view and record for extraoral defects. It also enhances the shape and convenience of preparation compared to conventional impression technique where soft tissue distortion and patient discomfort or irritation can be minimized.⁵

VI) Treatment of TMD

i. Arthritis of the temporo-mandibular joint.¹⁴

ii. Trigeminal neuralgia, atypical facial pain, paresthesias, and TMD pain.¹⁵

iii. TMJ pain dysfunction syndrome.¹⁶

Advantages of Laser²

- No anesthesia, no drill
- Less blood loss, less pain hemostatic, analgesic effect.
- Reduce post-operative edema

- Less post-op scarring
- Initial healing, rapid regeneration, reduce post sensitivity in restorations
- Dressing & suturing is not required for wound closer.
- Less chances of metastasis
- Sterilization of treatment site.
- Laser exposure to tooth enamel causes a reduction in caries activity.
- The patient becomes free of fear & anxiety.
- Advantageous for medically compromised patients
- The patient becomes free of fear & anxiety

Disadvantages of Laser²

- Laser beam could harm the patient or operator by direct beam or reflected light, causing retinal burns
- Laser - more expensive
- Need qualified personal
- Lasers can't be used in following situations
 - fill cavities located between teeth
 - remove defective crowns or silver fillings

Conclusion

Laser has become a ray of hope in dentistry. When used efficaciously and ethically, lasers are an exceptional modality of treatment for many clinical conditions that dentists treat on daily basis. But laser has never been the “magic wand” that many people have hoped for. It has got its own limitations. However, the futures of dental laser is bright with some of the newest ongoing researches.

References

1. T.H.Maiman. 1960. Stimulated optical radiation in ruby. NATURE; Aug 6.
2. Pendyala C, Tiwari RVC, Dixit H, Augustine V, Baruah Q, Baruah K. Contemporary Apprise on LASERS and its Applications in Dentistry. Int J Oral Health Med Res 2017; 4(2):47-51.
3. Dr. Kenneth Luk, Dr. Mike Swick. The Use of Lasers in Dentistry A Clinical Reference Guide for the Diode 810 nm & Er:Yag. Pdf Elexxion. Oct 2009.
4. Karic, Vesna & Shackleton, Joy & Howes, Dale. Laser therapy as an adjunctive therapy for denture stomatitis. South African Dental Journal 2019; 74.
5. Devi N, Kumar PA, Rakshna M, Rameshkumar KR. Application of lasers in prosthodontics: A review. J Indian Acad Dent Spec Res 2018;5:42-5.
6. Liliana sandu, V. Birdeanu. Laser welding procedures applied to removable partial dentures framework repairs. European cells and materials 2006;11 (2):29.
7. Atsawasuwan P, Greethong K, Nimmanov V: Treatment of gingival hyperpigmentation for esthetic purposes by Nd:YAG laser: report of 4 cases, J Periodontol 2007;72.
8. Dr. Rosh nash. Crown and veneer preparation using the Er, Cr:YSGG Waterlase™ hard and soft tissue laser. Cotemporary esthetics and restorative practice 2002;80-85.
9. El khourani Wadie and Pr Amal El yamani. “Lasers in Fixed Prosthodontics”. Acta Scientific Dental Sciences 3.12 (2019): 99-103.
10. Gupta R, Luthra RP, Gupta S. Lasers in dental implantology: A review. Int Dent Med J Adv Res 2016;2:1-4.
11. Oyster DK, Parker WB, Gher ME. CO2 lasers and temperature changes of titanium implants. J Periodontol 1995;66:1017-24.
12. Parker S. Surgical lasers and hard dental tissue. Br Dent J 2007;202:445-54.
13. Van As GA. Lasers in implant dentistry, Part 2. Dent Today 2015;34:94, 96-9.
14. Hansson T: Infrared laser in the treatment of craniomandibular disorders, arthrogenous pain. J Prosthetic Dentistry. 1989; 61: 614.

15. Eckerdal A. Kliniske erfaringer fra et 5-års icke-kontrolleret studie af low power laserbehandling af periorale neuropatier. [Clinical experiences from a 5 years non-controlled study of low power laser treatment of perioral neuropatias] [in Danish]. Tandlægebladet. 1994; 98 (11): 526-529
16. Bradley P: Thermographic Evaluation of Response to Low Level Laser Acupuncture. Proc. Second Meeting of the International Laser Therapy Association, London Sept 1992. p 32.