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Excision of Soft Tissue Oral Lesions by 810 nm Diode Laser

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Abstract: The present study was conducted on 20 patients suffering from different types of lesion like pyogenic granuloma, peripheral giant cell granuloma, mucoceles, pregnancy tumour, Fordyce's granules and irritating fibroma.The cases were selected from outpatient clinic of the Al Kydhemya Teaching Hospital. Patients were treated by diode laser (810±20 nm) at the affected areas of the oral cavity with continuous contact focused mode until excision of the lesion with coagulation of the oozing area after excision. Patients were followed up after 2 days, 7 days and 2 weeks to assess healing process and any post operative complication. Some of undiagnosed lesion sent for histopathological examination. No serious complications were recorded; one suffered from slight oedema and one case with simple bleeding. After 2 months follow up, recurrence occurred in one case. Diode laser provides a marked clinical improvement without the need for surgical intervention.

Introduction

The role of laser in dentistry is well-established in conservative management of oral disease; ablation of lesions, incisional and exisional biopsies, gingivectomies, gingivoplasties, soft tissue tuberosity reduction, certain crown lengthening procedures (Pick et al; 1993; Kafas et al; 2008; Jackson et al; 2002) management of inflamed periodontal tissues, peri-implant tissues, endodontics, dental bleaching and cavity preparation (souza, 2008).Oral mucosa is a term used to describe the moist lining of oral cavity (Wigdor et al., 1995). The structure of oral mucosa is composed of two layers, epithelium and connective tissue. The oral mucosa has no muscalris mucosa while it has a layer of a loose fatty or glandular connective tissue containing the major blood vessels, nerves that supply the mucosa (Bhaskar, 1991). The great majority of soft tissue masses of the oral cavity are hyperplastic inflammatory responses to local, usually trauma or infection. These benign reactive proliferationsis one or more component of the normal connective tissue structure and are sometimes unique to mouth because of their origin from periodontal or odontogenic tissue. Reactive lesions are much more common in the mouth than the other parts of body, because of the close proximity of mucosa to hard, often sharp, hard teeth and prosthetic appliances.

The scalpel and the conventional electrosurgical unite are the instrument used for excision of soft lesion. In addition, laser can be used for excision, incision of as an alternative method for soft tissue lesion removal. All laser tissue interaction producessome degree of tissue vaporization and a surrounding zone of thermal necrosis. This zone of thermal damage should be as minimum as it not affects wound healing and graft take. The factors that determine the

initial tissue effect include wavelength, laser power, wave form (as continuous contact mode), tissue optical properties and tissue thermal properties.

Diode laser provide great benefit over many other lasers because of small size comparable to other types. Diode laser also provide a wide range of spectrum that may be used in many medical fields ranging from physiotherapy, photodynamic therapy and surgical excision. Another important privilege of diode laser that it transmitted through optic fiber that can be used in different regions easily.

Patients and Methods

Twenty patients with different oral lesions, 8 males and 12 females, attended maxillofacial department outpatient clinic in Al-Kadhymia Teaching Hospital. Their age ranged between (5-60 years). Prior to surgery, the patients were examined with documentation of the special case sheet for each one**.**

Surgical procedure

Prior to surgery, medical and dental history, history of present illness, had been taken which involved past laser therapy if present.

The surgical procedure was started with injection of the surgical site by local anesthesia (lidocaine 2%, containing adrenalin 1:80000 concentration). After anesthetized the surgical site, the lesion or the mass grasped with tissue forceps and raised from its base, the laser knife "optical fiber tip" was handled perpendicular to the surgical site. The excision procedure started from the pediclecular base of the mass from all the direction, until removed completely.

The specimens were inserted in 10% formalin solution (except Fordyce's granules and mucoceles) as a fixative material and sent for histopathological examination.

After that, patient was given antibiotic cover, analgesia and NSAID for five days post-operatively.

	Lesion	No	%	Mode	Power	W/L	Exposure time	Power density
1	Irritation fibroma	2	10%	Continuous/ contact	3 watt	810±20	variable	3.819
2	Giant cell granuloma	1	5%					
3	Pyogenic granuloma	4	20%					
4	Pregnancy tumor	2	10%					
5	Fordyce's granules	1	5%					
6	Mucoceles	9	45%					
7	Fibroma in the tip of tongue	1	5%					

Results

The lesion/ mass were variable in size, ranged between (1-5 cm) in diameter, except in Fordyce's granules where the small papules spread along wide area of the buccal mucosa.

No. of cases	Site of the lesion	Histopathological exam.	Clinical diagnosis
9	Inner surface of the lower lip.	-	Mucoceles
2	Inner surface of the lower lip adjacent to an arch bar. Buccal mucosa adjacent to sharp tooth.	-	Irritation fibroma
1	Wide spread of these granules in the buccal side of the attached mucosa and check.	-	Fordyce's granules
1	Buccal mucosa of upper jaw	Giant cell granuloma	-
2	Buccal mucosa of upper jaw	Pregnancy tumor	-
4	Labial mucosa of lower jaw Buccal mucosa of upper jaw	Pyogenic granuloma	-
1	Tip of the tongue	Fibroma within the tip of tongue	-

Some standard signs and symptoms were applied for follow up which formalized as

Pain	No case of severe pain Local anesthesia used Post operative analgesia
Bleeding	Only one case suffered from moderate post operative bleeding and need admission and had been given I.V. fluid
Edema	There was mild edema presented in the first two days after operation Post operative NSAID
Necrosis	No sign of necrosis
Infection	There was only one case (fibroma within the tip of tongue) suffering from infection then dehiscence of wound, two times of suturing and antibiotic cover
Recurrence rate	One case (pregnancy tumor) recurred in two months after laser surgery at the same site
Time taken	Nineteen Cases operated by one session vary (5-15 minutes.) One case (Fordyce's granules) needed two sessions.
Others	No complications (like bone resorption, limiting in movement or fibrosis)

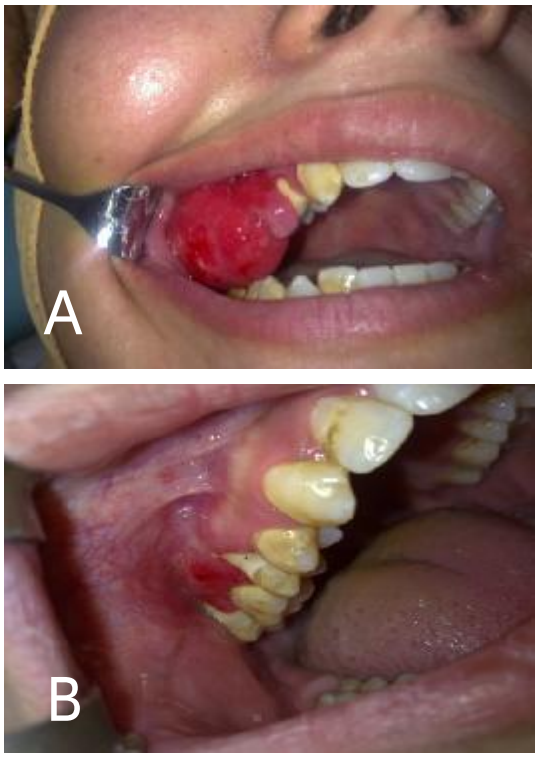

Fig.(1): A 17 years old female patient presented with a mass attached at the buccal gingival mucosa of the upper molar region A. (3 cm x 3 cm) histopathological result was peripheral giant cell granuloma B. The patient after two weeks after excision of the mass by diode laser

Fig.(2): A 35 years old male patient presented with a traumatic irritating fibroma within the labial mucosa of the lower lip A. Pre-operatively B. During laser surgery C. Two weeks follow up (complete healing)

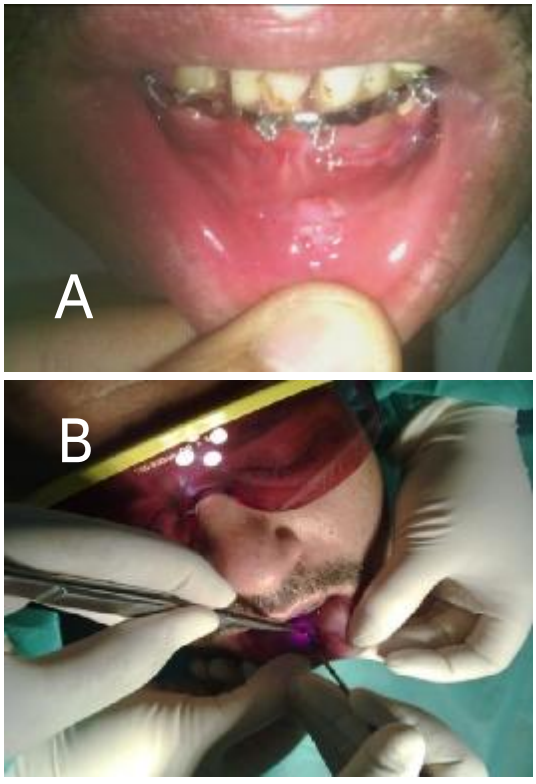

Fig.(3):A 12 years old male patient with Fordyce's Granules along the buccal mucosa of the cheek and attached mucosa adjacent to upper molar teeth A. Pre-operatively B. After two weeks follow up postoperativly.

Discussion

Research has consistently demonstrated that laser surgery can be performed safety by using parameter which protects underlying bone and vital structures and teeth (Liboonj et al., 1997).The factors that determine the initial tissue effect include laser wave length, power, wave form (continuous, pulse and chopped type), tissue optical properties and tissue thermal properties (Gold, 1994). Photothermal interaction is the basic reaction of tissue with diode surgical laser (810±20 nm). In this process, radiated light is absorbed by the tissue and transferred to heat energy which cause varies changes in tissue structure, these changes were important in cutting, vaporization and then coagulation. In the preliminary study, diode surgical laser creates a wound that can be characterized as thermal injury. The fiber was kept in steady motion and in contact mode that was directly over the target tissue (Pick RM, 1993).

Wavelength of the diode laser is considerably more absorbed due to hemoglobin choromophore than other laser (Wilder-Smith P et al., 1995). This initial test of the effectiveness of laser vaporization method show that precise cutting tool that minimal change to the adjacent tissue, coagulation and sealing of small vessels is excellent and this lead to less post-operative bleeding (Sauerio et al., 2008), unlike electrosurgical units produce adequate homeostasis but result in greater thermal injury and causing muscle fasciculation and also cause delay in the wound healing (Liboonj et al., 1997). Only one case of active bleeding from excision site (case of pyogenic granuloma and this relate to sever congestion of the area and bad oral hygiene) and for this active bleeding; Argon laser, Nd:YAG laser and Ho-YAG laser are the laser of choice.

Patients undergoing diode laser surgery in the oral cavity seem to have less pain because the thermal necrosis created by tissue vaporization cause sealing of the ends of sensory nerves, decrease their ability to transmit stimuli(White et al., 1991, Pick, 1993, Gold,1994), also denaturation protein act a decreasing pain (Muna et al., 2005).In addition, all the immune reaction component present the range of diode laser treatments antigen, antibodies, cytotoxic protein and sub-epithelial lymphocyte are all denaturated due to its deeper penetration. That means destruction of the diseased epithelium with its surface anti-gene, less risk of edema and the dressing layer of denaturated protein enhance healing with less risk of secondary infection (Mortiz et al., 1998).

Diode laser reveals a bactericidal effect and help to reduce inflammation in oral and dental treatment which decreasing the incidences of infection(Wilder-Smith, 1997).One case was suffering from infection persisted until the end of ten days due to fact that the patient did not follow the instruction. When the laser can be used to vaporize the base of the lesion, destroying cells layer by layer and healing of the underlying minor salivary glands, recurrence is reduced, obviating that need for excision of the minor glands (Yueb et al., 2007).Only one case of recurrence of pregnancy tumor and this was due to etiological factors related this tumor growth which are hormonal changes during pregnancy that lead to increase the chance of recurrence. So many surgeons prefer to remove this type of tumor after delivery.

The main criterion of some type of laser ablation is that the tissue is vaporized and would not be available for histological examination. Multiple biopsies need to be taken from the affected area before excision to determine the histology of the lesion (Charles, 2007), while in this study, diode laser preserves the cellular anatomy of the tissue removed to permit accurate microscopic diagnosis and this proved by accommodation of the suspected clinical diagnosis and histopathological diagnosis of these simple studying cases (Malcolm et al., 2006, Sauerio et al., 2008).

Conclusion

The technique is very easy, fast and safe. It could be done in outpatient clinic with local anesthesia. This modality satisfy the patient who suffers psychological from surgical treatment

especially in children and the fear and suffering from their side effects (Mortiz A et al; 1998; Mortiz, 1997).

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الخلاصة

أجريت هذه الدراسة على عشرين مريضا" حيث كانوا يعانون من اورام حميدة مختلفة في الفم و اللسان مثل الاورام الحبيبية القيحية, الخلية العملاقة الحبيبية الطرفية, اكياس الغدة اللعابية الصغيرة, الأورام الحبيبية الهرمونية المصاحبة للحمل و الاورام المتليفة.تم اختيار هذه الحالات في العيادة الاستشارية لجراحة الوجه و الفكين في مستشفى الكاظمية التعليمي, و تم علاج الحالات بواسطة ليزر الدايوود الطبي بطول موجي (810± 20) نانومتر ذو حزمة مستمرة موضوعة بصورة مباشرة فوق الورم لرفعه و تنظيف المنطقة بشكل جيد. بعدها يتم متابعة المرض بعد يومين من اجراء العلاج, اسبوع و اسبوعين لحين اكتساب الشفاء التام.تم ارسال الاورام المرفوعة الغير مشخصة نسيجيا الى التشريح المرضي. لم تحدث مضاعفات خطيرة بعد العلاج عدا حالة نزف بسيطة تم علاجها موضعيا و كذلك حالة واحدة لالتهاب الجرح بسبب عدم اتباع المريض التعليمات المعطاة له, مع حالة لرجوع المرض بعد شهرين من العلاج و كان الورم الحبيبي المصاحب للمرأة الحامل. اثبتت الدراسة كفاءة العلاج بالليزر و عدم احتياج التداخل الجراحي لرفع الاورام الحميدة من الفم.