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Successful Excision of Oral Irritational Fibroma Using 940 nm Diode Laser: Case Series

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Abstract

Background: Irritational fibroma is a frequently observed benign exophytic and reactive oral lesion that develops as a result of trauma. The usual sites of irritational fibroma are buccal mucosa, tongue, and lower labial mucosa. These lesions are excised using conventional surgery, electrosurgery, or more recently by laser.

Methods: A total of 36 patients underwent surgical excision of superficial proliferative lesions under local anesthesia using a 940 nm diode laser. Bleeding was stopped using laser dry bandage setting, and no suturing was needed. All specimens were sent for histopathological examination. Patients were examined for intra-operative and post-operative complications.

Results: The procedure was simple to perform with minimum bleeding and excellent precision. It was well accepted by the patients, who also reported mild post-operative pain. Optimum healing was achieved with no residual ulceration or scarring. The excised specimens were adequate for histopathological examination and all diagnosed as oral fibromas.

Conclusion: The 940 nm diode laser can be utilized in excisional biopsy of irritational fibromas with minimum bleeding, discomfort, scarring, and postoperative pain and should be considered as a practical alternative to the traditional surgical technique.

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Introduction

Irritational fibroma (IF) is the most prevalent tumor-like reactive lesion in the oral cavity. It develops resultant to injury caused by traumatic irritants such as chronic biting, overhanging restorations, and overextended borders of removable appliances [1,2]. Irritational fibroma has been referred to using different terms such as traumatic fibroma, peripheral fibroma, fibrous nodule, fibroepithelial polyp, focal fibrous hyperplasia, and inflammatory fibrous hyperplasia [2].

Clinically, IF presents as a painless, round or ovoid, sessile or pedunculate, smooth-surfaced, pinkish exophytic lesion with a rubbery to firm consistency [1,2]. Occasionally, the surface may appear white due to hyperkeratosis or ulcerated due to secondary trauma.

Irritational fibroma can develop on any surface of the oral cavity, particularly in the trauma bearing areas. Therefore, the buccal mucosa, along the occlusal line, is the most prevalent site followed by the tongue and lower labial mucosa [3]. The size of IF usually ranges from a few millimeters to 2 cm in diameter; however, in rare cases, it may appear as a large nodular mass with a diameter of more than 3 cm [4]. Irritational fibroma is usually seen in the fourth to sixth decade of life with a female predominance. The differential diagnosis of IF includes pyogenic granuloma, peripheral giant cell granuloma, and peripheral ossifying fibroma. The final diagnosis is mainly based on biopsy and histopathological examination. Recurrences are rare and may be caused by repetitive trauma at the same site. Interestingly, IF does not have a risk for malignancy [1,3].

Irritational fibroma can be treated by conservative surgical excision; however, this modality might be complicated by intra-operative bleeding, infection, and delayed healing.

Since its introduction, by Maiman, in 1960, lasers with different wavelengths have made remarkable progress in the field of dentistry, proving to be crucial in oral surgery as a collateral approach for soft tissue surgery. This rapid advancement could be attributed to the fact that lasers allow efficient excision of soft tissue with excellent hemostasis and field visibility. When compared to conventional scalpel techniques, electrocautery, or high-frequency devices, lasers offer maximum post-operative patient comfort [5].

The diode laser has become the most frequently used laser in dentistry and has gained its popularity due to its extreme compactness, affordability, ease of operation, simple set-up, and small size. It is a semiconductor device that uses aluminum, gallium, arsenide, and occasionally indium as the active medium. The device produces coherent radiation in the visible or infrared spectrum. Therefore, all wavelengths are absorbed properly by pigmented tissue, which contains melanin and hemoglobin. However, they are poorly absorbed by calcified tissue such as hydroxyapatite and water present in the enamel. This allows for diode lasers to act selectively and precisely cut, coagulate, ablate, or vaporize the areas near the dental structure with less damage and better post-operative healing. In addition, applying diode lasers decreases the need for anesthesia, significantly controls hemostasis, and provides a relatively bloodless surgical site with no need for sutures [5,6]. Diode lasers utilize an optical flexible fiber ranging from 200 to 600 μm to deliver the treatment beam to the target area, and the radiation emission can be continuous or pulsed. Several studies have recently demonstrated the beneficial effects of diode lasers as an efficient tool for excision of benign oral soft tissue lesions [6-8].

The aim of this paper is to present our experience in a case series of oral IF excised using a 940 nm diode laser.

Materials & Methods

During the period between March 2016 and February 2019, a total of 36 patients attended the Oral Medicine clinic at Prince Sultan Military Medical City for assessment and management of oral soft tissue growths. The ages of the patients ranged from 7 to 67 years (mean=43.7 years, median=45 years). The most usual locations for the exophytic lesions were the tongue and the buccal mucosa equally (n=15 each), followed by the labial mucosa (n=6). The size of the lesions varied from 3 mm to 2 cm in diameter. Three patients presented with more than one lesion. The duration of lesion existence varied from patient to patient and was reported by some patients to be a few months, while others reported a longer duration extending up to several years (Table 1).

Table 1: Patient Demographic Features and Lesion Characteristics

Patient No#	Gender	Age (years)	Irritational Fibroma		
			Location	Size (maximum diameter)	Duration
1.	Female	58	Tongue	6 mm	3 years
2.	Female	38	Tongue	7 mm	>15 years
3.	Female	49	Tongue	4 mm	10 years
4.	Female	62	Tongue	5 mm	1 year
5.	Male	7	Tongue	3 mm	8 months
6.	Female	54	Tongue	4 mm	18 months
7.	Male	64	Tongue	4 mm	1 year
8.	Female	31	Tongue	5 mm	2 years
9.	Female	54	Tongue	5 mm	4 months
10.	Male	62	Tongue	7 mm	6 months
11.	Female	60	Tongue	5 mm	5 months
12.	Female	53	Tongue	8 mm	2 years
13.	Female	55	Tongue	7 mm	8 months
14.	Mmale	37	Tongue	5 mm	6 months
15.	Female	45	Tongue	5 mm	6 months
16.	Female	42	Buccal mucosa	1.5 cm	2 years
17.	Female	58	Buccal mucosa	2 cm	3 years

18.	Female	36	Buccal mucosa	8 mm	1 year
19.	Male	29	Buccal mucosa	10 mm	2 years
20.	Male	44	Buccal mucosa	4 mm, 3 mm	1 year
21.	Male	43	Buccal mucosa	7 mm	5 months
22.	Female	30	Buccal mucosa	10 mm	3 years
23.	Female	55	Buccal mucosa	5 mm	1 year
24.	Male	45	Buccal mucosa	6 mm	18 months
25.	Female	30	Buccal mucosa	7 mm	3 years
26.	Female	24	Buccal mucosa	9 mm	2 years
27.	Female	67	Buccal mucosa	3 mm, 4 mm	5 months
28.	Female	48	Buccal mucosa	4 mm	1 year
29.	Female	58	Buccal mucosa	4 mm	2 years
30.	Male	47	Buccal mucosa	5 mm	3 years
31.	Female	27	Labial mucosa	8 mm	8 months
32.	Female	65	Labial mucosa	5 mm	4 months
33.	Male	11	Labial mucosa	5 mm	3 months
34.	Female	27	Labial mucosa	1 cm	9 months
35.	Male	12	Labial mucosa	5 mm	2 years
36.	Female	45	Labial mucosa	5 mm, 5 mm	2 years

Clinical diagnosis of oral IF was made after examination. The treatment plan was explained to the patients who all gave consent to undergo surgical removal of the superficial proliferative oral lesions using a 940 nm diode laser (Epic Biolase, Irvine, CA) (Image 1).

Image 1: 940 nm diode laser (Epic Biolase, Irvine, CA)

After administration of local anesthesia (2% lidocaine with 1/100,000 epinephrine), the lesions were ligated to retract with minimum tension and facilitate manipulation. A 0.4 mm diameter disposable initiated surgical tip (ezTip E4-4mm) was applied in contact mode with a focused beam and moved around the base of the lesion using the Circumferential Incision Technique (CIT) to remove the tissue (Image 2). Each lesion was excised completely as one piece and immersed in 10% formalin fixative solution for histopathological examination. Depending on the size and consistency of the lesion, the average power used for excision ranged from 2.5w - 3.5w with continuous wave (CW) as the operational mode (Table 2). Immediate coagulation was achieved, and no suturing was needed. Laser hemostasis (0.5w, CW) was implemented when needed (Image 3). All required safety measures including wearing protective goggles, using gauze in the operative field, and high vacuum suction were applied throughout the procedures.

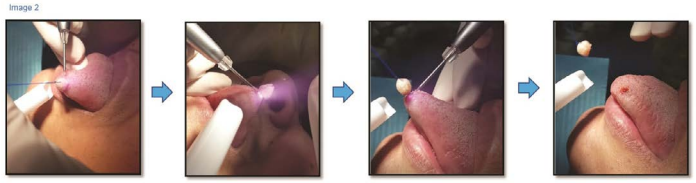

Image 2: Oral Irritational Fibroma Laser Excision

Table 2: Laser Parameters

Type of laser	Diode
Wave length	940 nm
Operational mode	Continues Wave - Contact
Power	Excision: 2.5 -3.5 W, Haemostasis: 0.5 W
Fiber diameter	ezTip E4-4mm surgical

Image 3: Oral Irritational Fibroma Laser Haemostasis

Patients were discharged with all necessary post-operative instructions along with a prescription of oral analgesics to be used upon need. Antibiotics were not prescribed. Patients were scheduled for a routine recall appointment one to two weeks post-surgery to evaluate the wound and review the histopathology report. If the healing at this visit was complete, the patient was discharged; otherwise, the next recall appointment was scheduled after another

two weeks. The follow-up of selected cases is displayed in Image 4.

Image 4: Oral Irritational Fibroma (IF) Post-laser Excision Healing: **A,** tongue IF; **B,** buccal mucosa IF; **C,** labial mucosa IF

Results

A total of 36 patients with oral IF, 25 (69.4 %) females and 11 (30.5 %) males, were included in this series. Clinically, most of the lesions presented with an intact surface except for a few which presented with either surface keratosis (7 cases) or focal ulceration (2 cases).

The excised specimens were adequate for histopathological examination, and all lesions were benign. Histopathological examination using hematoxylin and eosin staining showed a nodular mass composed of dense collagen bundles with wavy and spindle-shaped fibroblasts. The overlying stratified squamous epithelium demonstrated atrophy of rete ridges due to connective tissue proliferation. Some cases showed surface hyper-keratinization or ulceration. The histopathologic descriptions confirmed the diagnosis of oral IF.

Some patients failed to attend their scheduled follow-up appointments, instead coming at a later date five to seven weeks post-surgery. Eight patients did not show up for any of their post-surgery appointments and when contacted over the phone reported complete healing of the wound with no post-operative complications.

Overall, excision of IF using the diode laser was simple to perform with excellent precision, minimum bleeding, and no suturing. It was well accepted by the patients, who also described very mild post-operative pain. Wound healing was facilitated by granulation and secondary epithelialization. Optimum healing in most cases was achieved within two to four weeks with no residual ulceration or scarring.

Discussion

Most oral exophytic lesions are considered to be more reactive than neoplastic, with IF being the most frequently observed of this reactive entity. In this series, 69% of IF were found in females, which is consistent with previously reported findings showing a higher prevalence among females [9]. Moreover, the age of the majority (64%) of patients presenting with IF was between 30 and 59 years, coinciding with previous reports [4].

In this series, IF was found in sites subjected to recurring irritation such as the buccal mucosa, tongue, and labial mucosa and presented clinically as a sessile or pedunculated nodular mass. All excised IF lesions were less than 2 cm in size. This is not unusual as IF usually reaches its maximum size within a few months and seldom exceeds 2 cm [4].

IF is usually an asymptomatic, moderately firm, immobile mass with a surface color that is most often normal

but may show pallor due to decreased vascularity, thickened surface keratin, or ulceration from recurring trauma[1,2], as observed in 25% of patients in this case series. Different kinds of treatment for IF are available including scalpel excision, electrical surgery, and laser surgery. Noteworthy, there are some complications with conventional surgery, such as intra-operative and post-operative bleeding, difficulties in wound healing, deep anesthesia, swelling, scarring, and post-surgical pain. Conversely, lasers have recently made great progress in the field of dentistry, and when compared to scalpel, electrocautery or high-frequency devices provide maximum post-operative patient comfort [3], clean incision of tissues, a highly decontaminated surgical bed, immediate coagulation, improved healing, and minimal post-operative edema [4]. The diode laser, used here, is a soft tissue laser that has found great acceptance and provides numerous advantages due to its available compact size and practicability. This has rendered it an enhanced and useful tool for today's dental clinical practice, and the diode laser is now one of the most commonly employed laser devices for the excision of oral soft tissue lesions.

Surgical removal with diode laser is virtually bloodless due to its efficiency in the coagulation of superficial lesions, thus providing a dry surgical field. In addition, post-operative edema and discomfort are minimal. The mechanism of diode laser that leads to ablation or decomposition of biological material is photochemical, thermal, or plasma mediated. The diode laser is absorbed by pigmented tissue and hemoglobin without penetrating surrounding tissues. It transmits energy to the cells through warming, coagulating, welding, drying, carbonization, vaporization, and protein denaturation. Due to its absorption in hemoglobin within blood vessels, sealing of capillaries by protein denaturation and stimulation of clotting factor VII production is achieved throughout the procedure, offering better site visibility. The thermal effect of the laser also seals the capillaries and lymphatics, which reduces postoperative edema and bleeding. Moreover, histologically, laser wounds have been found to contain a significantly lower number of myofibroblasts. This results in less wound contraction and scarring and ultimately improved healing [10]. Various studies have reported that the use of lasers may result in sterile conditions in both pulsed and continuous modes through significant reduction of viable bacteria [11,12]. Furthermore, results indicate that in addition to its bactericidal effect, laser irradiation can also inhibit LPS-induced macrophage activation and therefore blunt the inflammatory response [13].

This series is included among the largest number of oral IF managed successfully in a single center with 940 nm diode laser excision. Interestingly, all patients were satisfied with laser surgery as it was painless both intra-operatively and post-operatively. Healing was achieved uneventfully within a couple of weeks following surgery.

Conclusion

We conclude that the 940 nm diode laser can be employed in procedures requiring excisional biopsy of tongue, buccal, and labial IF lesions with superior patient comfort and minimal problems in histopathological diagnosis. As contrasted with traditional methods, laser surgery is less time consuming, more precise, and produces less scar-tissue contraction. Diode lasers can be deemed as a good modality even for relatively large lesions and should be considered as a viable alternative to conventional surgical techniques.

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