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Case Report

Title: Ultrasound-guided sclerotherapy for a pyogenic granuloma associated with an arteriovenous malformation: a case report

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ABSTRACT

Vascular anomalies (VAs) are congenital developmental disorders associated with morbidity and aesthetic impairment. Pyogenic granuloma (PG) developing over arteriovenous malformations (AVM) is uncommon and lacks well-defined management protocols. An 84-year-old male presented with a large PG on the lower lip following chemical trauma, arising over an AVM confirmed by color Doppler ultrasonography. Ultrasound-guided sclerotherapy with 3% polidocanol was performed, resulting in complete remission of both lesions after four sessions (60 days). Residual pediculated fibrotic tissue was managed by base ligation. No recurrence was observed at five-month follow-up. The association of PG with AVM is rare and may influence the therapeutic approach. Doppler ultrasonography enabled identification of a fast-flow AVM and guided treatment. Sclerotherapy with polidocanol minimized hemorrhagic risk and resulted in satisfactory healing without complications. Ultrasound-guided sclerotherapy appears to be a safe and effective minimally invasive treatment for VAs in the orofacial region.

KEYWORDS

Arteriovenous Malformations; Vascular anomalies; Pyogenic Granuloma; Sclerotherapy; Ultrasonography.

Statement of Clinical Relevance

Ultrasound-guided sclerotherapy is a safe, minimally invasive option for pyogenic granuloma associated with arteriovenous malformation. Doppler imaging enables accurate diagnosis and targeted treatment, reducing hemorrhagic risk and morbidity. This approach is particularly useful in complex vascular lesions of the orofacial region.

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Introduction

Vascular anomalies (VAs) comprise a spectrum of congenital developmental disorders associated with significant morbidity and aesthetic impairment[1]. They are broadly classified into vascular tumors, characterized by endothelial cell proliferation, and vascular malformations (VMs), which consist of structural vascular anomalies with normal endothelial cell turnover[2,3]. VMs are further classified according to the affected vessel type and flow characteristics into slow-flow malformations, including venous, capillary, lymphatic, and combined malformations, and fast-flow malformations, including arteriovenous malformations (AVMs)[4].

Pyogenic granuloma (PG), also known as lobular capillary hemangioma, is classified as a benign vascular tumor by the International Society for the Study of Vascular Anomalies[3]. Although its pathogenesis remains unclear, local trauma, irritation, systemic conditions, and pre-existing vascular anomalies have been implicated in its development[5-7]. PG arising over or adjacent to VMs is uncommon, with previously reported cases describing associations between PG and port-wine stains[8-10].

Conventional surgical excision is the standard treatment for PG, although other modalities, including sclerotherapy, laser therapy, and cryotherapy, have been described.[5,6] VMs may be managed using sclerotherapy[11-14], embolization[12,14], surgery[11-13], laser therapy[11,12,14], elastic compression[11], pharmacological treatment, or interventional radiology[13], depending on their characteristics and clinical presentation.[11-14] When PG occurs in association with VMs, reported treatments include surgical excision, ligation of the PG base, laser therapy, sclerotherapy, and cryotherapy[9,10,15].

Ultrasonography has become an increasingly valuable imaging tool in dentistry, providing information on lesion morphology, extent, number, and compressibility. When combined with color and power Doppler, it allows the assessment of blood flow characteristics and helps differentiate high-flow from low-flow lesions, supporting diagnostic evaluation when interpreted alongside clinical findings[16,17]. Its real-time imaging capability also facilitates image-guided

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interventions, including sclerotherapy, by enabling needle positioning within the target region and helping minimize injury to adjacent tissues[16].

Considering the uncommon association between PG and VAs, the role of sclerotherapy in the management of vascular lesions, and the potential benefits of ultrasound guidance during treatment, this report describes the management of a large PG arising over na AVM of the lower lip in an older adult following chemical trauma. Both lesions were treated with ultrasound-guided sclerotherapy using 3% polidocanol.

Case report

An 84-year-old male presented at the Oral Medicine service with an extensive lesion on the lower lip, causing aesthetic concern and spontaneous bleeding after an accident involving cyanoacrylate. On clinical history, the patient reported that the substance had splashed onto his lower lip, and his attempt to remove it led to bleeding followed by progressive, painless swelling over a one-month period.

On physical examination, the patient presented a painless pedunculated, well-circumscribed nodule with an irregular surface, firm consistency, reddish coloration, measuring approximately 20 x 15 x 10mm and located on the lower lip. This nodule was situated over a well-circumscribed, purpuric papule, with a smooth surface and soft consistency (**Figs. 1A and 1B).** Color Doppler ultrasonography revealed fast-flow vessels originating in the lower lip and extending into the exophytic lesion (**Fig. 2A**). A clinical and imaging diagnosis of PG arising over an AVM was made.

Histopathological examination of the lesion was not performed because of the hemorrhagic risk associated with biopsy of the underlying high-flow vascular malformation. The clinical and imaging findings supported the diagnosis of PG arising over an AVM. Given the hemorrhagic risks associated with surgical treatment, the lesion was managed with ultrasound-guided sclerotherapy using 3% polidocanol, delivered in four sessions at two-week intervals, with weekly ultrasonographic follow-up.

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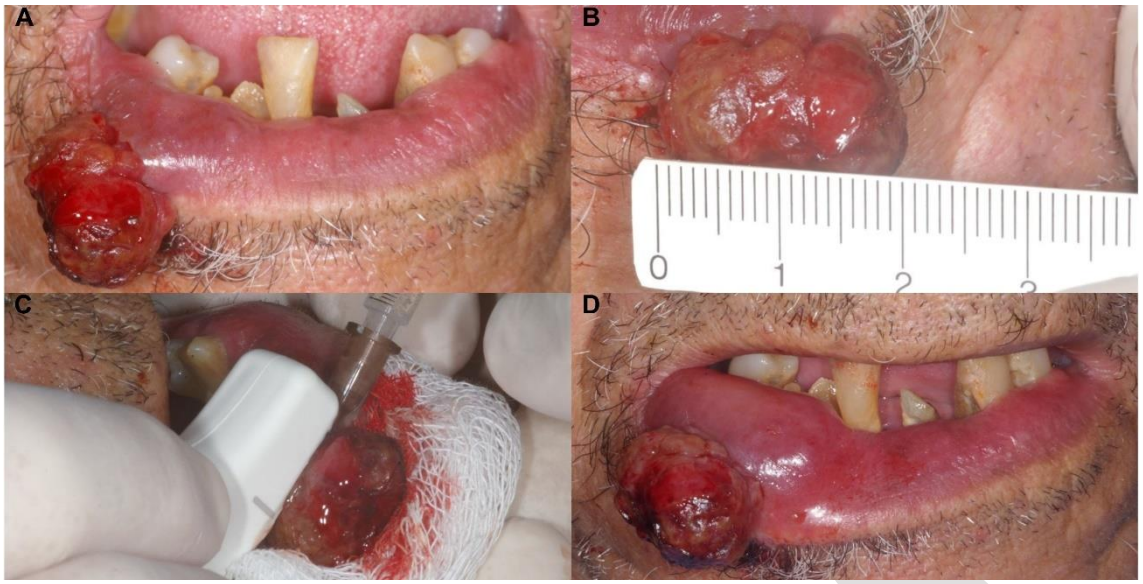


Figure 1. a) Initial clinical appearance of the tumor. **b)** Measurement of the lesion using a flexible ruler. **c)** Injection of polidocanol 3% with a 26G needle attached to a 1 mL syringe. **d)** Lesion appearance immediately after the first sclerotherapy session.

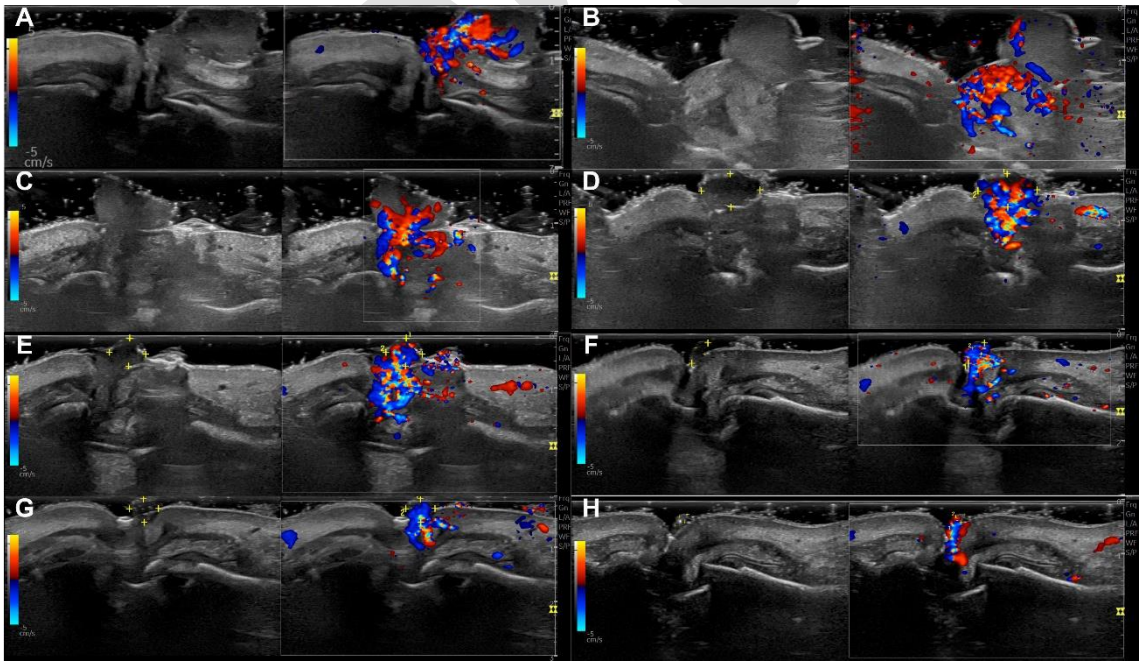


Figure 2. a) Initial ultrasonographic aspect. **b)** Lesion after the first session. **c)** Follow-up after the first session. **d)** Before the second session. **e)** Follow-up after the second session. **f)** Before the third session. **g)** Before the fourth session. **h)** Follow-up after the fourth session.

Under real-time ultrasonographic guidance, two injection sites were used: one within the PG and the other in the region of the feeding artery at the lesion base. The needle was visualized during insertion to guide its positioning at each target site. A significant reduction in blood flow was observed following injection in the region of the feeding artery, with progressive flow reduction over successive sessions. A total of 1.6 mL was administered to the AVM and 2.9 mL to the PG, amounting to 4.5 mL over the four sessions (**Table 1**). The patient reported no pain during the procedures, and transient swelling resolved within a few days.

Table 1. Total and per session partial drug volume used in treatment of pyogenic granuloma and arteriovenous malformation.

Site	1º Session	2º Session	3º Session	4º Session	Total
Pyogenic granuloma	1.2mL	1.0mL	0.3mL	0.4mL	2.9mL
Arteriovenous malformation	0.6mL	0.6mL	0.2mL	0.2mL	1.6mL
Total	1.8mL	1.6mL	0.5mL	0.6mL	4.5mL

A marked clinical response was observed within 60 days. A very small amount of residual fibrous tissue remained, and ultrasonography demonstrated intralesional scarring and a marked reduction in the AVM (**Figs. 2B–2H**). The residual fibrous tissue was managed by ligation at the lesion base using 6-0 nylon sutures. The tissue detached spontaneously one day after the procedure, without complications (**Figs. 3A and 3B**). No recurrence was observed at the five-month follow-up (**Fig. 3C**).

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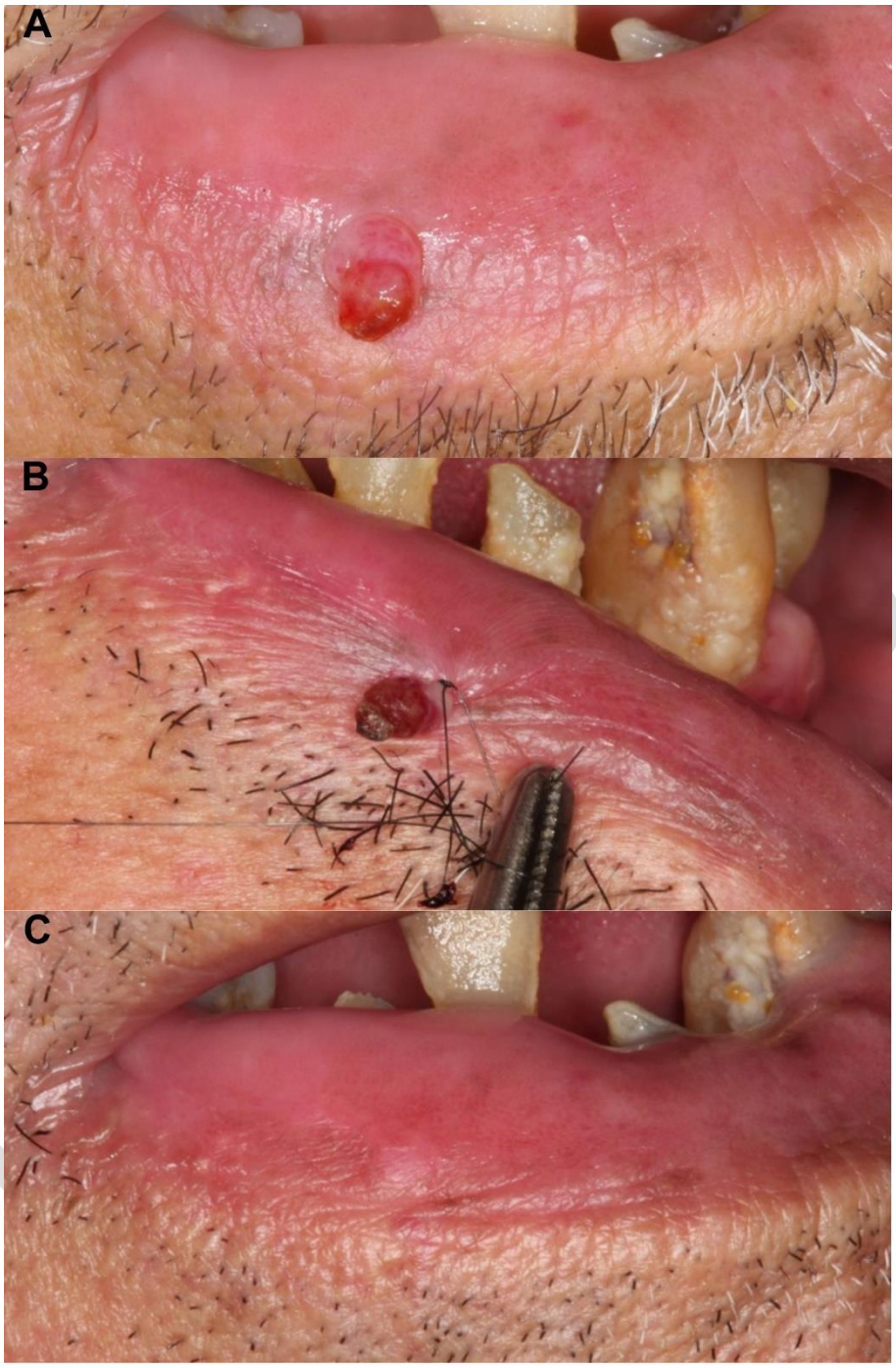


Figure 3. a) Lesion fibrosis observed 60 days after sclerotherapy treatment. **b)** Application of 6-0 nylon ligature. **c)** Final clinical appearance of treated lip region.

Discussion

PG is a common, benign, reactive vascular proliferation that affects skin and mucous membranes[6], with a higher incidence in the second and fifth decades and females being more frequently affected[7]. Moreover, PG most often occurs in the skin and oral cavity, where the gingiva is involved in three-quarters of cases.

Conversely, oral PG may also occur on the lips, tongue, buccal mucosa, hard palate and peri-implant mucosa[5,18]. The concomitant occurrence of a PG and an AVM is rare; thus, treatment protocols for this condition are not well established[9].

Although the differential diagnosis included other vascular lesions, such as hemangioma, and neoplastic lesions[6], the history of lesion development following trauma, its clinical characteristics, and the ultrasonographic findings of an underlying vascular malformation supported the diagnosis of PG arising over an AVM, in the lower lip of an elderly male patient, an uncommon site and an unusual demographic profile for this lesion.

Ultrasonography has shown favorable results in the detection and measurement of intraoral soft and hard tissue lesions, particularly oral malignancies. Although histopathological examination remains the gold standard for definitive diagnosis of many oral lesions, ultrasonography has demonstrated high diagnostic accuracy for intraoral conditions, such as autoimmune diseases, mucosal growths and potentially premalignant lesions[16].

Despite these advantages, ultrasonography has limitations in defining the extent of deep or extensive lesions and examining areas near bone or air-filled structures[16]. Color Doppler ultrasonography is a useful method for assessing the internal structure and vascularity of different lesions[19]. In the present case, the AVM in the lower lip was identified using this method, which guided the therapeutic approach.

PG can be managed with various treatment modalities, including surgical resection or laser surgical excision, radiofrequency coagulation, cryotherapy, and chemical cauterization. Nevertheless, these modalities have been associated with an increased risk of intraoperative bleeding, postoperative infection, and PG recurrence. Thus, sclerotherapy represents an effective alternative treatment, given that it is a minimally invasive procedure[20].

Although 3% polidocanol is a relatively newer sclerosing agent for PG treatment compared with agents such as ethanolamine oleate and sodium tetradecyl sulfate (STS)[20], its local anesthetic properties make injections generally painless and reduce the need for additional anesthesia. Furthermore, polidocanol has been associated with a low incidence of allergic reactions[20-22],

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while tissue necrosis and ulceration have been reported more frequently with STS than with polidocanol[20,22].

Sclerotherapy is an important treatment option for vascular anomalies, due to its lower scar formation and less intraoperative bleeding compared to embolization, surgical removal, and laser treatment. Sharma et al. (2021)[22], in a clinical series, recommended the use of 0.5–4 mL of 3% polidocanol, depending on lesion size, as was done in the present case (Table 1). Satisfactory clinical healing was achieved within 60 days of the first polidocanol application. Apart from transient swelling, no other complications, such as pain or intraoperative bleeding, were reported.

Majumdar et al. (2015)[23] managed a PG over an AVM on the upper back using diathermy after recurrence following previous surgical excisions. In contrast, Hung et al. (2004)[24] treated an intravascular PG associated with an AVM on the palm with surgical excision, reporting no recurrence. In the current case, both the PG and AVM were effectively managed by sclerotherapy. The favorable outcome is likely attributable to the vascular dependence of the external lesion primarily supplied by the basal pedicle, which has been disorganized by polidocanol injections, minimizing the risk of complications or recurrence. Finally, ligation of the lesion base with suture was chosen due to the remaining fibrosis tissue, achieving complete healing of the PG and the AVM.

It is important to acknowledge the limitations of this study. This is a rare single case report, which limits the generalizability of the findings. While the outcome was successful, the efficacy of this combined approach needs to be validated in clinical trials. Although the follow-up period of five months after the final procedure is clear of recurrence, long-term monitoring is essential to fully assess the durability of the treatment and rule out potential late recurrence of the AVM.

Conclusion

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The occurrence of a PG on AVM is rare, especially when located in the orofacial region of an elderly male patient. Our findings demonstrate that ultrasound-guided sclerotherapy with polidocanol is a safe and effective treatment, minimizing hemorrhagic and aesthetic defect risk. Subsequent suture ligation can effectively remove residual fibrotic tissue, and the management of PG and AVM can reduce the risk of recurrence. This combined, minimally invasive strategy should be considered a valuable therapeutic option for similar complex VAs in the orofacial region, although long-term studies are needed.

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Credit authorship contribution statement:

W.G.M.A.M: Writing - review & editing, Writing - original draft, Project administration, Conceptualization, Visualization, Validation, Methodology, Data Curation.

A.K.B.M: Writing - review & editing, Writing - original draft, Project administration, Conceptualization, Visualization, Validation, Methodology, Data Curation.

L.O.P.S: Writing - review & editing, Writing - original draft, Project administration, Conceptualization, Visualization, Validation, Methodology, Data Curation.

W.H.C: Writing - review & editing, Supervision, Project administration, Resources, Investigation.

S.F.S: Writing - review & editing, Supervision, Resources, Investigation.

T.A.S: Writing - review & editing, Supervision, Resources, Investigation.

M.A.A.C: Writing - review & editing, Supervision, Project administration, Resources, Investigation.

R.A.M: Writing - review & editing, Supervision, Project administration, Resources, Investigation.

ETHICAL APPROVAL

Informed consent was obtained from the patient.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest

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