

The Outcome of 810 nm Surgical Diode Laser in the Management of Oral Soft Tissue Lesions

Ammar S Al-Alawi *BDS MSc*

Dept. of Maxillofacial Surgery, Al-Kadhimiya Teaching Hospital, Ministry of Health, Baghdad, Iraq

Abstract

Background	Surgical diode lasers have been used in oral surgical procedures with beneficial effects as compared to the conventional techniques.
Objective	To evaluate the efficacy and safety of 810 nm surgical diode laser in the field of oral and maxillofacial surgery.
Methods	Forty patients who had different oral lesions were attending consultation clinic of the Maxillofacial Surgery Department in the Al-Kadhimiya Teaching Hospital. The patients have been treated by 810 nm diode laser. The power of the diode laser was 2-5 Watts in continuous mode. Excisional biopsies were sent for histopathological examination. Intraoperative and postoperative clinical examinations were done.
Results	The clinical observations revealed no bleeding intraoperatively and postoperatively, no infection and minimal swelling was seen postoperatively.
Conclusion	The benefits of 810 nm diode laser application in oral and maxillofacial surgery have been justified based on its efficacy and safety. There is a good acceptance for this new modality of treatment by the patients.
Keywords	Surgical diode laser, soft tissue lesion, oral surgery

Introduction

The use of laser in dentistry has increased over the past few years. The first laser was introduced into the fields of medicine and dentistry during the 1960s^(1,2).

Unlike other light sources, the laser emits a coherent, collimated and monochromatic radiation. These characteristics render laser radiation with unique applications in the field of the medicine and surgery especially in the field of the oral and maxillofacial surgery. Different lasers have many advantages in oral surgery like haemostatic property, postoperative comfort to the patient and incision quality⁽³⁾.

In laser-tissue interaction, the factors that determine the initial tissue effect include laser

wavelength, laser power, laser mode (continuous, pulsed, and chopped beam), tissue optical properties, and tissue thermal properties⁽⁴⁾. The degree of absorption of the laser radiation inside the tissue components determines the type of interaction mechanism obtained by laser on soft tissue⁽⁵⁾. In the oral cavity, the pyogenic granuloma clinically presents as a sessile or pedunculated vascular mass with ulcerated surface, purplish-red in color, painless and soft lesion.

Fibrous epulis are most common soft tissue swellings of mouth. It presents near at the anterior part of the mouth and arises from interdental papilla on the gingiva between two teeth and it can also form on the buccal mucosa.

It is a hyperplastic response to the chronic irritation or trauma to the gingival margin by sharp edges of the carious cavity or by calculus. Giant cell epulis is probably hyperplastic is usually and found on the gingival margin between teeth anterior to the premolar. The swelling is rounded, soft and typically red or purplish in color ^(6,7).

The most surgical lasers conducted in oral surgery are excimer laser which emits laser light between 200-400 nm, argon laser emit laser between 488 -514.5 nm, Nd: YAG is located in an invisible spectrum 1064 nm, Er: YAG laser which has wavelength 2940 nm, CO₂ laser has 10600 nm wave lengths. Diode laser emits wavelength of 790-980 nm and it can be used in the continuous as well as pulsed mode. According to the clinical application, contact handpiece is used for tissue cutting and non contact handpiece is used for tissue coagulation. The diode laser offers special effects in the oral cavity like bactericidal effect and inflammation reduction in periodontal pockets ⁽⁸⁾. Due to the conservative nature of treatment accomplished with diode laser, it can be utilized in both aesthetic enhancement purposes and treatment of soft tissue lesions ⁽⁹⁾.

The aim of the current study is to evaluate the efficacy and safety of surgical diode laser in the field of oral and maxillofacial surgery.

Methods

This research dealt with 40 patients who presented with oral lesions and were attending the consultation clinic of the Maxillofacial Surgery Department at the Al-Kadhimiya Teaching Hospital and requiring surgical intervention for various oral lesions. The period of study was from Nov. 2008 to Nov. 2011.

The work-up of treatment included a clinical examination to validate the preoperative diagnosis depending on shape and site of the lesions.

Photographs were taken for all lesions before and immediately after treatment. Fig. 1 and 2 shows two types of clinical lesions preoperatively.



Fig. 1. Pyogenic granuloma of palatal mucosa.

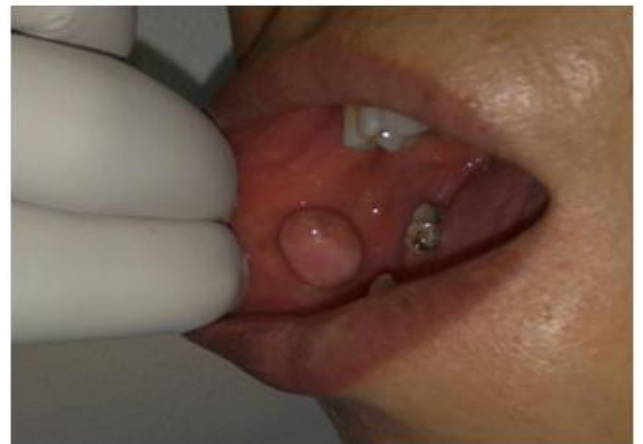


Fig. 2. Fibroma on right side of buccal mucosa.

Diode laser (Diomed 15 laser) was used for oral surgical procedures. It is an integrated GaAlAs semiconductor laser. Its maximum output power is 15 W and it works in continuous, single, and repeated pulsed modes. Its wavelength is 810 nm, and the pulse duration is 0.1-1.0 second.

The laser soft tissue surgical operations were done by choosing an appropriate power ranging (2-5 W) with a contact and continuous mode. The exposure time was varied according to the tissue response. All the oral surgical procedures were done with local anesthesia (Lidocaine 2%, infiltration anesthesia).

Clinical evaluation (including presence of intra and postoperative hemorrhage, pain, swelling, infection and scar formation) was done immediately, three days later, and then one week postoperatively. In all surgical procedures, an excisional biopsy was taken and sent for

histopathological analysis to confirm clinical diagnosis of nature of the lesion.

Results

The locations of the oral lesions were at different sites in oral cavity. The sites of pyogenic granuloma were on palatal and buccal alveolar mucosa between teeth. The sites of fibroma were at the left and right buccal mucosa. The sites of giant cell granuloma were at interdental papillae of the anterior teeth. A pie graph showing the percentage of oral lesion types is illustrated in Fig. 3.

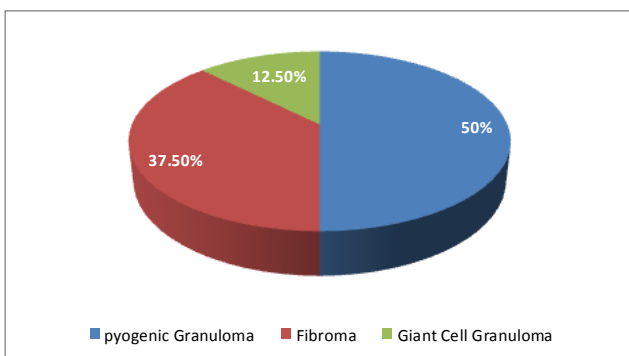


Figure 3. Pie chart showing the percentage of each type of oral lesions.

The intra and postoperative complications are shown in Table 1; the bleeding was not observed during the treatment or in postoperative period. Mild pain was observed in 5 patients on 3rd day postoperatively and it was managed by ponstan capsules 20 mg three times daily. In 4 cases minimal postoperative swelling was recorded on 3rd day. Postoperative infection was not recorded and there was no need for sutures. After completion of one week, no scar tissue formation was seen.

All patients tolerated well this modality of the oral soft tissue surgery (Fig. 4 and 5).

Table 1. Intra and postoperative complications of the oral lesions

Complication	IO	Day 0 PO	Day 3 PO
Bleeding	0	0	0
Pain	0	0	5
Swelling	0	0	4
infection	0	0	0

IO = intraoperative, PO = postoperative



Fig. 4. Complete fibroma excision by 3 W, continuous & contact mode surgical diode laser.



Fig. 5. Complete pyogenic granuloma excision by 4 W, continuous & contact mode surgical diode laser.

Discussion

Since the invention of laser in 1960, surgeons have been interested in applying this technology to improve outcomes in a variety of diseases and surgical procedures⁽¹⁰⁾. The instruments of choice for soft tissue surgery are the scalpel and the conventional electrosurgery unit. The scalpels have been used for many years because of their ease of use, accuracy, and minimal damage to the surrounding tissue; on the other hand, they cannot provide hemostasis especially in vascular tissue⁽¹¹⁾. In our clinical work, intraoperatively and postoperatively bleeding was minimal or not observed and the

postoperative edema was greatly diminished. These results are in agreement with previous rese repasts revealing that the advantages of laser application in soft tissue surgery include a relatively bloodless surgical and postsurgical course, minimal swelling, coagulation and cutting minimal or no suturing (12).

In this clinical trial, uncontrolled postoperative pain was detected in few cases and postoperative infection was not reported and there was no scar formation. These results agreed with previous reports which proved the advantages of laser surgery including : sterilization of the surgical site while cutting tissue and a dry surgical field, reduced postoperative pain, less oedema, limited scarring and no-touch technique (13,14). Clinically, the use of diode laser in the treatment of oral and maxillofacial diseases has found an application in the removal of premalignant lesions of the oral mucosa (15).

In clinical studies, the remarkable cutting ability and tolerable damage zone show clearly that diode laser system is effective and useful in soft tissue surgery of oral cavity because of its excellent coagulation ability, the smooth heal of wounds, and its simple use allows good modeling of the gingiva (16) and more precise incision margin is seen compared to other systems (8). The evaluation of safety and efficacy of the diode laser system is already done for the treatment of facial pigments and vascular lesions and in oral surgery in fibroma, epulis fissuratum, and gingival hyperplasia (17).

Finally, it was concluded that the diode laser applications in the field of oral and maxillofacial surgery was found to be justified on the basis of its safety and efficacy in this study.

References

1. Goldman L, Hornby P, Meyer R, et al. Impact of the laser on dental caries. *Nature*. 1964; 203: 417.
2. Hussein A. Applications of Lasers in Dentistry: A Review. *Arch Orofacial Sci*. 2006; 1: 1-4.
3. Deppe H, Horch G. Laser applications in oral surgery and implant dentistry. *Laser Med Sci*. 2007; 2: 217-21.
4. Douglas N, Dederich NH. Laser/tissue interaction. *Algha Omegan*. 1991; 84: 33-6.

5. Walsh LJ. The current status of laser applications in dentistry. *Australian Dent J*. 2003; 48: 146-55.
6. Cawson RA, Odell EW. *Cawsons essentials of oral pathology and oral medicine*. 8th ed. UK: Churchill Livingstone; 2008. p. 314-7.
7. Stward GR, Harris M, McGowan DA. *An outline of oral surgery*. part I, 2nd ed. UK, WRITE; 1998. p. 298-304.
8. Romanos G, Nentwig G. Diode laser (980 nm) in oral and maxillofacial surgical procedure: clinical observation based on clinical applications. *J Clin Laser Med Surg*. 1999; 17: 193-9.
9. Reichwage DP, Barjenbruch T, Lemberg K, et al. Esthetic contemporary dentistry and soft tissue recontouring with the diode laser. *J Indiana Dent Assoc*. 2004; 83(1): 13-5.
10. Papadaki M, Doukas A, William A, et al. Vertical ramus osteotomy with Er:YAG laser: a feasibility study. *Int J Oral Maxillofac Surg*. 2007; 36: 1193-7.
11. Liboon J, Funkhouser W, Terris D. Comparison of mucosal incisions made by scalpel, CO₂ laser, electrocautery and costant-electrocautery. *Otolaryngol Head Neck Surg*. 1997; 116: 379-85.
12. Pick RM, Colvard DM. Current status of lasers in soft tissue dental surgery. *J Periodontol*. 1993; 64: 589-602.
13. Kafas P, Kalfas S. Carbonization of a radicular cyst using fiberoptic diode laser: A case report. *Cases J* 2008; 1: 113.
14. Frentzen M, Gotz W, Ivanenko M, et al. Osteotomywith 80-micros CO₂ laser pulses-histological results. *Lasers Med Sci*. 2003; 18: 119-24.
15. Eliades A, Stavrianos C, Kokkas A, et al. 808 nm diode laser in oral surgery: a case report of laser removal of fibroma. *Res J Med Sci*. 2010; 4: 175-8.
16. Goharkhay K, Mortiz A, Wilder-Smith P, et al. Effects on oral soft tissue produced by a diode laser in vitro. *Laser Surg Med*. 1999; 25: 401-6.
17. Desiate A, Cantore S, Tullo D, et al. 980 nm diode lasers in oral and facial practice: current state of the scienceand art. *Int J Med Sci*. 2009; 6: 358-63.

Correspondence to Dr. Ammar S Al-Alawi

E-mail: amasan2010@yahoo.com

Cell phone: + 964 7906635864

Received 3rd Oct. 2012; Accepted 17th Mar. 2013.