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Systematic Review

Venous Malformation of the Maxilla: A Systematic Review and a Report of an Unusual Case

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Abstract

Background: Venous malformation, formerly designated as cavernous hemangioma, is a rare vascular lesion characterized by significant endothelial cells proliferation, predominantly affecting young females. Diagnosis is challenging due to its low incidence and variety of clinical, radiological, and histological presentations. Objectives: The aim was to review the current scientific understanding of maxillary venous malformation based on the available literature and present an additional rare case of venous malformation of the upper maxilla. Methods: A systematic review was conducted across PubMed, Google Scholar, and Embase databases for studies published between January 1990 and April 2025. Inclusion criteria encompassed meta-analyses, systematic reviews, randomized controlled trials, non-randomized controlled trials, cohort studies, and case reports describing cavernous hemangiomas and venous malformation of the maxilla. All clinical and radiological characteristics were considered. Results: Out of 10,021 studies identified through our database search, 22 met the inclusion criteria, describing 28 (29 with our case) clinical cases of maxillary venous malformation. Conclusions: Maxillary venous malformation presents complex and varied clinical and radiological aspects, which are crucial for preoperative assessment and management. Appropriate measures may be necessary to prevent bleeding complications during lesion removal. To the best of our knowledge, this is the first comprehensive review on venous malformation of the maxilla. In addition, we report an unusual case identified incidentally during implant planning and successfully removed through isolated bone augmentation.

Keywords: cavernous hemangioma; vascular malformations; venous malformation; maxilla; jaws

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1. Introduction

Hemangiomas are benign tumors of the blood vessels that arise from abnormal proliferation of endothelial cells and can be either localized or diffuse [1]. While hemangiomas are common, especially in children under 10, intraosseous hemangiomas are rare, especially those located in the maxillae [2,3]. Although the prevalence and incidence of jaw hemangiomas are not clearly established in the literature, they account for approximately 0.2% of bone tumors [2–4].

The most common anatomical sites of intraosseous hemangiomas are the vertebral and cranial regions, followed by the jaws [1]. Notably, hemangiomas of the mandible are reported to be three times more common than those of the upper jaw, with the mandibular ascending branch being the most common location [2]. Maxillary hemangiomas can appear at any age, but they are often diagnosed in the young. These lesions are usually asymptomatic in childhood and are discovered in adulthood due to gradual growth that eventually leads to symptoms.

Ethiopathogenesis of maxillary hemangiomas is not well established, but several assumptions have been proposed. These include genetic mutations, early embolic events, and hormonal changes. While these theories are plausible, none fully explain the female predominance observed in affected patients [1].

The pathophysiology of hemangiomas is supposed to result from complex angiogenic and vasculogenesis phenomena. This proliferation occurs in three stages: (1) endothelial cell proliferation: rapid multiplication of endothelial cells stimulated by VEGF, bFGF, and TGF-beta; (2) rapid growth: cell numbers stabilize but cells increase in size, causing rapid tumor growth; and (3) spontaneous regression: a decrease in the number of vessels, with endothelial cells being replaced by fibroblasts and adipocytes.

Cavernous hemangioma of the maxilla, considered at present as a malformation of venous type, is due to endothelial dysmorphogenesis resulting from a lesion present at birth. Despite its classification as a hemangioma, a cavernous hemangioma is a benign (but not harmless) condition. The abnormal tissue causes blood flow to slow through the cavities [1,5].

In this article, for the sake of convenience, although the term cavernous hemangioma it is still widely used in the literature, the term venous malformation is herein used as proposed by the experts on vascular anomalies of the International Society for the Study of Vascular Anomalies (2025) [4].

Given the rarity of maxillary venous malformation and the existing gaps in the current knowledge, our study aims to review the clinical and radiological criteria discussed in the literature. We present, to our knowledge, the first systematic review of the literature on cavernous hemangiomas of the maxilla as well as an additional unusual case located in the upper anterior maxillary region discovered fortuitously at the implant planning stage.

2. Methods

2.1. The Identifying Question

This systematic review aimed to address the following question:

What is the current state of scientific knowledge regarding maxillary venous malformation, based on the available literature?

2.2. A Search Strategy

An electronic search was conducted (A.P., E.P., and A.J.C.) for all relevant articles published between January 1990 and April 2025 in the PubMed, Google Scholar, and Embase databases. This timeframe was selected to ensure a comprehensive review of the literature while capturing relevant studies on this topic. Data were extracted independently by three reviewers, and the data extraction was performed manually. This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement [5]. We registered our detailed protocols in the public registry Open Science Framework (https://osf.io/v7qam/, accessed on 19 June 2025).

The screening process involved assessing titles, abstracts, and full texts to determine eligibility for inclusion. The search strategy was structured using Medical Subject Heading

(MeSH) terms, including ('cavernous hemangioma'/exp OR 'cavernous hemangioma' OR (cavernous AND ('hemangioma'/exp OR hemangioma))) AND ('maxilla'/exp OR maxilla) and a second search with ('venous malformation maxilla' OR (venous AND ('malformation'/exp OR malformation) AND ('maxilla'/exp OR maxilla))).

2.3. Inclusion Criteria

Studies reporting the discovery of a hemangioma in one and/or both maxillae (upper maxilla and mandible), regardless of the position within the maxilla, were included. All clinical and radiological forms were considered. The study designs included meta-analyses, systematic reviews, randomized controlled trials, non-randomized controlled trials, cohort studies, and case reports. Articles that did not meet the inclusion criteria were excluded.

2.4. Exclusion Criteria

Studies presenting a hemangioma lesion not located in the maxillae were excluded from the final analysis. Histological form other than cavernous.

3. Results

A total of 10,021 studies were identified through our database search (Figure 1, Table 1). During the initial screening phase, titles and abstracts were independently assessed to determine if they aligned with the study's objective. After the removal of 2342 duplicates, 7191 articles were excluded after title screening, and 321 articles were excluded after abstract screening for being unrelated to hemangioma of the maxilla.

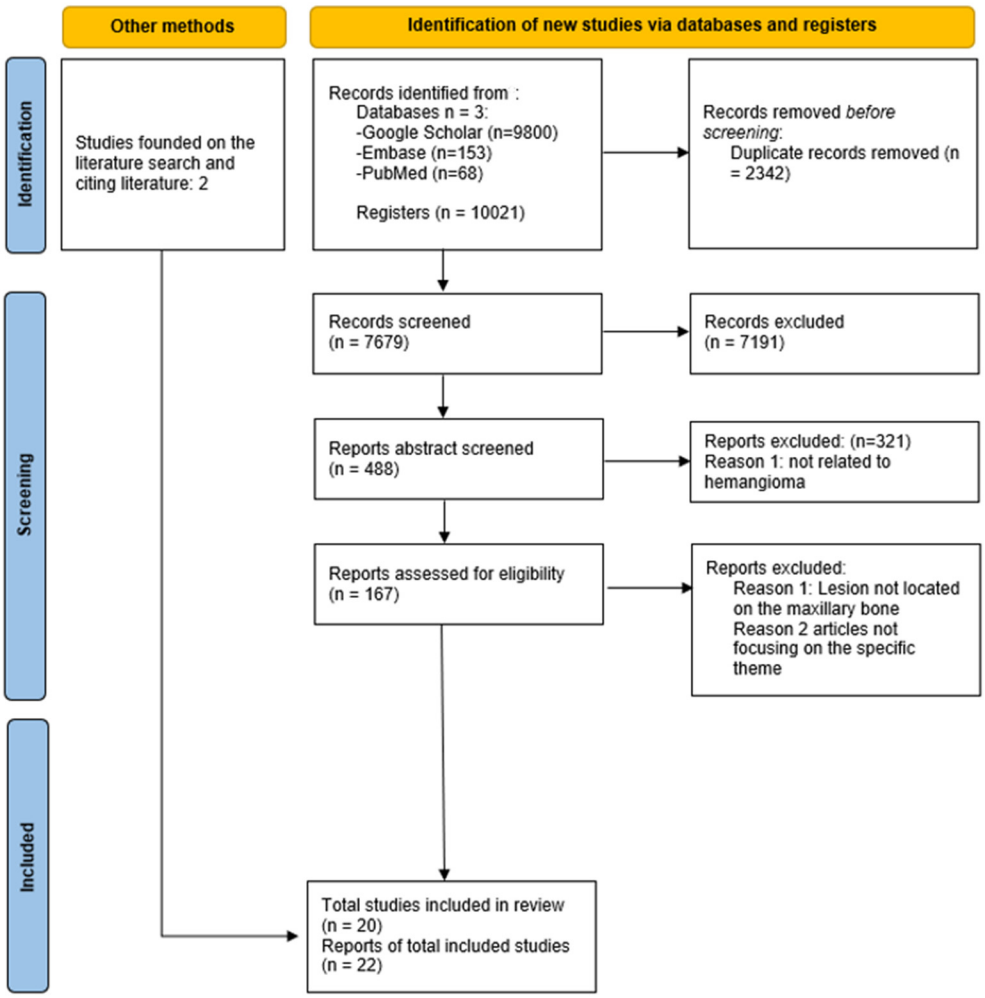

Figure 1. PRISMA flow chart diagram of search strategy.

Table 1. Summary of the included articles and basic characteristics.

Author	Type of Study	Cases (*n*)	Gender	Age (y)	Symptoms	Localization	Treatment	Size	X-Ray
Janahi et al. [6]	Case report	1	M	16	Swelling	Palate (anterior part)	Embolization, radiotherapy, and excision	1 × 2 cm	Radiodense
Ribeiro et al. [7]	Case report	1	M	20	Swelling	Right maxillary region	Surgical resection		Radiolucent
Park et al. [8]	Case report	1	F	12	Asymptomatic	Right maxilla	Complete excision and curettage, with sodium tetradecyl sulfate injection	3 × 2.9 × 2.7	Radiolucent
Ghorbani et al. [9]	Case report	1	F	45	Swelling	Right maxilla (extending into the middle meatal)	Excision with 3 mm of margin		Mixed
Kumawat et al. [10]	Case report	1	F	16	Swelling	Left maxillary bone, in region 23 to 26	Surgical excision and curettage	3 cm × 2 cm (extraoral)	Mixed
Kai Yu Jen [11]	Case report	1	F	74	Conspicuous swelling around her nasal vestibule	From the maxillary anterior to premolars region	Surgical excision (hemi maxillectomy)	20 mm × 38 mm × 58 mm	Radiolucent
Kaya et al. [12].	Case report	1	F	42	Asymptomatic	Left maxilla in close proximity to the zygomatic	Surgical excision	16 mm diameter	MRI
Yamashita et al. [13]	Case report	1	F	64	Asymptomatic	Base of the left maxilla	Surgical excision and curettage, with tetracycline hydrochloride ointment gauze applied		Radio-opaque
Aditya et al. [14]	Case report	1	M	16	Swelling	Maxillary left anterior region	Sclerotherapy: 3% Setrol (sodium tetradecyl sulfate) intralesional injection at multiple sites each 2–3 weeks of interval and follow-up. Surgery only if necessary	31 × 26 × 49 mm	Mixed
Mastanduono et al. [15]	Case series	2	1: F 2: M	1: 62 2: 14	Swelling	1: 13–14–15 region 2: 11–24 region	Not specified		1 Radiolucent 2: Mixed
Gupta et al. [16]	Case report	1	M	1 month old	Progressive swelling and alveolar fullness	Right maxilla	Oral steroids (2 mg/kg/day) for two months, followed by gradual fortnightly tapering	/	Mixed
Piastro et al. [17]	Case report	1	F	56	Left nasal epistaxis and discomfort	Palate	Surgical excision	/	Radiolucent
Chandra et al. [18]	Case report	1	M	46	Teeth pushed apart	Between teeth 12 and 13	Surgical excision	/	Radiolucent
Mittal et al. [19]	Case report	1	F	21	Slow and gradually increasing swelling; exfoliation of one of the upper right teeth	Right maxilla	Not specified	/	Mixed
Johnson et al. [20]	Case report	1	M	47	Enlarging, painless mass	Right maxilla	Surgical resection	/	Radio-opaque
Panagos et al. [21]	Case report	1	M	77	Sinus congestion and frequent epistaxis, which required hospitalization and transfusion	Left palate and maxilla	Selective embolization of the feeding vessels, followed by surgical resection	6 × 4 cm	Radio-opaque
Goyal et al. [22]	Case report	1	F	Unspecified (young patient)	Asymptomatic	Left maxilla	Surgical excision	2.1 × 1.5 × 1.5 cm	Mixed
Cai X et al. [23]	Case report	1	M	11	Swelling	Right maxilla and right maxillary sinus	Surgical resection	3 cm × 2.5 cm × 2.5 cm	Radiolucent

Table 1. *Cont.*

Author	Type of Study	Cases (*n*)	Gender	Age (y)	Symptoms	Localization	Treatment	Size	X-Ray
Persky MS et al. [24]	Case series	3 cases	1: F 2: M 3: M	1: 10 2: 4 3: 23	Asymptomatic		Not specified		Not specified
Kumar N. A. et al. [25]	Case report	1	F	65	Asymptomatic	Left maxillary alveolar ridge	Polidocanol injections and Excision	Soft swelling of approximately 0.8 × 1 cm	Not specified
Douami A. [26]	Case report	1	F	71	Asymptomatic	Left maxillary bone	Surgical excision	1.5 × 1 cm approximately	Radio-opaque
Colletti et al. [27]	Case series	1, 3 not specified	F, 3 not specified	16 *n*3 not specified	Swelling, palatal mass 3 not specified	Right maxillary bone 3 not specified	Surgical excision and curettage 3 not specified	Not specified	Radiolucent lesion 3 not specified
Our case	Case report	1	M	63	Asymptomatic	Right palate	Surgical excision	9 × 8 × 12.5 mm	Radiolucent

The full-text analysis showed 157 articles did not focus on the specific theme. Twenty articles were founded via databases and registers during the systematic search. Two articles were founded during the research in the cited literature, and they were added to the final number of cases. The remaining 20 articles were further analyzed for final inclusion and qualitative analysis.

Two articles found separately from the main research were included in the review according to their utility and their fitting to the search. A total of 22 articles were included.

Doubts about articles and their information were solved with discussion or consulting a forth expert. No automation tools were used to reduce the risk of bias.

The main data searched in the articles included age, sex, symptoms, localization, radiological aspect, size, and treatment. The outcomes reported were primarily descriptive and did not require complicated conversions.

When information on these variables was missing or unclear, no data were added to the summary and the discussion. The risk of bias, summary statistics, and precision of data of each included study are not mentioned due to the descriptive nature of the results.

3.1. Synthesis

The literature review found in total 29 cases (28 + 1), including case reports and short case series, including our case. Gender (M/F) distribution consisted of 12 male subjects, 14 female subjects, and 3 not specified. The ages of the patients ranged from 1 month old to 77 years, with a mean age of 35.6. Clinically, 15 patients presented symptoms; in three cases this was not specified, while eight were asymptomatic and identified as incidental findings. Radiologically, seven cases were described as producing a radiolucent image, while five reported a radiodense image, seven cases were described as a mixed radio-opaque and radiolucent image, and for four cases, it was not specified. Lesion size varied from medium (1–3 cm) in seven cases to large (>3 cm) in four cases. Most studies (11) did not provide details on lesion size. Regarding the histological diagnosis, all the cases were identified as venous malformation. Cases using the terminology of cavernous intraosseous hemangiomas were carefully controlled and corresponded well to a histological form of venous malformation [28].

Three cases were not fully described by the author but were confirmed as venous malformations [27]. The results are described with a narrative approach due to the variability in terms of cases presentations and rarity of the disease. In this case, no sensitive analysis was conducted.

One case of cavernous hemangioma, representing a hemangiomatous variant of ameloblastoma, was not included in this review [29]. Regarding management, tumor

resection was preferred in four studies, with two embolizations before the surgeries. Surgical excision was the most preferred treatment, used in 14 studies. Surveillance was reported in only two studies. Some adjuvant or sclerotic treatments by sodium tetradecyl injections were used in two studies. Two cases benefited from embolization of the lesion. One case was treated with hemi maxillectomy and one other with subtotal maxillectomy. Only two studies reported non-surgical management with regular patient follow-up, including oral steroids treatment of the lesion or sclerotherapy (Sertol injections) combined with follow-up. Only one case of radiotherapy combined with surgery was reported.

3.2. Case Presentation

A 63-year-old male patient in good general health, a nonsmoker with no allergies and taking no medications, was referred by his general dentist to the Oral Surgery and Implantology Unit of the University Hospitals of Geneva for extraction of tooth 21, which had a root fissure, and implant-supported reconstruction. The patient had undergone root canal treatment and a post crown several years prior. Upon extraction of tooth 21, an absence of the buccal bone wall was noted (Figure 2).

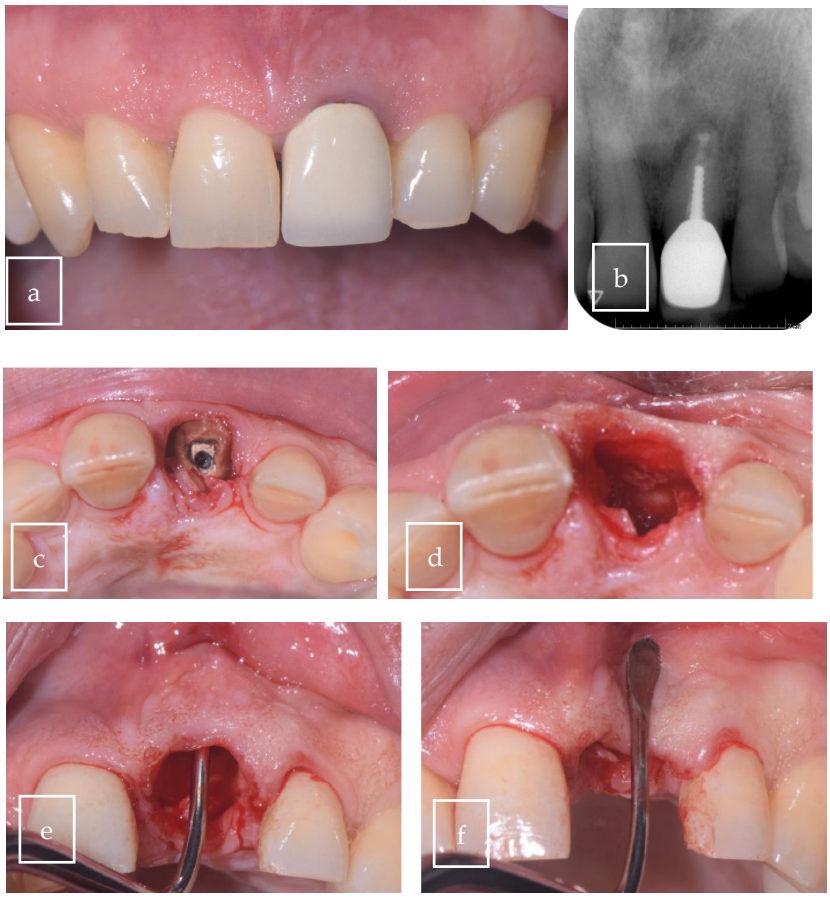

Figure 2. (**a**) Clinical view showing the initial status of the anterior maxillary area; (**b**) intra-oral radiograph. (**c**,**d**) Clinical views during extraction of tooth 21; (**e**,**f**) post-extraction clinical views.

During follow-up examination at 2 years, the patient presented clinically with bone atrophy at edentulous site 21, and intra-oral radiograph showed no signs of re-ossification at the socket (Figure 3).

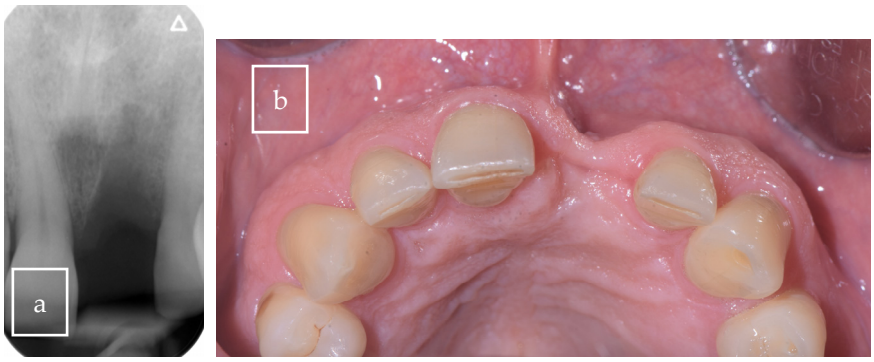

Figure 3. Occlusal view 2 months after tooth extraction and intra-oral radiograph horizontal showing the alveolar defects (**a**,**b**).

A cone beam computed tomography (CBCT) exam was performed, which showed severe bone atrophy at site 21, measuring 9 × 8 × 12.5 mm (L × W × H) with complete lysis of the vestibular bone wall (Figure 4), as well as the incidental discovery of a bone lesion of the hard palate (B, C). In the left paramedian bony palate, posterolateral to the incisor canal, a ground-glass osteolytic area approximately 9 × 5 mm in size was observed, suggesting fibrous dysplasia (Figure 5).

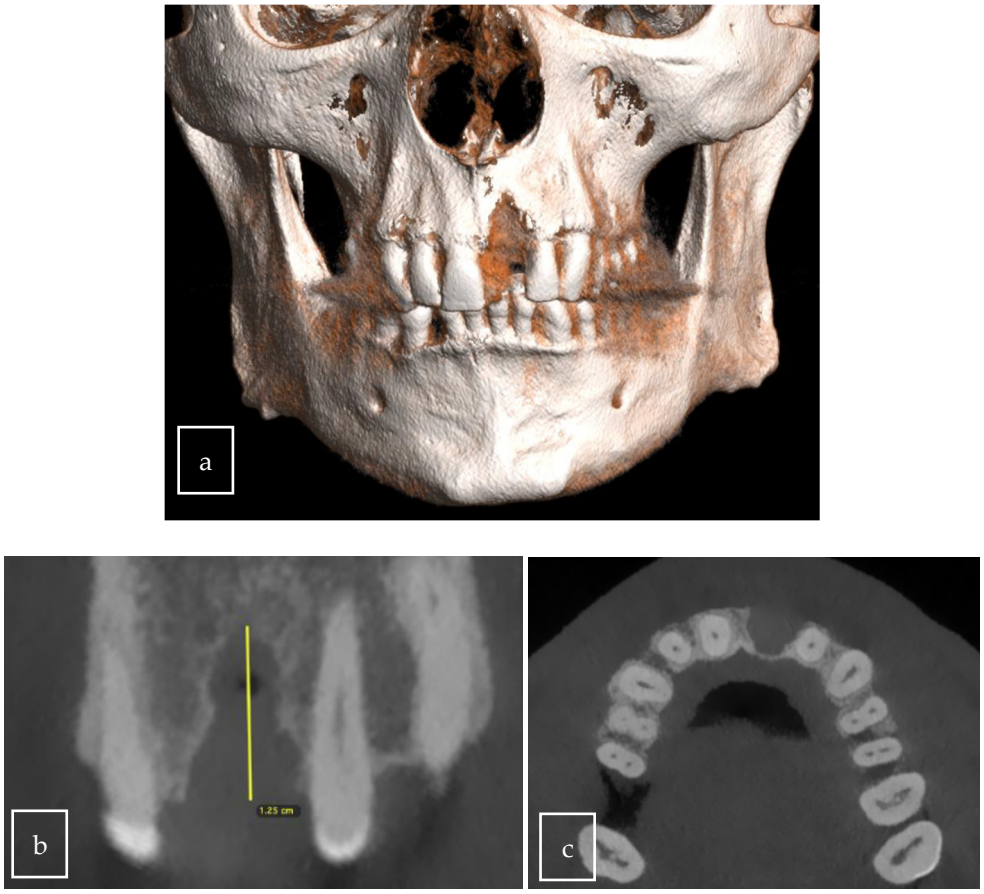

Figure 4. (**a**) Three-dimensional examination. (**b**,**c**) Pre-operative CBCT scan showing axial (left) and transversal (right) views.

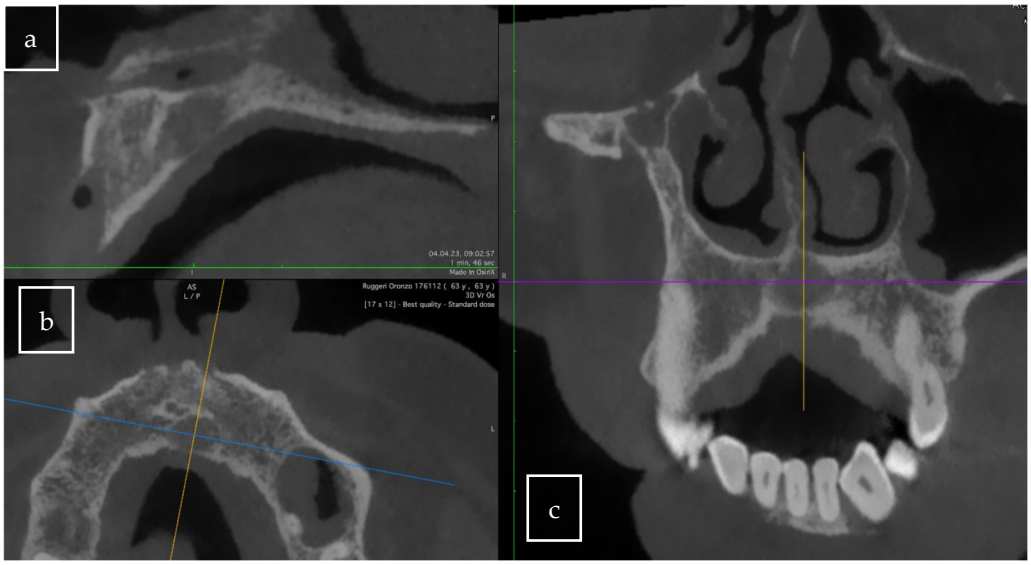

Figure 5. Pre-operative CBCT (a) sagittal, (**b**) transversal and (**c**) axial views revealed a radiotransparent lesion located in the palatal incisors.

The patient was informed, and biopsy/excision along with bone augmentation were planned. Co-amoxicillin (Mepha) was administered one hour prior to surgery (2 g) and continued for 6 days after surgery (2 × 1 g daily). Under local anesthesia (4% articaine with 1:100,000 adrenaline—Ubistesin™ Forte—3M ESPE), a full-thickness flap following midcrestal and intrasulcular incisions in adjacent dentate areas was made. The lesion was then completely enucleated at palatal site (Figure 6). Histopathological examination revealed an intraosseous vascular proliferation composed of numerous, rather thin-walled vessels of different sizes lined by non-atypical endothelial cells highlighted by CD31 immunostaining and consistent with a diagnosis of intraosseous venous malformation (Figure 7).

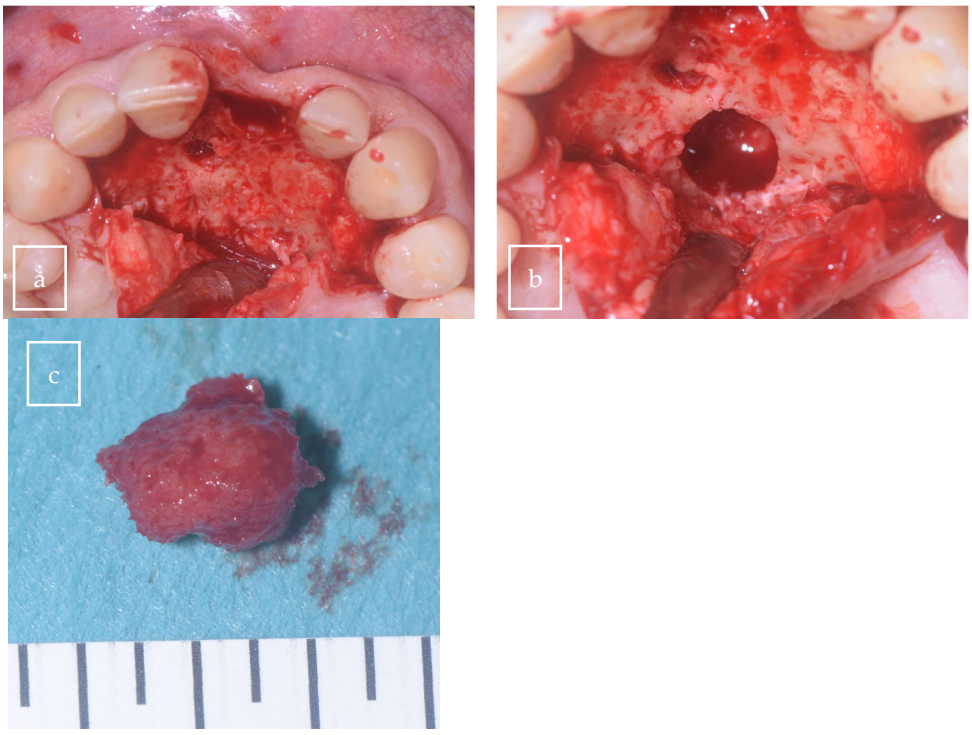

Figure 6. Intraoperative view (**a**) before and (**b**) after the enucleation; (**c**) macroscopic view of the removed tissue.

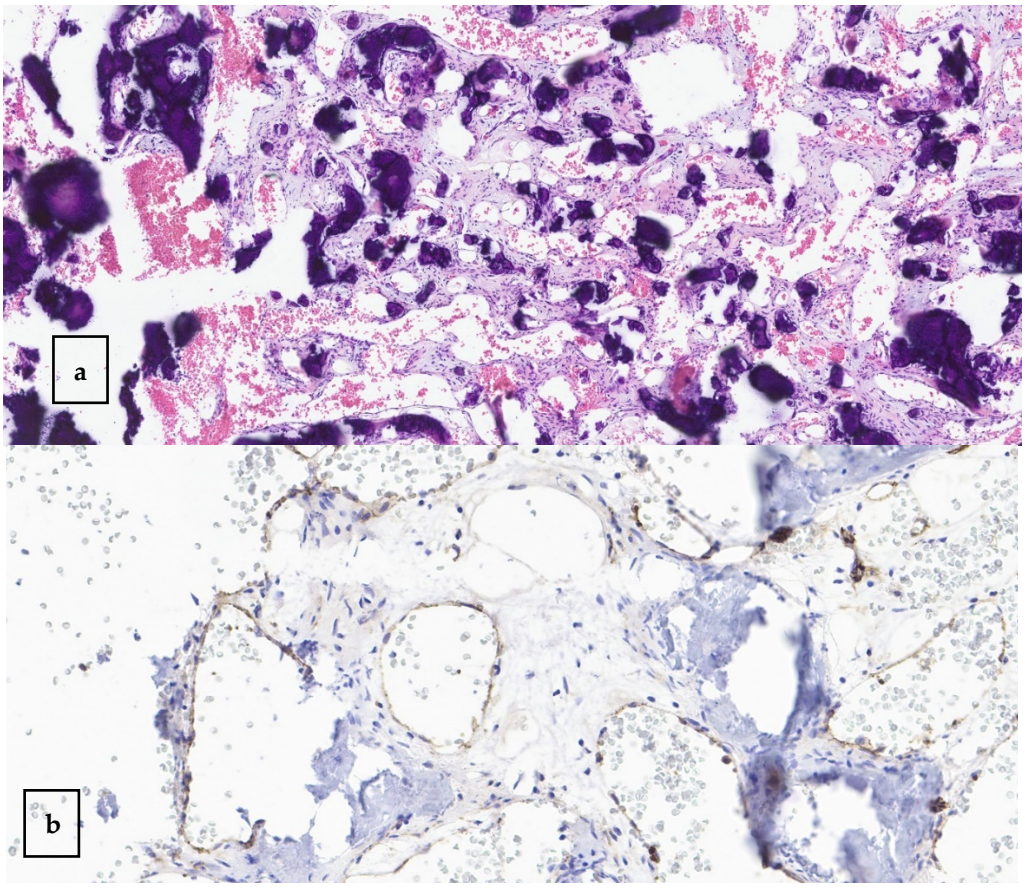

Figure 7. Histopathological examination of the excised specimen showing numerous vascular spaces of various size lined by a single layer of endothelial cells. (**a**) hematoxylin and eosin stain ×20; (**b**) CD31 immunostaining ×40.

After exposure of the osseous defect, the granulation tissue was thoroughly debrided. Subsequently, MaxGraft® blocks (20 × 10 × 10 mm, 1× block) were adapted according to the defect size and local contours of the surrounding vital bone and secured into place using a 12 mm fixation screw (Cortex Screw 1.5 mm, 10 mm, Synthes®, Oberdorf, Switzerland). Augmentation was covered by a collagen membrane (Osteobiol® Evolution, Technoss, Turin, Italy), followed by wound closure using Supramid 4.0 sutures (B.Braun®, Melsungen, Germany) (Figure 8).

Nonsteroidal analgesics (Ibuprofen 600 mg and Paracetamol 1000 mg tablets) were prescribed. The patient was advised to follow routine precautionary measures and supportive antiseptic therapy with 0.2% chlorhexidine rinses (Dentohexin, Streuli Pharma AG®, Uznach, Switzerland) twice daily for 1 week. The patient returned after 10 days post surgery for suture removal. Healing was without complications, and at 5 months, implant bed preparation was carried out freehand at the future implant position, according to the manufacturer's instructions for placing Bone Level Tissue implants (BLT, Straumann®, Basel, Switzerland). A Straumann® BLT implant (Basel, Switzerland) with a diameter of 4.1 mm and a length of 12 mm was manually placed at site 21, achieving primary stability with an insertion torque of 35 N/cm (Figure 9).

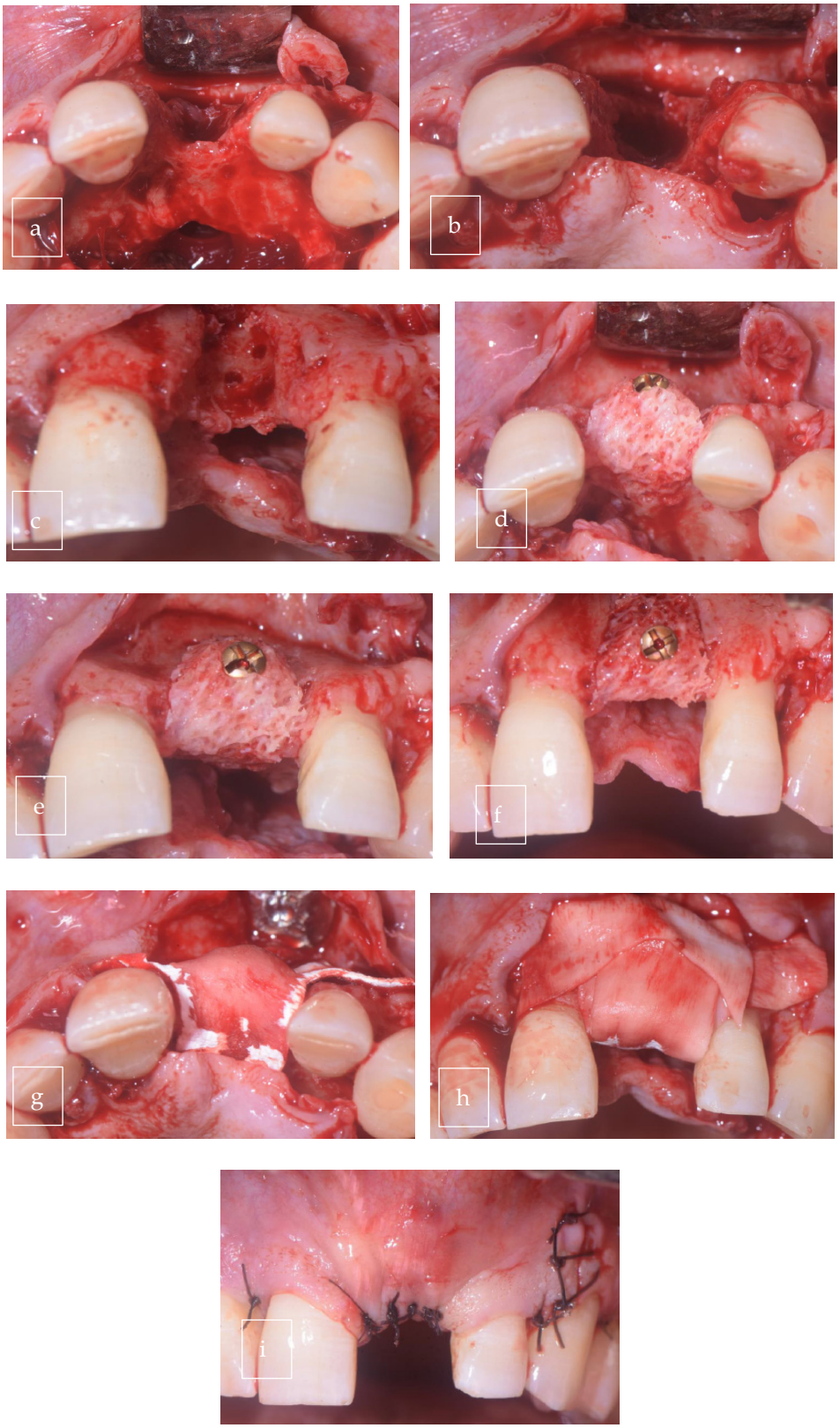

Figure 8. Intraoperative view before and after thorough debridement to remove residual inflammatory tissues, bone preparation, and occlusal (**a**,**b**,**d**,**e**,**g**) and frontal view (**c**,**e**,**f**,**h**,**i**) after bone block augmentation and fixation covered by collagen membrane and after wound closure.

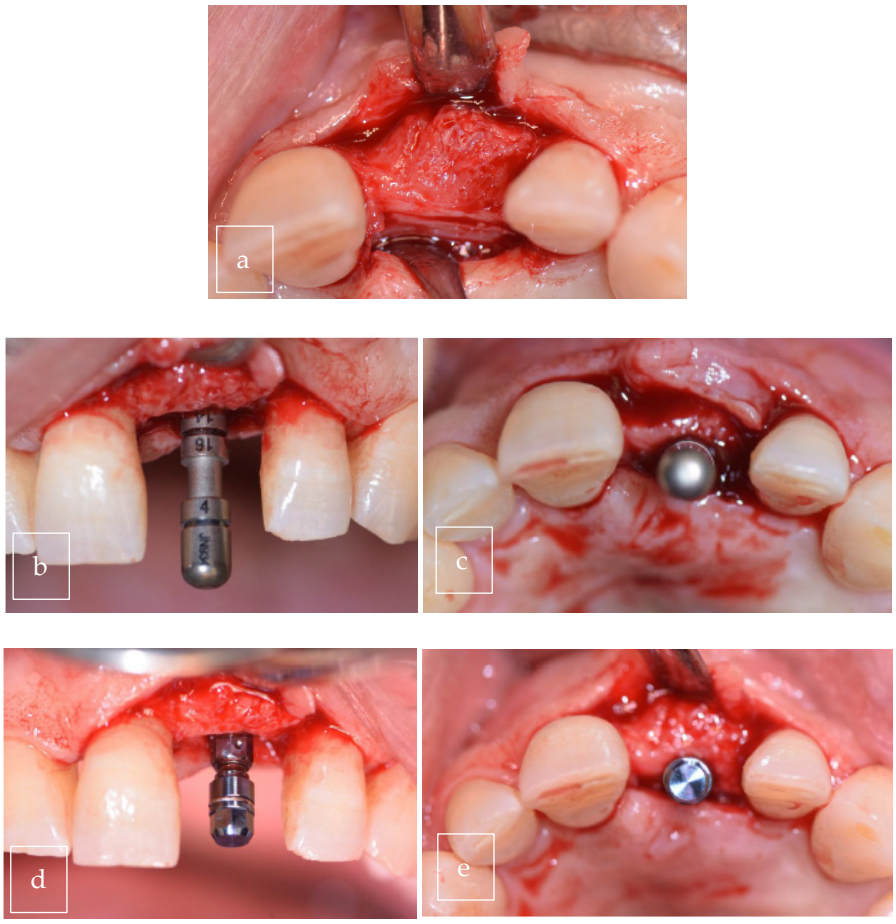

Figure 9. Occlusal aspect of the exposed edentulous site 21 after 5 months of healing and buccal (**b**,**d**) and occlusal views (**a**,**c**,**e**) showing control of the drilling axe of site 21 and after placement of implant.

Control intra-oral radiographs were taken, and post-operative advice was given to the patient along with a prescription for oral antibiotics (amoxicillin with clavulanic acid 2 g/day/days for 5 days). At the 10-day clinical follow-up, the sutures were removed. After a healing period of two months, the healing was uneventful, and a screw-retained single-unit crown (E-max-press) was delivered using an RC Variobase® abutment (Straumann®, Basel, Switzerland). The implant-supported restorations showed good aesthetic and functional results after a 3-year follow-up (Figures 10 and 11).

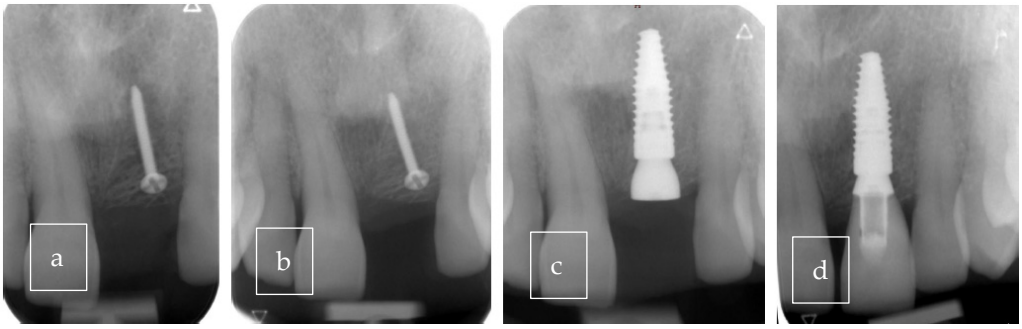

Figure 10. Periapical 2D radiographs taken after bone augmentation (**a**), after 5 months of healing (**b**), after implant placement (**c**), and after the screw-retained restauration was delivered, with the 1-year post-placement reentry indicating adequate implant integration and stable peri-implant osseous conditions and marginal levels (**d**).

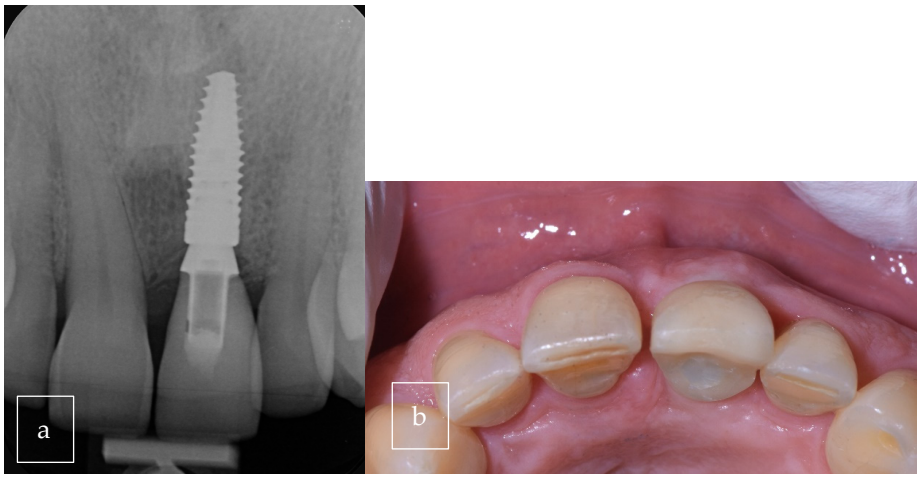

Figure 11. Radiographic (**a**) and clinical examination (**b**) at 3-year follow-up period.

4. Discussion

Based on our literature review, maxillary cavernous hemangiomas (venous malformation) are rare vascular tumors. A total of 22 articles, mostly consisting of case reports, indicate a predominance in young adult women. Lesion size varies, typically ranging between 1 and 3 cm, and most patients (about 64%) were symptomatic. The symptoms presented are primarily non-painful swelling, sometimes associated with spontaneous bleeding. Management typically involves surgical intervention, namely tumor resection or curettage, combined with complementary methods such as embolization in some cases. Surgical procedures carry the risk of surgical complications, including profuse bleeding.

Diagnosis of maxillary hemangiomas is difficult due to their low incidence and variability in their clinical, radiological, and histological presentations. The manual process of review was necessary due to their rarity and heterogeneity, but this could be a limitation in the review process.

The ISSVA classification of vascular anomalies was adopted in 2014 and revised in 2018 and 2025 (Table 2) to classify vascular tumors as benign, borderline, or malignant [4]. The first vascular type includes infantile hemangioma, congenital hemangioma, tufted angioma, spindle-cell hemangioma, epithelioid hemangioma, pyogenic granuloma, and rare lesions. Borderline lesions include hemangioendothelioma and Kaposi's sarcoma. Malignant tumors comprise angiosarcoma, epithelioid hemangioendothelioma, and rare lesions. Infantile hemangioma (Glut 1-positive) and rapidly involving congenital hemangioma are not found in adults. Vascular malformations include venous malformations (often still called cavernous hemangiomas), capillary malformations, lymphatic malformations, arteriovenous fistulas, and arteriovenous malformations.

Clinically, maxillary hemangiomas often exhibit nonspecific symptoms. In our study, we found that they manifested as variable-sized intra-oral masses that can evolve into a subcutaneous mass that may be indurated. Asymptomatic presentation and spontaneous pain are possible symptoms. The most frequently reported presentation (36% of cases) was asymptomatic swelling. Also, tooth mobility, tooth loss, or tooth displacement have been reported. Lesions can also manifest as extraoral swelling at various locations, including the lower third of the face, posterior mandibular, and zygomatic regions. In general, the lesions are generally asymptomatic at first, but depending on their location and how they affect adjacent anatomical structures, they can cause more marked symptoms as they grow [27–32].

Table 2. ISSVA classification [4].

Vascular Tumors	*Vascular Malformation*
Benign	
Infantile hemangioma rapidly involuting (RICH)	Capillary malformations
Non-involuting (NICH)	Lymphatic malformations
Partially involuting (PICH)	Venous malformation
Tufted angioma	Arteriovenous malformations
Spindle-cell hemangioma	Arteriovenous fistula
Pyogenic granuloma	
Others	
Locally aggressive or borderline	
Kaposiform hemangioendothelioma	
Retiform hemangioendothelioma	
Papilary lintralymphatic angioendothelioma	
Dabska tumor	
Composite hemangioendothelioma	
Pseudomyogenic hemangioendothelioma not otherwise specified	
Kaposi sarcoma	
Others	
Malignant	
Angiosarcoma	
Epithelioid hemangioendothelioma	
Others	

The clinical presentations varied widely. These ranged from incidental finding, increased mobility of the tooth, persistent bleeding following the extraction, breathing difficulties, spontaneous and recurrent bleeding or noose epistaxis, hypertrophy and discoloration of the oral mucosa, trismus, and root resorption of adjacent teeth. Compared to our case, just one other case described a lesion of the hard palate opposite the central incisors. While this lesion was discovered in the context of palatal gingival bleeding, the lesion in our case was discovered fortuitously during implant planning.

4.1. Radiological Criteria

On conventional radiography, maxillary hemangiomas appear as radiolucent lesions with blurred, ill-defined borders not specific to hemangiomas. In most cases, the appearance of flat bone hemangiomas is described as 'sunburst' or 'spoked wheel-shaped', while that of long bone hemangiomas is more like 'honeycombs' or soap bubbles [32–36].

In the mandible, hemangiomas typically present as radiolucent, with fine trabeculations and cystic spaces. Magnetic resonance imaging (MRI) and computed tomography (CT) provide better visualization of internal structures and vascularity. The radiological appearance of hemangiomas in the maxilla is more variable, with descriptions in the literature including loss of continuity of the lamina dura, cystic lesions with fine trabeculations, or diffuse radiolucency [35,36]. Radiologically, hemangiomas can also be classified according to their size into three main categories:

a. Small (<1 cm): These lesions are generally well-encapsulated and localized, with little tendency to expand;
b. Medium (1–3 cm): These lesions may exhibit capillary or early cavernous features;
c. Large (>3 cm): These lesions are more invasive due to the presence of large vascular spaces and are associated with faster growth;

Several radiological examinations, listed below, are used to diagnose maxillary hemangiomas:

1. Computed tomography: Maxillary hemangiomas often appear as radiolucent lesions on CT, with well- or poorly defined margins. Images often show thin bony septa, giving a honeycomb or soap bubble appearance. The presence of calcified honeycomb structures is a suggestive although nonspecific sign. Contrast enhancement after injection highlights the vascular appearance of the lesion [36–38];
2. MRI is the gold standard for characterizing the vascular nature of hemangiomas. On T1-weighted images, hemangiomas often appear hypointense or isointense compared to muscle. On T2-weighted images, they are typically hyperintense due to blood stasis in the dilated vascular spaces. After gadolinium injection, heterogeneous enhancement is observed, indicative of abundant vascularization of the lesion. This characteristic is essential for differentiating hemangiomas from other maxillary lesions [37–39];
3. Angiography: This approach can be used to assess the vascularization of maxillary hemangiomas, confirming their vascular nature and aiding in planning of possible preoperative embolization, should surgery be necessary. However, this approach is generally reserved for complex cases due to its invasive nature [40–42].

4.2. Histological Criteria

Histologically, maxillary hemangiomas are subdivided into several subtypes according to the structure of the vessels involved: capillary, cavernous, mixed, and vascular variants.

1. Capillary hemangioma: Consists of small, thin-walled vessels, often closely spaced. The capillaries are lined with endothelial cells without atypia. This type is more common in soft tissues but can also occur in maxillary bones;
2. Cavernous hemangioma: Characterized by large vascular spaces, filled with blood and, in some cases, organized thrombi, separated by thin connective tissue walls. This cavernous structure is more common in bone hemangiomas, which explains their characteristic radiological appearance;
3. Mixed hemangioma: Characterized by a combination of capillary and cavernous structures. This type is less common but presents with varied histological appearances within the same lesion [4].

All the cases in our study were classified as a cavernous hemangioma or vascular malformation.

4.3. Differential Diagnosis

The radiological features of central maxillary hemangiomas resemble those of many other pathological entities, such as ameloblastoma, giant cell granuloma, osteosarcoma, multiple myeloma, fibrous dysplasia, and dentigerous or other odontogenic cysts. Clinically, central maxillary hemangiomas can be mistaken for central arteriovenous fistulas, aneurysms, or shunts.

4.4. Management and Treatment

Management of maxillary hemangiomas varies but aims to control bleeding, eradicating the pathology, and prevent recurrence.

Treatment options are embolization, surgical resection, and curettage. In symptomatic cases or before surgery, embolization can reduce the vascularity of the lesion and minimize the risk of bleeding. Surgical resection is sometimes necessary, particularly for symptomatic lesions, but requires careful planning due to the high risk of bleeding.

The case presented here involves a 63-year-old man, which contrasts with most cases reported in the literature, where many patients are female, with an average age of 30. The anterior maxillary localization of the lesion in our case remains rare, with only one other

similar case reported. The lesion in our case, measuring 9 × 8 × 12.5 mm, and its radiological appearance was consistent with most lesions described in the literature. Surgical treatment of these lesions is associated with significant bleeding and a risk of hemorrhage. The patient had a history of diastema between his natural teeth 11 and 21 and wished to have it on the implant prosthetic reconstruction, which we reproduced. In our case, the lesion was surgically enucleated during bone augmentation performed at the atrophied edentulous site 21, without any complications.

5. Conclusions

Maxillary venous malformations present with complex and diverse clinical and radiological features. Clinical, radiological, and histological criteria are essential for an accurate diagnosis, and appropriate measures may be necessary to minimize potential severe complications during lesion removal.

MRI remains the preferred tool for characterizing these lesions in preoperative assessment, while histological examination provides a final diagnosis and allows to distinguish types of hemangiomas.

Altogether, tailored management based on the individual characteristics of each lesion is crucial to ensure effective and safe management of this rare condition.

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