

## The Effectiveness of Diode Laser 810 nm in the Removal of Oral Pyogenic Granuloma in Repetitive Pulsed Mode

Ammar S. Al-Alawi *BDS, MSc*

Dept. of Maxillofacial Surgery, Al-Imamein Al-Kadhiemein Medical City, Baghdad, Iraq

### Abstract

- Background** A variety of benign soft tissue swellings can be found arising from oral mucosa, most of which are inflammatory hyperplasia and granuloma. Surgical diode lasers have been used in oral surgical procedures with beneficial and undoubted operative advantages and a better quality of the outpatient operation compared with electro- and coldblade techniques.
- Objective** To assess the effectiveness of diode laser 810 nm in the removal of pyogenic granuloma of oral cavity in repetitive pulsed mode.
- Methods** This study was conducted at the consultation clinic of the Maxillofacial Surgery Department in the Al-Imamein Al-Kadhiemein Medical City on 35 patients who suffered from oral pyogenic granuloma. The period of the study was from January 2013 to January 2015. The laser used in this study was diode laser 810 nm in repetitive pulsed mode. The maximum power was 5-8 watts. The pulse duration was 0.2-0.4 second and 0.2-0.4 second pulse interval. Excisional biopsies were sent for Histopathological study. Clinical examination was done and had included presence of swelling, infection, disturbance of function, pain and bleeding.
- Results** Patients with pyogenic granuloma were treated efficiently with repetitive mode of diode laser 810 nm. Minimal to moderate swelling, no disturbance of function, no infection and mild pain were observed postoperatively, no bleeding was seen neither intraoperatively nor postoperatively.
- Conclusion** Repetitive pulsed mode of diode laser 810 nm is efficient and safe in removal of pyogenic granuloma of oral cavity.
- Keywords** Diode laser, oral pyogenic granuloma
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**List of abbreviation:** cw = Continuous wave, GaAlAs = Gallium Aluminum Arsenide

### Introduction

A variety of benign soft tissue swellings can be found arising from oral mucosa, most of which are inflammatory hyperplasia and granuloma. These lesions can be divided into those which arise from the mucosa covering the alveolar processes and those which arise elsewhere in oral cavity. The soft tissue masses which are excised should be

sent for histological examination <sup>(1)</sup>. Lasers are rapidly becoming the standard of care for many procedures performed by oral and maxillofacial surgeons. The reason for this transition is due to the fact that many procedures can be executed more efficiently and with less morbidity using lasers as compared to a scalpel, electrocautery or high frequency devices <sup>(2)</sup>. The laser-tissue effects and interactions depend on the interplay of irradiation parameters such as wavelength of

laser source, physical properties of the irradiated tissue, laser pulse energy, continuous wave (cw) or pulsed irradiation, laser beam size on the tissue, laser pulse duration and repetition rate <sup>(3)</sup>. Laser excision of benign soft tissue lesions, such as fibroma, papilloma, mucocele, gingival lesions, benign salivary glands lesions, salivary stones, epulis fissurata, tongue lesions and hyperplastic tissue excisions is minimally invasive and can make the surgery less extensive, and may reduce the need for general anesthesia or in-patient hospital care, resulting in the lowered overall costs <sup>(4,5)</sup>.

There are many advantages to the use of lasers in maxillofacial surgery. These advantages include: hemostasis and excellent field visibility, reduced postoperative pain and edema, precision, enhanced infection control, lack of mechanical tissue trauma, reduced scarring and tissue shrinkage, less instruments at the site of operation and prevention of tumor seeding <sup>(6)</sup>.

The aim of this study is to assess the effectiveness of repetitive pulse mode of diode laser 810 nm in removal of pyogenic granuloma of oral cavity.

## Methods

A total of 35 patients who had oral pyogenic granuloma were treated at the Department of the Maxillofacial Surgery, Al-Imamein Al-Kadhiemein Medical City during the period from January 2013 to January 2015. Photographs had been taken for all lesions pre- and postoperative period of treatment. Patients with any systemic diseases were excluded from the study and all operations were performed by the same surgical team throughout the procedures. The patients, the surgeon, and the operative staff wore safety glasses. The diagnosis of all lesions was confirmed by histopathological examination. All treatments were performed under local anesthesia.

The type of laser, which was used in this study is diode laser (Diomed 15 laser). It is an

integrated 810 nm wavelength, Gallium Aluminum Arsenide (GaAlAs) semiconductor laser. Its maximum output power is 15 W, 0.1-1.0 second is the pulse duration, 0.1-1.0 second is the pulse interval and it works in continuous, single, and repeated pulsed modes.

The laser surgical operations had been done at repetitive pulsed mode for 5-8 W maximum power, 0.2-0.4 seconds pulse duration and 0.2-0.4 second pulse interval. All patients were told about laser surgical procedures, its complications before the surgery and obtained patient's agreement (Medical Ethics).

In all the patients treated, the treated tissue and its surrounded areas were cooled by gauze pack soaked in normal saline after the laser surgical procedure. Some of the patients were given suitable postoperative care such as 0.12% chlorhexidine mouthwash, Amoxicillin capsules 500 mg as antibiotics and Ponstan tablets 500 mg as analgesics.

All patients were seen on a regular basis for follow-up: At one and two weeks after treatment.

Each patient was evaluated clinically for swelling, infection, disturbance of function, pain and bleeding (Figures 1 and 2).

## Results

This study has enrolled 35 patients with oral pyogenic granuloma. The results of this study were evaluated clinically depend on swelling, infection, disturbance of function, pain and bleeding.

In all cases, there was no incidence of infection in the days following the procedure. Postoperative swelling was minimal to moderate. No sutures were required. No bleeding was seen neither intraoperative nor postoperative period. Postoperative pain was mild in few patients. No disturbance of function was observed.

The patients were satisfied with the treatment protocol and the results obtained. They were comfortable either intraoperatively or postoperatively (Figures 3, 4, 5 and 6).



**Figure 1. Pyogenic granuloma of left side of palatal mucosa**



**Figure 2. Pyogenic granuloma of right side of maxillary alveolar mucosa**



**Figure 3. Complete excision of granuloma by 5 W pulsed mode diode laser**



**Figure 4. One week later**



**Figure 5. Complete excision of granuloma by 5W pulsed mode diode laser**



**Figure 6. Excisional biopsy of lesion sent for histopathological examination**

### **Discussion**

Laser excision is most desirable for any solid, exophytic-type lesion because of the improved visibility and precise control of tissue removal <sup>(6)</sup>.

Currently, laser soft tissue applications have constituted the primary area for the clinical use of lasers in dentistry <sup>(7)</sup>. For therapeutic purposes, the laser-tissue interaction mechanisms are mainly determined by two parameters, namely the laser exposure time on the tissue and the effective power density taking into account the tissue-specific absorption <sup>(5)</sup>.

Many reports have proved the benefits of laser soft tissue surgery include: minimal swelling,

dry surgical field, sterilization of the surgical site, reduced postoperative pain (laser energy can inhibit pain receptors at the site of operation), a relatively bloodless surgical and postsurgical course and no-touch technique.

In this clinical work, mild postoperative pain was detected in few cases; the postoperative swelling was greatly reduced (laser energy can cause sealing of lymphatic vessels). These results are in agreement with results of reports which proved the excellent postoperative conditions, minimal pain and swelling <sup>(8,9)</sup>.

Diode laser have high penetration depth in the tissue and it has been highly absorbed by hemoglobin and cause good hemostasis.

Clinically, the intraoperative bleeding was minimal or not observed and no postoperative bleeding has occurred. Postoperative infection has not been encountered. These results are in agreement with reports which proved the homeostasis was optimum immediately after the removal of the benign exophytic lesions with diode laser <sup>(10)</sup> and after removal of hemangioma <sup>(11)</sup>.

The advantages of laser application are relatively bloodless surgical and post-surgical courses with minimal swelling and scarring. Diode laser has been used for excisional biopsy of pyogenic granuloma and gingival pigmentation <sup>(12)</sup>.

The safety and efficacy of laser systems, especially the diode laser, are already evaluated for the treatment of oral surgery, for example upper and lower frenulectomy, fibroma and excision of epulis fissuratum and gingival hyperplasia.

High degree of patient acceptance and satisfaction, without compromising health and function, has been found in this clinical work. This result is in agreement with reports, which have concluded that the use of the 810-nm diode laser may indeed be the best choice in oral soft tissue surgery <sup>(13,14)</sup>.

From this clinical study, it is concluded that surgical diode laser in repetitive pulse mode is an efficient, precise and modern method in removal of pyogenic granuloma of oral cavity. This treatment modality provides satisfactory results and well patient's acceptance without compromising their health and functionality.

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### Conflict of interest

The author declares no conflict of interest.

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E-mail: amzain225@yahoo.com

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