

Expedited Removal of Pyogenic Granuloma by Diode Laser in a Pediatric Patient

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Abstract:

Introduction: Pyogenic granuloma (PG) is one of the inflammatory hyperplasia seen in the oral cavity. It is a reactionary response to minor trauma or chronic irritation. The most common treatment of PG is surgical excision but alternative approaches such as laser excision have also been proposed especially for pediatric patients.

Case report: Herein, we present a case of gingival pyogenic granuloma in a 6-year-old patient. The lesion was excised successfully with diode laser as a conservative and non-stressful method in a pediatric patient.

Results and conclusion: The use of laser as modern medicine offers a new tool for treatment of oral lesions as comfortable as possible in pediatric patients, which results in less stress and fear in children.

Keywords: pyogenic granuloma; hyperplasia; diode laser; pediatric

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Introduction

Pyogenic granuloma (PG) is an inflammatory hyperplasia which occurs in the oral cavity or on the skin.¹ It was first described by Hullihen in 1844 and the term pyogenic granuloma or granuloma pyogenicum was introduced by Hartzell in 1904.^{2,3}

Although, PG is common on the skin, it rarely occurs in the gastrointestinal tract except for the oral cavity, where it is often found on keratinized tissue.⁴

PG is considered to be a reactive tumor like lesion which arises in response to various stimuli such as chronic low grade local irritation, traumatic injury, hormonal factors or certain kinds of drugs.⁴ Agulio reported formation of PG as a result of injury to a primary tooth and Milano et al reported a case of PG associated with aberrant tooth development.^{5,6} It has been stated that even

eruption of teeth can be a precipitating factor of pyogenic granuloma development.^{4,7,8}

PG may occur in all ages. The peak age of incidence is usually the second decade of life, although a preference for children has been reported by some investigators. It is also more common in young adult females, possibly because of vascular effects of female hormones.⁴

Clinically, PG manifests as a smooth or lobulated exophytic lesion on a pedunculated or sometimes sessile base, which is usually hemorrhagic and compressible.⁴

The differential diagnosis of PG includes peripheral giant cell granuloma, peripheral ossifying fibroma, hemangioma and inflammatory gingival hyperplasia. Final diagnosis is mainly based on biopsy and histopathological examination.⁴

Various treatment techniques have been described for PG. Conservative surgical excision and removal

of the causative irritant or source of trauma are the usual treatments. Also cryosurgery, cauterization with silver nitrate, sclerotherapy, Nd: YAG (Neodymium-Doped Yttrium Aluminium Garnet) and CO₂ (Carbon Dioxide) laser as well as laser photocoagulation have been proposed as treatment options.^{4,9}

Conventional surgery can be followed by several complications such as intraoperative bleeding, difficulties in wound healing and maintenance of sterility during surgery.¹⁰

The use of lasers in a variety of surgical procedures has been well documented. Diode lasers present a solid semiconductor as active medium, by associating aluminum, gallium, and arsenate (with wavelengths varying between 800 and 980 nm) in the visible and invisible range of near infrared waves. As its wavelength is poorly absorbed by hard dental tissue, diode laser is safe and well indicated for soft oral tissue surgeries in regions near the dental structures and for cutting, vaporization, curettage, blood coagulation, and hemostasis in the oral region.¹¹

Powell et al reported the use of Nd: YAG laser for excision of PG, with lower risk of bleeding compared to other surgical techniques.¹² Diode laser was also introduced as a powerful tool for treatment of pyogenic granuloma by Rai et al.⁹

Diode laser with wavelength of 810-980 nm have been used for soft tissue cutting in pediatric patients. Advantages of lasers in removal of soft tissue lesion in pediatric patients include less hemorrhage and post-surgical discomfort.¹³

Case presentation

A 6-year-old male patient was referred to Laser Department of Shahid Beheshti University of Medical Sciences. The patient parents complained of a lesion on the gingiva which was first noticed two months ago and had gradually increased in size. The parents stated that the first permanent molar started to erupt about three months ago. Extra oral examination and review of system did not reveal any systemic disorder.

On clinical examination solitary sessile, exophytic mass, red in color and soft in consistency which was about 11×13mm in diameter was seen on the right mandibular buccal gingiva between 2nd primary molar and 1st permanent molar. The lesion was lobulated with a smooth surface which was ulcerated and covered with fibrinoleukocyter exudate on some areas (Figure 1, 2). It also bled on touch. Panoramic X-ray of the patient was

not associated with any bony lesions (Figure 3). Based on clinical findings a provisional diagnosis of pyogenic granuloma was made.

Written informed consent was obtained from the patient's parents for excising the lesion by diode laser. The patient and the whole staff were asked to wear protective glasses. After infiltration of local anesthesia,



Figure 1. Clinical view of the lesion



Figure 2. Lobulated exophytic lesion with areas of ulceration

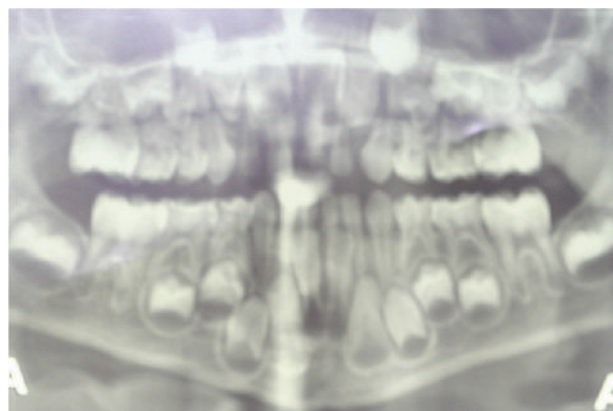


Figure 3. Panoramic view of the patient

Diode laser GA-AL-AS (Gallium/Aluminum/Arsenide) (Doctor Smile Diode Laser, Italy) at 810 nm wavelength and continuous wave mode with a power output of 3 watt and a 0.4-mm diameter fiber optic was set for excising the lesion by a trained oral medicine resident. The tip was directed at an angle of 10 to 15 degrees, moving around the base of the lesion with a circular motion. It took 3 minutes to complete the procedure. The diode laser provided an optimum combination of clean cutting of the tissue and hemostasis (Figure 4). The patient was discharged with necessary post-operative instructions for maintenance of good oral hygiene and keeping the area clean. No additional analgesic or antibiotic was recommended. The patient was visited in 14 days and the healing process was desirable (Figure 5). No recurrence of the lesion was reported by patient's parents in 13 months.

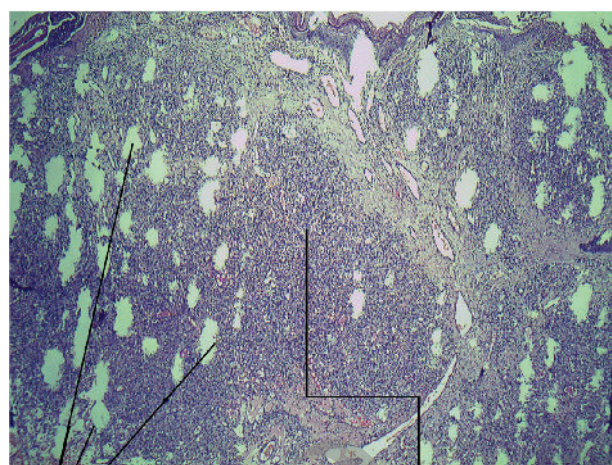
The specimen was sent for histopathological examination in formalin Buffer Solution 10%. Histopathological view of the specimen stained by Hematoxylin and eosin showed a soft tissue fragment covered by Para keratinized stratified squamous epithelium which was ulcerated and



Figure 4. Immediately after excision of the lesion



Figure 5. Follow up visit in 14 days



Section of vessels

Connective tissue with scattered inflammation and granulation tissue

Figure 6. Microscopic view showing capillary blood vessels and scattered inflammation that resembles granulation tissue. (H&E stain $\times 40$).

replaced by fibrinoleukocyte membrane in some spaces. Proliferation of multiple blood vessels, hemorrhage and inflammatory cell infiltration was also seen in the connective tissue (Figure 6). The characteristics confirmed the diagnosis of PG.

Discussion

Hyperplastic reactive lesions which include inflammatory gingival hyperplasia, oral pyogenic granuloma, peripheral giant cell granuloma and peripheral cemento-ossifying fibroma are among the most common oral lesions.^{4,14}

Unanimously it is agreed that PG is formed in response to various stimuli such as chronic low grade local irritation, traumatic injuries and certain kinds of drugs. Injury to primary tooth, aberrant tooth development and even eruption of teeth as seen in the present case have also been mentioned in the literature as precipitating factors for the development of PG.^{4,7,8,15} In the present case, eruption of 1st permanent molar and probable impaction of food debris could have been the predisposing factors.

Although a wide age range (4.5 to 93 years old) has been postulated for oral PG, the highest incidence is the 2nd decade of life.^{4,16}

Conservative surgical excision and elimination of causative irritant is the usual treatment. Also cryosurgery, cauterization with silver nitrate, sclerotherapy, Nd:YAG and CO₂ laser as well as laser photocoagulation have

been proposed as treatment options.^{4,9}

Powell et al applied Nd: YAG laser for excision of PG. Lower risk of bleeding compared to other surgical techniques and superior coagulation characteristics over CO₂ laser was observed.¹²

White et al also proposed that CO₂ and Nd: YAG lasers are successful surgical options when performing excision of benign intraoral lesions. Advantages of laser therapy include minimal postoperative pain, conservative site-specific minimally invasive surgeries, and elimination of need for sutures. Laser excision is well tolerated by patients with no adverse effect.¹⁶ Also flash lamp pulsed dye laser was used by Maffert et al for excision of a mass of granulation tissue which did not respond to the usual treatment methods.¹⁷

Rai et al introduced laser as a powerful tool for treatment of pyogenic granuloma. They used diode laser with the following specifications: wavelength 808 nm (± 10), output energy 0.1–7.0 W, and input power 300 VA for removal of PG. The authors stated that diode laser could be a good therapeutic option for intraoral pyogenic granuloma. They proposed laser therapy, since it has the advantage of being less invasive, limitation of hemorrhage during surgery, a better field of view for the surgeon and sutureless procedure with minimal postoperative discomfort. Reduced intra-operative and post-operative complications have been associated with laser use for oral soft tissue surgery.⁹

Akbulut et al stated that diode lasers are useful for oral soft tissue surgical procedures because their specific wavelength (810-980 nm) is absorbed by water (although less than the carbon dioxide laser wavelength) and also other chromophores, such as melanin, and in particular, oxyhemoglobin. Moreover, the exclusive use of this laser by contact or at an extremely close distance avoids damage, due to 'beam escape,' in an open field, which makes it much safer than other laser sources. Also diode lasers have the ability to cut the tissue to perform coagulation and hemostasis, and have a higher tissue ablation capacity and enough bleeding hemostatic properties compared to most laser systems.¹¹

Diode laser with 810-980 nm wavelengths has been used for soft tissue cutting in pediatric patients. Advantages of lasers in removal of soft tissue lesions in pediatric patients include less hemorrhage and post-surgical discomfort.¹³

It has also been documented in numerous studies that laser creates locally sterile conditions which would result in the reduction of bacteremia concomitant to the operation.¹⁰

From another perspective application of laser in oral soft tissue surgery for pediatric patients would result in less stress and fear in patients.¹³ The patient did not complain of any discomfort during and after the procedure.

Conclusion

The use of laser for soft tissue surgeries such as removal of pyogenic granuloma would lessen stress and fear of pediatric patients and would also minimize discomfort during and after surgery.

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