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Abstract

Introduction: Pyogenic granuloma (PG) is a prevalent inflammatory hyperplasia of skin and oral mucosa which is often caused by constant low-grade local irritation, traumatic injury or hormonal factors. In many cases, gingival irritation and inflammation due to poor oral hygiene are precipitating factors. Oral PG occurs predominantly on the gingiva, but it is also encountered on the lips, tongue, buccal mucosa and rarely on the hard palate. Although surgical excision is the first choice of treatment, many other treatment modalities could be counted such as cryosurgery, sodium tetradecyl sulfate sclerotherapy, intralesional steroids, flash lamp pulsed dye laser, neodymium-doped yttrium aluminium garnet (Nd:YAG) laser, carbon dioxide (CO2) laser, erbium-doped yttrium aluminium garnet (Er:YAG) lasers and diode laser have been suggested. After surgical excision recurrence occurs up to 16% of these lesions. It is believed that recurrence ensues as a result of incomplete excision, failure to eliminate etiologic factors or repeated trauma.

Case Report: A 50-year-old female was referred to the Department of Oral Surgery, Gazi University, School of Dentistry, complaining of a swelling and growth on the right side of the hard palate for four months. Patient reported a similar growth in the same area about two years earlier, which had turned out to be a PG by histopathology. The treatment plan included surgical excision of the lesion using diode laser.

Results: The patient reported no pain after the surgery. She was discharged with a prescription of chlorhexidine mouthwash and necessary post-operative instructions. At 7 days follow up visit, immediate recurrence of the lesion was observed, and it was excised by diode laser with 2 mm margins at its clinical periphery, to a depth up to the periosteum, by the same operator. No recurrence or scarring was observed in 14 months follow-up.

Conclusion: Although diode laser is a secure and efficient technique for the treatment of intraoral PG, in order to minimize its recurrence, the lesion should be excised with a wider margin down to the periosteum or to the causing agent. Also due to its high recurrence rate, long-term follow-up is recommended.

Keywords: Pyogenic Granuloma; Recurrence; Diode laser.

Introduction

Pyogenic granuloma (PG) is a prevalent, benign mucocutaneous lesion exhibited by an exuberant tissue, caused by a local irritation or trauma.1-3 It was first described in English literature by Hullihen4 in 1844; but the term ‘pyogenic granuloma’ or ‘granuloma pyogenicum’ was presented by Hartzell5 in 1904. However, the term ‘pyogenic granuloma’ can be a misnomer because the lesion neither causes pus formation nor it represents a true granuloma, histologically. Some researchers use the term “lobular capillary hemangiomata” which is histologically a more accurate term for this lesion.2,6,7

Clinically, PG appears as a sessile or pedunculated exophytic mass with smooth or lobulated surface that may easily bleed or ulcerate, and covered by yellow fibrinous membrane. The color of the lesion depends on the vascularity of the growth, so it can be red, purple or pink.1,3,8,10 In the 75% of all cases, gingiva is the most affected site by PG. Aside from the gingiva it is also encountered on the lips, tongue, buccal mucosa and the hard palate. The maxillary gingiva is more commonly affected than the mandibular one and the anterior region more than the posterior. Also the lesions are more frequently on the buccal side of the gingiva than the lingual side.6,8,11

The lesion usually develops slowly, without pain and asymptomatically. But in some cases it may develops fast, reaches its full size and remains stable. The size ranges from a few millimeters to several centimeters but it rarely...
A 50-year-old female was referred to the Department of Oral Surgery at Gazi University, School of Dentistry, complaining about a swelling and growth on the right side of the hard palate, for 4 months. The lesion was painless but caused discomfort and often bled while eating. Patient stated a resembling growth in the same area about two years earlier, which was excised in another institute and biopsy specimen had turned out to be PG. The patient's medical history and extraoral examination were unexceptional. Intraoral examination revealed a large lobulated sessile mass on the hard palate, which was extending buccally toward the space of the extracted right maxillary first molar. It was reddish pink and covered by a pseudomembrane on some areas. The lesion measured approximately 35 mm x 30 mm x 25 mm, with soft to firm consistency and also bled on touch (Figure 1). Periodontal examination revealed inadequate oral hygiene and localized moderate periodontitis in the right maxillary posterior region. According to radiography, there was only horizontal bone loss on the right maxillary posterior teeth due to periodontal disease, but there were no visible abnormalities in the region of the growth (Figure 2). The differential diagnosis comprised peripheral giant cell granuloma, peripheral ossifying fibroma, hemangioma and hyperplastic gingival inflammation. The lesion was provisionally diagnosed as a recurrent PG according to the clinical findings and the previous biopsy report. The patient was asked to give a written informed consent for laser excision of the lesion. Following infiltration local anesthesia (articain 4% with 1:200,000 epinephrine Ultracaine D-S Forte; Aventis Pharma, Istanbul, Turkey), right maxillary first and second premolar and second molar were extracted, due to moderate periodontitis and bone

**Case Report**

A 50-year-old female was referred to the Department of
loss. Then the patient and the whole staff wore protective glasses. A Diode Laser (Doctor Smile Diode Laser, Vicenza, Italy) was used, at 808 nm wavelength and continuous wave mode, with a power output of 2 W and a 0.4 mm diameter fiber optic, for excising the lesion by a trained oral surgery resident. After the laser tip was initiated by rubbing a piece of articulating paper on the fiber to pick up some pigment, the procedure began with outlining the intended incision line. Then the dots were connected to create the designed incision. When the convenient depth was reached, excision was performed by clasping the mass with a forceps, applying traction, and horizontally undermining the tissue. It took 5 minutes to complete the procedure. No sutures were placed after laser surgery and diode laser enabled optimum combination of clean cutting of tissue and hemostasis (Figure 3).

The patient was discharged with necessary post-operative instructions; chlorhexidine mouthwash (0.12%) was prescribed, and a follow-up appointment within 7 days was arranged.

The excised sample was stored in 10% formalin and then sent for histopathological examination. On lower magnification a large ulcerated area covered with fibrin exudate was observed. Otherwise the epithelium was acanthotic, edematous, and invaded by inflammatory cells. Underneath the squamous epithelium, numerous small endothelial lined channels in a lobular structure were seen. A mixed inflammatory cell infiltrate of neutrophils, plasma cells, and lymphocytes was noticed. The lesion had areas with fibrous appearances (Figure 4A). The histopathology confirmed the diagnosis of PG with a positive inferior surgical margin (Figure 4B).

At 7 days follow up visit, immediate recurrence of the lesion was observed. On clinical examination small papules were observed in the same region (Figure 5A) and the patient was scheduled for a second visit to excise the lesion; however she failed to keep her appointment and revisited the clinic 3 weeks later. The lesion had conspicuously increased in size (Figure 5A).

Intraoral examination revealed a lobulated oval mass of 15 mm x 10 mm x 2 mm, red in color and soft in consistency, which bled upon probing. As the patient refused scalpel excision, laser surgery was planned again. The lesion was excised with 2 mm margins at its clinical periphery and to a depth up to the periosteum by the same operator with diode laser (Doctor Smile Diode Laser, Vicenza, Italy), with the same irradiation parameters (Figure 6).

The new sample was sent for histopathological examination and the diagnosis of PG (with negative inferior margin) was reaffirmed. The patient was recalled weekly for 1 month to control for probable recurrence and she was followed up for 14 months, and there has been no recurrence so far (Figure 7 and 8).
Discussion

PG is a well-recognized inflammatory hyperplastic oral lesion which comprises about 1.85% of all oral pathologies, other than caries and gingivitis.\textsuperscript{26} Usually the lesion is neither symptomatic nor painful but minor trauma to the growth can induce significant bleeding. Moreover, PG causes functional problems with mastication, swallowing, speaking and may create esthetic problems.\textsuperscript{2,3,8,9,27-30,32-34,37} In this study the lesion was also painless though it caused discomfort and bleeding while eating, which made the patient go seeking for treatment.

Even though PG is seen in a wide age range, the incidence culminates during the second decade of life, and females seem to be twice more affected. Oral PG occurs most commonly on the gingiva, but can also be encountered on the lips, tongue, buccal mucosa and rarely like this case, it may appear on the hard palate.\textsuperscript{3,13,36}

PG is most commonly treated by surgical excision; but many other treatment modalities, including various types of laser, have also been successfully used.\textsuperscript{2,3,8,9,27-30,32-34,37} Laser surgery offers more benefits compared to conventional treatment modalities such as reduced bleeding, instant sterilization, reduced bacteremia, less need for sutures and/or post-surgical dressing, decreased pain and edema during and after the procedure, less wound contraction and minimal scar tissue formation, faster healing process and increased patients acceptance.\textsuperscript{5,38}

The effectiveness of the flash lamp pulsed dye laser for the treatment of cutaneous PG have been reported by numerous authors for decades.\textsuperscript{26-27} Meffert et al\textsuperscript{39} used the flash lamp pulsed dye laser to treat a resolute intraoral mass of granulation tissue, and deduced that a series of treatments with the pulsed dye laser worked well on this lesion.

Powell et al\textsuperscript{40} reported one of the first uses of Nd:YAG laser for excision of PG, and noticed decreased risk of bleeding in comparison to other methods along with superior coagulation characteristics; which were the reasons why they chose Nd:YAG laser. Kocaman et al\textsuperscript{8} proposed the use of Nd:YAG laser in the treatment of PG, due to its effect of decreasing bleeding during operation with a consequent reduction in operating time, promoted post-operative hemostasis and better patient acceptance.

White et al\textsuperscript{35} used Nd:YAG and CO\textsubscript{2} lasers for the excision of benign intraoral lesions including PGs, which was well endured by patients without intraoperative or postoperative side effects.

Fekrazad et al\textsuperscript{9} preferred Er:YAG laser for excision of a gingival PG and stated that the use of Er:YAG laser can be considered as an effective and safe method for PG excision with minimal invasion. It was also reported that using Er:YAG laser causes less damage on the lesion, hereby the remaining tissue has more pathological value.

Although CO\textsubscript{2} and Er:YAG lasers are suitable for cutting due to their higher absorption in water and less penetration, they provide less coagulation than Nd:YAG and diode laser.\textsuperscript{9}

Diode laser wavelengths are highly absorbed by pigmented tissue whereas they are poorly absorbed by teeth and bones; therefore soft tissue surgeries can be safely done close to tooth structures. Furthermore diode laser can be used in continuous or gated pulse mode by contact or at an extremely close distance to the tissue, which avoids damage, because it prevents the 'beam escape' in an open field and makes this laser safer than other laser sources. Like Nd:YAG and CO\textsubscript{2} lasers, diode lasers have the capability to cut or to vaporize soft tissues.\textsuperscript{35,39,40} In addition, Janda et al\textsuperscript{41} pointed out that diode laser had low thermal effect on depth of carbonized zones at the surface of the tissue in histological examination. Although in our study the depth of carbonized zone would be negligible due to the lesion's large size, likewise we observed similar findings too.

Rai et al\textsuperscript{42} used diode laser for the treatment of an intraoral PG with following irradiation parameters: wavelength 808 nm (± 10), output energy 0.1–7.0 W, and input power 300 VA. Without any complication complete healing of the lesion was achieved, and the researchers asserted that diode laser could be a good therapeutic choice for intraoral PGs.

Recently several other researchers preferred diode laser when performing excision of PGs.\textsuperscript{2,3,8,9,27-30,32-34} In our case we chose diode laser because it ensures relatively bloodless surgical field, which is crucial in these hemorrhagic lesions, improves hemostasis and coagulation, and leaves minimal swelling and scarring after surgery.

Several studies have reported that after simple excision, recurrence occurs in up to 16% of lesions.\textsuperscript{11,35,42,43} Recurrence can be resulted from insufficient excision, failure to eliminate etiologic factors and/or repetitive trauma. Recently, angiopoietin 1, 2 and ephrin b2, agents in other
vascular tumors such as *Bartonella henselae*, *B. Quintana* and human herpesvirus-8, have been presumed to have a part in PG recurrence. Viral oncoenges, hormonal influences, microscopic arteriovenous malformation along with inclusion bodies and gene depression in fibroblasts, have also been implied as causes of PG recurrence. In addition, it should be underlined that generally the recurrence rate is much higher in gingival cases than other oral mucosal sites.\(^1,3,4,9,10\)

Even though several authors reported no recurrence after laser surgery in the management of PGs,\(^1,2,5,9,12\) some clinicians still advocate the ‘surgical excision’ to minimize the risk of recurrence for PGs.\(^9,12\) Moreover in the literature, the injection of absolute ethanol, sodium tetracycl sulfate sclerotherapy and corticosteroids have also been successfully used in recurrent PG cases.\(^2,5,9,10,12\) In this case, insufficient excision and inflammation that result from inadequate oral hygiene could have been the etiology behind the recurrence. However we could not deduce whether diode laser is an effective treatment modality to reduce the recurrence. Further researches are required to investigate the influence of the various types of lasers, laser wavelengths and surgical methods, on the recurrence of PG.

**Conclusion**

Although the use of diode laser in the management of introral PG is a safe technique with several clinical benefits; clinician should eliminate all the causative irritant and/or source of trauma, and the lesion should be excised with 2 mm margins at its clinical periphery and to a depth up to the periosteam to prevent the recurrence of PG. Even so, due to its high recurrence rate, long-term follow-up is recommended.

**Conflict of Interest**

The author has no conflict of interest to declare.

**References**

Recurrent Pyogenic Granuloma of the Hard Palate and Diode Laser


