IJL, Issue 2, Vol. 23, 2024
https://doi.org/10.31900/ijl.v23i2.474

Research Article

IRAQI JOURNAL OF LASER

Exposure of Maxillary Impacted Canine (Buccal vs Palatal) by Diode Laser (810+980)nm

Alaa faiz Abdullah[1,*], Soudad Salman Ahmed[2], Balsam Saadi Abdul Hameed[3]

[1] *Health Ministry of Iraq, Baghdad, Iraq*
[2] *Department of Physics, College of Science, University of Baghdad, Baghdad, Iraq*
[3] *Consultant maxillofacial surgeon, Imam Al-Kazemin Medical City, Baghdad, Iraq*
* *Email address of the Corresponding Author: aalaa.faez2102m@ilps.uobaghdad.edu.iq*

Article history: Received 6 Apr. 2024; Revised 26 Jun. 2024; Accepted 10 Jul. 2024; Published online 15 Dec. 2024

Abstract

Background: Diode lasers(810+980) provide deep soft tissue penetration and have minimal interaction with tooth-hard tissues and excellent coagulation/haemostasis.
Objective: The aim of the current research was the exposure of maxillary buccally impacted canines by diode laser(810+980)nm in comparing palatally impacted canines depending on these parameters (pain, oedema, healing time).
Materials and methods: All patients with an impaction of the maxillary canines, such as buccal or palatal impaction, were required to be exposed. They were separated into two groups: one with seven patients in the buccal position and another with seven patients in the palatal position. Systemically healthy patients in two groups had treatment with diode lasers (980+810)mn. This study did not allow the inclusion of patients who were pregnant or in any other medically compromised patients. Pain, edema, and healing were recorded using follow-up scores on the first, second, and fifth days as well as the first and second week following surgery and statistically examined.
Results: The age mean in this study five male and nine female was 26.2. $P \leq 0.05$ was designated as the significant level..patients with buccally impacted canines exposure experience less pain, less swelling, and healing more quickly than patients with palatally impacted canines.
Conclusion: Patients with buccally impacted canines had less pain and swelling and faster wound healing than patients with palatally impacted canines when exposed.

Keywords: buccally impacted canine, diode laser, palatally impacted canine.

1. Introduction

A tooth that does not erupt after the regular development pattern is finished is known as an impacted tooth. After the third molar teeth. Maxillary canines are the teeth that are impacted the most often. Maxillary

canine impaction is a common clinical problem. Canine impaction could arise from a regional, systemic, or hereditary reason or factors. The diagnosis and localization of the impacted canine is the most important step in the care of impacted canines, based on clinical and radiographic assessments. [1]. Early detection of possible impaction and intervention is the ideal strategy for treating impacted maxillary canines. In the event that prevention is not possible, doctors may want to think about orthodontic treatment combined with the canine is surgically exposed in order to draw with occlusion. Open communication between the oral surgeon and orthodontist is crucial in this situation because it will enable the implementation of the proper surgical and orthodontic procedures [2]. Depending on where it is in relation to the dental arch, the maxillary canine impaction may be palatal or labial. Two-thirds of maxillary canines that are impacted are located palatally, and around one-third are labially impacted [3.4]. There are numerous methods for exposing impacted canines. First, the most popular approach nowadays is conventional canine exposure, which uses a scalpel and has the advantages of being inexpensive and having a long-lasting tool; however, achieving hemostasis may be challenging[5,6,7,8,9]. Second, excellent hemostasis can be achieved with electrocautery, which seals blood vessels; while cutting at the same time. However, compared to scalpel surgery, thermal damage from increased heat generation might cause healing to be delayed. [9, 10]. Third, the arsenal of an orthodontist has recently expanded to include lasers. In places with limited access, the contact cutting mode is crucial because it offers an improved vision of the bloodless site and the ability to execute delicate soft tissue treatments, but the disadvantage is the high cost of the laser device. These complementary applications include laser exposure of teeth that are superficially impacted, laser gingivectomy to enhance bracket placement or dental hygiene, and aesthetic laser gingival recontouring [11].

2. Materials and Method

fourteen cases, who were chosen for this study and their ages ranged from 19 to 31. Each case was systemically healthy. Patients were excluded from this study if they were medically comprised patients as well as pregnant women. Cases (2 groups) went to the teaching hospital, Imam Al-Kazemin Medical City had case sheets (clinical investigation, extraoral investigation, intraoral examination, medical history, & dental history), and were treated by diode laser(810+980)nm(Quicklase, UK). Prior to the surgery, all patients had CBCT(Cone beam computed tomography) to determine the position of the tooth and see if there was bone covering the impacted tooth or not. The pain, oedema, and healing time score were evaluated after surgery follow-up visits.

3. Surgical procedure

A. Buccally impacted canine exposure

1. first topical anesthesia was used (20% Benzocaine topical anesthesia gel), if the patient complains of pain or discomfort then infiltrative local anesthesia(lignospan special. Lidocanie2% with adrenaline(epinephrine) 1:80,000,2.2ml of solution per cartridge,septodent, France).
2. The patient, the assistant, and the operator were all wearing safety glasses. Avoiding instruments with highly reflective or mirrored surfaces was advised due to the possibility of laser beam reflection.
3. After determining the location of the canine impaction and if covered by bone or not by CBCT(Cone beam computed tomography).
4. The operation started. Once the tooth's location has been established, create a window using a dual diode laser ((810+980 nm), Power 2.5W with 400µm optical fiber diameter at 60 mJ of output energy and continuous mode) for showing the canine impaction crown. Figure1.
5. If was covered by bone that was very thin bone removed by curette. Normal saline was used to irrigate the surgery site.
6. Then the orthodontist comes and places a bracket on the crown of the impacted canine.

7. Provide the patient with instructions, medicine, and a follow-up appointment.

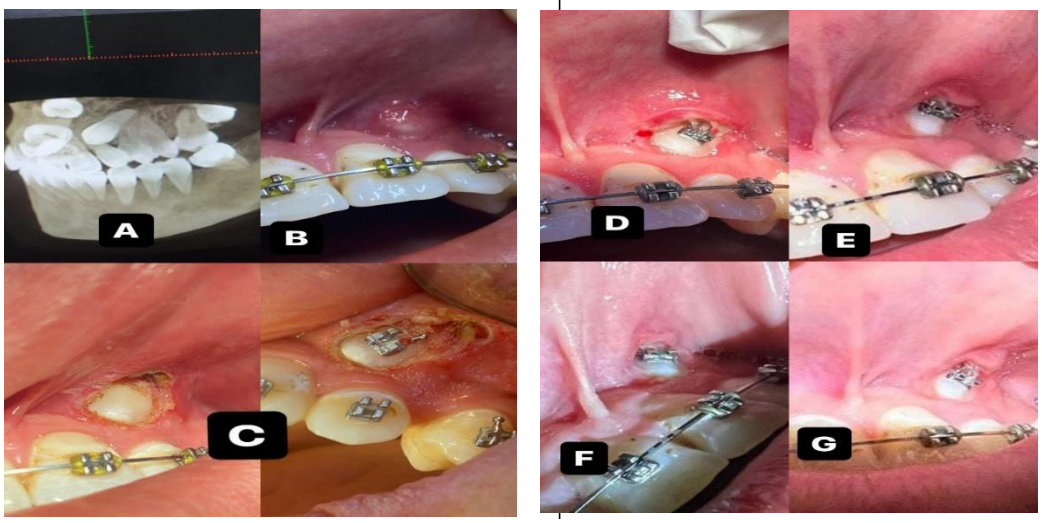

Fig. 1: exposure of buccally impacted canine by laser .A: Cone beam computed tomography.B: before treatment. C: exposure of impacted canine and bracket placement D: two days following surgery,E: five days following surgery F: one week following surgery, G: two weeks following surgery.

B. Palatally impacted canine exposure

1. first topical anesthesia was used (20% Benzocaine topical anesthesia gel) if the patient complained of pain or discomfort then infiltrative local anesthesia(lignospan special. Lidocanie2% with adrenaline(epinephrine) 1:80,000,2.2ml of solution per cartridge,septodent, France).
2. The patient, the assistant, and the operator were all wearing safety glasses. Avoiding instruments with highly reflective or mirrored surfaces was advised due to the possibility of laser beam reflection.

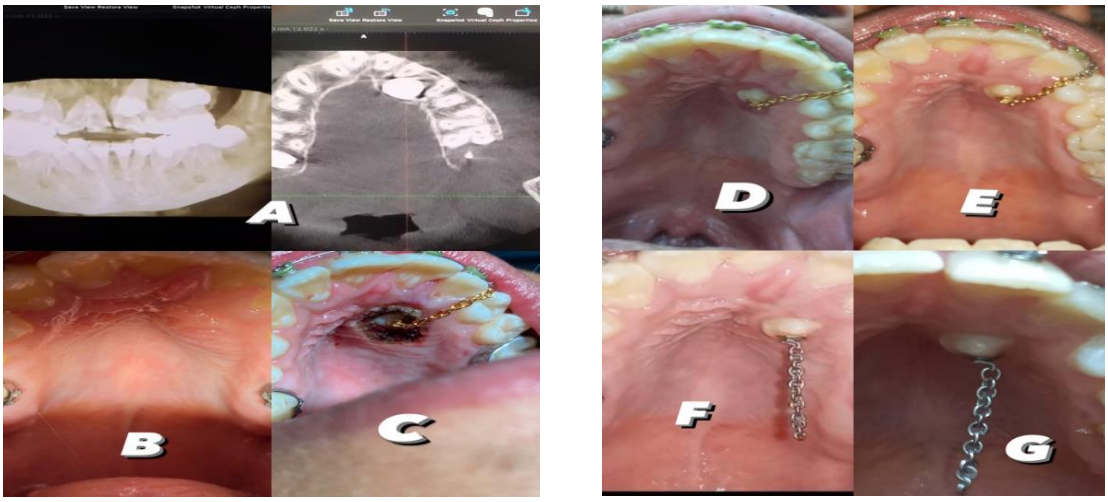

Fig.2: exposure of palatally impacted canine by laser .A:Cone beam computed tomography.B:before treatment.c: exposure of impacted canine. D: two days following the procedure, E:five days following the procedure, F: one week following surgery:, G:2 weeks following surgery.

3. After determining the location of the canines impaction and if coveresd by bone or not by CBCT(Cone beam computed tomography).
4. The operation started. Once the tooth's location has been established, create a window using a dual diode laser ((810+980 nm), Power 2.5W with 400µm optical fiber diameter at 60 mJ of output energy and continuous mode) for showing the canine impaction crown. Figure2.
5. If it is covered by bone, we remove it using a handpiece with a round bur and irrigation by normal saline to avoid getting heat on the bone.
6. . insertion of bracket by orthodontist
7. Provide the patient with instructions, medicine, and a follow-up appointment.

4. Clinical Assessments

The following parameters were assessed for both groups: pain score (Visual Analog Scale (VAS)) (Sung YT, 2018) [12],oedema score(swelling)(Marini L,2018) [13], and healing (Healing index of landry,turnbull, and howley)(Gangwani KD,2018) [14]. Pain was evaluated two hours , two and three days after surgery according to the following scores:0.no pain,1-3.mild,4-6.moderate,7-10.severe.Oedema was evaluated one, five days after surgery according to the following scores: 1. very slight oedema (hardly visible), 2. slight oedemata, 3 moderate oedema (about 1 mm raised skin), 4. severe oedemata (extend swelling even beyond the application area). Healing was evaluated one,two weeks after surgery according to the following scores: 0. very poor: Tissue color: more than 50% of gingivae red Response to palpation:bleeding Granulation tissue: present Incision margin: not epithelialised, with loss of epithelium beyond margins Suppuration: presen,1. poor: Tissue color: more than 50% of gingivae red Response to palpation: bleeding Granulation tissue: present Incision margin: not epitheliased with connective tissue exposed.,2.good: Tissue color: less than 50% of gingivae red Response to palpation: no bleeding Granulation tissue: noneIncision margin: no connective tissue exposed,3.very good: Tissue color: less than 25% of gingivae red response to palpation: no bleeding granulation tissue: noneIncision margin: no connective tissue exposed,4.excellent: Tissue color: all gingivae pinkResponse to palpation: no bleeding granulation tissue: noneIncision margin: no connective tissue exposed.

5. Statistical Analysis

The data was compiled and analyzed using statistical methods. The data analysis was conducted using JMP 16 software, developed by Gary in the United States. This investigation involved conducting descriptive and association tests to compare the two laser procedures. The student's t-test and the Oneway test were employed for quantitative variables. The significance level was established at $P < 0.05$.

6. Result

6.1. Pain score

In the buccal group, Two hours *after exposure* less pain than in the palatal group, but in two, or three days, The pain disappeared between the two groups.
in two groups
A.Pain score (2 hours) vs. the position of tooth impaction as shown in fig. (3)
(F(1,14)= 1.0833, p. value = 0.3169*)
B. Pain score (2 days) vs. the position of tooth impaction as shown in fig (4)
(F(1,14)= 0.0336, p. value = 0.857)
C. Pain score (3 days) vs. the position of tooth impaction as shown in fig(5)
(F(1,14)= 0.1171, p. value = 0.7377)

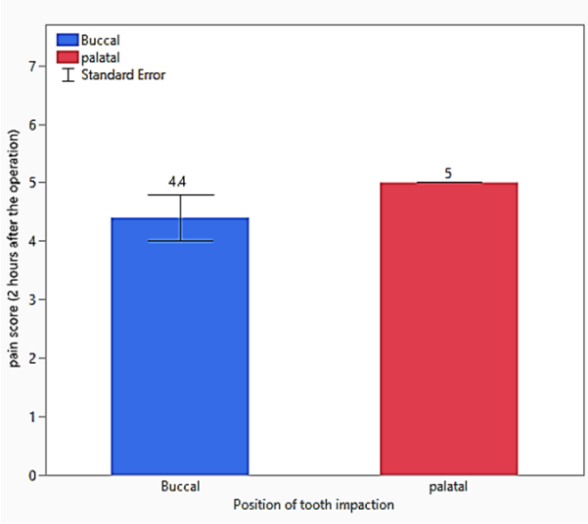

Fig.3: pain score(2 hours after operation) vs. the position of tooth impaction.

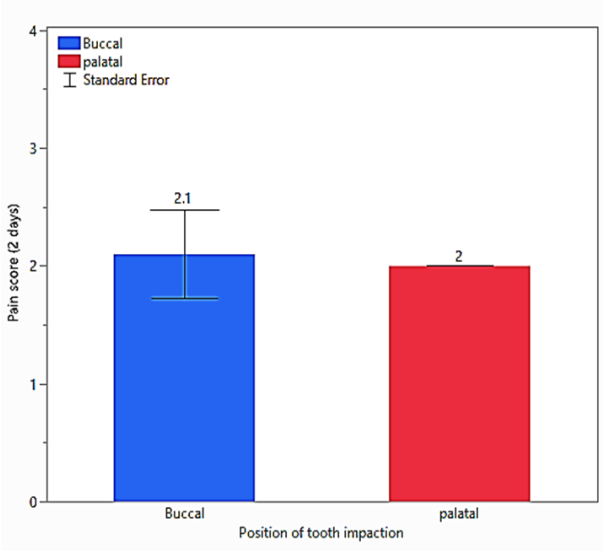

Fig. 4: pain score (2 days after exposure) vs. the position of tooth impaction.

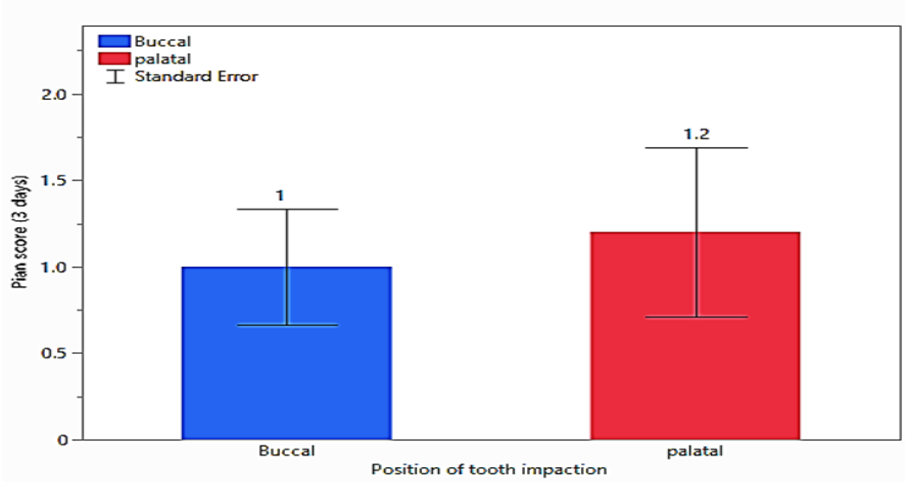

Fig.5: pain score (3days after operation) vs. the position of tooth impaction

6.2 Oedema

In the buccal group, one, and five days after exposure less oedema than the palatal group.
A. Oedema score (1 day) vs. the position of tooth impaction as shown in Figure 6.
(F(1,14)= 0.6190, p. value =0.4455)
B. Oedema score (5 days) vs. the position of tooth impaction as shown in Figure 7.
(F(1,14)= o.5700, p. value =0.2323)

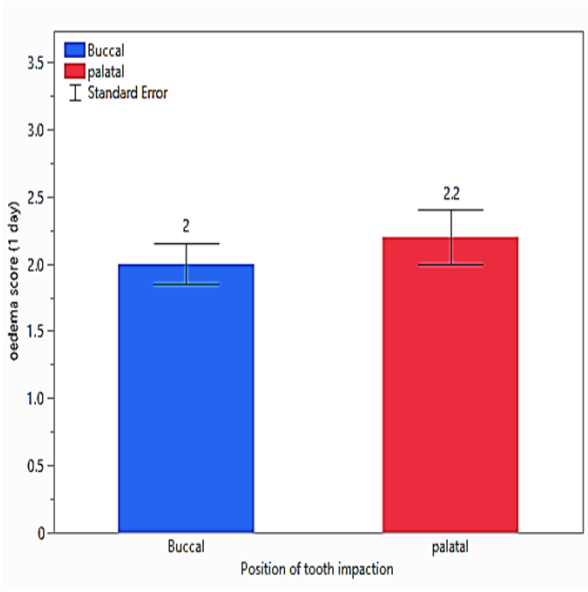

Fig. 6: Oedema score (1 day after operation) vs. the position of tooth impaction

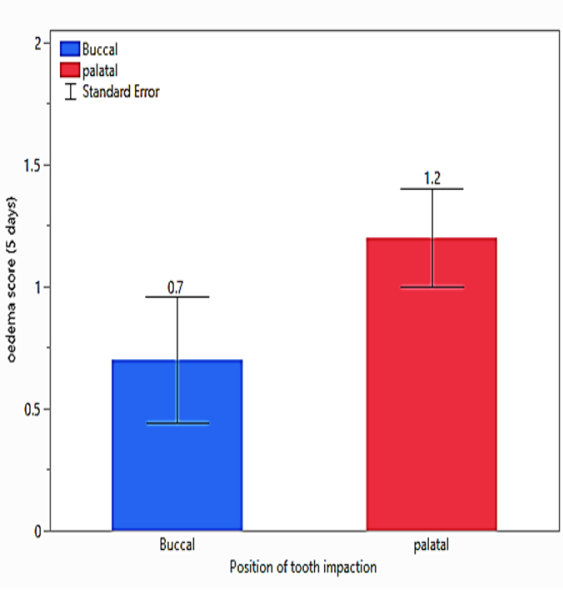

Fig.7: Oedema score(5 days after exposure) vs. the position of tooth impaction

6.3. Healing

In the buccal group, one, or two weeks after exposure faster healing than palatal group.
A. Healing score after one week vs. the position of tooth impaction as shown in Figure 8.
(F(1,14)= 6.5000, p. value = 0.0242*)
B. Healing score after 2 weeks vs. the position of tooth impaction AS shown in Figure 9.
(F(1,29)= 6.5000, p. value = 0.0242*)

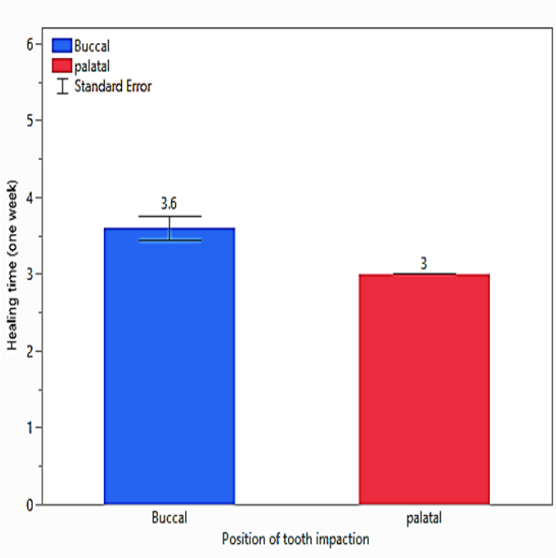

Fig. 8: Healing time score (1 week after exposure) vs. the position of tooth impaction

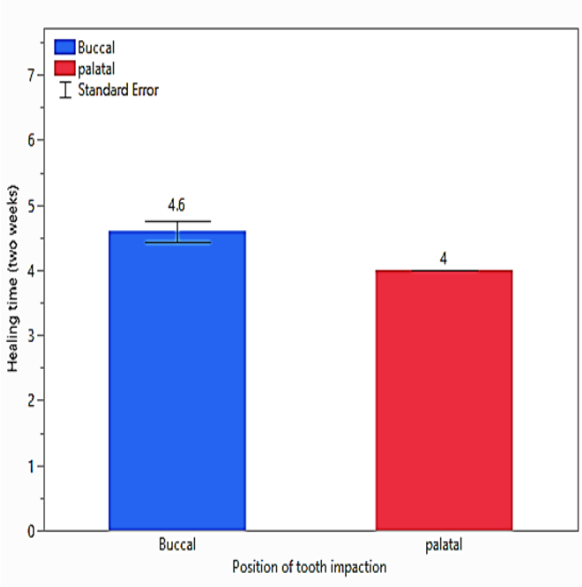

Fig. 9: Healing time score(2 weeks after exposure) vs. the position of tooth impaction

7. Discussion

Diode lasers have been used in oral soft tissue surgery due to their intraoperative and postoperative advantages.

This study aimed to investigate If there was a difference in the location of the impacted canine tooth (bucaal .vs palatal), exposed with a diode laser(810+980nm)depending on these parameters (pain,oedema,healing time).patient with buccally impacted canines usually experiences less pain, oedema, and faster healing process than patients with palatally impacted canines.

Diode lasers (810+980 nm) have minimal interaction with dental hard tissue and produce deep soft tissue penetration and good coagulation/haemostasis [14]. The use of lasers to assist in surgical procedures offers numerous benefits, including the closure of blood vessels and lymphatic vessels, less edema and bleeding during the recovery phase, no sutural requirement, increased patient satisfaction, and the majority of the time, topical anesthesia is sufficient before laser intervention [15]. Many papers in the literature describe the use of laser technology in the surgical exposure of impacted canines. Examples include a comparison between a diode laser and a conventional scalpel or the use of a diode laser only for palatal or buccal exposure. To our knowledge, however, no articles have yet been published in the literature that describe the use of a diode laser (810 + 980 nm) for surgical exposure of the impacted canines in the buccal and palatal regions and comparison of those results. In a previous study, the use of a 980 nm diode laser was shown to minimize bleeding, lessen pain, and allow the attachment of orthodontic brackets during surgical exposure of the maxillary palatal impacted canine[16]. In previous research, Patients performing laser exposure required less intra-operative local anaesthetic than those performing conventional exposure with a scalpel and had less discomfort following surgery (requiring fewer analgesics). The initiated fiber-optic tip of the diode laser device readily cuts, ablates, and reshapes the oral soft tissues with little or less discomfort, bleeding, or suturing required This is compared to using a scalpel [17].In this research, We discovered that when the impacted canine tooth was exposed using a diode laser (810-980)nm and compared in terms of palatal and buccal location, there was a very slight difference in terms of pain, swelling, and healing. However, we concluded that there was less pain and swelling and faster healing in buccally impacted canines than in palatally impacted canines because of thin buccal tissue and may be not covered by bone or covered by shell bone can be removed by curette [18]. Because of the location of impaction in the palate, the thick palatal tissue, and the increased thickness of the cortical bone on the palate[19], also the palate was located on the roof of the mouth, the patient may touch it with his tongue, causing the area to become moist with saliva When compared to canines in buccal position.

8. Conclusion

Diode laser (810+980)nm can be used to expose teeth during orthodontic treatment without producing discomfort or swelling after the procedure, and it helps to keep the area dry so that orthodontic brackets can be applied. A buccally impacted tooth has less pain and less oedema, and the healing time is faster compared to a palatally impacted tooth.

References

[1] Moro H. A better diagnose for canine pathology patients by other associated dental anomalies. Journal of Clinical Review & Case Reports. 2022 Feb 10;7(2):4-8.

[2] Bedoya MM, Park JH. A review of the diagnosis and management of impacted maxillary canines. The Journal of the American Dental Association. 2009 Dec 1;140(12):1485-93.

[3] Littlewood SJ, Mitchell L. An introduction to orthodontics. Oxford university press; 2019 Mar 16.

[4] Kohli SS, Singh Kohli V. Management of Bilaterally Impacted Labial and Palatal Maxillary Canines With One-Year Follow-Up: A Case Report. Journal of Indian Orthodontic Society. 2021 Jan;55(1):73-84.

[5] Fornaini C, Rocca JP, Bertrand MF, Merigo E, Nammour S, Vescovi P. Nd: YAG and diode laser in the surgical management of soft tissues related to orthodontic treatment. Photomedicine and laser surgery. 2007 Oct 1;25(5):381-92.
[6] Sobouti F, Rakhshan V, Chiniforush N, Khatami M. Effects of laser-assisted cosmetic smile lift gingivectomy on postoperative bleeding and pain in fixed orthodontic patients: a controlled clinical trial. Progress in orthodontics. 2014 Dec;15:1-5.
[7] Matthews DC. Seeing the Light-The Truth about Soft Tissue Lasers and Nonsurgical Periodontal Therapy. Journal of the Canadian Dental Association. 2010 Apr 1;76(2).
[8] Ize-Iyamu IN, Saheeb BD, Edetanlen BE. Comparing the 810nm diode laser with conventional surgery in orthodontic soft tissue procedures. Ghana Medical Journal. 2013;47(3):107-11.
[9] Amaral MB, De Ávila JM, Abreu MH, Mesquita RA. Diode laser surgery versus scalpel surgery in the treatment of fibrous hyperplasia: a randomized clinical trial. International journal of oral and maxillofacial surgery. 2015 Nov 1;44(11):1383-9.
[10] Kumar P, Rattan V, Rai S. Comparative evaluation of healing after gingivectomy with electrocautery and laser. Journal of oral biology and craniofacial research. 2015 May 1;5(2):69-74.
[11] Azma E, Safavi N. Diode laser application in soft tissue oral surgery. Journal of lasers in medical sciences. 2013;4(4):206.
[12] Sung YT, Wu JS. The visual analogue scale for rating, ranking and paired-comparison (VAS-RRP): a new technique for psychological measurement. Behavior research methods. 2018 Aug;50:1694-715.
[13] Marini L, Rojas MA, Sahrmann P, Aghazada R, Pilloni A. Early Wound Healing Score: a system to evaluate the early healing of periodontal soft tissue wounds. Journal of periodontal & implant science. 2018 Oct;48(5):274.
[14] Gangwani KD, Shetty L, Kulkarni D, Seshagiri R, Chopra R. Piezosurgery versus conventional method alveoloplasty. Annals of Maxillofacial Surgery. 2018 Jul 1;8(2):181-7.
[15] Seifi M, Matini NS. Laser surgery of soft tissue in orthodontics: Review of the clinical trials. Journal of Lasers in Medical Sciences. 2017;8(Suppl 1):S1.
[16] Migliario M., Rizzi M., Lucchina A. G., and Renò F., Diode laser clinical efficacy and mini-invasivity in surgical exposure of impacted teeth, Journal of Craniofacial Surgery. (2016) 27, no. 8, e779–e784.
[17] Borzabadi-Farahani, A. The adjunctive soft-tissue diode laser in orthodontics. Compend. Contin. Educ. Dent. 2017, 38, e18–e31.
[18] Kokich VG, Mathews DP. Surgical and orthodontic management of impacted teeth. Dental Clinics of North America. 1993 Apr 1;37(2):181-204.
[19] Bishara SE, Ortho D. Impacted maxillary canines: a review. American journal of orthodontics and dentofacial orthopedics. 1992 Feb 1;101(2):159-71.

كشف الأنياب المنطمرة في الفك العلوي (الشدقي ضد الحنكي) بواسطة ليزر ديود (980+810) نانومتر

الاء فائز عبدالله[1,*] ، سؤدد سلمان احمد[2] ، بلسم سعدي عبدالحميد[3]

[1]وزارة الصحة ,بغداد,العراق
[2]كلية علوم فيزياء ،جامعة بغداد،بغداد،العراق
[3]اختصاص جراحه الوجه والفكين ، مستشفى الامامين الكاظمين التعليمية ،بغداد،العراق

*البريد الالكتروني للباحث: aalaa.faez2102m@ilps.upbaghdad.iq

الخلاصة

الهدف: الهدف من البحث الحالي هو كشف الأنياب المنطمرة في الشدق العلوي باستخدام ليزر الدايود (810 + 980) نانومتر في مقارنة الأنياب المنطمرة حنكياً اعتماداً على هذه العوامل (الألم، الورم، زمن الشفاء). **المقدمة**: يوفر ليزر الصمام الثنائي (810 + 980) اختراقًا عميقًا للأنسجة الرخوة وتخثر الدم وتجلط الدم بشكل ممتاز ولديه الحد الأدنى من التفاعل مع أنسجة الأسنان الصلبة.

المواد والطرق: جميع المرضى الذين يعانون من انطمار الأنياب الفكية، مثل انطمار الشدق أو الحنك، يجب أن يتم كشفهم. تم تقسيمهم إلى مجموعتين: واحدة بها سبعة مرضى في الوضع الشدقي والأخرى بها سبعة مرضى في الوضع الحنكي. كان المرضى الأصحاء في مجموعتين العلاج بالليزر ديود (980 + 810) نانوميتر. لم تسمح هذه الدراسة بإدراج المرضى الحوامل أو أي مرضى آخرين معرضين للخطر طبيًا.. تم تسجيل الألم والورم والشفاء باستخدام نتائج المتابعة في الأيام الأول والثاني والخامس وكذلك الأسبوع الأول والثاني. بعد الجراحة وفحصها إحصائيا.

النتائج: كان متوسط العمر في هذه الدراسة خمسة ذكور وتسعة إناث 26.2. تم تحديد $P \geq 0.05$ كمستوى معنوي. المرضى الذين يعانون من الأنياب المنطمرة في الشدق يشعرون بألم أقل وتورم أقل ويشفون بسرعة أكبر من المرضى الذين يعانون من الأنياب المنطمرة في الحنك .

الاستنتاج: كان المرضى الذين يعانون من الأنياب المطمورة في الشدق يعانون من ألم وتورم أقل وشفاء أسرع من المرضى الذين يعانون من الأنياب المطمورة في الحنك عند الكشف.