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Use of GaAlAs Diode Laser for Excisional Biopsy of Gingival Giant Cell Fibroma: A Case Report of a Rare Lesion

Sabiha Naaz[1], Abdul Ahad[1*], Afshan Bey[1], Hena A Ansari[2]

1. Department of Periodontics, Dr. Ziauddin Ahmad Dental College, Faculty of Medicine, Aligarh Muslim University, Aligarh, India
2. Department of Pathology, Jawaharlal Nehru Medical College, Faculty of Medicine, Aligarh Muslim University, Aligarh, India

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**** Corresponding author:***
Department of Dentistry, Medini Rai Medical College, Palamu, Jharkhand, India

Email: aahad.amu@gmail.com

A B S T R A C T

Giant cell fibroma (GCF) is a relatively rare lesion in the oral cavity. Despite having unique microscopic features, it can be easily misdiagnosed clinically as any common hyperplastic lesion. This report presents a case of a 21-year old male with a lesion involving the papilla between the mandibular central incisors. The lesion was excised completely under topical anesthesia using a 980 nm diode laser. On histopathological examination of the excised tissue, no thermal damage or any other alteration was observed, while the features were suggestive of GCF. Healing of the gingiva was uneventful and without any signs of recurrence. Apart from the widely known advantages of the diode laser, it also appears to maintain the integrity of biopsy specimens, if used with appropriate settings. This advantage may play a vital role in the biopsy of rare lesions where the diagnosis is entirely based on accurate histopathological examination.

Keywords: Giant Cells; Lasers, Semiconductor; Biopsy; Fibroma

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INTRODUCTION

Focal proliferations of the gingiva are frequently observed, most of which are fibrous hyperplastic connective tissue lesions. These are broadly classified into four common categories: pyogenic granuloma, peripheral gingival fibroma, peripheral giant cell granuloma, and peripheral ossifying fibroma [1]. Each of them might have more or less similar clinical presentations but have their characteristic histopathological features. The giant cell fibroma (GCF) is a separate entity among these lesions and has an unknown etiology. It is rare, accounting for only 2-5% of all oral fibrous proliferations [2]. It is most often seen in the first three decades of life and does not usually have any gender predilection. However, some studies have shown a slight female preponderance [2,3]. Although conventional surgical excision of such lesions by a scalpel is commonly performed, diode laser offers a better alternative in terms of higher patient acceptance, being less traumatic, and requiring shorter chair time [4].

A more important advantage is having a clear surgical field, enabling the clinician to excise the lesion with higher accuracy, facilitating thorough debridement, and minimal traumatization of the adjacent tissues. Unlike other techniques such as electrocautery and cryosurgery, diode laser does not produce significant thermal changes or disturb the tissue architecture of biopsy specimens, facilitating accurate histopathological evaluation [4].

CASE REPORT

A 21-year-old male presented to the outpatient Department of Periodontics, Dr Ziauddin Ahmad Dental College and Hospital, Aligarh, complaining of swollen gums around his lower front teeth for the past one year. He reported that the painless swelling gradually increased to its current size. There was no associated relevant medical history or significant extraoral finding.

Intraoral examination revealed generalized chronic gingivitis and a solitary, exophytic, pedunculated, pale red mass involving the papilla between the mandibular central incisors protruding on the labial as well as the lingual aspect (Figs. 1A, 1B and 1C). On close observation, the lesion's surface was found to be irregular, much like the stippling on the attached gingiva. On palpation, it was found to be firm in consistency. Radiographic examination did not reveal any significant change (Fig. 1D). A provisional diagnosis of peripheral ossifying fibroma was made on the basis of history and clinical features.

Fig. 1. (A) Preoperative labial view of solitary, pedunculated, pale red mass involving the papilla between the mandibular central incisors; (B) preoperative occlusal view; (C) preoperative lingual view; (D) no significant change seen on periapical radiograph

Treatment:

After full mouth scaling, there was a significant improvement in overall periodontal condition; however, no signs of regression were seen after 4 weeks of follow-up. The patient was informed about the treatment plan and written informed consent was obtained for excisional biopsy with diode laser. Topical anesthetic gel (2% benzocaine) was applied over and around the lesion. Excision was performed using a diode laser with 980 nm wavelength with an initiated tip with 320 µm diameter (FONA Laser, Sirona Dental Systems GmbH, Germany) in chopped mode (duty cycle of 50%, frequency of 20 Hz) at 1.5 W average power (Fig. 2A).

Fig. 2. (A) Excision of the lesion using diode laser; (B) excised tissue; (C) intra-operative labial view; (D) intra-operative occlusal view. The wound was left open for healing by secondary intention.

The tip was contacting the base of the lesion at an angle of 10°-15° while the tissue was held using forceps. The laser was used for approximately 4 min to excise the lesion. The operators and the patient wore protective eyewear, and a high volume suction was used to evacuate the vapor from the surgical field. The biopsy specimen (Fig. 2B) was kept in 10% formalin and sent for histopathological examination. Tooth surfaces, denuded after excision of the mass, were thoroughly cleaned using Gracey curette #1-2, and the operative field was irrigated with saline. The surgical wound was left open for healing by secondary intention (Figs. 2C and 2D). To prevent pain and sensitivity, the patient was advised to avoid hot or spicy food and carbonated beverages. He was also instructed to gently brush the operated area and to do warm saline rinses four times daily for 1 week. The patient was instructed to take 500 mg paracetamol tablets in case of pain. Healing was uneventful, and the patient did not take the analgesic tablets since his postoperative pain

was mild, even in the first 24 h. At the 2-week follow-up visit, complete healing was observed (Figs. 3A, 3B, and 3C).

Histopathological examination:

Hematoxylin and eosin staining revealed polypoid fragments of tissue partially covered by thickened squamous epithelium (Fig. 3D). The underlying stroma showed haphazardly arranged thickened collagen bundles separated by prominent myxoid change (Fig. 3E). Scattered pleomorphic giant cells were seen along with stellate-shaped cells in the myxoid areas (Fig. 3F), which was suggestive of GCF.

Follow up:

The patient was advised to show-up every 2 months to check for possible recurrence and to monitor oral hygiene maintenance. After more than 6 months of follow-up, no signs of recurrence were observed.

DISCUSSION

GCF is a reactive non-neoplastic lesion. It may be pedunculated or sessile [2] and is found more frequently on the mandibular gingiva, followed by the tongue, palate, and the buccal mucosa [5]. Its color is usually similar to that of the surrounding tissue unless it is traumatized [5]. The name of this lesion can be attributed to its large, stellate-shaped, mononuclear, and multinuclear giant cells. It can be mistaken for papilloma or fibroma because of its papillary surface and fibrous consistency, respectively [1,6-8]. The etiology of GCF is not clear; however, it might occur due to chronic irritation [8]. GCF is clinically similar to many other fibrous lesions, including peripheral ossifying fibroma. There is no apparent underlying bone involvement visible on radiographs in most of the peripheral ossifying fibroma cases. However, superficial erosions of bone occur on rare occasions [4]. Since the lesion appeared to be involving the marginal gingiva and interdental papilla, we considered peripheral ossifying fibroma as the provisional diagnosis. Although clinically similar to other fibrous lesions, GCF can be diagnosed distinctly with histopathological examination. It is distinguished by the functional changes in fibroblastic cells apart from the abundance of giant cells [9].

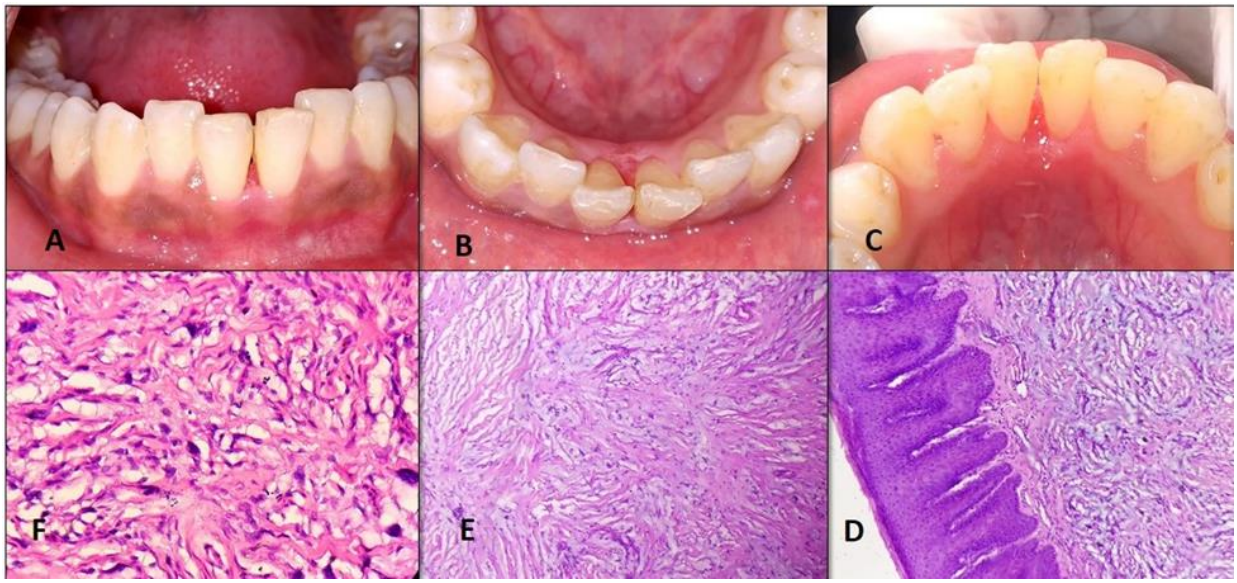

Fig. 3. (A) Postoperative labial view showing complete healing after 2 weeks; (B) postoperative occlusal view; (C) postoperative lingual view; (D) photomicrograph showing overlying stratified squamous epithelium with acanthosis and underlying stroma with haphazardly arranged thickened collagen bundles separated by prominent myxoid change (x10, hematoxylin and eosin staining); (E) photomicrograph showing scattered pleomorphic giant cells seen along with stellate-shaped cells in myxoid areas (x10, hematoxylin and eosin staining); (F) photomicrograph showing scattered pleomorphic giant cells seen along with stellate-shaped cells in myxoid areas (x40, hematoxylin and eosin staining)

These lesions do not regress spontaneously due to excessive collagenous tissue; therefore, they are best treated by excision [10]. Not many recurrences have been reported except in instances where incomplete excision has been done [2]. Scalpel offers advantages such as its ease of use and precise incision along with well-defined margins, but has a limitation of excess bleeding, which disrupts the visibility of the operating field, often leading to incomplete removal of the lesion, causing a recurrence. Surgical excision with a safe margin of healthy tissue often results in soft tissue defects which need to be corrected later by mucogingival surgery [10]. Other treatment options for GCF include electrocautery, CO_2 laser, and diode laser.

Although electrocautery has benefits of hemostasis, painless surgery, and self-disinfecting tip, it causes burning flesh odor, tissue changes due to heat, as well as delayed healing [11]. Therefore, it is not a suitable option for excisional biopsy of such reactive gingival lesions.

GaAlAs diode lasers are among the most efficient converters of electrical energy into laser light with deep tissue penetration. By optimizing the laser settings, different tissue effects can be achieved, opening a broad range of possible indications [12]. The diode lasers have many advantages over other modalities, including ease of operation, minimal intraoperative bleeding, which offers a clear surgical field, less postoperative discomfort and pain, and faster healing [13]. Sealing of small blood and lymphatic vessels ensures hemostasis and minimal postoperative edema [13]. The hemostasis is also enhanced by the diode laser stimulating the clotting factor VII [14]. Bagheri et al. [15] reported a similar case of GCF on the buccal mucosa with a hyperkeratotic and granular surface. They also used a diode laser for the excision, owing to its hemostatic properties. Moritz et al. [16] reported the bactericidal effect of the diode laser, which causes a marked reduction in the number of bacteria on the wound bed; thus decreasing the risk of bacteremia. It has been histologically found that laser wounds have a meager number of myofibroblasts, which causes minimal wound contraction and scarring and therefore results in improved healing [17].

GCF, being a rare lesion, is challenging to diagnose clinically. Therefore, only a proper histopathological examination would help to reach the correct diagnosis for which it is necessary to have an intact biopsy specimen. During the histopathological examination, we observed that diode laser, despite having thermal effects, did not alter the microarchitecture of the biopsy specimen. It facilitates an accurate diagnosis, particularly in such relatively atypical, sensitive, and rare lesions, which is a distinct advantage over electrocautery and cryosurgery. This particular advantage of using diode laser has not been widely reported, except in a few older studies and case reports [4,11,14,18,19].

Chawla et al. [4] used a diode laser with 810 nm wavelength at 2 W for excisional biopsy of peripheral ossifying fibroma and reported minimal alterations in the microarchitecture of biopsy specimen which could be attributed to the heat produced during laser irradiation. Janda et al. [18] compared the histological effects of Ho:YAG, Nd:YAG, and two GaAlAs diode lasers with different wavelengths. They found low thermal effects on the depth of tissue with Nd:YAG and diode lasers, as large carbonization zones at the surface resulted in high power loss. It has also been reported that regressive tissue changes due to the thermal effects of diode lasers are usually insignificant, as far as histopathological diagnosis is concerned [20]. It is important to note that this particular advantage may not be universal with all wavelengths and power settings of the diode laser. An appropriately selected setting (wavelength, mode, average power, peak power, duty cycle, frequency, and the overall time taken for excision) may be the reason behind no alteration of the biopsy specimen.

In a pilot study, Suter et al. [19] evaluated the histopathological characteristics and suitability of diode and CO_2 lasers for excisional biopsy of mucosal lesions and concluded that both lasers could be successfully used for this purpose. In the present case, laser was used in the chopped

mode, also known as gated pulse mode, where the average power is half of that in the continuous mode. It has been reported earlier by Beer et al, [21] that, the area and depth of reversible damage are positively correlated with the average laser power. They suggested that micro-pulse mode may lead to further reduction of tissue damage and accelerated wound healing. However, their findings were based on bovine tissues. Thus, clear advantage of micro-pulse mode for human tissues is yet to be established.

CONCLUSION

Reactive gingival lesions, particularly the GCF, are usually challenging to diagnose merely based on clinical findings. Thus, an accurate histopathological examination is vital to make a correct diagnosis of this rare entity. This case report suggests that excisional biopsy by a diode laser could be a reliable technique for maintaining the integrity of biopsy specimens. Owing to many other advantages including high patient acceptance, it can be used as an alternative to conventional techniques. However, more research is needed to validate our findings and explore the effects of different laser parameters on tissue architecture.

CONFLICT OF INTEREST STATEMENT

None declared.

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