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GINGIVAL PYOGENIC GRANULOMA: A BRIEF OVERVIEW

Periodontology

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ABSTRACT

Pyogenic granuloma was referred as an inflammatory hyperplasia caused by various stimuli and comprises a cluster of nodular growth in the oral cavity. It is generally accepted that the lesion is a localized tissue reaction to minor trauma or irritation. Pyogenic granuloma of oral cavity is a relatively common lesion in pregnancy which usually tends to regress after delivery. Gingiva is the most common intraoral site for occurrence of pyogenic granuloma. Although pyogenic granuloma is a non-neoplastic growth in the oral cavity, proper diagnosis and treatment planing of the lesion are important.

KEYWORDS

Pyogenic Granuloma, Pregnancy, Sclerotherapy, Satellitosis, Nd: YAG laser, CO2 laser Er: YAG laser, Corticosteroids And Flash Lamp Pumped Dye Laser.

INTRODUCTION

Pyogenic granuloma was referred as an inflammatory hyperplasia caused by various stimuli and comprises a cluster of nodular growth in the oral cavity. It was first described by two French surgeons Poncet and Dor in 1897 as benign, exophytic vascular tumors. The term pyogenic granuloma first introduced by Hartzell in 1904.[1] it is misnomer because the lesions are neither pus-producing nor granulomatous. However, this term is universally understood and any attempt to change the term creates something complicated that is difficult to understand. [2] Pyogenic granuloma of oral cavity is a relatively common lesion in pregnancy which usually tends to regress after delivery. The development of multiple pyogenic granulomas known as Satellitosis, May occurs as a complication of tumor removal or trauma.[3]

ETIOLOGY

No definite microorganism has yet to been found to be responsible for the etiology of pyogenic granuloma. It is generally accepted that the lesion is a localized tissue reaction to minor trauma or irritation.[4] Namazi et al[5] stated that "trauma, hormonal influences, viral oncogens, microscopic arterioveneous malformation, production of angiogenic growth factor and cytogenic abnormalities have all postulated to play a role. Aguilo [6] reported that pyogenic granuloma arises as a result of injury to primary teeth and Milano et al.[7] reported aberrant tooth development associated with development of Pyogenic granuloma. Bachymer et al.[8] and LEE et al.[9] reported cases of oral Pyogenic granuloma in patients who were under cyclosporine for chronic graft vs. host disease. Fowler et al. R-8 SA[10] first reported oral pyogenic granuloma associated with GTR. The lesion arises after DFDBA and expanded Polytetrafluoroethylene membrane.

ETIOPATHOGENESIS

Recently, by immunohistochemestery the angiogenesis associated factor, Tie-2, angiopoitin-1, angiopoitin-2, epherin B2 and Eph B4 were detected in Pyogenic granuloma.[11] gingival irritation as result of calculus, overhanging or rough restoration might be predisposing factor for the development of gingival pyogenic granuloma. It was hypothesized that microulceration from these irritants may allow the ingress of low virulent oral microflora into the gingival connective tissue. This evokes an exaggerated hyperplastic vascular response in the connective tissue resulting in the formation of pyogenic granuloma.[12]

ETIOPATHOGENESIS OF GINGIVAL PYOGENIC GRANULOMA IN PREGNANCY

A prevalence of Pyogenic granuloma in pregnancies develop only up to 5 %.[13,14] Pregnant women may have an altered susceptibility to plaque accumulation, which may be aggravated by local irritating factors as overhanging margins of restoration or calculus, that may lead to gingivitis.[14] If left untreated ,a hyperplastic gingival may develop and sometimes resulting in Pyogenic granuloma.[15] Hormonal changes during pregnancy, especially the sex hormone estrogen and progesterone in circulation, affects biological, immunological and physiological functions.[16] They may stimulate fibroblast growth factor(FGF) and transforming growth factor-b(TGF-B) production in fibroblast that supports hyperplastic granulation reaction.[17] Estrogen alters the vascular endothelial growth factor (VEGF) production in macrophages. During pregnancy, the VEGF is highly expressed in pyogenic granuloma but almost undectable after parturition. It plays a critical role in the development and regression of a pyogenic granuloma during pregnancy.[11]

CLINICAL FEATURES

Lesion usually appears as localized mass with sessile or pedunculated base. The surface can be smooth or lobulated with deep red or purplish color. The lesions were hemorrhagic, compressible and bleed easily on slight provocation, but it is painless. The lesion most commonly occurs during 2 and 3 decades. Pyogenic granuloma was more predominant among females. Most common intraoral site of occurrence of pyogenic granuloma is gingiva.[18]Gingival pyogenic granuloma is more common in the maxilla than in the mandible.[12]

DIFFERENTIAL DIAGNOSIS

Differential diagnosis of pyogenic granuloma includes, peripheral giant cell granuloma, peripheral ossifying fibroma, peripheral fibroma, hemangioma, hyperplastic gingival inflammation and in some cases malignant lesion such as Kaposi's sarcoma, metastatic carcinoma, amelanotic melanoma and non-Hodgkin's lymphoma.[19,20,21]

HISTOLOGICAL FATURES

Histological, there are two types of pyogenic granuloma of the oral cavity: lobular capillary hemangioma (LCH) and non-lobular capillary hemangioma.[22] LCH has two distinct areas: a lobular area and a superficial usually ulcerative area. The lobular area was characterized by lobular proliferation of vascular elements and the superficial area has inflammatory granulation tissue beneath the ulcers.[22]In non- LCH two distinct areas: a central area composed of vascular granulation tissue and a superficial ulcerative area similar to that present in LCH. Ulcerative area of LCH was covered with a layer of fibrin and entrapped neutrophils. Small and large thin wall vessels lined by flattened endothelial cells were present. The stroma contains lymphocytes, plasma cells and large number of neutrophils. The lobular area located beneath the ulcerative area or was covered by intact epithelium. Ulcerative areas of non-LCH were similar to those found in the ulcerative area of LCH. The central area of non-LCH consisted of small proliferating vessels with small and large thin wall vessels lined by flattened endothelial cells. A variable number of both acute and chronic inflammatory cells were present.[22]

TREATMENT

Treatment of gingival pyogenic granuloma includes:

1. **Topical Therapy:** by Intralesional corticosteroids injection and Sclerotherapy.

2. **Surgical Excision:** by laser therapy and conventional techniques by scalpel.

Treatment Of Gingival Pyogenic Granuloma With Topical Therapy

Different studies on treatment of gingival pyogenic granuloma with topical therapy. (Refer to table number 1)

Table Number-1 Different Studies On Treatment Of Gingival Pyogenic Granuloma With Topical Therapy.

Study	Study Design	Patient And Method	Conclusion
Parisi et al. 2006[23]	Case Report	A 33 year old female patient with multiple gingival and palatal recurrent pyogenic granulomas. (Satellitosis) **Treatment:** A solution prepared by diluting 0.1 ml of triamcinolone 40 mg/ml with 0.5 ml of 0.5% bupivacane. A total 0.1 ml of the mixture was injected into the lesion.	A both gingival and palatal lesion was regressed significantly in response to treatment with corticosteroids. This may become an alternative treatment for pyogenic granuloma, particularly for highly recurrent lesions.
Deore et al. 2014[24]	Case report	18 year old women with recurrent gingival pyogenic granuloma with concurrent presentation of port-wine stain. **Treatment :** Intralesional injection of 3% sodium tetradecyl sulfate.	Complete resolution of lesion within one week. Sodium tetradecyl sulfate can be effective alternative for the treatment of recurrent pyogenic granuloma associated with port-wine stains. After 1 year follow-up no recurrence has been reported.
Regmee et al. 2017[25]	Case report	28 year old female clinically diagnosed with oral pyogenic granuloma. **Treatment :** Intralesional injection of 3% sodium tetradecyl sulfate	Complete resolution of lesion at 4th week. One year follow-up no recurrence was reported.
Khaitan et al. 2018[26]	Case series	40 patients clinically diagnosed with oral pyogenic granuloma.(16 male and 24 female) **Treatment :** The lesion was treated with Intralesional injection of 0.2-0.5 ml of 3 % sodium tetradecyl sulfate.	All 40 patients showed complete regression of lesion after one to four consecutive Intralesional injections in weekly interval. Lesions of 20 patients regressed after 1 week. 16 patients in 2 nd week. 3 patients in 3 rd week and 1 patient in 4 th weeks. 6 months follow-up no recurrence was reported.

Parisi et al. (2006)[23] reported the first case of intraoral pyogenic granuloma with Satellitosis. The lesion was treated with Intralesional corticosteroids. The anti-inflammatory and vasoconstructive actions of the corticosteroid may suppress or prevented the release of angiogenic factors. It is important to inject appropriate amount of steroid to prevent tissue necrosis.

Sclerotherapy is the treatment of a vascular lesion by injecting a sclerosing agent which causes permanent damage to the endothelial vessels resulting in necrosis.[27]Commonly used sclerosing agents are sodium tetradecyl sulfate, polidocanol, sodium morrhuate, ethanolamine oleate and alcohol. 0.2-0.5 ml of 3 % sodium tetradecyl sulfate injection is commonly used sclerosing agent for oral pyogenic granuloma. Sclerotherapy is simple, minimally invasive, minimal blood loss and less surgical expertise is required. There were minimal postoperative complications with no postoperative dressing or specific care and patient can resume his daily activities immediately.[28]

Sclerotherapy with 3 % sodium tetradecyl sulfate has been proved as a cost effective conservative approach in the treatment of oral pyogenic granuloma.

Treatment Of Gingival Pyogenic Granuloma With Laser Therapy

Different studies on treatment of gingival pyogenic granuloma with laser therapy. (Refer to table number 2)

Table Number-2 Different Studies On Treatment Of Gingival Pyogenic Granuloma With Laser Therapy.

Study	Study Design	Patient And Method	Conclusion
Powell et al. 1994[29]	Case Report	19 year female patient with gingival overgrowth at 29 week gestation. Biopsy confirmed pyogenic granuloma. **Treatment :** The excision of lesion using Nd: YAG laser under general anesthesia when patient had reached 36 week gestation period.	No recurrence after 15 month follow-up
Meffert et al. 1998[30]	Case Report	66 yr old women with recurrent gingival granulation tissue around her dental implants. Surgical resection and histological demonstrating features of both pyogenic granuloma and peripheral ossifying fibroma. Recurrence was noted 2 weeks following surgical resection. **Treatment :** The lesion was treated with flash lamp pulsed dye laser (PDL)	No recurrence in almost 2 year of follow-up with flash lamp pulse dye laser.
Lindenmuller et al.2010[31]	Case Report	34 year old women in the 39 week of pregnancy presented with a recurrent mass on the lingual gingival margin between lower left canine and 1st premolar. **Treatment :** CO_2 laser assisted-surgical excision was performed 4 week after delivery.	A 12 month follow-up revealed no recurrence of the mass.
Fekrazad et al. 2014[32]	Case Report	A 24 year old female patient presented with gingival overgrowth on the buccal and palatal side of maxillary 2nd premolar and 1st molar region. **Treatment**: Surgical excision with Er : YAG laser was performed	Due to the proximity of the lesion with dental hard tissue, Er: YAG laser appear to be the most appropriate laser. A 9 month follow-up no recurrence was reported.
Kocaman et al. 2014[33]	Case Report	14 year female patient with localized gingival mass on buccal aspect. **Treatment :** Surgical removal of lesion was performed by using Nd:YAG laser	Post-operative problems and discomfort are minimal and no scaring developed after surgery. 3 month follow-up there was no recurrence of the lesion.
Gokmenoglu et al. 2016[34]	Case Series	A female patients with pyogenic granuloma on maxillary anterior gingival **Treatment :** Surgical excision was performed by using Nd: YAG laser.	No significant complications, such as bleeding, severe pain or delayed wound healing. 3 month after surgery no recurrence of the lesion.

Excision by laser is the recommended method, as it is well accepted by patient with no unfavorable consequences.[19] Laser surgery compared with conventional methods includes maintenance of sterile conditions, minimal bleeding, good possible estimation of cutting depth, no need of suturing, accelerates early healing and minimal post-operative complications.[32, 35] Perhaps due to high cost of laser devices it is not very cost-effective. The skills of dentist working with the laser are of great importance. The type of laser used in the surgery is also very

important. The coagulation caused by CO_2 and Er: YAG lasers are less. When using Er: YAG laser, as the lesion is less damage the remaining tissue has more pathological value. Nd: YAG laser may cause hemostasis or necrosis by its thermal coagulation effects depending upon the amount of heat generated.[36] CO_2 laser irradiation is highly absorbed by water and hydroxyapatite. Unnecessary exposure to enamel, dentin, cementum and bone produces carbonization at low energy densities.[37,38] The Nd: YAG laser was used in lesions adjacent to hard tissue, because of more precise control of laser energy adjacent to non-involved teeth. Nd: YAG laser irradiation does not cause carbonization of hard dental tissue because it is not well absorbed by water and hydroxyapatite at low energy densities.[39, 40] The Nd: YAG laser is unique in that it can be utilized in both a contact (excision) and non-contact (coagulation) mode. In contrast, the CO_2 laser is utilized only in a non-contact mode. When selecting laser power setting for surgery, the minimum power required producing desired effects should always be chosen. In Nd: YAG laser collateral damage to adjacent hard and soft tissue is less likely due to smaller beam size and short interaction times as compared to continuous wave laser devices.[41,42].

Treatment Of Gingival Pyogenic Granuloma With Conventional Therapy

Different studies on treatment of gingival pyogenic granuloma with conventional therapy. (Refer to table number 3)

Table Number-3 Different Studies On Treatment Of Gingival Pyogenic Granuloma With Conventional Therapy.

Study	Study Design	Patient And Method	Conclusion
Lawoyin et al. 1997[12]	Case series	38 patients with histological confirmed pyogenic granuloma of the oral cavity included in the study. **Treatment :** Surgical excision of the lesion with the tissue at its base.	9 patients were reported for review after 1 year. No recurrence was reported for any of these nine patients.
Al-Khateeb et.al 2003[43]	Retrospective study	108 cases of oral pyogenic granuloma were included. **Treatment:** Gingival and palatal lesions were surgically excised down to periosteum with curettage. Lesion of the lips, tongue or buccal mucosa were excised via elliptical incision and surgical defects closed primarily.	Surgical excision of pyogenic granuloma there was a low recurrence rate of 5.8 %

Complete surgical excision of the lesion with the tissue at its base. Surgical excision extending down to the periosteum should be done along with through debridement of the adjacent tooth to remove the source of irritation. After surgical excision recurrence occurs up to 16% of the lesions.[44] Incomplete excision of lesion is common cause for recurrence.[45,46]

CONCLUSION

Although pyogenic granuloma is a non-neoplastic growth in the oral cavity, proper diagnosis and treatment planing of the lesion are important. Pyogenic granuloma arises in response to low grade local irritation, so removal of causative irritants (plaque, calculus and foreign material) is an important part of treatment. Conventional excision surgery is the treatment of choice for pyogenic granuloma, but some new approaches for the treatment such as Sclerotherapy, corticosteroids, excision by different laser and flash lamp pulsed dye laser has been reported as alternative therapies. During pregnancy the prevalence of pyogenic granuloma is high. So, during pregnancy careful oral hygiene maintenance is important to avoid occurrence of pyogenic granuloma.

REFERENCES

1. Hartzell MB (1904) Granuloma pyogenicum. J Cutans Dis Syph 22, 520-525.
2. Marx RE, Stern D. Oral and Maxillofacial Pathology: A Rationale for Diagnosis and Treatment. 1st ed. Surrey: Quintessence Publishing; 2003.
3. Zaynoun ST, Juljulian HH, Kurban AK (1974). Pyogenic granuloma with multiple satellites. Arch Dermatol 109: 689–691.
4. Holmstrup P, Reibel J: Tumors and Cysts of the Periodontium (ed 3). Copenhagen, Denmark, Munksgaard, 1998, pp 356-379.
5. Namazi Esmaeil, Baliga Sharmila, Muglikar Sangeeta, Rahul K. A case report of pregnancy tumor and its management using the diode laser. Journal of Dental Lasers. 2012;6 (2):68-71.
6. Aguilo L (2002) Pyogenic granuloma subsequent to injury of a primary tooth. A case report. Int J Paediatr Dent 12, 438-441.
7. Milano M, Flaitz CM, Bennett J (2001) Pyogenic granuloma associated with aberrant tooth development. Tex Dent J 118, 166-172.
8. Bachmeyer C, Devergie A, Mansouri S, Dubertret L, Aractingi S (1996) Pyogenic granuloma of the tongue in chronic graft versus host disease. Ann Dermatol Venerol 123, 552-554 (in French)
9. Lee L, Miller PA, Maxymiw WG, Messner HA, Rotstein LE (1994) Intraoral pyogenic granuloma after allogenic bone marrow transplant. Report of three cases. Oral Surg Oral Med Oral Pathol 78, 607-610.
10. Fowler EB, Cuenin MF, Thompson SH, Kudryk VL, Billman MA (1996) pyogenic granuloma associated with guided tissue regeneration: a case report. J Periodontol 67, 1011-1015.
11. Yuan K, Jin YT, Lin MT: Expression of Tie-2, angiopoietin-1, angiopoietin-2, ephrinB2 and EphB4 in pyogenic granuloma of human gingiva implicates their roles in inflammatory angiogenesis.J Periodont Res 35:165, 2000
12. Lawoyin JO, Arotiba JT, Dosumu OO: Oral pyogenic granuloma: A review of 38 cases from Ibadan, Nigeria. Br J Oral Maxillofac Surg 35:185, 1997
13. Adriaens LM, Alessandri R, Sporri S, Lang NP, Persson GR. Does pregnancy have an impact on the subgingival microbiota? J Periodontol 2009; 80: 72–81.
14. Lo¨e H, Sillness J. Periodontal disease in pregnancy. 1. Prevalence and severity. Acta Odontol Scand 1963; 21: 533–551.
15. Boyarova TV, Dryankova MM, Bobeva AI, Genadiev GI. Pregnancy and gingival hyperplasia. Folia Med (Plovdiv) 2001; 43: 53–56.
16. Ojanotko-Harri AO, Harri MP, Hurttia HM, Sewon LA. Altered tissue metabolism of progesterone in pregnancy gingivitis and granuloma Clin Periodontol 1991; 18: 262–266.
17. Kanda N, Watanabe S. Regulatory roles of sex hormones in cutaneous biology and immunology. J Dermatol Sci 2005; 38: 1–7.
18. Laskaris G. Color Atlas of Oral Diseases. New York: Thieme Medical Publishers, Inc, 1994. pp 335e57.
19. Rai S, Kaur M, Bhatnagar P. Laser: a powerful tool for treatment of pyogenic granuloma. J Cutan Aesthet Surg. 2011 May;4(2):144-7.
20. Kamal R, Dahiya P, Puri A. Oral pyogenic granuloma: Various concepts of etiopathogenesis. J Oral Maxillofac Pathol. 2012 Jan; 16(1):79-82.
21. Greenberg MS, Glick M, JA S. In: Burkett's textbook of oral medicine. 11th ed. USA: BC Becker Inc; 2008. pp. 131–2.
22. Epivatianos A, Antoniades D, Zaraboukas T, et al. Pyogenic granuloma of the oral cavity: comparative study of its clinicopathological and immunohistological features. Pathol Int 2005; 55:391–397.
23. Parisi E, Glick PH, Glick M. Recurrent intraoral pyogenic granuloma with Satellitosis treated with corticosteroids. Oral Dis 2006; 12:70–72.
24. Deore GD, Gurav AN, Patil R, Shete AR, NaikTari RS, Khiste SV, Inamdar S. Sclerotherapy: a novel bloodless approach to treat recurrent oral pyogenic granuloma associated with port-wine stain. Ann Vasc Surg. 2014; 28(6):1564.e9-e14.
25. Regmee P, Rimal J, Maharjan IK, Pandey S, Niroula D, Luitel A. Sclerotherapy for oral pyogenic granuloma – A case report. JCMS Nepal 2017; 13:290-2.
26. Khaitan T, Sinha R, Kabiraj A, Ramani D, Sharma M.Conservative approach in the management of oral pyogenic granuloma by Sclerotherapy. J Indian Acad Oral Med Radiol 2018; 30: 46-51
27. Croffie J, Somogyi L, Chuttani R, DiSario J, Liu J, Mishkin D, *et al.* Sclerosing agents for use in GI endoscopy. Gastrointest Endosc 2007; 66:1-6.
28. Sacchidanand S, Purohit V. Sclerotherapy for the treatment of pyogenic granuloma. Indian J Dermatol 2013;58:77-8.
29. Powell JL, Bailey CL, Coopland AT, et al: Nd-YAG laser excision of a giant gingival pyogenic granuloma of pregnancy. Lasers Surg Med 14:178, 1994
30. Meffert JJ, Cagna DR, Meffert RM: Treatment of oral granulation tissue with the flashlamp pulsed dye laser. Dermatol Surg 24:845, 1998
31. Lindenmuller IH, Noll P ,Maneghani T, Walter C. CO_2 laser- assisted treatment of a giant pyogenic granuloma of the gingival. Int J Dent Hygiene 8, 2010; 249-252.
32. Fekrazad R, Chiniforoush N. One Visit Providing Desirable Smile by Laser Application. J Lasers Med Sci. 2014; 5(1):47-50.
33. Kocaman G, Belduz N, Erdogan C, Ozbek E, Sadik E, Kara C. The use of surgical Nd: YAG laser in an oral pyogenic granuloma: A case report. J Cosmet Laser Ther. 2014 Aug;16(4):197-200.
34. Ceren Gokmenoglu, Elif Sadik, Mustafa Cihan Yavuz, Varol Canakci, Merve Topaloglu, Cankat Kara (2016) Treatment of different oral soft tissue lesions with surgical Nd: YAG laser: case series. Clinical Advances in Periodontics.
35. Chiniforush N, Kamali A, Shahabi S, Bassir SH. Leukoplakia removal by CO_2 laser. J Lasers Med Sci. 2012; 3(1):33-5.
36. Powell JL, Zwirek *SJ,* Sankey HZ. Hemangioma of the cervix managed with the Nd: YAG laser. Obstet Gynecol 1991; 78:962-964.
37. White, J.M., Goodis, H.E., and Rose, C.L. (1991). Use of the pulsed Nd: YAG laser for intra-oral soft tissue surgery. Lasers Surg. Med. 11,455^*61.
38. Neev, J., White, J.M., and Goodis, H.E. (1994). Thermal characteristics during Nd: YAG and CO ,laser application to enamel and dentin. Proceedings of Laser Surgery; Advanced Characterization, Therapeutics, and Systems IV, SPIE 2128, 424-430.
39. Miserendino, L.J., Levy, G, and Miserendino, CA. (1995). Laser interaction with biologic tissues, in: Lasers in Dentistry. L.J. Miserendino and R.M. Pick (eds.). Chicago: Quintessence, pp. 39-55.
40. White, J.M., Goodis, H.E., Yessik, M.J., and Myers, T.D. (1995). Histologic effects of a high-repetition pulsed Nd: YAG laser on intraoral soft tissue. Proceedings of Lasers in Dentistry, SPIE 2394, 143-153.
41. Perry, DA., Goodis, H.E., and White, J.M. (1997). In vitro study of the effects of Nd: YAG laser probe parameters on bovine oral soft tissue excision. Lasers Surg. Med. 20, 39^6.
42. White, J.M., Neev, J., Goodis, H.E., and Berns, M.W. (1992). Surface temperature and thermal penetration depth of Nd: YAG laser applied to enamel and dentin. Proceedings of Laser Surgery: Advanced Characterization, Therapeutics and Systems III, SPIE 1643, 423^136.
43. Al- Khateeb T, Ababneh K (2003) Oral pyogenic granuloma in Jordanians : a retrospective analysis of 108 cases. J Oral Maxillofac Surg 61, 1285-1288.
44. Taira JW, Hill TL, Everette MA (1992) Lobular capillary hemangioma (pyogenic granuloma) with Satellitosis. J Am Acad Dermatol 27, 297-300
45. Leopard JP. Cryosurgery and its application in oral surgery. Br J Oral Surg 1975; 3: 1288152.
46. Blickenstaff RD, Roenigk RK; Peters MS, Goellner JR. Recurrent pyogenic granuloma with satellitoses. J Am Acad Dermatol 1989; 21: 1241-1244.