



Successful Diode Laser Management of a Lip Pyogenic Granuloma in a Patient With Anemia

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Abstract

Introduction: Pyogenic granuloma (PG) is a benign vascular lesion prone to significant bleeding when manipulated. High-power lasers provide key advantages, including precise incision, vaporization, and hemostasis, when managing such lesions, enhancing both intraoperative efficiency and postoperative recovery.

Methods: This report describes the diagnosis and surgical excision of a large PG on the lower lip of an anemic patient using a high-power diode laser.

Results: A 30-year-old female patient presented with a nodular, erythematous, pedunculated lesion with firm consistency and an ulcerated surface, measuring approximately 2 cm. Initial evaluation revealed severe anemia (hemoglobin level of 6 g/dL) caused by a uterine fibroid. After partial improvement of the anemia, an excisional biopsy of the lesion was performed using a high-power diode laser, which provided effective hemostasis during surgery and no postoperative complications. Histopathological examination of the excised tissue confirmed the diagnosis of PG.

Conclusion: This case highlights the efficacy and safety of high-power diode lasers in managing oral lesions, especially in the management of systemic conditions such as anemia. The laser's ability to ensure precise excision and effective hemostasis demonstrates its potential as an indispensable tool in modern minimally invasive surgical approaches, particularly in aesthetic and medically complex cases.

Keywords: Granuloma; Pyogenic; Laser therapy; Anemia; Lip; Biopsy.

Introduction

Non-neoplastic proliferative lesions are commonly observed in the stomatognathic system, arising from an increase in cell division in response to stimuli such as trauma or inflammation. Pyogenic granuloma (PG), one of the most frequent oral lesions, is a benign, highly vascular lesion that can occur in the skin or mucous membranes.¹ PG is particularly prevalent in children, young adults, and pregnant women, with a strong predilection for females.^{2,3}

Initially thought to arise from pyogenic (infectious) factors, PG is now understood as a reactive lesion triggered by local irritation or trauma, with no direct infectious cause. Hormonal influences, particularly during pregnancy, also contribute to its pathogenesis by stimulating angiogenic factors such as vascular endothelial growth factor (VEGF), leading to increased vascularization.^{4,5} The term granuloma gravidarum was historically used for PG in pregnant women but has fallen out of favor due to its limited diagnostic specificity.⁶

Clinically, PG typically presents as a painless, pedunculated or sessile lesion that may become ulcerated, with varying coloration. The lesion is prone to bleeding,

particularly in the gingival region, and can rapidly grow, often leading patients to fear malignancies.^{4,5} The main treatment modality is surgical excision, with recurrence rates ranging from 0% to 16%, often linked to the persistence of the causative factor.^{6,7}

The management of PG in extra-oral sites, such as the lips and facial skin, requires additional considerations compared to oral locations. In these areas, effective treatment must not only ensure complete lesion removal and bleeding control but also prioritize aesthetic preservation and functional recovery.⁸ Additionally, differential diagnosis requires the exclusion of malignant and infectious conditions such as amelanotic melanoma, Kaposi's sarcoma, and bacillary angiomatosis, making histopathological confirmation essential.³

In cutaneous presentations, PG can be managed with a variety of therapeutic approaches, ranging from topical agents such as 5% imiquimod, beta-blockers (timolol, propranolol), and intralesional corticosteroids to physical methods including cryotherapy, curettage with cauterization, and sclerotherapy.⁸ However, surgical excision with primary closure remains the treatment

of choice for either cutaneous or mucous PG, with recurrence rates ranging from 0% to 16%, often linked to the persistence of the causative factor.⁷

Several surgical techniques have been proposed to optimize PG management, including cryosurgery, intralesional steroid injections, electrocauterization, and laser surgery. High-power diode lasers have gained prominence in dentistry due to their cost-effectiveness, portability, and excellent hemostatic properties. Their ability to promote precise excision, microvascular sealing, and reduced postoperative inflammation makes them particularly advantageous in soft tissue surgery.^{9,10}

Beyond their general benefits, the use of high-power lasers is especially relevant in patients with systemic conditions that increase surgical risks, such as anemia. Given that PG is a highly vascular lesion with a tendency for significant bleeding, surgical management in anemic patients poses additional challenges.^{11,12} This study reports the successful surgical excision of a large PG on the lower lip of an anemic patient using a high-power diode laser, highlighting its advantages in achieving effective hemostasis and optimizing clinical outcomes.

Case Report

A 30-year-old female patient from Aracoiaba, Ceará, Brazil, presented to the Dentistry School Clinic at Christus University Center with a chief complaint of a “lump on the lip” that had been developing for five months. She attributed the lesion to recurrent trauma from accidental biting of her lower lip.

During anamnesis, the patient reported a history of hemorrhagic stroke 10 years prior and was undergoing treatment with topiramate (200 mg/d) for seizures and ferric polymaltose (400 mg/d) for anemia. Her seizures were well controlled, with no recent episodes, minimizing the perioperative neurological risk. She was also receiving treatment for a uterine leiomyoma, requiring additional ferrous sulfate injections every two weeks.

Clinical examination revealed a 2.5 cm nodular, erythematous, pedunculated lesion with a firm consistency and ulcerated surface on the lower lip (Figure 1). The patient reported spontaneous bleeding episodes. The diagnostic hypothesis of PG was based on clinical findings, and hematological tests (complete blood count and coagulation profile) were requested before surgical intervention.

Laboratory results indicated microcytic/hypochromic anemia, with hemoglobin of 6.0 g/dL initially, which improved to 9.1 g/dL after two ferrous sulfate injections over a two-week period, allowing for safer surgical planning (Table 1). An additional dose was scheduled for the postoperative period, with the expectation of further improvement in hematological parameters. Given the risks associated with surgery and the lesion's impact on the patient's quality of life, excisional biopsy using a high-



Figure 1. Initial clinical aspect of the lesion, in a frontal view (a), right lateral view (b), and left lateral view (c), showing a 2.5 cm nodular, erythematous, pedunculated lesion on the lower lip, with areas either ulcerated or covered by fibrinous-hemorrhagic crust

power diode laser was planned.

Preoperative medication included amoxicillin (500 mg every 8 hours for 7 days), nimesulide (100 mg every 12 hours for 5 days), and dipyrone monohydrate (500 mg every 6 hours as needed). The procedure was performed under local anesthesia with 2% mepivacaine and 1:100,000 epinephrine. Using Dietrich forceps for stabilization, the lesion was excised with a high-power diode laser (Thera Lase Surgery®, DMC, Brazil) at 980 ± 20 nm, continuous mode, and 4W power, with a 400 μ m optical fiber. A total of 100.5 Joules was applied for incision, removal, and hemostatic control. The wound was closed with interrupted 4-0 nylon sutures (Figure 2a), and the specimen was sent for histopathological analysis. The operative time from incision to complete excision and hemostasis was approximately 7 minutes.

Histopathology confirmed PG, showing proliferating capillary vessels, inflammatory infiltrate, and hemorrhage without malignancy (Figure 3). At the 7-day follow-up, healing progressed well, with no infection (Figure 4a). At the 4-month follow-up, the patient showed complete lesion remission, no recurrence, and no scarring, achieving excellent aesthetic and functional outcomes (Figure 4c).

Discussion

Although traditionally associated with the gingival region, PGs can develop in response to various irritating stimuli, such as trauma, dental calculus, biofilm accumulation, chronic irritation, ill-fitting restorations, occlusal interference, food impaction, periodontitis, and pre-existing vascular lesions.¹

Table 1. Hematological Parameters (Erythrogram)

Parameter	1st Test	2nd Test	Reference Range
Red blood cells (million/mm ³)	3.43	4.05	3.7 – 5.3
Hemoglobin (g/dL)	6.0	9.1	11.5 – 15.7
Hematocrit (%)	22.0	26.4	35 – 47
VCM (fL)	64.1	65.2	80 – 99
HCM (pg)	19.8	22.5	27.0 – 32.0
CHCM (g/dL)	30.9	34.5	32.0 – 36.0
RDW (%)	16.0	18.8	11.9 – 15.5

Caption: VCM: Mean Corpuscular Volume; HCM: Mean Corpuscular Hemoglobin; CHCM: Mean Corpuscular Hemoglobin Concentration; RDW: Red Cell Distribution Width.

In this case, the patient's demographic profile—gender, age, and trauma history—aligned with findings from previous studies, including Brazilian reports. However, PG occurrence on the lower lip is uncommon.^{7,13} The diagnosis was based not only on clinical features but also on anamnesis, as PG can mimic neoplastic and other vascular lesions.³ Differential diagnoses include hemangioendothelioma, hemangioma, vascular malformations, Kaposi's sarcoma, and amelanotic melanoma.¹⁴ Additionally, certain lymphomas can present with similar clinical features, necessitating histopathological confirmation.³

Surgical excision remains the standard treatment for PG, though it is associated with risks such as excessive bleeding, pain, and recurrence. Alternative conservative treatments, including beta-blockers, sclerotherapy, and intralesional corticosteroid injections, have been considered, particularly in recurrent cases.^{15–17}

PG is also managed with cryotherapy and electrosurgery, both of which are effective but sometimes associated with incomplete removal or greater postoperative discomfort compared to laser excision. In this case, the diode laser offered precise tissue ablation with excellent intraoperative hemostasis, which was especially beneficial given the patient's anemia.

The choice of treatment should be based on lesion-related factors (diagnosis, location, extent) and patient-related factors (systemic health, age).¹⁸ In this case, the patient had microcytic/hypochromic anemia, likely exacerbated by a uterine leiomyoma.

Anemia, defined by the World Health Organization as a reduction in hemoglobin concentration, is a prevalent condition worldwide, with iron deficiency anemia being the most common subtype.¹⁹ It results from inadequate red blood cell production, increased destruction, or significant blood loss.²⁰ Among women of reproductive age, iron deficiency anemia is often due to dietary deficiencies, impaired absorption, or chronic blood loss from gynecological or gastrointestinal disorders. It is also linked to inflammatory conditions, malignancies, infections, and other nutritional deficiencies.²¹

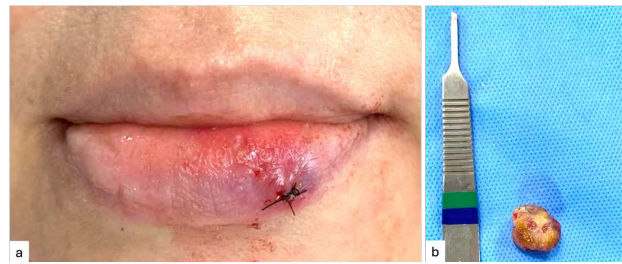


Figure 2. a. Immediate postoperative clinical aspect, showing a sutured area for additional hemostatic control and minimization of aesthetic defects. b. Surgical specimen sent for histopathological examination

The patient's gynecological condition, classified by the Fédération Internationale de Gynécologie et d'Obstétrique (FIGO) as a major cause of abnormal uterine bleeding, likely contributed to her anemia. Other causes include endometrial polyps, adenomyosis, malignancies, coagulopathies, ovulatory dysfunction, and iatrogenic factors.²² In this case, anemia was managed with ferrous sulfate supplementation, a standard therapeutic approach.²¹

Anemic patients have reduced immune competence, making them more susceptible to infections. Oral manifestations include angular cheilitis, aphthous lesions, glossitis, and lingual depapillation. Special precautions are required for surgical procedures due to impaired healing and increased bleeding risk. Shorter appointments are advised, and local anesthetics with vasoconstrictors, such as epinephrine (1:100,000), are preferred for hemostasis. Empirical antibiotic prophylaxis is often recommended to prevent secondary infections, aligning with this patient's management. Multidisciplinary coordination is essential to optimize outcomes, including anemia correction through supplementation or transfusion if needed.²⁰

High-powered lasers have emerged as a valuable alternative to traditional cold scalpel excision for PG treatment. Their advantages include superior hemostasis, enhanced healing, reduced postoperative pain and edema, and improved operative field visualization.²³ Laser technology also offers bactericidal and photobiomodulation effects, supporting its increasing use in soft tissue surgery.^{24,25} However, microscopic evaluation of laser-assisted healing remains an important research area.^{26,27}

In this case, laser excision was chosen due to the patient's systemic condition and the lesion's vascular nature. This approach effectively minimized intraoperative and postoperative bleeding. To further reduce recurrence risk, the procedure included complete removal of the lesion base, as well as patient counseling to avoid mechanical trauma to the area, especially during the healing period. Although additional hemostatic measures could have been employed, the laser procedure alone was sufficient to control hemorrhage.

Histopathological analysis confirmed the diagnosis of

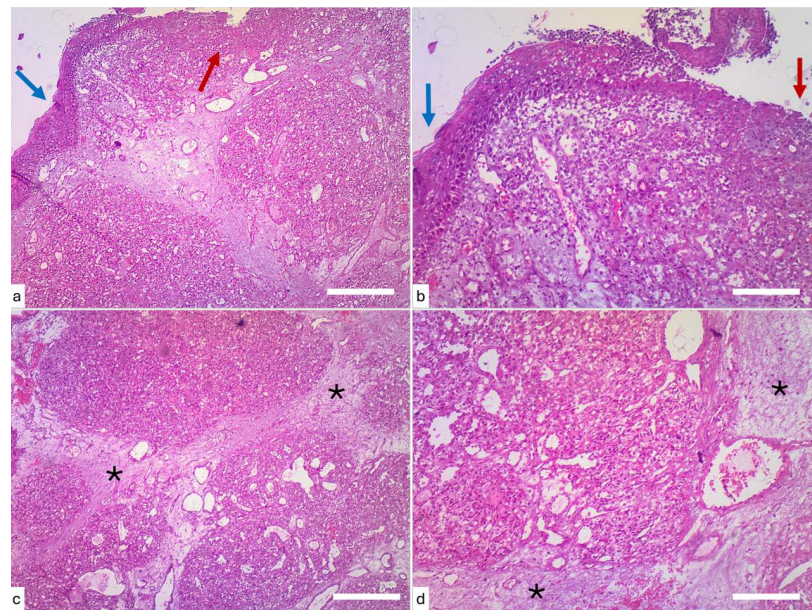


Figure 3. Photomicrographs illustrating: Histological sections of mucosa lined by stratified squamous epithelium (a and b, blue arrow), showing an area of ulceration (a and b, red arrow). The underlying connective tissue is highly vascularized (c and d), with proliferation of newly formed capillaries of varied diameters, lined by non-atypical endothelial cells (d), arranged in a lobular pattern, separated by fibroconnective tissue septa (c and d, black asterisks). A mixed inflammatory infiltrate is present, predominantly composed of neutrophils, lymphocytes, and plasma cells, along with areas of recent hemorrhage and hemosiderin deposits



Figure 4. **a and b:** Clinical appearance of the lower lip region at the 7-day follow-up, before (a) and after (b) suture removal, in a frontal (a) and lateral (b) view, showing good healing by secondary intention with a slight surrounding erythematous area. **c and d:** Four-month follow-up, in a frontal (c) and lateral (d) view, showing slight hypopigmentation with a normal appearance in the operated region, with no clinical signs of recurrence or hypertrophic scars

PG, showing a dense connective tissue with a high density of newly formed vessels, granulation tissue, inflammatory cells, and fibroblasts. The superficial epithelium exhibited focal ulceration, consistent with the previous literature.^{28,29} These findings highlight the importance of histological examination in distinguishing PG from other lesions with similar clinical presentations. In this case, the absence of atypical mitotic figures, cellular pleomorphism, and infiltrative growth patterns, combined with the

characteristic lobular capillary proliferation, confidently excluded malignant entities.

Conclusion

In conclusion, this case underscores the necessity of a comprehensive diagnostic approach for PG, particularly in atypical locations. The successful management of this patient demonstrates the importance of individualized treatment planning, including the preoperative

optimization of systemic conditions and the integration of minimally invasive techniques such as high-powered laser excision. This approach not only ensured optimal hemostasis and minimized intraoperative bleeding but also promoted superior healing with minimal scarring, ultimately restoring both function and aesthetics. The use of advanced laser technology in PG treatment represents a promising alternative to conventional surgical methods, particularly in medically compromised patients, contributing to improved clinical outcomes and quality of life.

Authors' Contribution

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Ethical Approval

This case report was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from the patient's guardian for both treatment and publication of clinical information/images. The study protocol was reviewed and approved by the Ethics Committee of Christus University Center – Unichristus, Fortaleza, Brazil.

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References

- Lomeli Martinez SM, Carrillo Contreras NG, Gómez Sandoval JR, Zepeda Nuño JS, Gomez Mireles JC, Varela Hernández JJ, et al. Oral pyogenic granuloma: a narrative review. *Int J Mol Sci.* 2023;24(23):16885. doi: [10.3390/ijms242316885](https://doi.org/10.3390/ijms242316885).
- Coran AG, Adzick NS, Krummel TM, Laberge JM, Shamberger R, Caldamone A. *Pediatric Surgery: Expert Consult-Online and Print.* Elsevier Health Sciences; 2012.
- Wollina U, Langner D, França K, Gianfaldoni S, Lotti T, Tchernev G. Pyogenic granuloma - a common benign vascular tumor with variable clinical presentation: new findings and treatment options. *Open Access Maced J Med Sci.* 2017;5(4):423-6. doi: [10.3889/oamjms.2017.111](https://doi.org/10.3889/oamjms.2017.111).
- Aldelaimi AA, Enezei HH, Humadi TY, Mohammed KA, Aldelaimi TN. Pyogenic granuloma of oral and maxillofacial region. *Res Sq [Preprint].* February 28, 2024. doi: <https://doi.org/10.21203/rs.3.rs-3954202/v1>.
- Neville BW, Damm DD, Allen CM, Chi AC. *Oral and Maxillofacial Pathology Elsevier eBook on VitalSource.* Elsevier Health Sciences; 2023.
- Meshram M, Durge K, Shirbhate U. An overview of oral pyogenic granuloma and its management: a case report. *Cureus.* 2023;15(11):e48305. doi: [10.7759/cureus.48305](https://doi.org/10.7759/cureus.48305).
- Gordón-Núñez MA, de Vasconcelos Carvalho M, Benevenuto TG, Lopes MF, Silva LM, Galvão HC. Oral pyogenic granuloma: a retrospective analysis of 293 cases in a Brazilian population. *J Oral Maxillofac Surg.* 2010;68(9):2185-8. doi: [10.1016/j.joms.2009.07.070](https://doi.org/10.1016/j.joms.2009.07.070).
- Plachouri KM, Georgiou S. Therapeutic approaches to pyogenic granuloma: an updated review. *Int J Dermatol.* 2019;58(6):642-8. doi: [10.1111/ijd.14268](https://doi.org/10.1111/ijd.14268).
- Pisano M, Sammartino P, Di Vittorio L, Iandolo A, Caggiano M, Roghi M, et al. Use of diode laser for surgical removal of pyogenic granuloma of the lower lip in a pediatric patient: a case report. *Am J Case Rep.* 2021;22:e929690. doi: [10.12659/ajcr.929690](https://doi.org/10.12659/ajcr.929690).
- Zezell DM, Ana PA. High power lasers and their interaction with biological tissues. In: de Freitas PM, Simões A, eds. *Lasers in Dentistry.* John Wiley & Sons; 2015. doi: [10.1002/9781118987742.ch2](https://doi.org/10.1002/9781118987742.ch2).
- Komori S, Matsumoto K, Matsuo K, Suzuki H, Komori T. Clinical study of laser treatment for frenectomy of pediatric patients. *Int J Clin Pediatr Dent.* 2017;10(3):272-7. doi: [10.5005/jp-journals-10005-1449](https://doi.org/10.5005/jp-journals-10005-1449).
- Mazzoni A, Navarro RS, Fernandes KPS, Mesquita-Ferrari RA, Horliana A, Silva T, et al. Comparison of the effects of high-power diode laser and electrocautery for lingual frenectomy in infants: a blinded randomized controlled clinical trial. *J Clin Med.* 2022;11(13):3783. doi: [10.3390/jcm11133783](https://doi.org/10.3390/jcm11133783).
- Avelar RL, Antunes AA, de Carvalho RW, de Santana Santos T, de Oliveira Neto PJ, de Souza Andrade ES. Oral pyogenic granuloma: a epidemiologic study of 191 cases. *RGO Rev Gaúcha Odontol.* 2008;56(2):131-5.
- Lin RL, Janniger CK. Pyogenic granuloma. *Cutis.* 2004;74(4):229-33.
- Alakhras O, Baroudi I, Alahmad O, Douri T. A successful treatment with oral beta-blocker: a case report of a recurrent pyogenic granuloma in the external auditory canal. *SAGE Open Med Case Rep.* 2023;11:2050313x231205711. doi: [10.1177/2050313x231205711](https://doi.org/10.1177/2050313x231205711).
- Parisi E, Glick PH, Glick M. Recurrent intraoral pyogenic granuloma with satellitosis treated with corticosteroids. *Oral Dis.* 2006;12(1):70-2. doi: [10.1111/j.1601-0825.2005.01158.x](https://doi.org/10.1111/j.1601-0825.2005.01158.x).
- Sacchidanand S, Purohit V. Sclerotherapy for the treatment of pyogenic granuloma. *Indian J Dermatol.* 2013;58(1):77-8. doi: [10.4103/0019-5154.105317](https://doi.org/10.4103/0019-5154.105317).
- Flowers RH, Maglione J, Wilson BB. Removing pyogenic granulomas: a simple and effective surgical technique. *Clin Pediatr (Phila).* 2015;54(10):1003-5. doi: [10.1177/0009922814557789](https://doi.org/10.1177/0009922814557789).
- De Santis GC. Anemia: definition, epidemiology, pathophysiology, classification, clinical picture, and treatment. *Medicina (Ribeirão Preto).* 2019;52(3):239-51. doi: [10.11606/issn.2176-7262.v52i3p239-251](https://doi.org/10.11606/issn.2176-7262.v52i3p239-251).
- Little JW, Miller C, Rhodus NL. *Dental Management of the Medically Compromised Patient-E-Book.* Elsevier Health Sciences; 2017.
- Petraglia F, Gallone A, Sieroszewski P, Pulanic D, Marton I, Calda P, et al. Iron deficiency anemia: preconceptional, pregnancy and postpartum management—a call for action. *J Endometr Uterine Disord.* 2024;7:100079. doi: [10.1016/j.jeud.2024.100079](https://doi.org/10.1016/j.jeud.2024.100079).
- Whitaker L, Critchley HO. Abnormal uterine bleeding. *Best Pract Res Clin Obstet Gynaecol.* 2016;34:54-65. doi: [10.1016/j.bpobgyn.2015.11.012](https://doi.org/10.1016/j.bpobgyn.2015.11.012).
- Akbulut N, Kursun ES, Tumer MK, Kamburoglu K, Gulsen U. Is the 810-nm diode laser the best choice in oral soft tissue

- therapy? *Eur J Dent*. 2013;7(2):207-11. doi: [10.4103/1305-7456.110174](https://doi.org/10.4103/1305-7456.110174).
24. Aoki A, Mizutani K, Schwarz F, Sculean A, Yukna RA, Takasaki AA, et al. Periodontal and peri-implant wound healing following laser therapy. *Periodontol 2000*. 2015;68(1):217-69. doi: [10.1111/prd.12080](https://doi.org/10.1111/prd.12080).
25. Ortega-Concepción D, Cano-Durán JA, Peña-Cardelles JF, Paredes-Rodríguez VM, González-Serrano J, López-Quiles J. The application of diode laser in the treatment of oral soft tissues lesions. A literature review. *J Clin Exp Dent*. 2017;9(7):e925-8. doi: [10.4317/jced.53795](https://doi.org/10.4317/jced.53795).
26. D'Arcangelo C, Di Nardo Di Maio F, Prosperi GD, Conte E, Baldi M, Caputi S. A preliminary study of healing of diode laser versus scalpel incisions in rat oral tissue: a comparison of clinical, histological, and immunohistochemical results. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2007;103(6):764-73. doi: [10.1016/j.tripleo.2006.08.002](https://doi.org/10.1016/j.tripleo.2006.08.002).
27. Zeredo JL, Sasaki KM, Yozgatian JH, Okada Y, Toda K. Comparison of jaw-opening reflexes evoked by Er:YAG laser versus scalpel incisions in rats. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2005;100(1):31-5. doi: [10.1016/j.tripleo.2004.11.012](https://doi.org/10.1016/j.tripleo.2004.11.012).
28. Kadeh H, Saravani S, Tajik M. Reactive hyperplastic lesions of the oral cavity. *Iran J Otorhinolaryngol*. 2015;27(79):137-44.
29. Krishnapillai R, Punnoose K, Angadi PV, Koneru A. Oral pyogenic granuloma--a review of 215 cases in a South Indian Teaching Hospital, Karnataka, over a period of 20 years. *Oral Maxillofac Surg*. 2012;16(3):305-9. doi: [10.1007/s10006-012-0315-z](https://doi.org/10.1007/s10006-012-0315-z).