



Diode Laser as Minimal Invasive Treatment Modality for Oral Pyogenic Granuloma in a Pediatric Patient: A Case Report

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Abstract

The pyogenic granuloma is a soft-tissue growth relatively common in oral cavity, which is considered as reactive rather than neoplastic in nature. The pyogenic granuloma may occur at any age, but its peak incidence occurs in the second decade of life. Lasers emerged as an alternative surgical tool for such soft-tissue lesions. Till now, there was no case reported in the literature about using diode laser for pyogenic granuloma in the pediatric patient. This article presents a case report of an 11-year-old boy with pyogenic granuloma in the anterior hard palatal region in relation to marginal gingiva of central incisors. A GaAlAs diode laser with wavelength 808 ± 10 nm was used to perform laser surgery with parameters settings such as: Pulse-power: 5 W; Pulse-Length: $26 \mu\text{s}$; Frequency 20 kHz, Average output: 5 W. The fiber tip of 400 μm in contact mode was used for conducting the laser beam in excising the lesion. The whole laser surgical procedure was performed successfully and was found advantageous in intra-operative and post-operative aspects with faster and good healing in follow-up visits. The behavior and anxiety of the patient were assessed before, during, and after the laser surgery procedure using the Venhams's anxiety scale. Hence, Laser was found as the conservative surgical tool for pyogenic granuloma for minimally invasive dentistry and helped in instilling a positive dental attitude and behavior in pediatric patient.

Keywords: Case report, diode laser, minimally invasive dentistry, oral pyogenic granuloma, oral vascular lesion

Introduction

Pyogenic granuloma is a soft-tissue growth, relatively common in the oral cavity, which is considered as reactive rather than neoplastic in nature.[1] Although, its etiology is still not very clear, but this lesion is thought to be the exuberant response of tissue to local irritation, traumatic injury,[2] hormonal imbalance, or due to certain drugs.[3] Clinically, pyogenic granuloma mostly appears as a soft, lobulated, pedunculated or sessile

nodular mass that is frequently hemorrhagic and compressible.[3] It may vary in size from a few millimeters to several centimeters. Intra-orally, they have predilection mostly for marginal gingiva followed by palate, buccal mucosa, tongue, and lips.[3]

The pyogenic granuloma may occur at any age, but its peak incidence occurs in the second decade of life.[4] It has also been reported in children by few investigators.[4] It is also seen in young adult women, probably due to vascular effects of female hormones.[3]



Various kinds of treatment modalities have been described for oral pyogenic granulomas. Traditionally, conservative surgical excision of the mass-like growth along with the elimination of the causative irritant. Other treatment options are cryosurgery, cauterization with silver nitrate, sclerotherapy, and lasers.[3,5] Conventional surgical excision of such lesion may be accompanied by several complications such as intraoperative bleeding, longer wound healing duration, and maintenance of sterility during surgery.[6] However, in the pediatric patient, behavior management is pivotal in the surgical treatment of such kind of oral lesions. Faster, painless, aseptic, minimal hemorrhage, no need of suture, lesser post-operative pain/discomfort, along with faster healing, are the realistic advantages of laser in the treatment of pyogenic granuloma in children. Lasers emerged as an alternative treatment tool for such soft-tissue lesions. So far, there is no case of oral pyogenic granuloma of the hard palate in a pediatric patient treated with diode laser reported in the literature. The current article presents a case report of pyogenic granuloma of hard palate in a pediatric patient treated successfully by using diode laser without any local anesthesia, antibiotics, and analgesics. The patient's behavior and anxiety were evaluated before, during, and after the laser surgical procedure using the Venham's anxiety scale (1980). This case report article has been written as per the CARE checklist case report guidelines.

Case Presentation

An 11-year-old male patient reported to the out-patient department of Pediatric Dentistry with a complaint of nodular-growth mass-like swelling on the palate in relation to marginal gingiva of central incisors for about two months. The patient also complained of occasional bleeding from the same nodular swelling along with discomfort during eating and brushing the teeth. The medical history revealed that the patient has good health, without any previous systemic ailments. Dental history revealed irregular oral hygiene practices in the patient and also had a history of penetration of fruit seed into the palate behind upper front teeth for about 2 months back. The patient's family and psychosocial history were not significant. The patient showed positive behavior as assessed by Frankl's behavior rating scale (1962).

On general physical examination, patient was found systemically healthy. Intra-oral examination revealed a localized erythematous smooth lobulated sessile mass-like growth on the midline of anterior hard palate in relation to marginal gingiva of maxillary central incisors

measuring about 0.8×0.9 cm. On palpation, the mass was soft and compressible that readily bled on probing or on touch. The periodontal assessment did not reveal periodontal pockets, but abundant extrinsic stains, high plaque and calculus score was observed with poor oral hygiene index (Fig. 1). In the radiographic examination, no bone involvement was seen (Fig. 2).

Differential diagnoses included oral pyogenic granuloma, dentoalveolar abscess, peripheral giant cell



Figure 1. Pre-operative intra-oral view of pyogenic granuloma



Figure 2. Pre-operative radiograph showing no bony or periapical involvement

granuloma, fibroma, hemangioma, hyperplastic gingival inflammation, Kaposi's sarcoma.

The clinical diagnosis of oral pyogenic granuloma was established based on the patient's case history, characteristic oral examination findings, and history of trauma due to impingement of sharp fruit's seed with poor oral hygiene status.

Patient's parents were explained about the diagnosis, treatment modalities, and prognosis. Excision of pyogenic granuloma using diode laser was planned for the present case. Written informed consent was obtained from the patient's parents.

Firstly, oral prophylaxis with scaling was done on the first visit. Subsequently, laser excision of pyogenic granuloma was scheduled after 3 days.

Tell show do (TSD) technique was employed as behavior management to keep the patient relaxed and cooperative during the entire procedure of laser surgery. The behavior and anxiety of the patient before, during and after the laser treatment procedure was assessed by using Venham's anxiety scale (1980). All the necessary precautionary safety measures were adopted during laser surgery.

A diode laser (Elexxion claros pico® Singen Germany); laser class-4 GaAlAs diode, with a wavelength 808 ± 10 nm, was used to perform laser surgical procedure with the parameter settings: Pulse-power: 5 W; Pulse-Length: $26 \mu\text{s}$; Frequency 20 kHz, Average output: 5 W (Fig. 3). The fiber tip of $400 \mu\text{m}$ was used for conducting the laser beam in excising the lesion.

First, the operating area was anesthetized with topical lidocaine anesthetic spray (Nummit Spray, ICPA Health Products Ltd), and then 5 minutes later, the pyogenic granuloma mass was excised by using a fiberoptic probe of the laser device in pulse mode. The fiberoptic tip was directed at an acute angle of about 15 degrees and was moving circumferentially around the base of the pyogenic granuloma lesion in a circular fashion. The excision area palatal to maxillary incisors bled slightly and then coagulated within few seconds. The sufficient time was given in between the fiber tip applications for tissue cooling. The laser energy produces a coagulation layer on the excision surface of the operating area. Hemostasis was achieved adequately during the entire laser surgical procedure (Fig. 4). Hence, no sutures were needed to place after laser excision of the growth. Antibiotics and non-steroid anti-inflammatory drugs were not prescribed. Patient was sent to home with important post-operative instructions. Patient and parents were advised for regular follow-up visits for clinical evaluation. The patient

showed cooperative behavior before, during, and after the entire laser surgical procedure as assessed by Venham's anxiety scale.

The excised tissue specimen for biopsy was stored in 10% formalin solution and then sent for histopathological examination. The result of the biopsy confirmed the pyogenic granuloma in the current case report.



Figure 3. Photograph of diode laser machine used for excision of pyogenic granuloma



Figure 4. Immediate post-operative view of excision surface after laser surgery

On follow-up visits, the healing was found satisfactory after the first week of laser surgery (Fig. 5). Subsequently, it was found completely healed without any scar after one month of laser surgery (Fig. 6). The patient was advised for meticulous oral hygiene practices and long-term follow-up visits. The patient's parents reported no recurrence in one year follow-up period.

Discussion

Pyogenic granuloma is a kind of reactive inflammatory hyperplastic tissue lesion.[1] The lesions having common clinical features constitute the differential diagnosis like hemangioma, peripheral giant cell granuloma, inflammatory gingival hyperplasia, and peripheral ossifying fibroma, etc.[5]

In order to establish the diagnosis of a reactive hyperplastic lesion like pyogenic granuloma, factors such as poor oral hygiene (dental calculus, plaque), few

unspecified infections as well as over-contoured defective dental restorations, hormonal disturbances during puberty or pregnancy, certain drugs, and any episode of traumatic injury to the oral cavity should be considered. [3] These irritation factors make the underlying fibrovascular connective tissue hyperplastic, and also there is proliferation of granulation tissue that leads to pyogenic granuloma formation.[3]

In the present case, the patient was at the age of puberty and had abundant plaque and calculus, and also had a history of traumatic injury due to penetration of any sharp fruit seed into the palate. Hence, the history of traumatic impingement on the anterior hard palate, puberty age, poor oral hygiene status, and characteristic features of the lesion were suggestive of pyogenic granuloma.

Oral pyogenic granuloma poses functional problems with mastication, speaking, deglutition, and cosmetic deformity. Minor trauma to pyogenic granuloma elicits bleeding followed by ulceration occurs. Nutrition and oral hygiene practices may also be hampered due to such soft-tissue oral lesions.

Although surgical resection with or without embolization has been suggested for oral vascular lesions, but the complications like scarring and bleeding occur. In literature, up to 16% recurrence rate of pyogenic granuloma after excision has been reported.[3] The reason of recurrence has been believed to be due to incomplete excision of the mass, failure to eliminate causative factors, and might be due to re-injury to the same lesion site.[3] In the present case, no recurrence was reported by the patient's parents.

The laser as a therapeutic modality for the excision of an oral vascular lesion like pyogenic granuloma has been reported as a conservative, effective, and better-tolerated treatment option.[7] Lasers also make conservative site-specific minimally invasive surgeries with no use of sutures without intra-operative hemorrhage and also cause faster healing.[8]

Lasers such as Nd:YAG, CO₂ laser, flash lamp pulsed dye laser have been used for the treatment of oral pyogenic granuloma with success.[3] In pediatric patients, diode laser with a wavelength range of 810–980 nm has been employed for soft tissue surgeries.[8,9] In the present case also, the lesion was treated without any intra-operative and post-operative complications. No recurrence of the lesion was reported in the present case.

In their case report, Rai et al[5] used a diode laser of wavelength 808 (± 10 nm), output energy 0.1–7.0 Watt for the excision of the lesion, and reported that diode



Figure 5. Follow-up after one week of laser surgery

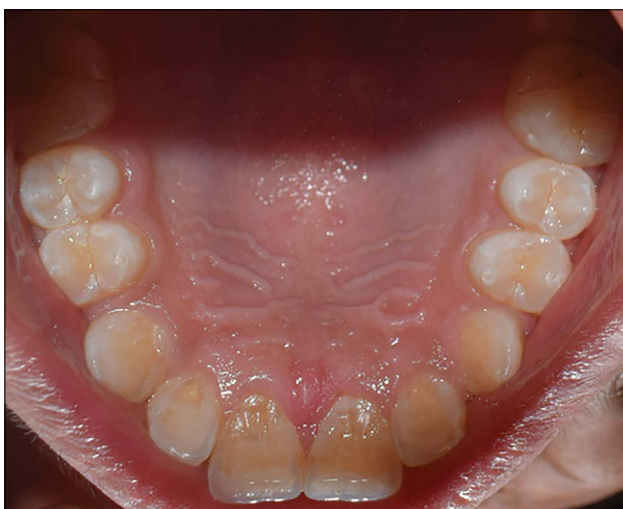


Figure 6. Follow-up after one month of laser surgery

laser can be a good treatment option for oral pyogenic granuloma.[5]

Akbulut et al[9] reported that diode lasers are useful for soft tissue surgeries of oral cavity due to its specific wavelength 810nm that is absorbed by water and also by chromophores like oxyhemoglobin and melanin. They also stated that diode laser should be used either in contact mode or in close distance to the lesion to be excised.[9] Diode lasers have a higher tissue ablation capacity and hemostatic properties during surgery in contrast to other lasers.[9]

During a surgical procedure, laser maintains the sterile condition in the surgical area that leads to reduction in bacteremia.[8]

In the present case report, a diode laser of wavelength 810 nm was chosen to treat oral pyogenic granuloma because of its advantages in oral soft tissue procedures. The diode laser of 810 nm wavelength has been called as the versatile laser due to its advantages and applications in various procedures like soft-tissue surgery, periodontal therapy, endodontics, implantology, and tooth whitening.[10]

In Laser surgery, thermal damage may occur in anatomical structures like the underlying periosteum and bone, and this can be stopped from occurring by using an appropriate power of laser beam, by keeping the orientation of the laser beam parallel and also away from the underlying periosteum/bone and also employing appropriate time intervals between laser beam applications to allow sufficient cooling of tissue.[10] In the present case, the laser fiber tip was also held at an appropriate smaller angle or almost parallel to the lesion to protect the underlying periosteum or bone.

The soft tissue diode lasers (diode laser 810nm) have an excellent incision performance in epithelium with a cutting (penetration) depth of 2–6mm into the tissue. [10] However, the major drawback of such a diode laser of wavelength 810nm is its inability to perform the hard tissue surgical procedures like cavity preparation, bone cutting, etc.[10]

Most importantly, lasers provide a stress-free environment and instill a positive dental attitude in children during dental visits.[11] The reduction of stress and fear during oral surgical procedures are because needles, scalpels, sutures, and syringes containing local anesthesia are usually not required during laser surgery. In the present case also, the patient did not demonstrate any kind of pain and anxious behavior intra-operatively.

From preventive perspectives, Parents should be made aware regarding the importance of their children's dental visits in early age for optimal oral health

care.[12] Routine dental check-ups can help in early identification of risk-factors, etiological factors of oral and dental-related problems and hence can be intervened appropriately.

Conclusion

In the present case report, treatment of pyogenic granuloma using the diode laser of 810nm wavelength resulted in good and faster healing without any complications and recurrence. Usage of laser showed a reduction in surgery-related fear and instilled a positive dental attitude in the pediatric patient, which was evaluated by Venham's anxiety scale scores. Hence, diode laser can be used as an alternative therapeutic modality for oral pyogenic granuloma in pediatric age-group with minimally invasive dentistry approach.

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Conflict of Interest: None declared.

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