VER
Vascular & Endovascular Review

Intraoperative Embolization : Key Step in the Resection of Sinonasal Hemangiopericytoma

Eppy Buchori Aristiady, MD[1], Raisa Mahmudah, MD[1], I Made Tirta Saputra, MD[1]

[1]Department of Radiology, Faculty of Medicine, Universitas Padjadjaran, Dr. Hasan Sadikin General Hospital, Bandung, Indonesia.

Corresponding Author :
Eppy Buchori Aristiady, MD
Department of Radiology, Faculty of Medicine, Universitas Padjadjaran, Dr. Hasan Sadikin General Hospital, Bandung, Indonesia.
Email : eppy@unpad.ac.id

ABSTRACT

Sinonasal hemangiopericytoma (SNHPC) is a rare mesenchymal neoplasm characterized by perivascular myoid differentiation and a distinctive “staghorn” vascular pattern. Although complete surgical excision remains the primary treatment modality, the decision to perform surgery must be made with caution due to the significant risk of intraoperative bleeding associated with the tumor’s high vascular profile and its complex anatomical location within the sinonasal region. This case report highlights the importance of thorough vascular assessment, including presurgical embolization, in preventing massive intraoperative hemorrhage during the resection of sinonasal hemangiopericytoma.

KEYWORDS: Sinonasal hemangiopericytoma, staghorn vascular pattern, presurgical embolization.

How to Cite: Eppy Buchori Aristiady, Raisa Mahmudah, I Made Tirta Saputra, (2025) Intraoperative Embolization : Key Step in the Resection of Sinonasal Hemangiopericytoma, Vascular and Endovascular Review, Vol.8, No.20s, 170-175

INTRODUCTION

A 37 years old Indonesian male patient was admitted to the ENT Clinic of the Hasan Sadikin General Hospital Bandung for having a blocked left nostril for the past 2 years. The patient also reported that it has worsened for over the past 6 months. The complaint is accompanied by a runny nose and occasional pain. There are no complaints of shortness of breath, hoarseness, fever, or neck lumps. Four months ago, the patient began to experience a lump spreading toward the left cheek. The patient is currently able to eat and drink normally. There is a history of weight loss of 2 kg over the past 3 months.

Endoscopic findings revealed a reddish, nodular, and easily bleeding mass located at the level of the inferior turbinate, accompanied by yellowish discharge in the left nasal cavity.

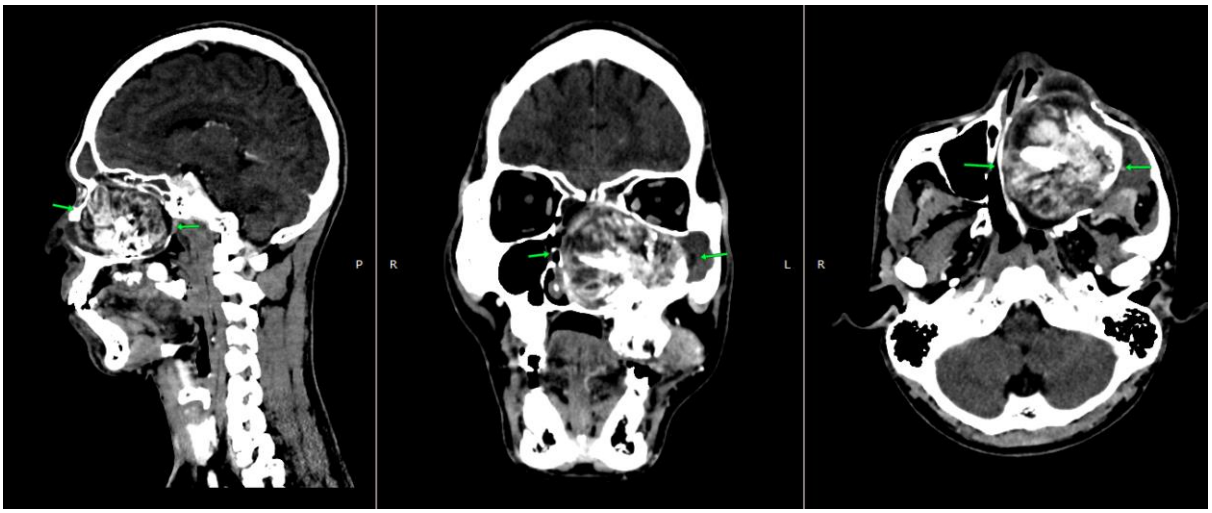

Figure 1. Brain CT with contrast

The patient then underwent a Contrast-enhanced computed tomography (CECT), showed in Figure 1. The scan showed a 6.03 x 7.20 x 4.56 cm isodense inhomogeneous mass with relatively clear borders, and a chondroid matrix within it occupying the right maxillary sinus region extending into the right sphenoid sinus, the right nasal concha, pushing the left orbit superiorly, and also extending into the left dental alveolar; left bulbar proptosis; left frontal bone hyperostosis: suspected of chondrosarcoma.

The patient underwent surgery. However, during the surgical procedure, massive bleeding occurred and could not be stopped with sutures and tampons. Shortly, the patient was immediately sent to interventional radiology for transarterial embolization.

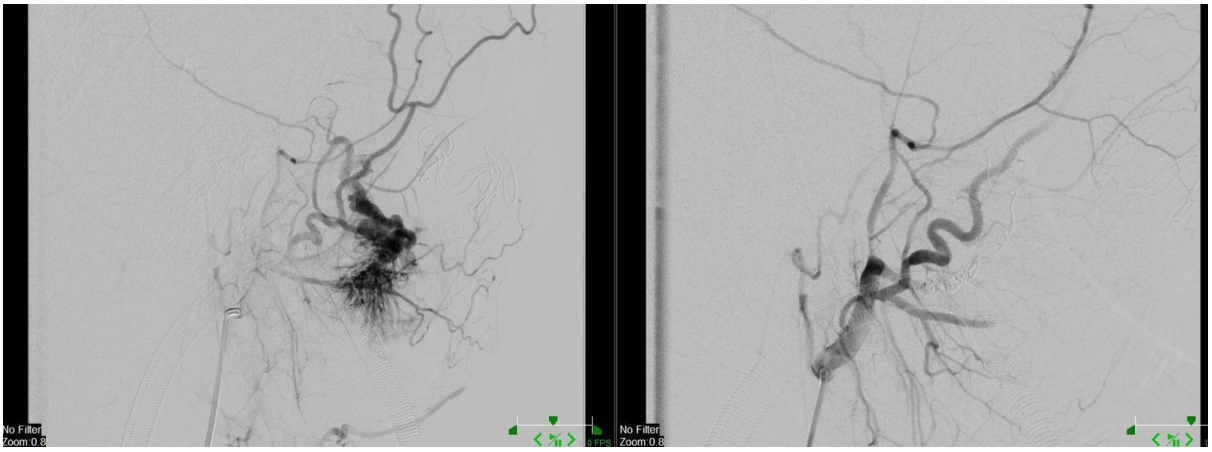

Figure 2. Pre embolization

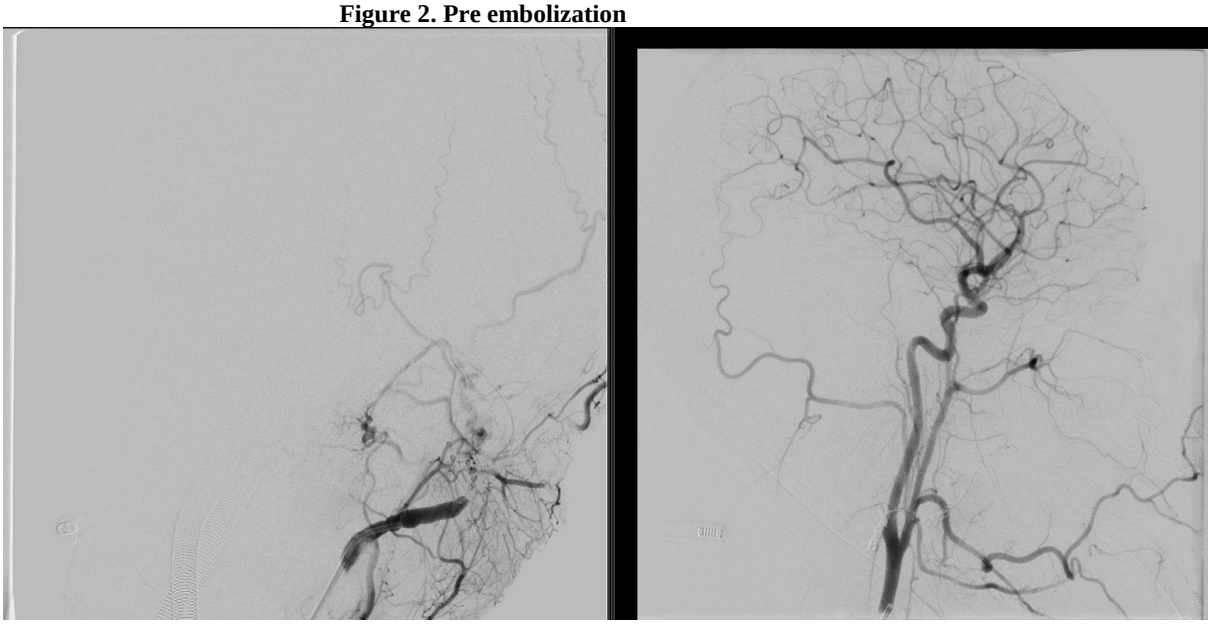

Figure 3. Post embolization

During catheterization, a tumor stain was observed in the left nasal cavity, which was fed by branches of the left external carotid artery, particularly the left internal maxillary artery, as well as branches of the left internal carotid artery, with drainage to the left sigmoid vein, as shown in Figure 2. Superselective catheterization was performed with a microcatheter on the left maxillary artery branch. Embolization was then performed using several coils on the left maxillary artery until the flow slowed down as shown in Figure 4.

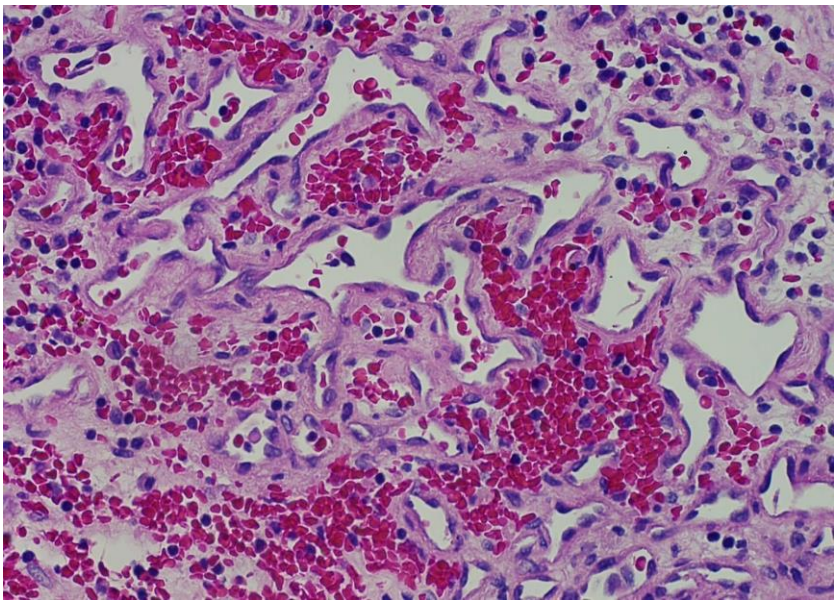

Figure 4. Histopathology of the mass

The resected mass was then submitted for histopathological examination, showed in Figure 4. The staining showed a sub-epithelial fibrocollagenous matrix with inflammatory cells accompanied with inflammatory cells, proliferative capillaries, and bleeding. Showed a well-defined tumor mass with infiltrative border consist of plump or hobnail hyperplastic round-oval shaped endothelial cells. The tumor forms an anastomosing vascular structure resembling staghorn vessels. The nuclei are relatively monomorphic with coarse chromatin, and mitotic figures are rarely observed. Supported the diagnosis of HPC, this was further confirmed by immunohistochemistry (IHC) in which negative S100 staining and positive K167.

DISCUSSION

Sinonasal hemangiopericytoma is a mesenchymal neoplasm consisting of perivascular myoid phenotype which means it is formed from smooth muscle cells that build up surrounding capillaries.[1,3] These contractile cells regulate vascular caliber, thereby modulating blood flow and permeability.[2] Hemangiopericytoma, first described by Stout and Murray in 1942, is a distinct soft tissue neoplasm believed to originate from pericytes, characterized histologically by branching ("staghorn") vascular channels and perivascular hyalinization.[1,3] In 2005, World Health Organization (WHO) distinguished this pattern of tumor into Glomangiopericytoma (GPC) as a nasal and paranasal sinuses borderline and low malignant potential soft tissue tumor while Solitary Fibrous Tumor (SFT) as more aggressive and invasive tumor that has NAB2 + STAT6 genetical characteristic.[3,4] And regarding terms that are used in clinical practice, the term "hemangiopericytoma" is accepted for any tumors with hemangiopericytoma-like histology.[5]

Hemangiopericytoma (HPC) may develop in various anatomical sites throughout the body, with a predilection for the lower extremities, pelvis, and retroperitoneal region. The head and neck area represents the third most common site, accounting for approximately 15%–30% of all cases, while only about 5% occur within the nasal cavity and paranasal sinuses. These tumors most frequently affect individuals in their fifth to sixth decades of life. Sinonasal hemangiopericytoma (SNHPC) generally demonstrates indolent, painless growth, with epistaxis and nasal obstruction as the most common presenting symptoms. On otorhinolaryngologic evaluation, the lesion may grossly resemble various soft tissue tumors, including nasal polyps. Pain typically emerges in later stages and may be associated with progressive facial swelling, suggesting local invasion; however, clinical features may vary according to the anatomical site of the tumor. Visual disturbances and headaches can also occur, though they are relatively uncommon. Consequently, the differential diagnosis of sinonasal hemangiopericytoma (SNHPC) is broad and includes multiple benign and malignant entities. These may range from vascular or soft tissue tumors such as juvenile hemangioma, glomus tumor, and angiosarcoma, to smooth muscle and nerve sheath tumors like leiomyoma, leiomyosarcoma, and schwannoma. Other considerations include mesothelioma, liposarcoma, benign or malignant fibrous histiocytoma, solitary fibrous tumor, synovial sarcoma, chondrosarcoma, neuroblastoma, and adenoid cystic carcinoma.[2]

The patient presented with a long-standing history of unilateral nasal obstruction, intermittent pain, runny nose, and weight loss. Physical examination revealed a reddish, nodular, and easily bleeding mass located at the level of the inferior turbinate, accompanied by yellowish discharge in the left nasal cavity. These clinical findings suggested a nasal cavity mass, prompting further evaluation using radiological and pathological elements.

The diagnosis of hemangiopericytoma (HPC) is established based on clinoradiological and pathological findings, with histopathological tissue examination remaining the gold standard for definitive diagnosis due to its unspecific clinical features.[3,5] Although definitive diagnosis relies on histopathological assessment, biopsy is generally avoided because of the high risk of significant hemorrhage. Therefore, radiological evaluation using CT and/or MRI should preferentially be performed.[6] CT and MRI are essential in measuring the location, shape, size, susceptible content of the mass, its borders and infiltration as well as its susceptibility of bony erosion to the adjacent bone structures. These measurements were subsequently utilized to determine the most appropriate surgical approach for the resection, the extent of resection, and the prognosis of the patient. However, diagnostic errors may prompt suboptimal surgical planning, resulting in partial resection and consequently elevating the likelihood of tumor recurrence or metastatic spread.[7]

On CT, HPC usually demonstrates spherical or lobulated mass with bony erosive characteristics.[3] And since HPC is a vascular tumor, it showed an avid and homogeneous enhancement on contrast-enhanced scans, as also observed in this patient. However, such findings are insufficient for a definitive diagnosis of HPC. MRI is particularly useful in determining the presence of intracranial extension. The literature also notes that MRI can further characterize the tumor in terms of its cellularity and vascularity through T2-weighted imaging (T2WI), vascular signal voids, apparent diffusion coefficient (ADC) values, and wash-in/wash-out patterns on dynamic contrast-enhanced MRI (DCE-MRI). On MRI, HPC typically demonstrates intermediate-to-high signal intensity on T2WI, appearing brighter than adjacent muscle, which reflects its high soft-tissue or fluid content and hypervascular nature. The ADC, measured from diffusion-weighted imaging (DWI), indicates the degree of water diffusion within the tumor. A high ADC value suggests relatively free water diffusion, reflecting lower cellular density and, therefore, a borderline rather than malignant nature. On DCE-MRI, it demonstrates rapid wash-in and rapid wash-out enhancement patterns, corresponding to its rich vascular network and high blood flow velocity. T2WI may also reveal dark regions (signal voids) representing large, fast-flow vessels, further supporting the hypervascular characteristic of the tumor.[8] In our case, the scan revealed a large, isodense, inhomogeneous mass with relatively clear borders, interpreted to contain a chondroid matrix. This mass was large enough to occupy the right maxillary sinus region extending into the right sphenoid sinus, the right nasal concha, pushing the left orbit superiorly, and also extending into the left dental alveolar; left bulbar proptosis; left frontal bone hyperostosis. Unfortunately, MRI was not performed leading to a preliminary suspicion of Chondrosarcoma. Surgical resection was then performed via a craniofacial approach without presurgical embolization.

If the lesion is identified as sinonasal HPC, it generally exhibits limited responsiveness to chemotherapy and radiotherapy; therefore, these adjunctive treatments are not recommended in the initial management.[4] Historically, wide surgical excision through an open craniofacial approach has been the standard treatment. More recently, endoscopic endonasal resection has become increasingly favored, with studies showing no statistically significant difference in recurrence rates compared with traditional open techniques. The endoscopic technique provides multiple benefits, such as superior visualization with an expanded and enhanced visual field of the tumor and nasopharyngeal structures, which facilitates precise assessment of the tumor attachment, margins, and adjacent tissues. It also enables simpler postoperative surveillance, maintains normal nasal and paranasal sinus function as well as lacrimal system integrity, and avoids external incisions or facial disfigurement. Moreover, it is associated with reduced intraoperative bleeding compared to the external approach. Despite these benefits, open surgery still has a role in cases involving extensive paranasal sinus invasion, extension to the orbital structures, superficial tissue involvement, or spread to the pterygopalatine fossa.[1,2,4] For lesions arising within the paranasal sinuses, external surgical access is commonly selected to ensure complete resection. A craniofacial approach becomes essential when there is involvement of the skull base or cribriform plate. Conversely, tumors confined to the nasal cavity or limited to the ethmoid or sphenoid sinuses can be effectively managed through an endonasal endoscopic technique. In this case, both tumors were successfully excised en bloc using an endoscopic approach, with preservation of the cribriform plate.[7]

Even though the treatment choice for sinoasal HPC is complete surgical resection, the decision to undertake surgical resection requires cautious consideration, given the substantial risk of intraoperative bleeding caused by its high degree of vascularization and its complex anatomical location in sinonasal region.[1] Therefore, preoperative angiographic evaluation is effective in assessing intraoperative bleeding risk by determining the tumor's vascularity and guiding the need for preoperative embolization, particularly in large tumors.[1,2]

Preoperative embolization has been shown to significantly improve surgical safety in selected highly vascular sinonasal tumors.[9] For extensive or markedly vascular tumors, pre-surgical vascular occlusion may be utilized to reduce intraoperative hemorrhage in both endoscopic and open surgical approaches. This strategy is especially indicated for large lesions or those with intracranial extension, as it decreases operative bleeding, improves surgical visibility, and supports complete oncologic excision.[1,2,4,7,9] Reports in the literature describe successful ophthalmic artery embolization prior to resection of large sinonasal HPCs, demonstrating a marked decrease in intraoperative bleeding following angiographic occlusion.[1] A case report even documented that preoperative embolization followed by complete transnasal endoscopic tumor resection resulted in a blood loss of only 10 mL.[7] Adjunctive strategies such as intraoperative cauterization and hypotensive anesthesia can also be employed to enhance the effectiveness of presurgical embolization in minimizing intraoperative blood loss.[9]

Although embolization carries certain risks—such as ischemia of adjacent organs, facial erythema, or thrombotic events related to catheter placement—these complications are generally less frequent than the occurrence of severe intraoperative hemorrhage. When performed with precise angiographic technique and careful attention to prevent reflux of embolic materials into unintended regions, the procedure is relatively safe. Angiographic assessment of a hypervascular tumor should therefore be considered, even in the absence of a confirmed diagnosis, as preoperative embolization can enhance surgical safety and significantly reduce intraoperative blood loss.[2]

The feasibility of performing angiography and embolization may vary across institutions, and angiography itself poses potential risks. In situations where angiography cannot be undertaken, intraoperative hemorrhage can be mitigated by cauterizing vessels suspected of supplying the tumor. If the ethmoidal arterial branches (anterior or posterior) are identified as the primary vascular supply, coagulation can be performed either along the ethmoid roof or within the orbital cavity. For more posterior tumors, cauterization of the sphenopalatine artery at the sphenopalatine foramen may help further reduce intraoperative hemorrhage. Additionally, one case report described an alternative method for intraoperative hemorrhage control without pre-surgical embolization, in which the anterior and posterior ethmoidal arteries were cauterized using a conjunctival surgical access route prior to tumor excision. This technique was selected because the tumor base was well-defined and the arterial supply was believed to originate from a derivative of the internal carotid circulation.[7]

In cases where presurgical embolization is not performed, postoperative embolization is still required to manage uncontrolled intraoperative bleeding.[7] As observed in the present case, massive bleeding occurred and could not be controlled by sutures or packing. The patient was subsequently referred to interventional radiology for transarterial embolization immediately after surgery. During angiographic catheterization, tumoral blush was identified in the left nasal cavity, supplied predominantly through vascular divisions of the left external carotid system, most notably the internal maxillary artery, along with minor contribution from branches of the left internal carotid system, and venous drainage toward the left sigmoid sinus. Targeted catheterization of the maxillary arterial feeder was achieved using a microcatheter, after which coil-based vascular occlusion was performed until blood flow markedly diminished. The resected specimen was subsequently submitted for histopathological analysis.

Hemangiopericytoma exhibits a histopathological profile characterized by a monotonous proliferation of round to oval or short spindle-shaped cells beneath the epithelium, with a prominent branching ("staghorn") vascular pattern, perivascular hyalinization, and abundant interstitial collagen deposition.[3,4,10] On immunohistochemistry, it is positive for proliferation marker Ki-67, cytoplasmic SMA (Smooth Muscle Actin), Vimentin, and nuclear beta catenin in 80-100% with negative result regarding CD34, AE1/AE3, Bcl2, CD99, CD117, Factor VIIIR Ag, S-100 protein, and STAT6 staining.[4,11] Subsequent evidence demonstrated that hemangiopericytoma and solitary fibrous tumor share essentially indistinguishable morphologic and immunophenotypic profiles, with the classic hemangiopericytoma subtype representing a more cellular, less collagen-rich form of the spectrum. This unifying

concept is reinforced by the identification of the same NAB2-STAT6 fusion and consistent nuclear STAT6 immunoreactivity in lesions historically labeled as hemangiopericytoma or solitary fibrous tumor across all anatomical locations, including intracranial sites.[10] Most of the HPCs are histologically benign, but a small percentage have atypical characteristics with uncertain malignancy potential, with some case series demonstrating the presence of metastatic disease in about 12% of cases. In our case, the resected mass was then concluded to be consistent with sinonasal HPC due to its plump or hobnail hyperplastic round-oval shaped endothelial cells, staghorn arrangement, and negative S100 and positive Ki-67 in immunohistochemistry staining.

Regarding prognosis, both tumor size and the extent of local infiltration serve as important prognostic indicators influencing survival in patients with sinonasal hemangiopericytoma (SNHPC). This situation becomes more challenging in cases of large tumors involving the head and neck region, where the intricate anatomy often precludes complete radical resection with adequate safety margins. Nevertheless, achieving tumor-free surgical margins remains a critical goal in the management of HPC. The histological grade of the lesion also represents a significant prognostic factor, with mitotic activity being the most commonly cited criterion to differentiate benign or low-grade tumors from malignant or high-grade variants. Poorly differentiated lesions, typically exhibiting more than four mitoses per high-power field, are associated with an unfavorable prognosis.[2] Another study demonstrated a correlation between the degree of malignancy and Ki-67 expression, indicating that higher Ki-67 positivity tends to reflect a greater likelihood of aggressive behavior in sinonasal HPC.[4] In our case, the malignant potential warrants further investigation, given the strong Ki-67 positivity despite low mitotic activity.

The reported recurrence is 17%. Tumor recurrence is primarily associated with incomplete resection and may require repeat surgical intervention. Most recurrences develop within five years following the initial procedure, although delayed local recurrence has been documented up to 12 years postoperatively. Early recurrence, particularly within the first year, is typically indicative of residual disease. Metastatic spread occurs in approximately 5–10% of cases and is generally preceded by multiple local relapses. Postoperative care should include prolonged surveillance, with scheduled nasal endoscopic evaluations supported by MRI or CT imaging to detect early recurrence. In the uncommon event of metastatic progression, radiotherapy and chemotherapy may be employed either as adjunctive treatment or for palliative purposes.[4]

CONCLUSION

Sinonasal hemangiopericytoma (SNHPC) is a an uncommon mesenchymal lesion marked by perivascular myoid features and a prominent staghorn-shaped vascular network. Due to its nonspecific clinical presentation and highly vascular nature, diagnosis relies on clinoradiological correlation and histopathological confirmation, with immunohistochemistry serving an essential role in differentiation from other soft tissue tumors. Complete surgical excision remains the mainstay of treatment, as the tumor shows relative resistance to chemotherapy and radiotherapy. Preoperative angiography and embolization are valuable in assessing and minimizing intraoperative bleeding risk, particularly in large or hypervascular lesions. When embolization cannot be performed, intraoperative or postoperative cauterization and selective arterial embolization may help control hemorrhage. The clinical outcome is largely determined by lesion dimensions, depth of infiltration, histologic characteristics, and the adequacy of surgical removal. Although recurrence and metastasis are uncommon, long-term surveillance with periodic endoscopic and radiological evaluations is crucial to detect potential recurrence or delayed metastasis.

REFERENCES

1. Abir M, Mouna K, Malika O, Bellakhdhar M, Jihen H, Wassim K, et al. Sinonasal hemangiopericytoma: Report of two cases and review of literature. International Journal of Surgery Case Reports. 2022 Jun;95:107241.
2. Amorim Filho FS, Gripp FM, Faria GS, Capuzzo Gonçalves M, Miyahira L. Hemangiopericytoma: Conducts and perioperative management of an extent sinonasal tumor in a Jehovah's Witnesses patient - Case report. Cancer Reports. 2022 Feb 23;5(9).
3. Almarri FK, Alnatheer AM, Abuhaimed MK, Albathi AA, Alqahtani AQ, Tatwani T. A rare case of glomangiopericytoma in the nasal cavity: A case report in light of recent literature. Annals of Medicine & Surgery. 2022 May;77.
4. Al-Jobory YM, Pan Z, Manes RP, Omay SB, Ikuta I. Sinonasal Glomangiopericytoma: Review of Imaging Appearance and Clinical Management Update for a Rare Sinonasal Neoplasm. The Yale journal of biology and medicine [Internet]. 2021;94(4):593–7. Available from: https://pubmed.ncbi.nlm.nih.gov/34970096/
5. Pokharel A, Rai S, Baral A. Sinonasal hemangiopericytoma: A rare sinonasal tumor. SAGE open medical case reports [Internet]. 2023 [cited 2023 Oct 19];11:2050313X231173787. Available from: https://pubmed.ncbi.nlm.nih.gov/37284225/
6. Ledderose GJ, Donata Gellrich, Holtmannspötter M, Leunig A. Endoscopic Resection of Sinonasal Hemangiopericytoma following Preoperative Embolisation: A Case Report and Literature Review. Case Reports in Otolaryngology. 2013 Jan 1;2013:1–7.
7. Kuruma Tessei, Arimoto Mariko, Kishimoto Mayuko, You Kinga, Kawade Yuka, Uchida Yasue, et al. Endoscopic Transnasal Resection of Sinonasal Hemangiopericytoma: A Report of Two Cases. Journal of Otolaryngology and Rhinology. 2021 Apr 21;7(1).
8. Suh CH, Lee JH, Lee MK, Cho SJ, Chung SR, Choi YJ, et al. CT and MRI Findings of Glomangiopericytoma in the Head and Neck: Case Series Study and Systematic Review. American Journal of Neuroradiology [Internet]. 2019 Dec 5 [cited 2025 Oct 20];41(1):155–9. Available from: https://www.ajnr.org/content/ajnr/41/1/155.full.pdf
9. Naveed W, Ahmed S, Hussain S, Marium S, Ansari MA. Sinonasal Lobular Capillary Hemangioma of the Nasal Cavity: A Rare Giant Vascular Tumor Managed With Preoperative Embolization and Medial Maxillectomy. Cureus. 2025 Sep 24;

10. Moukhlissi M, Elouaouch S, Narjiss Aichouni, Soufiane Berhili, Loubna Mezouar. Hemangiopericytoma of the central nervous system: a case report. The Pan African medical journal [Internet]. 2023 Jan 1 [cited 2023 Oct 7];44. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10148174/
11. Thompson LDR, Miettinen M, Wenig BM. Sinonasal-Type Hemangiopericytoma. The American Journal of Surgical Pathology. 2003 Jun;27(6):737–49.