Diode Laser - Mediated Photocoagulation in an Alveolar Socket after Tooth Extraction: A Preliminary Study

Klangthong A Sattayut S*,** Kantrong N***,**** Prasongvaranon V***** Thanudape L******

Abstract

Diode laser has been addressed for its potential use in soft tissue surgery for decades and successful outcomes have been reported. This study therefore aimed at investigating the adjunctive effect of diode laser on the socket coagulation after tooth extraction. Twelve healthy individuals who required an extraction of premolar for an orthodontic purpose were subjected to randomization. Control group (N=6) was subjected to local gauze pressure technique to stop socket bleeding after the operation, while the experimental group (N=6) was irradiated with diode laser (808 nm, 0.5 watt, 5-second interval) 1 cm above the alveolar socket until bleeding stopped. Bleeding time and VAS scores between two groups were compared by using Mann Whitney U-test. Our data indicated that bleeding time was 2.74-fold faster when diode laser irradiation was incorporated in the treatment. Photocoagulation induced by diode laser significantly accelerated the clotting. In this study, we showed the efficacy of diode laser application in promoting a blood coagulation at the extraction wound, in adjunct with a conventional tooth extraction procedure.

Keywords: *Diode laser/ Tooth extraction/ Bleeding control/ Post-extraction socket bleeding*

Received: *Aug 28, 2020*
Revised: *Mar 25, 2022*
Accepted: *April 04, 2022*

Introduction

Postoperative bleeding is a major complication commonly found after tooth extraction procedure. This unfavorable event may occur immediately after extraction or begin 2-3 hours postoperatively depending on traumatic level of extraction, pathology of the extracted tooth, and injury of the surrounding tissues.[1] The simplest method for promoting blood coagulation is the utilization of local pressure technique. In patients on warfarin treatment, 88.6% among them experienced blood oozing from the alveolar socket after tooth extraction that can be controlled by a gauze compression at home,[2] indicating its effectiveness on promoting bleeding hemostasis even in patients with coagulopathy. However, in a case with suspicious bleeding tendency or persistent bleeding from the alveolar socket after extraction, additional local hemostatic measures are necessary to control post-extraction bleeding complication[3].

Several strategies have been introduced as alternative methods to aid clot retention at the tooth extraction site. While most common procedures include an additional use of local hemostatic agents to attenuate bleeding at the extraction wound, the use of laser in dental surgery has shed new lights on the prevention of post-operative bleeding complication. It is believed that the mechanism by which the diode laser promotes photocoagulation is initiated via an energy absorption by hemoglobin.[4] Importantly, a large body of evidence has clearly elucidated the

** Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Khon Kaen University, Amphur Muang, Khon Kaen.*
*** Laser in Dentistry Research Group, Khon Kaen University, Amphur Muang, Khon Kaen.*
**** Department of Restorative Dentistry, Faculty of Dentistry, Khon Kaen University, Amphur Muang, Khon Kaen.*
***** Research Group of Chronic Inflammatory Oral Diseases and Systemic Diseases Associated with Oral Health, Faculty of Dentistry, Khon Kaen University, Amphur Muang, Khon Kaen.*
****** Dental Hospital, Faculty of Dentistry Hospital, Khon Kaen University, Amphur Muang, Khon Kaen.*
******* Dental division, Pong-namron Hospital, Amphur Pong-namron, Chanthaburi.*

benefits of diode laser for clinical dentistry, particularly as an alternative treatment modality that could potentially be used with oral soft tissues.[5–7]

Benefits of diode laser in surgical treatment has been extensively addressed in the past decade. One major outcome is the reduction of postoperative complications i.e. pain, facial edema, and trismus after the utilization of diode laser in combination with a traditional surgical procedure to remove lower third molars[8]. Previous study also indicated that postoperative pain and edema after periodontal flap surgery were decreased when the surgical sites were photo-irradiated by diode laser.[9] Notably, the application of diode laser during orthodontic treatment can facilitate and reduce the pain occurred after tooth movement.[10,11] In addition, irradiation of tooth enamel with diode laser has shown to decrease the mineral loss of enamel in response to hydrogen peroxide exposure.[12] Collectively, earlier research studies have suggested diode laser a promising medical equipment that could be employed in multiple areas of dental treatments.

It is noteworthy that continuous-wave diode laser has recently been reported to be an efficient tool in mediating blood coagulation during a laser microsurgery procedure on the skin.[13] Remarkably, blood coagulation was visible after laser irradiation for 3 seconds. The use of diode laser in dermal surgery also offers another advantage i.e., a fixation of collagen scaffold which results in the faster wound healing process.[13] Despite its use for pain alleviation and bleeding control, it is still unclear whether diode laser can be used in combination with a conventional tooth extraction procedure to mitigate a potentially delayed coagulation at the extraction site. This study thus aimed to investigate the application of diode laser power and its effect on wound hemostasis after simple tooth extraction.

Materials and methods

Subject recruitment and inclusion criteria

This preliminary clinical study was conducted upon the approval from Khon Kaen University ethics committee (Reference number: HE 552039) based on the declaration of Helsinki. Study population were walk-in dental patients at the Oral Surgery Clinic, Faculty of Dentistry, Khon Kaen University, whose simple extraction of premolar was indicated upon a request from orthodontist. All recruited participants must be in a good health without underlying systemic conditions, and classified as American Society of Anesthesiologist (ASA) physical status class I, in a range of 16 – 35 years of age. In addition, patients with concurrent history of taking anticoagulants or antiplatelet drugs were excluded from the study. Participants must have at least one premolar that required a simple extraction incorporated in an orthodontic treatment plan. Premolars planned to be extracted must be sound, asymptomatic and not exhibit any carious lesion and periapical pathology. Root dilaceration must not be visible on a pre-operative periapical radiograph, otherwise the patients were excluded from the trial. In addition, administering local anesthesia with 2% mepivacaine containing 1:100,000 epinephrine must not be contraindicated for its use in any recruited subjects.

Subject randomization, extraction and bleeding control procedures

Twelve healthy individuals were recruited into this study. All subjects were given a consent form prior to the beginning of the trial, subsequently randomized using a shuffled deck of cards to determine the bleeding control method they received. In accordance with a standard protocol for simple tooth extraction, patient history taking, physical examination, and vital sign monitoring were performed. The entire operation was done by one experienced oral maxillofacial surgeon to ensure a

well-controlled extraction procedure. Time used for injection and extraction were recorded by another assigned dentist.

After the extraction procedure was completed, bleeding from an alveolar socket was controlled by the method assigned from the randomization method. Control group was the subjects whose premolars were extracted and the bleeding was controlled using a gauze compression technique. Briefly, a fresh gauze damped with 0.9% normal saline was quickly used to wipe the seeping blood from the socket before a new sterile gauze was placed against the extraction wound and the subject was then asked to bite pieces of gauze with a moderate bite force. All individuals were informed that resistance from a gauze pressure must be felt with no muscle fatigue from biting. Coagulation at the extraction socket was timed by another blinded observer right after the gauze was placed. Bleeding control using gauze compression was evaluated every 30 seconds until the initial blood coagulation was formed (Figure 1). Bleeding time, starting from socket wiping with gauze to when the bleeding stopped, was then recorded.

In experimental group, standard tooth extraction protocol was followed as described above. However, a laser application protocol was adopted from a previous study reported by Ishikawa et al. using blue-violet light-emitting diode to photocoagulate the socket bleeding.[14] In brief, after wiping the extraction socket with a damp gauze, 808-nm diode laser of 0.5-watt power, and 2.4-mm spot size (Quanta808, Quanta System S.p.A., Solbiate Olona, Italy) was applied over a extraction socket for a duration of 5 seconds under continuous mode (Figure 2). Safety goggles were used by the operator and assistants. A laser handpiece delivering a collimated beam was position at 1 centimeter above the extraction wound without handpiece movement. Calculated energy density was 8.84 J/cm^2. After a 5-second irradiation intervals, bleeding time was recorded similarly as aforementioned. After the operation, all participating individuals were observed for another 30 minutes for a potential post-operative bleeding. They were also followed up with the same oral surgeon one week after the trial.

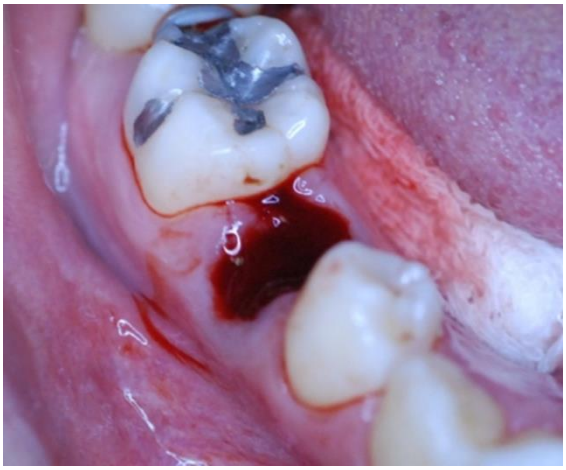

Figure 1 Initial blood coagulation at the alveolar socket seen after a gauze compression technique

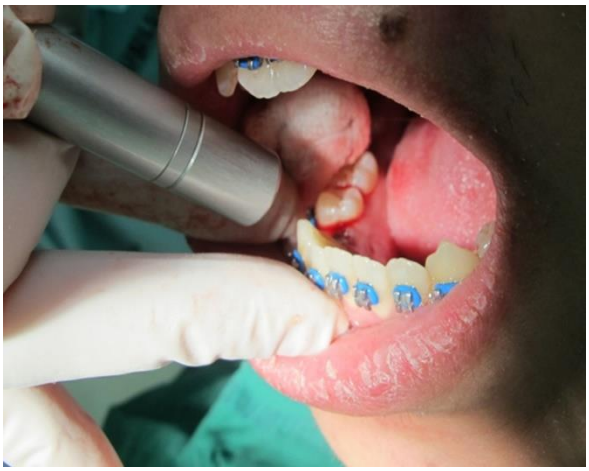

Figure 2 Positioning of Quanta 808 diode laser above the extraction wound

Statistical analysis

Bleeding time and post-operative pain intensity at different time points was compared between two groups of treatment by using Mann-Whitney U test, unless otherwise indicated in the table legend. A statistical comparison was considered significant when $P<0.05$. Statistical analysis was performed using a GraphPad Prism version 7 (GraphPad Software Inc., La Jolla, CA, USA)

Results

Summarized demographic data as well as method used to control socket bleeding, time used for extraction of the subjects participated in the trial were shown in Table 1. We found that the mean age of young individuals allocated into a conventional treatment and diode laser irradiation was 20.50±2.81 and 19.83±1.17 years old, respectively (Table 2). Distribution of the participants' gender between two groups was not statistically different (Table 2), as determined by Chi-square test at P=0.1213. Twelve healthy individuals were recruited into the study. Nine individuals out of 12 subjects were young females whose either right or left lower premolar needed to be extracted for orthodontic reason. Only one female underwent a simple extraction of upper right premolar as indicated by a request from her orthodontist. Three young males whose lower premolar was planned to be extracted joined the trial. All subjects were classified as ASA class I healthy patients and the average age was 20.33±2.15 years old. The procedure did not cause any visible trauma of the remaining gingiva and hard tissues in all individuals participated in the study.

Bleeding time as determined by the cease of spontaneous bleeding from the alveolar socket was compared between the two groups as shown in Table 2. While 270 seconds were allowed for bleeding to stop when gauze compression was used, it took 98.5 seconds for photocoagulation mediated by diode laser to occur. Median of bleeding time compared between 2 treatment methods was significantly different as indicated in Table 2.

Table 1 Demographic data and recorded information of each subject participated in the study

Subject ID	Gender*	Designated bleeding control method	Pre-operative blood pressure (mmHg)	Number of extracted tooth in 2-digit system	Age
1	Female	L	110/70	14	21
2	Female	L	110/70	34	19
3	Female	G	110/70	34	20
4	Male	L	120/70	44	20
5	Female	G	100/76	44	22
6	Female	G	110/70	45	16
7	Female	L	110/70	45	21
8	Female	G	110/70	34	24
9	Female	G	120/60	34	23
10	Female	G	120/70	45	20
11	Female	L	115/80	34	18
12	Male	L	130/80	44	20
Average (Mean ± SD)					20.33 ± 2.15

* L = Diode laser irradiation, G = Gauze compression, LA = Local anesthetics, NS = Not specified.

Table 2 Bleeding time recorded from the operation of each subject

Bleeding control method	Subject ID	Mean age (years)	Bleeding time (seconds)	Bleeding time (Median in seconds)	95% Confidence interval (seconds)
Gauze compression	3	20.50 ± 2.81^{ns}	240	270 *	209.1 – 410.9
	5		360		
	6		240		
	8		480		
	9		240		
	10		300		
Diode laser irradiation	1	19.83 ± 1.17^{ns}	107	98.5 *	34.44 – 155.6
	2		70		
	4		118		
	7		5		
	11		180		
	12		90		

*Asterisk indicates statistically-significant difference at *P*-value = 0.0022 as determined by using Mann-Whitney U test. Non-statistical significance of mean age between two groups was analyzed with unpaired t-test and *P*-value = 0.6043 was achieved.

Discussion

It is known to date that an emerging laser technology has become very beneficial for oral surgery particularly its application for the use with soft tissue operation. Diode laser, for instance, is most commonly utilized for gingival surgery as well as dental hard tissue mineralization.[12] Considering its abilities to alleviate unfavorable symptoms following surgical removal of the tooth, diode laser might be viewed as an adjunctive tool used with dental patients whose systemic conditions might compromise the treatment plan. Furthermore, medically compromised health conditions may render these patients unsafe to undergo a traditional surgical operation.

Diode laser has been a potential instrument used for increasing satisfactory treatment outcomes in dentistry. Recently, the use of low-level laser therapy has been introduced in adjunct with conventional periodontal treatment i.e. scaling and root planning.[15] A treatment combination with diode laser showed to promote host's periodontal tissue healing as the changes of clinical parameters i.e. sulcus bleeding and probing depth were significantly improved in a group to which diode laser was supplementally applied.[15] Intriguingly, gingivectomy in orthodontic patients with fixed appliances using diode laser in combination with a non-surgical periodontal treatment demonstrated a better improvement of gingival overgrowth index and probing depth when compared to subjects treated with non-surgical periodontal therapy alone.[6] In chronic periodontitis patients, it is also striking to note that diode laser, as an adjunctive therapy, provided a more satisfactory treatment result over the conventional scaling and root planning.[16] In addition, a recent *in vivo* study has demonstrated that irradiation of bony perforations on the femurs of mice with diode laser promoted formation of new trabecular bones and collagen fibers, when compared to the control group treated similarly without laser irradiation.[17,18] Providing its substantial beneficial use, diode laser has therefore been rendered a promising, adjunctive treatment modality used to yield a more favorable and predictable surgical outcome. However, due to the cost of the diode laser machine, the practical use for promoting a coagulation in the extraction sockets may still be limited.

In this study, we report the potential use of diode laser as a photocoagulator in dental patients who underwent a surgical procedure for simple tooth extraction. Our results showed that an immediate irradiation of alveolar socket after tooth extraction with 808-nm diode laser at low level (0.5 watt, 5-minute interval) can mediate photocoagulation, consistent with previous studies using diode laser to

successfully perform retinal photocoagulation[19,20] and venous occlusion in the greater saphenous vein[9,21] as well as hemostasis of the gingiva in several types of oral soft tissue surgeries.[22] Although a split-mouth design was not employed in this study, our results obtained from healthy individuals have demonstrated a significant reduction of bleeding time when diode laser was applied. Remarkably, the use of subthreshold micropulse diode laser resulted in retinal photocoagulation without damage of epithelium. [20] Although not investigated in this study, the mechanism diode laser employs for photocoagulating the blood is thought to be via the energy absorption of the irradiated tissue in which hemoglobin, acting as a chromophore absorbing laser energy, is constituted.[9] It is also possible that photocoagulation of the alveolar socket induced by diode laser is mediated by local steam bubble formation resulting in an indirect thermal change[23]. This phenomenon might lead to the generation of focal thrombosis that could result in the occlusion of superficial blood clot over the extraction wound. For better understanding of the use of diode laser, a precise mechanism by which local blood coagulation is mediated hence warrants further investigation.

Spontaneous bleeding from the alveolar socket and post-operative pain are the two most common complications after tooth extraction especially in third molars.[24,25] Even though the utilization of diode laser for post-operative pain relief was not our primary focus of the study, it is possible that the long duration of tissue numbness after inferior alveolar nerve blocking might considerably hinder an individual perception of pain, thus exercising the self assessment of post-operative pain must be very careful. Pre-operatively, all of the extracted premolars exhibited neither inflamed surrounding gingival tissues nor pulpal pathology; hence, postoperative pain resulted from tissue inflammation was not expected. One clear assumption that could be drawn from our data was that diode laser irradiation did not provoke a significant postoperative pain throughout the follow-up period. Strikingly, several lines of evidence have demonstrated its adjunctive property for pain alleviation. Diode laser irradiation at the surgical sites was associated with reduced postoperative pain [9,26] as well as swelling and trismus after surgical removal of lower third molar. [8] It is worth noting that diode laser irradiation after surgical removal of lower third molar mitigated trismus and facial edema; however, extraoral laser application showed more favorable outcomes when compared to an intraoral approach.[27] Interestingly, an irradiation of a low-level diode laser on the tooth prior to restorative procedures rendered the tooth less sensitive to mechanical preparation.[28] Collectively, earlier reports have highlighted the combination of diode laser with conventional surgical methods to achieve more successful, satisfactory treatment results. Further studies are therefore required to elucidate the mechanism by which diode laser energy diminishes pain in dental patients.

Clotting problem in individuals with acquired bleeding disorders from an anticoagulation therapy remains a serious concern among dental patients. Immediate diode laser irradiation of an alveolar socket after tooth extraction seems to be beneficial in promoting focal blood coagulation as our *in vivo* coagulation was 2.74-fold more rapid when diode laser was implemented (98.5 seconds mediated by diode laser versus 270 seconds induced by a local pressure, as shown in Table 2). Our research study was conducted in healthy individuals classified as ASA class I. Although the application of diode laser in type 2 diabetes mellitus patients was reported to be safe and effective in the healing of periodontium,[29] it is still unclear whether diode laser irradiation has any adverse effects on tissue healing in medically compromised patients with other chronic diseases. Safety and effectiveness of its clinical use with these patients thus remains to be investigated.

Conclusion

In conclusion, we first report the efficacy of a 808-nm diode laser used for photocoagulation at the extraction socket of the tooth in this clinical trial. We found that utilization of low-intensity diode laser promoted blood coagulation in the alveolar socket after tooth extraction. In stark contrast to a natural coagulation, bleeding control time was 2.74-fold accelerated when diode laser was applied immediately over the extraction site after the tooth was removed. However, further study in larger population using split-mouth design might be necessary to confirm our findings. Moreover, an objective method for assessing the blood coagulation should be implemented for a more accurate results, as well as an anatomical contribution of each tooth or dental arch must be considered for a more reliable interpretation of the results. Our results herein suggest clinical application of diode laser in a surgical dental practice to enhance blood clot formation.

Conflict of interest

The authors declare no conflict of interest related to this study.

Acknowledgement

This study was financially supported by Khon Kaen University Faculty of Dentistry research division and Laser in Dentistry Research Group-Khon Kaen University (LDRG-KKU). The authors thank LDRG-KKU research group for kindly providing a technical assistance of the diode laser machine. We also thank the staffs of Oral and Maxillofacial Surgery Clinic of the Faculty of Dentistry for providing necessary research facilities and equipment.

References

1. Kumbargere Nagraj S, Prashanti E, Aggarwal H, Lingappa A, Muthu MS, Kiran Kumar Krishanappa S, et al. Interventions for treating post-extraction bleeding. Cochrane Database Syst Rev 2018;3:CD011930.
2. Abdullah WA, Khalil H. Dental extraction in patients on warfarin treatment. Clin Cosmet Investig Dent 2014;6:65–9.
3. Bacci C, Maglione M, Favero L, Perini A, di Lenarda R, Berengo M, et al. Management of dental extraction in patients undergoing anticoagulant treatment. Results from a large, multicentre, prospective, case-control study. Thromb Haemost 2010;104(5):972–5.
4. Corcos L, Dini S, de Anna D, Marangoni O, Ferlaino E, Procacci T, et al. The immediate effects of endovenous diode 808-nm laser in the greater saphenous vein: morphologic study and clinical implications. J Vasc Surg 2005;41(6):1018–24; discussion 1025.
5. Lee EA. Laser-assisted gingival tissue procedures in esthetic dentistry. Pract Proced Aesthet Dent 2006;18(9):suppl 2-6.
6. To TN, Rabie AB, Wong RW, McGrath CP. The adjunct effectiveness of diode laser gingivectomy in maintaining periodontal health during orthodontic treatment. Angle Orthod 2013;83(1): 43–7.
7. Borzabadi-Farahani A. The Adjunctive Soft-Tissue Diode Laser in Orthodontics. Compend Contin Educ Dent 2017;38(eBook 5):e18–31.
8. Koparal M, Kucuk AO, Alan H, Asutay F, Avci M. Effects of low-level laser therapy following surgical extraction of the lower third molar with objective measurement of swelling using a three-dimensional system. Exp Ther Med 2018;15(4): 3820–6.

9. Sanz-Moliner JD, Nart J, Cohen RE, Ciancio SG. The effect of an 810-nm diode laser on postoperative pain and tissue response after modified Widman flap surgery: a pilot study in humans. J Periodontol 2013;84(2):152–8.
10. Ureturk SE, Sarac M, Firatli S, Can SB, Guven Y, Firatli E. The effect of low-level laser therapy on tooth movement during canine distalization. Lasers Med Sci 2017;32(4):757–64.
11. Doshi-Mehta G, Bhad-Patil WA. Efficacy of low-intensity laser therapy in reducing treatment time and orthodontic pain: a clinical investigation. Am J Orthod Dentofacial Orthop 2012;141(3):289–97.
12. Son JH, An JH, Kim BK, Hwang IN, Park YJ, Song HJ. Effect of laser irradiation on crystalline structure of enamel surface during whitening treatment with hydrogen peroxide. J Dent 2012;40(11):941–8.
13. Steinstraesser L, Wehner M, Trust G, Sorkin M, Bao D, Hirsch T, et al. Laser-mediated fixation of collagen-based scaffolds to dermal wounds. Lasers Surg Med 2010;42(2):141–9.
14. Ishikawa I, Okamoto T, Morita S, Shiramizu F, Fuma Y, Ichinose S, et al. Blue-violet light emitting diode (LED) irradiation immediately controls socket bleeding following tooth extraction: clinical and electron microscopic observations. Photomed Laser Surg 2011;29(5):333–8.
15. Aykol G, Baser U, Maden I, Kazak Z, Onan U, Tanrikulu-Kucuk S, et al. The effect of low-level laser therapy as an adjunct to non-surgical periodontal treatment. J Periodontol 2011;82(3): 481–8.
16. Qadri T, Javed F, Johannsen G, Gustafsson A. Role of diode lasers (800-980 nm) as adjuncts to scaling and root planing in the treatment of chronic periodontitis: a systematic review. Photomed Laser Surg 2015;33(11):568–75.
17. Gerbi ME, Pinheiro AL, Marzola C, Limeira Junior Fde A, Ramalho LM, Ponzi EA, et al. Assessment of bone repair associated with the use of organic bovine bone and membrane irradiated at 830 nm. Photomed Laser Surg 2005;23(4):382–8.
18. Gerbi M, Miranda JM, Arruda JAA, Moreno LMM, Carneiro VSM, Brasilino NC, et al. Photobiomodulation Therapy in Bone Repair Associated with Bone Morphogenetic Proteins and Guided Bone Regeneration: A Histomorphometric Study. Photomed Laser Surg 2018;36(11):581–8.
19. Balles MW, Puliafito CA, D'Amico DJ, Jacobson JJ, Birngruber R. Semiconductor diode laser photocoagulation in retinal vascular disease. Ophthalmology 1990;97(11):1553–61.
20. Vujosevic S, Bottega E, Casciano M, Pilotto E, Convento E, Midena E. Microperimetry and fundus autofluorescence in diabetic macular edema: subthreshold micropulse diode laser versus modified early treatment diabetic retinopathy study laser photocoagulation. Retina 2010;30(6):908–16.
21. Oh CK, Jung DS, Jang HS, Kwon KS. Endovenous laser surgery of the incompetent greater saphenous vein with a 980-nm diode laser. Dermatol Surg 2003;29(11):1135–40.
22. Romanos G, Nentwig GH. Diode laser (980 nm) in oral and maxillofacial surgical procedures: clinical observations based on clinical applications. J Clin Laser Med Surg 1999;17(5):193–7.
23. Proebstle TM, Lehr HA, Kargl A, Espinola-Klein C, Rother W, Bethge S, et al. Endovenous treatment of the greater saphenous vein with a 940-nm diode laser: thrombotic occlusion after endoluminal thermal damage by laser-generated steam bubbles. J Vasc Surg 2002;35(4):729–36.
24. Bui CH, Seldin EB, Dodson TB. Types, frequencies, and risk factors for complications after third molar extraction. J Oral Maxillofac Surg 2003;61(12): 1379–89.

25. Rakhshan V. Common risk factors for postoperative pain following the extraction of wisdom teeth. J Korean Assoc Oral Maxillofac Surg 2015;41(2): 59–65.
26. Yildiz MS, Gunpinar S. Free gingival graft adjunct with low-level laser therapy: a randomized placebo-controlled parallel group study. Clin Oral Investig 2019;23(4):1845–54.
27. Aras MH, Gungormus M. Placebo-controlled randomized clinical trial of the effect two different low-level laser therapies (LLLT)--intraoral and extraoral--on trismus and facial swelling following surgical extraction of the lower third molar. Lasers Med Sci 2010;25(5):641–5.
28. Femiano F, Femiano R, Femiano L, Aresu G, Festa VM, Rullo R, et al. Effectiveness of low-level diode laser therapy on pain during cavity preparation on permanent teeth. Am J Dent 2018;31(5):267–71.
29. Chandra S, Shashikuar P. Diode laser – a novel therapeutic approach in the treatment of chronic periodontitis in type 2 diabetes mellitus patients: a prospective randomized controlled clinical trial. J Lasers Med Sci 2019;10(1):56-63.

Corresponding Author

Angkana Klangthong
Department of Oral and Maxillofacial Surgery,
Faculty of Dentistry, Khon Kaen University
Amphur Mueang, Khon Kaen, 40002.
Tel: +66 43 202 405 #45152
Fax: +66 43 202 862
E-mail: angka_nu@kku.ac.th

การห้ามเลือดด้วยไดโอดเลเซอร์ในหลุมกระดูกเบ้าฟันภายหลังการถอนฟัน: การศึกษานำร่อง

อังคณา คลังทอง ศจี สัตยุตม์ *,** ณัฐพงษ์ กันตรง ***,**** วริษนันท์ ประสงค์วรานนท์***** ลภาภัทร ธนูเทพ*******

บทคัดย่อ

ไดโอดเลเซอร์ได้รับการกล่าวถึงประโยชน์สำหรับนำมาใช้ในการผ่าตัดเนื้อเยื่ออ่อนมานานหลายทศวรรษและได้รับการรายงานถึงความสำเร็จของผลลัพธ์จากการรักษา การศึกษานี้จึงมุ่งเป้าไปที่การตรวจสอบผลเสริมจากการใช้ไดโอดเลเซอร์ต่อการแข็งตัวของเลือดในกระดูกเบ้าฟันหลังการถอนฟัน บุคคลที่มีสุขภาพดี 12 คนที่ต้องการการถอนฟันกรามน้อยเพื่อวัตถุประสงค์ในการจัดฟันได้รับการสุ่ม กลุ่มควบคุม (N = 6) ต้องใช้เทคนิคการกดด้วยผ้าก๊อซเพื่อหยุดเลือดออกหลังการถอนฟัน ในขณะที่กลุ่มทดลอง (N = 6) ได้รับการฉายด้วยไดโอดเลเซอร์ (808 นาโนเมตร 0.5 วัตต์ช่วงเวลา 5 วินาที) 1 เซนติเมตรเหนือแผลถอนฟันจนกว่าเลือดจะหยุด ระยะเวลาการไหลของเลือดระหว่างสองกลุ่มถูกนำมาเปรียบเทียบโดยใช้สถิติแมนวิตนีย์ยู (Mann Whitney U-test) ข้อมูลของการศึกษาพบว่าระยะเวลาการไหลของเลือดลดลง 2.74 เท่าเมื่อใช้ไดโอดเลเซอร์ร่วมในการรักษา การห้ามเลือดด้วยไดโอดเลเซอร์ช่วยเร่งการแข็งตัวของเลือดได้อย่างมีนัยสำคัญ การศึกษานี้แสดงให้เห็นถึงประสิทธิภาพของการใช้ไดโอดเลเซอร์เสริมภายหลังการถอนฟันแบบดั้งเดิมในการส่งเสริมการแข็งตัวของเลือดที่แผลถอนฟัน

คำไขรหัส: *ไดโอดเลเซอร์/ การถอนฟัน/ การห้ามเลือด/ ภาวะเลือดออกจากกระดูกเบ้าฟันหลังถอนฟัน*

ผู้รับผิดชอบบทความ

อังคณา คลังทอง
สาขาวิชาศัลยศาสตร์ช่องปาก และแม็กซิลโลเฟเชียล
คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น
อำเภอเมือง จังหวัดขอนแก่น 40002
โทรศัพท์: 043 202 405 #45152
โทรสาร: 043 202 862
จดหมายอิเล็กทรอนิกส์: angka_nu@kku.ac.th

** สาขาวิชาศัลยศาสตร์ช่องปากและแม็กซิลโลเฟเชียล คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*
*** กลุ่มวิจัยเลเซอร์วิทยาทางทันตแพทยศาสตร์ คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*
**** สาขาวิชาทันตกรรมบูรณะ คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*
***** กลุ่มวิจัยโรคอักเสบเรื้อรังของช่องปากและโรคทางระบบที่เกี่ยวข้องกับสุขภาพช่องปาก คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*
****** โรงพยาบาลทันตกรรม คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*
******* แผนกทันตกรรม โรงพยาบาลโป่งน้ำร้อน อำเภอโป่งน้ำร้อน จังหวัดจันทบุรี*