



Questionnaire Study on Knowledge and Awareness of Lasers in Prosthodontics among Dental Students

*SK Shahil Rahaman*¹, *Dr. R. Srividya Devi*², *Dr. M. Sumati*³, *Dr. Nirmal Famila Bettie*⁴, *Dr. A. Ponsekar Abraham*⁵

¹ Junior Resident, ^{2,3} Assistant Professor, Department of Prosthodontics, Crown and Bridge

⁴ Professor, Department of Prosthodontics, Crown and Bridge

⁵ Head of the department, Department of Prosthodontics, Crown and Bridge

^{1,2,3,4,5} Thai Moogambigai Dental College and Hospital, Dr. MGR Educational and Research Institute

ABSTRACT

Aim

The aim of this survey is to assess about the knowledge and awareness of the use of lasers in prosthodontics among dental students in Chennai.

Materials and Methods

A survey containing a questionnaire of 15 questions about lasers used in prosthodontics was conducted. The questionnaire included, their knowledge about types of lasers, definitions and their applications. The questionnaire was circulated among 100 dental students through electronic form (google forms) and responses were tabulated and evaluated for statistical analysis.

Results

One hundred responses were received by the investigator. More than half of the participants (52%) appeared to know the correct definition of laser, whereas 58% knew the correct abbreviation. Around 32% of them agreed that CO₂ was the commonly used type of laser. 58 participants agreed that main components of a laser are all three-gain medium, a pump source, and a resonator. The fact that water absorption is more in erbium laser was agreed by 38 participants. 39% believed that 500-1000nm wavelength of laser is absorbed in pigmented tissues and blood elements. About 31% of the responses revealed the awareness about the fact that 3000-12000nm wavelength of laser is absorbed in hydroxyapatite tissues. 38% of the participants agreed that argon, helium and neon are used as soft tissue laser. 45% believed Er: YAG is a hard tissue laser. 33% agreed that argon is used as resin curing laser. Awareness of the fact that the wavelength of CO₂ lasers is 10600nm was among 17% of the participants. 55% agreed that lasers can be used implant placement, crown lengthening, and designing prosthesis and 52% appeared to have knowledge about the uses of lasers in fixed prosthodontics. Knowledge about use of lasers in implantology was noted among 37% of the participants and awareness about the use of laser in removable prosthesis was among 58% of the respondents.

Conclusion

The results of the study reveals that the knowledge about the use of Lasers was satisfactory among the dental students, but the awareness about its properties and its applications appeared to be less among the dental students. It can be suggested that a brief session on LASERS can be included as an orientation or foundation class for the undergraduate dental students.

Keywords: Prosthodontist, LASER, Prosthodontics.

INTRODUCTION

The use of lasers for treatment has become a common practice in the medical field. Theodore Harold Maiman is generally credited for building the first working ruby laser and operating it for the first time on May 16, 1960 at the Hughes Research Laboratory in Malibu, California. LASER stands for "Light Amplification by Stimulated Emission of Radiation." LASER is a monochromatic and coherent light which is produced by the release of more photons which triggers chain reaction¹. It can be used for soft tissue surgery and hemostasis². Traditionally, lasers have been classified according to the physical construction of laser. (eg: gas, liquid, solid state or semiconductor diode), the type of medium which undergoes lasing (eg: Erbium: Yttrium Aluminium Garnet) (Er: YAG) and the degree of hazard to the Skin or eyes³. Laser compartment consists of six major components: Active Medium, Pumping Mechanism, Optical Resonators, Cooling System, Control Panel, Delivery System, Absorption, Transmission, Reflection, Scattering. According to the wavelength lasers are classified as

1. The *ultraviolet* spectrum range (approximately below 400 nm),
2. The *visible* spectrum range (approximately 400-700 nm),
3. The *infrared* spectrum range (approximately 700 nm to the microwave spectrum).

Lasers are also used in prosthodontics. The uses include Complete denture Prosthodontics, Fixed partial denture (tissue management, crown preparation), Removable partial denture (laser welding), implant dentistry (soft tissue surgery, implant surface debridement, implant surface treatment, maxillofacial prosthodontics⁴, Sintering with CAD/CAM technology. Many applications like computer aided design and rapid prototyping technology, and study of occlusion in complete dentures using three-dimensional laser scanner⁷. Although many case studies indicate extensive use of lasers and promising results in dental implantology, lasers may be used for uncovering submerged implants atraumatically to prevent crestal bone loss, recontouring periimplant soft tissues and sculpting emergence profile for prosthetic components, raising surgical flaps, osseous recontouring, and creating parabolic tissue architecture⁶. The aim of this study is to analyse the awareness of use of lasers in prosthodontics among dental undergraduate students.

MATERIALS AND METHODS

A survey containing a questionnaire of 15 questions about lasers used in prosthodontics was conducted. The questionnaire included, their knowledge about types of lasers, definitions and their applications. The questionnaire was circulated among 100 dental students through electronic form (google forms) and responses were tabulated and evaluated for statistical analysis.

RESULTS

100 dental students from a private dental college participated in the study. Only 52% were aware of the correct definition of laser (Figure 1), with only 58% knowing its correct abbreviation (Figure 2). 32% of them agreed that CO₂ was the commonly used type of laser (Figure 3). 58% agreed that main components of a laser are all three-gain medium, a pump source, and a resonator (Figure 4). 38% were aware that erbium laser has greater water absorption (Figure 5). 39% believed that 500-1000nm wavelength of laser is absorbed in pigmented tissues and blood elements (Figure 6). 31% picked 3000-12000nm wavelength of laser is absorbed in hydroxyapatite tissues (Figure 7). 38% of the participants agreed that argon, helium and neon are used as soft tissue laser (Figure 8). 45% believed Er: YAG is a hard tissue laser (Figure 9). 33% agreed that argon is used as resin curing laser (Figure 10). Only 17% were aware of the fact the wavelength of CO₂ lasers is 10600nm (Figure 11). 55% agreed that lasers can be used implant placement, crown lengthening, and designing prosthesis (Figure 12). 52% were aware of the uses of lasers in fixed prosthodontics (Figure 13). 37% were of use of lasers in implantology (Figure 14). 58% of the participants were aware uses of laser in removable prosthesis (Figure 15).



Figure 1:-Laser definition

Figure 2:-What is the abbreviation of laser ?

Figure 3:-What is the most commonly used laser?

Figure 4:-What is the main component of laser?

Figure 5:-Which laser has greater water absorption?

Figure 6:-which wavelength of laser is absorbed in pigmented tissues and blood elements?

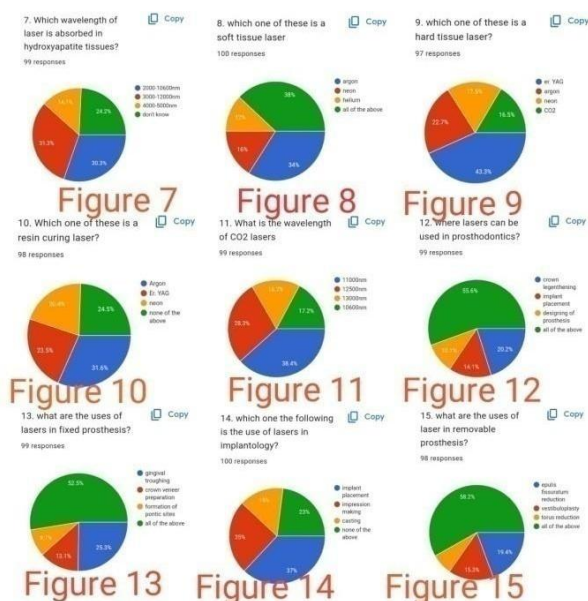


Figure 7:-Which wavelength of laser is absorbed in hydroxyapatite tissues?

Figure 8:-which one of these is a soft tissue laser

Figure 9:-which one of these is a hard tissue laser?

Figure 10:-Which one of these is a resin curing laser?

Figure 11:-What is the wavelength of CO2 lasers

Figure 12:-where lasers can be used in prosthodontics?

Figure 13:-what are the uses of lasers in fixed prosthesis?

Figure 14:-which one the following is the use of lasers in implantology?

Figure 15:-what are the uses of laser in removable prosthesis?

DISCUSSION

LASER is a device that produces a controlled ray of very powerful light that can be used as a tool in dentistry. As everyday use of laser in dental practice is increasing, it has become necessary for an aspiring dentist to have adequate knowledge about lasers that are used in dentistry. The participants were from clinical year dental graduates to training dentists. The knowledge about lasers among training dentists would be higher than the 3rd year graduate students. This knowledge could have resulted in varied responses among the students. About 52% of the participants were aware of this fact. The abbreviation was known to 58% of the dental students. CO₂ lasers are probably the most widely known gas lasers and are mainly used for laser marking, laser cutting, and laser welding, only 32% were aware of the fact that the erbium laser absorption coefficient in water is 10 times higher than that for the CO₂ (10,600-nm) and even higher than for the Nd:YAG (1064-nm) laser², only 38% were aware of this fact. A 9,300 nm or 9,600 nm carbon dioxide laser is a desirable tool for application in dental hard tissues. The absorption of hydroxyapatite is at 9,600 nm, whereas its reflection also peaks at 9,600 nm. The knowledge regarding this was also low among dental graduates. The knowledge of co2 wavelength was also 17%. The knowledge of different lasers as hard and soft tissue was also not significant. Lasers has various applications in removable prosthodontics, fixed prosthodontics as well as in implant dentistry. New advances in rapid prototyping technologies have demonstrated significant advantages compared to more conventional techniques for fabricating facial prosthesis. The use of selective laser sintering technology is an alternative approach for fabricating a wax pattern of maxillofacial prosthesis. This new approach can generate directly by prototyping and reduce labour-intensive laboratory procedures, the knowledge regarding this was not satisfactory among the participants. There are no studies yet that showed the use of lasers for crown preparation purposes. Hence awareness regarding this was poor. The knowledge of applications of lasers in different fields of prosthodontics was not adequate. A study by Harini K and Radhika Arjunker concluded that only 14 % of dentists have adequate knowledge on laser and its applications, which was slightly better in our study at 30%. Laser offers shorter and painless procedure with minimal or no discomfort, thus less damage to the surrounding tissue. Dentists need to adopt these methods to enhance their prosthodontics practice. P. Lasers offer unparalleled accuracy and operator control and may be helpful for finely tracing incision lines and shaping the desired gingival margin outline⁷. Recently, computer-aided design and rapid prototyping technology, surface treatment of base metal alloys, and study of occlusion in complete dentures use three-dimensional laser scanner. Thus, laser seems to be very helpful in reducing the complications⁸. MASER a microwave amplifier by Charles H. Townes, Gordon et al became the basic principle for laser pumping⁹.

CONCLUSION

Laser has become a ray of hope in dentistry and its role in prosthodontics has increased the success rate of prosthesis and helps in restoring form, function and aesthetics of the patients. From this study it was evident that the knowledge and awareness of lasers in prosthodontics among dental students was quite less. Hence more effort needs to taken to enforce knowledge and awareness regarding the use of lasers in prosthodontics through seminars, webinars and also workshops.

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- ⁹<https://www.ipskerala.com/JPID-vol-3/journal-jpid/JPID-Vol-03-Issue-01-Article03.pdf>

Appendix

QUESTION	OPTIONS	N % [100]
1.LASER	A] A device that produces a uncontrolled ray of very powerful light that cant be used as a tool B] A device that produces a controlled ray of very powerful light that can be used as a tool C] A device that produces a uncontrolled ray of very weak light that can be use... D] A device that produces a uncontrolled ray of very powerful light that can be u...	13 52 18 17
2.What is the abbreviation of laser ?	A] Light, amplification by stimulated emission of radiation B] Light acceleration by stimulated emission of radiation C] Light amplification by stimulated erosion of radiation D] Light amplification by simultaneous emission of radiation	58 17 9 16
3. What is the most commonly used laser?	O2 CO2 H2O I don't know	25 32 13 30
4.What is the main component of laser?	Gain medium Reflector Energy source All of the above	21 7 14 58
5.Which laser has greater water absorption?	Erbium lasers Aluminium lasers yttrium lasers None of the above	38 26 18 18
6. which wavelength of laser is absorbed in pigmented tissues and blood elements?	500-1000nm 600-1000nm 100-200nm don't know	39 34 8 19

7. Which wavelength of laser is absorbed in hydroxyapatite tissues?	2000-10600nm 3000-12000nm 4000-5000nm don't know	30 31 14 25
8. which one of these is a soft tissue laser	Argon Neon Helium all of the above	34 16 12 28
9. which one of these is a hard tissue laser?	er. YAG argon neon CO2	45 22 17 16
10. Which one of these is a resin curing laser?	Argon Er. YAG Neon none of the above	31 25 20 24
11. What is the wavelength of CO2 lasers	11000nm 12500nm 13000nm 10600nm	38 28 16 18
12. where lasers can be used in prosthodontics?	crown lengthening implant placement designing of prosthesis all of the above	20 15 10 55
13. what are the uses of lasers in fixed prosthesis?	gingival troughing crown veneer preparation formation of pontic sites all of the above	25 13 10 52
14. which one the following is the use of lasers in implantology?	implant placement impression making casting none of the above	37 25 15 23
15. what are the uses of laser in removable prosthesis?	epulis fissuratum reduction vestibuloplasty torus reduction all of the above	21 15 7 58