Pharmacophore

ISSN-2229-5402

Journal home page: http://www.pharmacophorejournal.com

APPLICATION OF LASERS IN VARIOUS PROCEDURES PERFORMED IN PROSTHODONTICS; A SYSTEMIC REVIEW

Badr Soliman Al Hussian[1*], Mohammed Al Hammad[2], Nader Al Amri[2], Faisal Al Markhan[2], Abdullah Asiri[3], Zeyad Al Deraibi[2], Anmar Alarnous[2]

1. *Department of Restorative Dentistry, Prince Sultan Military Medical City, Riyadh, Saudi Arabia.*
2. *Department of Dentistry, Riyadh Elm University, Riyadh, Saudi Arabia.*
3. *Department of Dental Materials, Smile Agents, Riyadh, Saudi Arabia.*

ARTICLE INFO

Received:
09 May 2022
Received in revised form:
19 Aug 2022
Accepted:
21 Aug 2022
Available online:
28 Aug 2022

Keywords: Lasers, Dental lasers, Prosthodontics, Systematic review

ABSTRACT

There are several benefits to using a laser, including less invasive, more accurate, and precise procedures with less discomfort, quicker healing, no direct soft and hard tissue contact, no vibration, and more patients. Attain rapid hemostasis and humidity control. Some people have anesthesia fears and allergies. Lasers have become an essential aspect of these patients' therapy. A systematic literature review from 2012 to 2022 was performed using PubMed, Medline, and ScienceDirect databases. review". PRISMA flowchart was used to describe the selection process of searched articles. The Cochrane risk of bias assessment method was used to assess the quality of the studies included. A total of eight studies were included in this systematic review, and the majority of the studies reported the successful use of lasers in accomplishing various types of soft and hard tissue prosthodontic procedures. Lasers of various types are effective in performing several prosthodontics procedures and can be an option in the future to replace conventional dental procedures.

To Cite This Article: Al Hussian BS, Al Hammad M, Al Amri N, Al Markhan F, Asiri A, Al Deraibi Z, et al. Application of Lasers in Various Procedures Performed in Prosthodontics; A Systemic Review. Pharmacophore. 2022;13(4):129-34. https://doi.org/10.51847/ssjjRKhXHR

Introduction

Laser is an abbreviation that stands for "Light Amplification by Stimulated Emission of Radiation," and it is utilized in a variety of disciplines. Lasers in dentistry have set a new level of treatment. Because of its exact excision, a time of wound healing, and the advantages of coagulation, which boosts tissue response to supplied procedures, the use and use of lasers in prosthodontics in delivering fixed dental prosthesis improves the level of care for both patients and dentists [1-3]. However, patients may get more precise therapy with a detailed understanding of Lasers, their wavelength and target tissue contact, and better handling. CO2 and neodymium-doped yttrium aluminum garnet lasers are the most often utilized lasers in prosthodontics (Nd: YAG). The widespread growth of mechanical cutting devices accompanied by sound and vibration causes patient apprehension, which is solved by the development of photomechanical interaction of laser-based dental equipment [4].

There are several benefits to using a laser, including less invasive, more accurate, and precise procedures with less discomfort, quicker healing, no direct soft and hard tissue contact, no vibration, and more patients. Attain rapid hemostasis and humidity control. Some people have anesthesia fears and/or allergies. Lasers have become an essential aspect of these patients' therapy. Every dental field now uses lasers, including oral medicine, oral surgery, pediatric dentistry, surgical and endodontic procedures, periodontal care, and implantology and prosthetic science. Different laser products for dental applications have been launched by manufacturers, with the lasers labeled according to their active medium, wavelength, delivery mechanism, emission mode, tissue absorption, and clinical use [5].

The lasers listed below can be utilized at high powers ranging from a fraction of a watt to 25 watts or more. The Erbium: YAG laser has the capacity to displace the drill. This laser is also used to change the color of gingival tissues, giving the patient pink gums, and is often used to prepare patients for cavity fillings. The Carbon Dioxide laser may be utilized to

Corresponding Author: Badr Soliman Al Hussian; Department of Restorative Dentistry, Prince Sultan Military Medical City, Riyadh, Saudi Arabia. E-mail: bader.hussain@riyadh.edu.sa

conduct gingivectomy as well as reposition tiny tumors. As a laser that does not need a local anesthetic, it causes no pain to the patient and causes no bleeding. Minor surgery is performed using the Argon laser. This gas laser emits a blue-green light that is sent to a handpiece or microscope through a fiber optic connection. Nd: YAG lasers are utilized for tissue retraction, endodontics, and oral surgery. Anesthesia is typically not required with this laser. For gingiva pocket operations, the dentist will inject the fiber between the gingiva and the tooth to sterilize and stimulate the tissue, causing the gingiva to attach to the tooth's neck. Since its introduction in the late 1990s, the diode laser has been shown to be beneficial in oral surgery and endodontic therapy. This laser also aids in the treatment of oral cavity illness and the correction of cosmetic faults. The diode laser is utilized for soft tissue operations since it is a small laser. Low-level lasers are less well-known and less costly. Low-level laser treatment is conducted using these lasers, which are often referred to as "soft lasers." Low-level lasers promote blood circulation and tissue regeneration. Holmium: YAG laser—This laser has been FDA-approved for use on the hard tissues of primary teeth [6].

Materials and Methods

A systematic literature review from 2012 to 2022 was performed using databases such as PubMed, Medline, and ScienceDirect. The keywords used were "lasers," "prosthodontics," and "systematic review" **(Table 1)**. PRISMA flowchart was used to describe the selection process of searched articles **(Figure 1)**.

Table 1. Inclusion and exclusion criteria

№	Inclusion criteria	Exclusion criteria
1.	Case-control and randomized control studies	Systematic reviews or meta-analyses or expert opinions, or narrative reviews
2.	Published between 2011 and 2022	Out of the specified time range
3.	Studies including lasers	Methods other than lasers
4.	English language of publication	Language other than English
7.	In vivo (humans)	In vitro

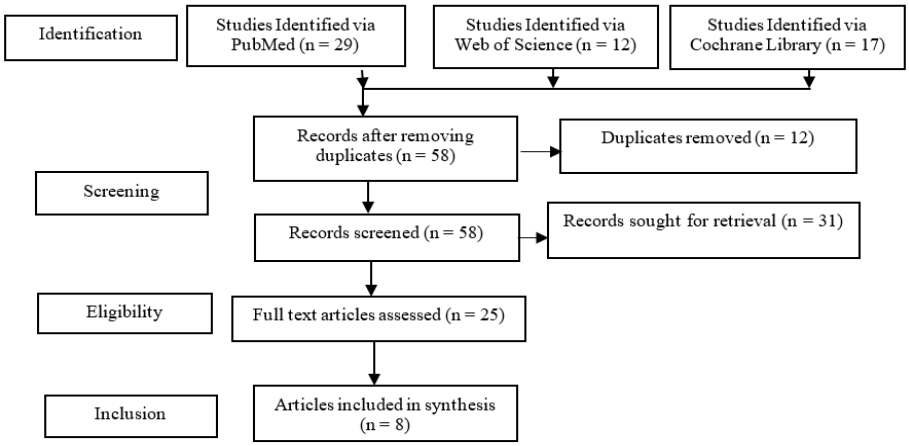

Figure 1. PRISMA Flow Diagram

Risk of Bias Assessment

The Cochrane risk of bias assessment method was used to assess the quality of the studies included **(Table 2)**.

Table 2. Summary of Cochrane Risk of Bias Assessment

Study	Selection Bias/Appropriate control selection/baseline characteristics similarity	Selection bias in randomization	Selection bias in allocation concealment	Performance-related bias in blinding	Reporting bias/Selective reporting of outcomes	Detection bias Blinding outcome assessors	Accounting for confounding bias
Devi *et al.*, [7]	+	+	+	+	+	+	-
Zaara *et al.*, [8]	+	+	+	+	-	+	-
Walid *et al.*, [9]	+	+	+	+	+	_	+
Soman *et al.*, [10]	+	+	+	+	+	+	-
Sorrentino *et al.*, [11]	+	-	+	+	+	+	+

VARRAK *et al*., [12]	+	+	+	-	+	+	+
Liana *et al*., [13]	+	-	+	+	+	+	+
Karic *et al*., [14]	+	+	+	-	+	+	+

Results and Discussion

Devi *et al*., 2018 investigated in a review that the need for a retraction cord is reduced by making a trough with the laser before taking an imprint, eliminating much of the challenging labor and making everything simple and brief [7]. The need for hemostatic drugs and electrocution is reduced or eliminated because the blood vessels are sealed, allowing for coagulation. The most used laser for generating troughed Nd: is YAG, which reduces postoperative problems while minimizing interference with epithelial attachment. Argon lasers are ideal for performing gingivectomy, gingivoplasty, or the excision and reshaping of soft tissues surrounding an abutment tooth. A good ending line and sufficient crown size result from careful management of soft tissues surrounding the abutment. Recontouring and removing leftover gingival tissues surrounding laminates are made simpler using an argon laser. While the Er family of lasers is used for osseous surgery and hard tissue recontouring, the CO2, diode, and Nd: YAG lasers are used for soft tissue treatment. It is possible to use laser energy to sterilize the implant surface. Sterilizing the implant surface with a laser—typically a diode, CO2, or Er: YAG laser- removes bacteria growth and boosts the implant's success rate. Subgingival calculus may be safely and effectively removed utilizing an Er: YAG laser from the titanium implant fixture.

Zaara *et al*. analyzed in the research that the highest setting for cutting enamel should be used when preparing the crown. The Er, Cr: YSGG laser is the most popular kind of laser [8]. Hydrokinetics is the technology behind it (laser-energized water to cut or ablate soft and hard tissue). More effective disinfection and debridement are possible by establishing a laser system operating at 2780 nm and using an ablative hydrokinetic process. When applied to a roughened implant surface, laser ablation using an Er: Cr: YSGG laser effectively eliminates possible impurities without damaging the titanium substrate.

Walid *et al*. determined in their research that it's possible that the Erbium: YAG laser will eventually displace the drill [9]. Gingival pigmentation may be altered with this laser, resulting in pinker gums for the patient. Patients getting fillings for cavities often undergo this laser's pre-treatment. Gingivectomy and the excision of tiny tumors are possible with the carbon dioxide laser. Without the need for any anesthesia, this laser surgery causes no pain to the patient and produces almost no bleeding. Argon lasers are utilized for less invasive procedures. Fiber optics transmit the blue-green light from the gas laser to a handpiece or microscope. Tissue retraction, endodontics, and oral surgery are all possible with the help of the Nd: YAG. Most of the time, this laser may be used without the need for anesthesia medicine. The dentist will place the fiber between the gum and tooth during treatments involving the gingiva pockets to disinfect and stimulate the tissue, resulting in the gums adhering to the neck of the tooth. The diode laser was introduced in the late 1990s and has proven useful in oral surgery and endodontic therapy. Oral diseases may be treated with this laser, and cosmetic issues can also be improved. The diode is a small, efficient laser that may be used for soft tissue operations.

In their study, Soman *et al*. discovered that the argon laser is the most often used laser for frenectomy treatments [10]. Although the argon laser appears best when used at a higher energy for cutting fibrous tissue, its hemostatic qualities make it a good choice for a lingual frenectomy. The argon laser eliminates tissues and keeps the work area sterile. For more extensive pre-prosthetic surgery, the CO2 laser is recommended owing to its rapid vaporization and efficient tissue vaporization. The maxillary tuberosity is a region of fibrous connective tissue that often borders on the retromolar pad. Because of this, the prosthesis must be modified to accommodate the tuberosity's smaller size. New denture occlusion may be evaluated with a laser scanner and 3D reconstruction. Verification of the connection between balanced occlusion parameters is also possible. Veneers may be removed by a laser, such as an Er: YAG or ErCr: YSGG, if they are no longer needed or have failed. The removal of restoration is made more accessible by using a laser. Due to their bactericidal action, diode lasers may be used with toluidine O dye or on their own for implant care. Lasers are an efficient tool for debriding the surface of implant abutments. In dental practice, titanium denture base plates are often made using the tried-and-true lost-wax method. While effective, this method takes a long time and is susceptible to errors due to the laboratory procedure. The titanium plate of a complete denture is fabricated using cutting-edge technology like a laser scanner, computer-aided design and manufacturing (CAD/CAM), and laser resonance shaping (LRF).

Sorrentino *et al*. (2022) observed that the diode laser is the quickest gingival retraction device (mean value = 56.20 s) when compared to the magic foam cord (85.75 s) and retraction cord (85.75 s) (252.15 s) [11]. Furthermore, the diode laser technique looks to be easier than the latter troughing technology. When compared to diode and Nd: YAG lasers, several writers found more gingival recession using double-cord and electro-surgery devices. Furthermore, both laser systems were found to be less aggressive in terms of gingival bleeding. Furthermore, another study found that the diode laser had better bleeding control than the retraction cord. However, it was poorer than the magic foam cord. Another research compared gingival troughing technologies based on gingival width and recession: retraction cord and diode, Nd: YAG, and Er: YAG laser systems. Gingival breadth differed significantly across lasers and retraction cords.

VARRAK *et al*. (2020) *et al*. investigated that the diode is a semi-conductor crystal-based solid active medium laser [12]. It is little absorbed by tooth structure, allowing soft tissue surgery near enamel, dentine, and cementum to be conducted safely. It is a significant soft tissue surgical laser for cutting and coagulating gingiva and mucosa and soft tissue curettage or sulcular debridement. Argon is a laser with an argon gas active medium activated by a high-current electrical discharge.

Those with a wavelength of [514 nm] are highly absorbed in soft tissue. These qualities influence gingival tissue retraction and hemostasis as an active substance gas, which is a laser for soft tissue. The light energy has a very high absorption by water, resulting in quick soft tissue elimination and hemostasis with a short penetration depth, which is crucial for treating mucosal lesions, particularly when cutting thick fibrous tissue. The solid active medium of an Nd: YAG laser is a garnet crystal. Cutting and coagulating oral soft tissues with strong hemostasis are common therapeutic uses. Dental hard tissue absorbs a small amount of Nd: YAG laser energy. However, since there is minimal contact with the sound dental structure, tissue surgery close to the tooth is secure and accurate. The active medium of Er: YAG [2940 nm] is a solid crystal of yttrium-al-garnet doped with erbium. They have the maximum water absorption of any dental wavelength and a strong affinity for hydroxyapatite. These lasers are great for cavities removal and tooth preparation when combined with a water spray. Erbium lasers may be employed for soft tissue ablation, and complex tissue ablation since dental soft tissue has a large amount of water; however, the hemostatic ability is restricted.

Liana *et al*. analyzed in the research that laser diode may be used with detachable prosthetics for various operations, including sulcular debridement. Diode lasers may be used to remove soft tissue adhesions to enhance re-epithelialization [13].

Karic *et al*. (2018) analyzed that ablating the osseous substance safely layer by layer using erbium lasers is possible [14]. A gradual but continuous ablation of bone avoids unexpected palate perforation or the formation of a fistula. Any laser wavelength may be utilized to induce hemostasis and reduce the risk of hematoma formation **(Table 3)**.

Table 3. Summary of the findings of included studies with the application of various lasers in prosthodontics.

Author's name	Erbium lasers	ND: YAG	Argon lasers	Diode lasers	CO_2 lasers
Devi *et al*., [7]	Sterilization of implant surface	minimizes epithelial attachment interference	Gingivoplasty, removal, and contouring of soft tissues	Sterilization of implant surface	Sterilization of implant surface
Zaara *et al*. [8]	cutting enamel,				
Walid *et al*., [9]	alter pigmentation in the gingival tissues	sterilize and stimulate the tissue	minor surgery	soft tissue procedures	Gingivectomy
Soman *et al*., [10]	remove unwanted or failed veneers		lingual frenectomy	Debridement of the implant abutment surface	maxillary tuberosity
Sorrentino *et al*., [11]		gingival troughing		gingival retraction system	
VARRAK *et al*., [12]	cavities removal, soft tissue ablation	cutting and coagulation of dental soft tissues	hemostasis of the gingival tissue	cutting and coagulating gingiva	
Liana *et al*., [13]	caries removal, soft tissue ablation				
Karic *et al*., [14]	Ablation of the osseous material layer			sulcular debridement	

The use of lasers has brought new hope to dentistry, particularly in prosthodontics, where they have been shown to improve prostheses' success rate and aid in restoring patients' form, function, and aesthetics. When appropriately utilized and responsibly, lasers provide high-quality outcomes. So, according to the most recent findings in this field of study, dental lasers have a promising future in transforming many patients' smiles. Success in fixed prosthodontics relies on pinpoint precision during treatment using the optimal amount of energy at the right wavelength. Crown lengthening, laser troughing, soft tissue modification surrounding laminates, Management of soft tissues around the abutment, osseous crown lengthening, altered passive eruption, and oval pontic site formation are all examples of how lasers are used in prosthodontics [15].

One of the benefits of using a laser is that production times are drastically reduced. Also, a higher degree of accuracy is possible. Some therapeutic uses and kinds of lasers need specialized training that isn't standard, which is one of the lasers' few drawbacks **(Table 4)**. The high price tag is associated with buying tools, incorporating new technology, and financing the necessary education and training. Since different treatments call for different wavelengths, more than one laser may be necessary [16].

Table 4. Advantages and disadvantages of various laser types.

Laser types	Advantages (According to prosthodontics)	Disadvantages (According to prosthodontics)
Erbium lasers	Without the need for any anesthesia, this laser surgery causes no pain to the patient and produces almost no bleeding [3].	the hemostatic ability is limited [3].
ND: YAG	Nd: YAG laser enabled quicker healing, better hemostasis, and decreased inflammation [5].	This laser type may be used for slower production rates on thicker materials. As a result, its efficiency is decreased [5].
Argon lasers	Because of its speed and efficacy in vaporization, the CO2 laser is recommended for more extensive pre-prosthetic surgery [6].	Tissue barriers are crossed, and tissues other than the target material are irradiated when laser light is delivered [6].

Diode lasers	It is the quickest, most secure, and easiest gingival retraction device, beating out the magic foam and retraction cables [7].	Recession is a problem with electrotomes and is more common than with diode lasers [7].
CO2 lasers	CO2 laser has the highest absorption by hydroxyapatite, around a factor of a thousand higher than the Er family of lasers [8].	It is not yet as widely employed as more traditional forms of surgery; The cost is also a problem. Because of the high cost, some patients cannot afford it [8].

The use of lasers in crown preparation is still up for discussion. There has been no detailed research on the use of lasers for crown preparation so far. Because the laser temporarily causes temporary paraesthesia of nerve endings, no local anesthetic is required during crown preparation. The procedure is more efficient and reliable than the standard approach. Disadvantages include: Specialized usage requires a dentist with training and experience. Pulsed lasers with relatively modest average outpower effectively repair the flaw in detachable partial dentures. The effectiveness of this supposedly exact and fast joining process relies on the careful regulation of several variables [17].

Mechanical retraction (using retraction cords), chemomechanical retraction (using a chemical in conjunction with a retraction cable), the matrix impression system, and surgical retraction are only a few of the traditional procedures utilized for gingival retraction (laser, electro-surgery, and rotary curettage). Crown troughing, a modern technique for gingival retraction that has largely replaced traditional retraction techniques, is one of the most effective ways to get the tissue around your teeth ready for an imprint of a fixed restoration. Laser troughing has some benefits of predictive efficiency, good hemostasis, little discomfort, postoperative complications, shorter operating times, and a sterile sulcus [18]. Neodymium: yttrium-aluminum-garnet (Nd-YAG) lasers, erbium: yttrium-aluminum-garnet (Er: YAG), and Diode lasers are just a few of the laser options available, and all shown remarkable results in previous studies. Veneers may be removed by a laser, such as an Er: YAG or ErCr: YSGG, if veneers are no longer needed or have failed. Erbium lasers have better water absorption (Er: YAG, Er, Cr: YSGG). The removal of restoration is made easier by using a laser. The silane-resin connection is weakened when water molecules in the glue absorb the laser light. Laser technology has allowed preceding the traditional practice of sawing off the crown before its removal. Using this technique, debonding is improved without any harm to the tooth [19].

Argon is a laser with an argon gas active medium activated by a high-current electrical discharge. Those with a wavelength of [514 nm] are highly absorbed in soft tissue. These qualities influence gingival tissue retraction and hemostasis. Tissue barriers are crossed, and tissues other than the target material are irradiated when laser light is delivered [20].

Because of its speed and efficacy in vaporization, the CO2 laser is recommended for more extensive pre-prosthetic surgery. Using the latest 600 and 1000 fibers with sculpted tips, the operator may precisely vaporize or cut away tissue as required to get the desired outcome. Peri-implant soft tissues may be treated with CO2 or Er: YAG lasers but not Nd: YAG systems. However, its absorption is the greatest of any laser. At a depth of around [0.5 mm], the necrotic region evaporates while capillary coagulation occurs in the veins, resulting in very low bleeding risk. CO2 laser has the highest absorption by hydroxyapatite, around a factor of a thousand higher than the Er family of lasers. Although the CO2 laser has many indications, it is not yet as widely employed as more traditional forms of surgery. Of course, the cost is also a problem. Because of the high cost, some patients cannot afford it [21].

Nd: YAG to treat periodontal disease, these lasers are often used. Because they prefer darker tissues, they can easily debride and disinfect periodontal pockets. Nd: YAG laser light kills bacteria in the tissues it treats, which aids in the healing process for periodontal infection. Gingivectomy, frenectomy, impression troughing, and biopsies are a few soft tissue treatments that may be performed using an Nd: YAG laser. Photobiomodulation treatments benefit greatly from these lasers' near-infrared wavelength and deep penetrating capabilities. Compared to retraction cords treated with ferric sulfate or aluminum chloride, Nd: YAG laser enabled quicker healing, better hemostasis, and decreased inflammation [22]. Tissue surgery next to a tooth may be performed safely and precisely because of the little contact with healthy tooth structure. They function well both in touch and non-contact applications. Since it is non-contact, its diameter can be only a few millimeters. These findings demonstrated that lasers resulted in broader gingival breadth and reduced gingival regression than retraction cord [23]. Furthermore, compared to diode and Nd: YAG lasers, the scientists found that wound healing with Er: YAG was smooth and quickest. This laser type may be used for slower production rates on thicker materials. As a result, its efficiency is decreased. It absorbs extremely little light in the visual range compared to lighter materials. Even with high engraving resolutions, the scan gap cannot be increased [24].

The lateral gingival displacement caused by the diode laser is higher than that caused by the magic foam cable. It seems to be the quickest, most secure, and easiest gingival retraction device, beating out both magic foam and retraction cables. Since diode lasers do not react with tooth enamel, they are ideal for use in soft tissue operations. Because it is little absorbed by tooth structure, oral surgeons may safely execute procedures on soft tissues without worrying about damaging the tooth's enamel, dentin, or cementum. Biostimulation of osteoblasts around implants is another use of laser systems employed as low laser treatment. Recession is a problem with electrotomes and is more common than with lasers, two benefits of widening with lasers [25].

Conclusion

Lasers of various types are effective in performing several prosthodontics procedures and can be an option in the future to replace conventional dental procedures.

Acknowledgments: We would like to acknowledge the help of Riyadh Elm University research center.

Conflict of interest: None

Financial support: None

Ethics statement: This study fulfills the ethical requirements of Riyadh Elm University.

References

1. Remizova AA, Sakaeva ZU, Dzgoeva ZG, Rayushkin II, Tingaeva YI, Povetkin SN, et al. The role of oral hygiene in the effectiveness of prosthetics on dental implants. Ann Dent Spec. 2021;9(1):39-46.
2. Ashurko I, Esayan A, Magdalyanova M, Tarasenko S. Current concepts of surgical methods to increase mucosal thickness during dental implantation. J. Adv Pharm Educ Res. 2021;11(3):37-41.
3. El Ashiry EA, Alamoudi NM, Farsi NM, Al Tuwirqi AA, Attar MH, Alag HK, et al. The Use of Micro-Computed Tomography for Evaluation of Internal Adaptation of Dental Restorative Materials in Primary Molars: An In-Vitro Study. Int J Pharm Res Allied Sci. 2019;8(1):129-37.
4. David CM, Gupta P. Lasers in dentistry: a review. Int J Adv Health Sci. 2015;2(8):7-13.
5. Pendyala C, Tiwari RV, Dixit H, Augustine V, Baruah Q, Baruah K. Contemporary apprise on LASERS and its applications in dentistry. J Int Oral Health Med Res. 2017;4:47-51.
6. Gupta A, Jain N, Makhija PG. Clinical applications of 980 nm diode laser for soft tissue procedures in prosthetic restorative dentistry (case report). 2012;3(4):185-8.
7. Devi N, Kumar PA, Rakshna M, Rameshkumar KR. Application of lasers in prosthodontics: A review. J Indian Acad Dent Spec Res. 2018;5(2):42-5.
8. Zaara A, Kumar CR, Sujesh M, Rao DC, Harilal G. Lasers in prosthodontics–A review. J Pros Implant Dent. 2018;3(1):20.
9. Walid AJ. Application of laser technology in fixed prosthodontics—a review of the literature. Open J Stomatol. 2020;10(10):271-80.
10. Soman A, Joseph S, Thomas AS, Harshakumar M, Saranya YS. Prosthodontic perspective of laser application: A review. Int J Contemp Dent Med Rev. 2020;2019:1-5. doi: 10.15713/ins.ijcdmr.154
11. Sorrentino R, Ruggiero G, Zarone F. Laser systems for gingival retraction in fixed prosthodontics: A narrative review. J Osseointegration. 2022;14(1):1-5.
12. Varrak A, Kunt GE, Ceylan G. Lasers Applications in Prosthodontics. ES J Dent Sci. 2020;1(3):1014.
13. Liana T, Nicoleta ȚA, Florin BD, Cristina TP, Andrei TS, Mihai CP, et al. Laser diode applications in prosthetic dentistry. Res Clin Med. 2020;4(3):25-9.
14. Karic V, Shackleton J, Howes D, Melman G. The role of laser therapy in removable prosthodontic dentistry. S Afr Dent J. 2018;73(3):165-6.
15. Gosawi S, Kumar S, Lakhyani R, Bacha S, Wangadangi S. Lasers in prosthodontics – A review. J Evol Med Dent Sci. 2012;1:624-33.
16. Nacharani P, Srivastava R, Palekar U, Choukse V. Lasers in prosthodontics – A review. NJDSR. 2014;1:74-7.
17. Lukram A, Sachdeva N, Sahu K, Yadav A. Application of laser in prosthetic dentistry – A review. Int J Dent Med Res. 2014;1(99):102.
18. Durrani S. Lasers and it's application in prosthetic dentistry. Int J Dent Med Res. 2015;1:183.
19. Das M, Paul R, Ali M, Zabroo B, Shamima S, Quazi N, et al. Lasers in Prosthodontics. Univ J Dent Sci. 2017;3:9-12.
20. Prasad KD, Hegde C, Agrawal G, Shetty M. Gingival displacement in prosthodontics: A critical review of existing methods. J Interdiscip Dent. 2011;1(2):80.
21. Prasanna GR, Reddy K, Kumar RN, Shivaprakash S. Evaluation of efficacy of different gingival displacement materials on gingival sulcus width. J Contemp Dent Pract. 2013;14(2):217.
22. Nagaraj KR. Use of lasers in prosthodontics: A review. Int J Clin Dent. 2012;5(1).
23. Punia V, Lath V, Khandelwal M, Punia SK, Lakhyani R. The current status of laser applications in prosthodontics. Natl J Integr Res Med. 2012;3(3).
24. Malhotra R, Thukral H. Laser applications in prosthodontics: A review. Int J Enhanc Res Med Dent Care. 2016;3:20-5.
25. Luke AM, Mathew S, Altawash MM, Madan BM. Lasers: A review with their applications in oral medicine. J Lasers Med Sci. 2019;10(4):324.