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Research Article

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Evaluation of Erbium Family Lasers' Effects on Retention of Dental Fiber Post to Resin Cement: Primary Review

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Abstract

Objective: The most common causes of fiber post-failure are inadequate restorations and dislodgement. The fiber post surface's composition and topography can be altered with laser irradiation which could enhance its retention. This review discusses the effect of the Er:YAG and Er,Cr:YSGG lasers on the surface of fiber posts (FPs) and their strength of adhesion to resin cement in teeth with endodontic therapy.
Materials and Methods: A thorough search considering Google Scholar and PubMed, Medline, Scopus, and Web of Science published data from 2013 to 2023 which concentrate on the Erbium family lasers in the fiber post modification to optimize retention and longevity of the coronal restoration in endodontically treated teeth.
Results: Twelve studies were recognized and included as reliable sources and reviewed in the study. Data indicated that Surface modification was more effectively achieved with the Er,Cr:YSGG laser than with the Er:YAG laser. In addition to several other evaluation methods, this was primarily accomplished by measuring the pull-out and bush-out shear bonding strength of the fiber post.
Conclusion: Er:YAG laser, and Er,Cr:YSGG Laser pre-treatment of FP surfaces were effective in providing high shear bonding strength as a result of surface modification. Bond strength may be reduced and fiber post surfaces may be damaged by high-laser power irradiation.

Keywords: fiber post, shear bonding strength, push-out, pull-out, Erbium family lasers.

1. Introduction

Endodontically treated teeth are less strong and more susceptible to breaking compared to vital and healthy teeth. This may be due to changes in dental tissue composition and physical characteristics after root canal treatment. In the case of severely damaged teeth, an endodontic post is required to restore and reinforce the tooth [1]. Different types of posts are used to restore the teeth after root canal treatment, including cast ceramic and metal posts and prefabricated metal and fiber posts (FPs) [2]. Aesthetic restorations are becoming more important, and fiber-reinforced posts are a good choice because their modulus of elasticity is similar to dentin's, so stresses can be distributed evenly across the remaining root structure instead of concentrated in one area to modify failure mode to least damage to the remaining tooth structure [3]. The polymeric epoxy resin used to make FPs has a high conversion rate. It has cross-linked structures that could be strengthened by fibers made of silica, carbon, quartz, or zirconia. These fibers could make up to 30- 50% of the fiber matrix [4]. Luting a post inside the root canal is a technically challenging procedure and adhesive techniques are recommended with appropriate bonding protocols for post-placement; this is to preserve the optimum amount of dentin, enhancing post-retention, resistance to root fracture, and reduce microleakage [5]. The smooth surface of unmodified fiber posts and their unreacted resin component weaken their mechanical interlocking with resin cement despite silane application [6]. The length, design, diameter of the post, and surface treatments made to the post surface are ranked as factors affecting post retention in many in vitro studies[7] . Uncovering monomers in the polymer matrix of the glass post can only be possible with surface treatments applied to the surface of the glass fiber post therefore; multiple surface treatments like hydrofluoric acid etching, sandblasting, silicoating, and hydrogen peroxide application were suggested to enhance the micro-mechanical interlocking due to their ability for resin coating removal and exposure of the impeded fibers [8]. However, none of the pretreatment methods are effective enough to recommend their use in daily practice [9].

Recently, one of the most recent innovations that could influence surface modification of the material to enhance bond strength and roughness is laser technology [10]. Various dental applications have been suggested for lasers, which are generally safe such as roughening zirconia restoration surface [11] or zirconia implant surface roughness [12] reducing tooth sensitivity [13], and improving caries resistances [14]. The Erbium lasers (2780nm and 2940nm) are among the famous types of lasers used in dentistry. They are in the medium-infrared spectrum, their beam is absorbed by soft tissue at 100-300µ and dentinal walls at up to 400µ [15]. Because water is the chromophore target, their usage in dentistry goes beyond soft tissues such as mucosa and gingiva, to the hard ones, including enamel, dentine, and carious tissue. The thermal effects of erbium lasers on the target tissues can be detected through vaporization. A photomechanical effect is created when water molecules explode, which aids in the ablative and cleaning processes [16]. However, the actual effect of laser application and its correct parameters is still controversial and needs more research.

So, this study aims to review the articles published around 2013-2023. These papers mainly discussed the effects of the erbium laser family on post-surface treatment and how altered their intra-radicular dentin bond strength.

2. Methodology

2.1 Data Source and Search Strategy

This review was performed through an electronic search on the following websites: MEDLINE (PubMed), Embase (Elsevier), Web of Science (Clarivate), and Google Scholar. Studies concentrating on the use of the Er, Cr:YSGG, and Er:YAG lasers for surface modification of the fiber posts were included and reviewed. All are in a full-text format and have the laser as a main study group or sub-groups with if included, a comparison with other modification techniques. Preparing for this review started first with the selection of sequenced articles which was performed by reading the abstract first and then data collection then arranging from the full-text arrangement and tabulating to summarize essential data and facilitate analysis. Only manuscripts published in the English language within the previous ten years were included in this search, till November 2023 by utilizing the following keywords: “fiber post”, “Er,Cr:YSGG”, “shear bond strength”, “SBS” ,: Er:YAG laser “pull out” or “push out” tests. An additional manual search was conducted through the relevant papers' references list.

Articles of the following categories were not included: Unpublished articles in trusted journals, irrelevant studies, individual viewpoints, and publications lacking an abstract or publications of case reports with a short follow-up period; all review studies and social media sources were also excluded.

3. Result

Following the initial search, 88 articles were found in total; 40 articles were still there after the duplicate and excluded items were removed. To comprehend the Erbium family laser effect on surface modification of fiber posts, Google Scholar and PubMed searches yielded 12 papers that were included in this review. Table 1 provides a summary of the findings of the listed studies. With Er,Cr:YSGG and Er:YAG laser, several surface treatment methods such, as sandblasting, hydrofluoric acid, Nd:YAG laser, and air ablation were included in this study. Topics included are modification of fiber post-surface roughness, and testing bond strength specifically shear bond strength. In addition to that, a variety of types of fiber posts such as quartz and glass were considered in this review. Every study included and reviewed used dual-cured resin cement as a luting material. The universal testing machine's cross-head speed was set to 0.5,1 and 2mm/min for evaluating either pull or push-out shear bonding strength.

3.1 Fiber post surface treated with Er:YAG laser

Er:YAG laser was used to treat the post surface. It can be absorbed by hydroxyl groups in the post, causing ablation of the organic matrix, exposure of the fibers, and increasing the surface roughness [17]. However, the actual effect of laser application and its suitable parameters still needs more research to exclude some differences in the effect and results of laser application in this field. Numerous research has recently investigated the impact of varying Er:YAG laser powers on fiber posts. Akin et al [18] showed that 150 mJ and 10 Hz increased glass fiber post-bonding. But Tuncdemir et al [19] found that utilizing the aforementioned parameters with an Er:YAG laser did not result in a statistically significant change to the push-out bond strength of quartz fiber posts. On the other hand, Arslan et al [20] examined the effects of a 4.5W, 10Hz using Er:YAG laser on glass fiber posts and found that 450 mJ of irradiation strengthened the pull-out bond between the fiber posts and the resin core. Furthermore; Gomes et al [21] revealed that the bond strength between the posts that were exposed to the Er:YAG laser irradiation and the root dentin was comparable to that of the posts that received only silane treatment. Moreover; Gorus et al [22] assessed the glass fiber post's micro-push-out bond strength; they found that the laser-treated group had reduced fiber post-bonding strength to resin cement due to Er:YAG irradiation. Recently, Raafat et al [23] applied Er:YAG laser and revealed that laser treatment for the cylindrical post surface using 10Hz, 1.5W, and pulse duration 100µs for 60sec can enhance its bond strength to intra-radicular dentin. Two possible reasons for studies that yield inconsistent results are differences in the type of fiber post and the laser settings.

3.2.Fiber post surface treated with Er,Cr:YSGG laser

As a result of Er,Cr:YSGG laser applied on fiber post surface, surface modification, wettability, and interface adhesion and stability have all may be enhanced [24]. Kurtulmus-Yilmaz et al. [25] found that the post/resin core micro-push-out bond strength was dramatically enhanced when glass fiber posts were irradiated with (1-1.5) W of Er,Cr:YSGG laser instead of without surface treatment. This was in contrast to a previous study made by Cengiz et al [26], Er,Cr:YSGG laser with 3.5W and 4.5W power for 60s did not improve the push-out bond strength of glass fiber and decreased in un quartz fiber or zirconia root posts. Another study by Gomes et al. [21] reported that all areas of the root showed an increase in the push-out bond strength of the fiber posts after being irradiated with an Er,Cr:YSGG laser set at 150mJ, 10 Hz, 1.5W, and140µs pulse duration. While, Ghavami et al. [27] concluded that the adhesion of the fiber post was not improved by irradiating an Er,Cr:YSGG laser with an MZ8 tip, at 20Hz, 140µs, and a mixture of 80% water and 60% air in the noncontact mode for 10 sec. Moreover; using a power of 1.5W made the bond strength of the post worse. After exposure to 1W laser power, there was no appreciable difference between the experimental and control groups. Hashemikamangar et al. [28] proved that the micro-push-out strength of fiber posts was improved by irradiating them with Er,Cr:YSGG laser at 1W and 1.5W, 20 Hz, and 140 µs.

Table 1: General Information of Reviewed Article**.**

Author; date	Types of fiber post/cement	Surface treatment	Laser parameters	Shear bond strength	Result /conclusion
Raafat et al.; 2023	Glass fiber post /dual-cured self-adhesive resin cement	-control/silane - Er:YAG laser	Er:YAG laser cylindrical fiber tip 10 Hz , 1.5W, 100µs. for 60 sec.	push-out test/ at 1 mm/min	Significant increase in bonding by laser
Amr Mekky et al.; 2022	Glass fiber post / self-adhesive resin cement	-no treatment -air-borne particle abrasion -diode laser -Er,Cr:YSGG laser	Er,Cr:YSGG, 1.5W, 10Hz, 140µs, for 60 seconds. Sapphire MGG6: 60% water, 40% air	pull-out test / at 1mm/min	Er,Cr:YSGG Significant increased bonding
Gorus et al.; 2020	Glass fiber post /Clearfil SA cement	-control -sandblasted - Er:YAG laser.	Er:YAG 2940nm 1.5W,10H for 60 sec.	push-out test, 0.5 mm/min.	Significant reduction of bonding
Rezaei-Soufi et al.; 2019	Quartz fiber /posts dual-cure resin cement.	-control -Er,Cr:YSGG laser	Er,Cr:YSGG laser (0.5, 1.0, 1.5)W, 20Hz, 150µs, with MZ6 tip, 10% water, 15% air for 30 sec.	Pull out test, 1 mm/min	Er,Cr:YSGG laser Significant increased bonding to dentin
Hashemika-mangar et al.; 2018	Glass fiber posts/ resin cement.	-control -Sandblasting -Er,Cr:YSGG laser irradiation at (1, 1.5, 2)W.	Er,Cr:YSGG laser. For every laser power, 20 Hz, 60% water, 40% air, 60µs. Two cycle with 40sec for each.	push-out/ 1mm/min	The fiber post's bonding strength improved by 1 W.
Ghavami-Lahiji et al.; 2018	- Conical Exacto Glass fiber -Double-tapered White Post DC Glass fiber posts	-no treatment -Er,Cr:YSGG laser irradiation at (1, 1.5)W, MZ8 tip	Er,Cr:YSGG laser settings: 1W or 1.5W at 20 Hz, 140 µs, 80% water, 60% air, 10 sec.	push-out test/ 1mm/min	1.5W decreased Bonding strength or no effect.
Gomes et al.; 2018	-Glass fiber posts – -Conventional -dual polymerizing resin cement	-Control-silane -Er:YAG laser -Er,Cr:YSGG -diode laser	Er:YAG 1.5 W/10Hz 100 µs, 60sec/Water spray (25 mL/min) Er,Cr:YSGG 1.5W, 10Hz, 140 µs, 60s/60% water 40% air, MG6 Sapphire tip	Push out test/ 0.5 mm/min speed	Er,Cr:YSGG laser radiation only enhanced the bonding.
Cengiz et al.; 2016	-Snowpost fibre post, - Quartz post Zirconia post/ Luting resin composite	-control -Er,Cr:YSGG laser at 3.5W and 45W	-Er,Cr:YSGG used at 3.5W and 4.5W power for 60 s, 60 µs, 20 Hz. 85% air-cooling, 75% water.	push out test/ 1mm/min	Er,Cr:YSGG laser did not enhance pushout bond strength.
Kurtulmus-Yilmaz et al.; 2014	- Quartz post Translucent fiber post -Glass fiber post, - Dual Resin core material.	-control -sandblast -hydrofluoric acid -24% H_2O_2 -CH_2Cl_2 - Er,Cr:YSGG .	-MG6 sapphire tip - noncontact mode, (1, 1.5, 2)W / 20Hz, 140 µs with 80% water and 60% air for 30 sec.	Micro-push out /1min/mm	Post/core interface better with 1W and 1.5W Er,Cr:YSGG.

Akin et al.; 2014	- quartz, Translucent, light post -Dual-cured composite luting cement	-control-no treatment -sandblasted - silica coated -hydrofluoric -acid-etched -Nd:YAG laser - Er:YAG laser	- 4mm titanium articulated arm pulsed at 10Hz, 150mJ, 1.5W, 700µs, and 20sec, with water irrigation.	Push out test/ 1 mm/min	Er:YAG laser enhanced bonding of fiber posts without considering Surface roughness.
Tuncdemir et al.; 2013	-Quartz fiber posts -self-curing adhesive cement	-control - alumina airborne abrasion -Er:YAG laser	Er:YAG laser 150mJ for 60sec, 100µs, 10Hz, with a R14 handpiece, non-contact with no air or water	push-out test/ 1 mm/min	Er:YAG laser did not influence push-out bond strength.
Arslan et al.; 2013	-FRC posts - Rebilda DC cement	- Control -air abrasion with 50-µm alumina - Er:YAG laser	Er:YAG laser, (1.5, 3, 4.5)W, 10Hz, for 60sec, 100µs, optical tip 400µm diameter.	pull-out tests/ 2 mm/min	Improved Pull-out bonding at 4.5W Er:YAG laser.

Rezaei-Soufi, et al [29] tested fiber posts without surface treatment. Results showed lower bonding strength to dentin compared to those treated with (0.5, 1, and 1.5) W Er,Cr:YSGG laser by Z6 tip. Recently, Amr Mekkyet al. [30] showed that the pull-out bonding strength of the glass fiber post to root dentin was improved by irradiation with Er,Cr:YSGG laser, and Sapphire MGG6 fiber tip.

4. Discussion

The target material's chemical and physical properties, as well as the many laser radiation parameters, determine the extent to which an irradiated substrate's surface is altered. Surface cleaning and chemical modification of surface qualities improvement or deterioration of bonding properties are both achievable depending on material properties and laser radiation parameters [4]. Despite having comparable wavelengths, Er:YAG and Er,Cr:YSGG lasers exhibit distinct water absorption differences. Er:YAG laser absorbs more water than Er,Cr:YSGG laser. Additionally, Er:YAG laser uses a water irrigation system to apply water to the surface directly, generating a water layer. Er,Cr:YSGG lasers use pressured air and water to create a water mist. The water pellicle generated on the glass fiber post during Er;YAG laser irradiation may have consumed energy since water absorbs erbium laser energy. The irrigation volume in this system was 5 times that of the Er,Cr:YSGG laser, which may affect the energy that reached the irradiated surface[31]. Because of the smaller water flow that allows more energy to contact with the target surface, glass fiber posts exposed to the Er,Cr:YSGG laser irradiation showed increased ablation of the polymeric matrix which led to enhance both surface roughness and bonding strength[6] . Glass fibers and the resin matrix will likely melt when exposed to high power laser irradiation. A solidification procedure that incorporates both layers into one another comes after this one. Low bond strength was obtained because of this altered surface topography which could prevent resin cement from entering the post surface [31]. High-power density Er,Cr:YSGG laser irradiation reduces dental post-flexural strength and modulus. When surface roughening fiber posts and resin cement improve contact, structural changes that affect durability must be considered [8].

This review assessed the pull-out or push-out bond strength of the fiber post to the dentinal wall or resin cement used for luting. The pull-out test measures the complete detachment force of a post from the entire length of the canal, enabling the evaluation of both shear and tensile stresses. However, one limitation of this test is the challenge of precisely controlling the applied load along the longitudinal axis of the samples [32].On the other hand, compared to the usual shear test, the push-out test more accurately and reliably measures bond strength. Uneven stress distribution in thick samples limits push-out strength testing; slicing the samples to make smaller pieces could help resolve this issue [33].

5. Conclusions

1-The improvement of fiber post retention was achieved more effectively by the Er,Cr:YSGG laser than by the Er:YAG laser.
2- Fiber post-structural damage can occur when the power of the Er,Cr:YSGG laser is more than 2W.

References

[1] Bhuva B, Giovarruscio M, Rahim N, Bitter K, and Mannocci F. "The restoration of root filled teeth: a review of the clinical literature," Int. Endod. J.2021; 54 (4): 509–535. doi: 10.1111/iej.13438.
[2] Lazari PC, de Carvalho MA, Del Bel Cury AA, and Magne P. "Survival of extensively damaged endodontically treated incisors restored with different types of posts-and-core foundation restoration material." J. Prosthet. Dent.2018 May; 119 (5): 769–776. doi: 10.1016/j.prosdent.2017.05.012.
[3] Wang X, Shu X, Zhang Y, Yang B, Jian Y, and Zhao K, "Evaluation of fiber posts vs metal posts for restoring severely damaged endodontically treated teeth: a systematic review and meta-analysis.," Quintessence Int.2019; 50(1): 8–20. doi: 10.3290/j.qi.a41499.
[4] Davoudi A et al., "Laser Treatment of Fiber Post and Final Push-Out Bond Strength: A Systematic Review and Meta-Analysis". Photobiomodulation Photomed. Laser Surg. 2020January; doi: 10.1089/photob.2020.4809.
[5] Ali, A.J.K R, J, "The Effect of the Type of Post Space Irrigation on the Push-Out Bond Strength of Glass Fiber Post (An in vitro Study)." Res. Med. Dent. Sci., 2021; 9(5) : 118–123.
[6] Mishra L et al., "Effects of surface treatments of glass fiber-reinforced post on bond strength to root dentine: A systematic review." Materials (Basel). 2020;13(8). doi: 10.3390/MA13081967.
[7] Dentistry R. "A systematic review of factors associated with the retention of glass fiber posts."2015; 29(1): 1–8. doi: 10.1590/1807-3107BOR-2015.vol29.0074.
[8] Hasham M, Hashem A, and Hamza F."Effect of Different Surface Treatments of Glass Fiber Posts on their Surface Roughness and Flexure Properties. Maced. J. Med. Sci. 2021; 9. (D): 229–234.
[9] Kürkçüoğlu I, Kucukesmen C, Özkır S, and Yilmaz B, "Effect of surface treatment on roughness and bond strength of CAD-CAM multidirectional glass fiber-reinforced composite resin used for implant-supported prostheses." Polym. Int.2021 Jan; 70(10). doi: 10.1002/pi.6173.
[10] Salman, S.Q and Hussein B, M, A. "Topographical Analysis of Human Enamel after Phosphoric Acid Etching and Er,Cr:YSGG Laser Irradiation." Shahid Beheshti Univ. Med. Sci.2023; 14(e68). doi: 10.34172/jlms.2023.68.
[11] Dawood,R.M, and Ibraheem AF. "Evaluation of Shear Bond Strength of Zirconia to Tooth Structure after Different Zirconia Surface Treatment Techniques," J. Baghdad Coll. Dent.2015; 27(1): 77–85. doi: 10.12816/0015268.
[12] Muhy.S,R and Hussein,B.M.A. "analysis-of-ND-YAG-laser-1064-and-532-nm-interaction-with-zirconia-dental-implant-after-different-exposure-time." J. Res. Med. Dent. Sci.2019Nov; 5(7): 40–47.
[13] Mubarak R.M, Hussein B. M .A. "Influence of Er : Cr ; YSGG laser Desensitization on SBS of resin cement to dentin." Iraqi J. Laser2022; 21(1): 18–27.
[14] Hadi.A. A. and Hussein.B. M .A. "Role of Er,Cr :YSGG Laser and Fluoride in Caries Resistance". Journal of Research in Medical and Dental Science. 2022; 100(8): 19-25.
[15] Johar K. & Kirpa J, Fundamentals of laser dentistry. Jaypee Brothers Medical Publishers (P) Ltd. https2011.doi.org/10.5005/jp/books/11324
[16] Convissar RA, "Laser dentistry 101: An introduction to wavelengths and laser-tissue interaction," Seminars in Orthodontics.2020; 26(2): 74–79. doi: 10.1053/j.sodo.2020.06.001.
[17] Oz O,P,Secilmis A, and Aydin C. "Effect of Laser Etching on Glass Fiber Posts Cemented with Different Adhesive Systems," Photomed. Laser Surg.2018; 36 (1): 51–57. doi: 10.1089/pho.2017.4304.
[18] Sipahi C, Piskin B, Akin GE, Bektas OO, and Akin H. "Adhesion between glass fiber posts and resin cement: evaluation of bond strength after various pre-treatments.," Acta Odontol. Scand.2014 Oct; 72(7): 509–515.doi: 10.3109/00016357.2013.875586.
[19] Tuncdemir AR, Yildirim C, Güller F, Ozcan E, and Usumez A."The effect of post surface treatments on the bond strength of fiber posts to root surfaces." Lasers Med. Sci.2013Jan; 28 (1):13–18. doi: 10.1007/s10103-012-1053-z.
[20] Arslan H, Kurklu D, and Benan L, "parameters on the pull-out bond strength of the fiber posts Effects of post surface treatments including Er : YAG laser with different parameters on the pull-out bond strength of the fiber posts," no. November 2013, doi: 10.1007/s10103-013-1485-0.

[21] Gomes KGF, Faria NS, Neto WR, Colucci V, and Gomes EA, “Influence of laser irradiation on the push-out bond strength between a glass fiber post and root dentin.” J. Prosthet. Dent.2018; 119(1): 97–102. doi: 10.1016/j.prosdent.2017.01.013.
[22] Gorus Z and Uner DD, “The evaluation of bond strength of glass fiber posts subjected to different surface treatments.” 2020; 26(12):29–32. doi: 10.5455/annalsmedres.2019.07.408.
[23] Raafat W, Kheiralla L, and Nabil O, “Effect of laser surface treatment of glass fiber posts on their bond strength to intra-radicular dentin at different root levels: An in-vitro study.” Int. J. Appl. Dent. Sci.2023; 9(1):149–155.doi: 10.22271/oral.2023.v9.i1c.1672.
[24] Kırmalı Ö, Akçakuş Battal T, Turker N, and Dündar A, “Mechanical properties of glass-fibre-reinforced composite posts after laser irradiation with different energy densities.” Aust. Endod. J.2021; 47(1): 34–42. doi: 10.1111/aej.12443.
[25] Kurtulmus-Yilmaz S, Cengiz E, Ozan O, Ramoglu S, and Yilmaz HG, “The effect of Er,Cr:YSGG laser application on the micropush-out bond strength of fiber posts to resin core material,” Photomed. Laser Surg.2014; 32 (10). doi: 10.1089/pho.2014.3780.
[26] Cengiz S, Koçak S, Koçak M, Velioğlu N, Sadettinoğlu K, and Özcan M, “Effect of Er,Cr:YSGG laser surface conditioning on the adhesion of fiber-reinforced composite and zirconia intraradicular posts to the root dentin.” J. Adhes. Sci. Technol.2016; 30(18): 1957–1967. doi: 10.1080/01694243.2016.1170587.
[27] Ghavami-Lahiji S, Benedicenti M, Karimian S, Shahabi R, “Influence of Er , Cr : YSGG Laser Surface Treatments on Micro Push-Out Bond Strength of Fiber Posts to Composite Resin Core Materials.” J. Dent. Biomater.2018; 5(1):533–542.
[28] Hashemikamangar SS, Hasanitabatabaee M, Kalantari S, Gholampourdehaky M, Ranjbaromrani L, and Ebrahimi H, “Bond strength of fiber posts to composite core: Effect of surface treatment with Er,Cr:YSGG laser and thermocycling.” J. Lasers Med. Sci.2018; 9(1): 36–42.doi: 10.15171/jlms.2018.09.
[29] Rezaei-Soufi L, Tapak L, Forouzande M, and Fekrazad R, “Effects of motion direction and power of Er,Cr:YSGG laser on pull-out bond strength of fiber post to root dentin in endodontically-treated single-canal premolar teeth.” Biomater. Res.2019 ;23(1): 1–8. doi: 10.1186/s40824-019-0165-y.
[30] Amr. Mekky , El-Hakim.M, Shokry.T,” “Effect of Posts Surface Treatments on the Pull-out Bond Strength of Glass Fiber Post to Root Dentin ‘A Comparative In - Vitro Study’.2022 ;2(1):1–13.
[31] Siqueira CB, De Faria NS, Raucci-Neto W, Colucci V, and Gomes EA, “Evaluation of Mechanical Properties of Glass Fiber Posts Subjected to Laser Surface Treatments.” Photomed. Laser Surg.2016; 34(10): 460–466. doi: 10.1089/pho.2016.4144.
[32] Souza JCM et al., “Surface modification of glass fiber reinforced composite posts to enhance their bond strength to resin - matrix cements : an integrative review”.2021; no. 0123456789.
[33] Al-Azzawi AKJ, “The Effect of Waterlase Laser and Herbal Alternative , Green Tea and Salvadora Persica (Siwak) Extract on Push - Out Bond Strength.” J. Baghdad Coll. Dent.2014; 26 (2)1–6. doi: 10.12816/0015187.

تقييم تأثير ليزر عائلة الاربيوم على قوة ارتباط الوتد الليفي مع الاسمنت الراتنجي:دراسه أستطلاعية

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الخلاصة

الهدف: الأسباب الأكثر شيوعا في فشل ارتباط الوتد الليفي هو الترميم الغيركافي والازاحه. التركيب السطحي للوتد الليفي يتأثر بواسطة إشعاع الليزر وقد يعزز من قوة التصاقه. في هذه الدراسة الاستطلاعية نناقش تأثيرليزر Er,YAGو ليزرEr,CR:YSGGعلى سطح الوتد الليفي وقوة التصاقه بالاسمنت الراتنجي في الأسنان المعالجة لبيا.

الطرق: تم بحث شامل في مقالات محرك كوكل وPubMedوMedlineوWeb of Scienceنشرت من 2013 إلى 2023وتركز على تأثير ليزر عائلة الاربيوم على تغير سطح الوتد الليفي وتحسين قوة الصاقه لكي تطيل عمر الحشوة التاجيه في الاسنان المعالجه لبيا.

النتائج: تم مراجعة اثني عشر دراسة، وتضمينها على أنها موثوقة بُحثت في الدراسة. وتشير البيانات إلى أن تعديل السطح تم تحقيقه بشكل أكثر فعالية باستخدام ليزر Er,Cr:YSGG من ليزر Er,YAG. وبالإضافة إلى العديد من أساليب التقييم الأخرى، تم إنجاز ذلك أساسا بقياس قدرة السحب والضغط مقياسالقوة الالصاق.

الاستنتاجات: المعالجة المسبقة لسطح الوتد الليفي بواسطه ليزر Er,YAG وليزر Er,Cr:YSGG كانت فعالة في توفير قوة ترابط عالية نتيجة لتعديل السطح. قد يتم تقليل قوة الالصاق وتتضرر أسطح الوتد الليفي بسبب الإشعاع العالي لطاقة الليزر.