Nasal Bridge Arterio-Venous Malformations (AVMs) Excision and Reconstruction: A Case Report

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Abstract

Arteriovenous malformations (AVMs) are vascular malformations that present high-flow direct communication between the arteries and veins. In the head and neck region, various tissues and organs may be affected by AVMs. Among them, their appearance in the nose is considerably rare, resulting in a paucity of literature regarding the surgical management of these lesions. We report the case of a 22-year- old male who presented with a pulsatile soft tissue mass on the nasal dorsum. MRA angiography was used to accurately confirm the diagnosis of the feeding arteries. AVMs was approached with a combination of preoperative selective embolization and surgical excision with subsequent reconstruction of nasal bone defect. The surgical approach in this case produced a good cosmetic outcome. This illustrates the importance of proper preoperative planning to ensure complete resection and good cosmetics outcomes.

Keywords: Arteriovenous Malformations; AVMs; Embolization; Nasal Dorsum; Nasal Bridge.

Introduction

Arteriovenous malformations (AVMs) are a rare pathological entity in which the arteries and veins directly communicate, not involving the capillary beds. Basically, these vascular lesions exhibit fistulous arteriovenous communication, “nidus”-like vascular tangle, or both.[1] Commonly, AVMs are congenital abnormalities but most of them are discovered in adulthood. The trigger for their expansion is still not completely understood.

AVMs can involve any organ and may present various symptoms depending on the involved lesions and their stages. It may show local erythema and hyperthermia in early stages. As it grows, patients may have pain, bleeding, and disfigurement caused by disease destruction of local tissue.[2] Patients also report feeling of throbbing or pulsating, pain with activity, or warmth in the area of the AVM. It is important to understand that AVMs may have significant hemodynamic impact, though uncommon, congestive heart failure is also a possible complication of it.

AVMs arise intertwined within healthy soft tissue and bone, thus, cause challenges and there is still no consensus on its management.

A multidisciplinary approach including surgical resection, transcatheter embolization, direct percutaneous embolization and sclerotherapy, laser coagulation, and drugs is generally considered.[3] Despite that, the recurrence rate of diffuse lesions is high, and a definite cure is rarely achieved. Focal lesions are more forgiving to treatment.

Hence, this report presents the case of an AVM on the nasal dorsum, which was treated with transcatheter arterial embolization and surgical resection.

Case Report

A 22-year-old male presented with one year history of a palpable-pulsatile mass on the nasal dorsum. The patient had a progressive slowly growing mass over nasal dorsum over one year which was painless and had occasional bilateral mild epistaxis. Physical examination revealed a pulsatile-compressible soft tissue mass on the nasal bridge just below the radix which measured 22 x 11 mm in diameter with underlying nasal bone defect [Figure 1]. On nasal endoscopy, left-sided nasal septum deviation was noted and no intra-nasal mass seen.

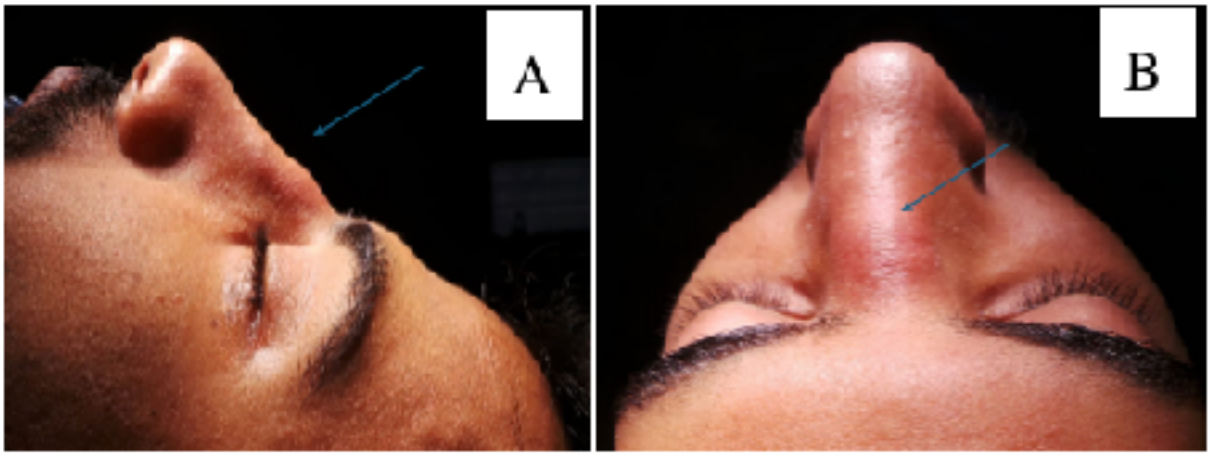


Figure 1: Pre-operative views; A-Lateral, B-helicopter- showing protruding and pulsating mass on the nasal dorsum (arrows).

Magnetic Resonance Imaging (MRI) of the paranasal sinuses (PNS) showed a well-defined irregular lesion within the subcutaneous tissue of anterior nasal area, measured about 11.6 x13.7 x 11.3 mm and it shows a tortuous tunnel like picture, which is hypointense signal on both T1/T2 was observed. On dynamic scan the lesion gives a picture of a vascular malformation.

Therefore, a diagnostic Magnetic Resonance Angiography (MRA) to diagnose the lesion and to evaluate feeding vessels was performed. We confirmed that the mass is arterio-venous malformation. [Figure 2]. It was fed through both angular arteries from external carotid arteries and both ophthalmic arteries from Internal carotid arteries. The angular artery is more prominent in the right side than the left [Figure 3].

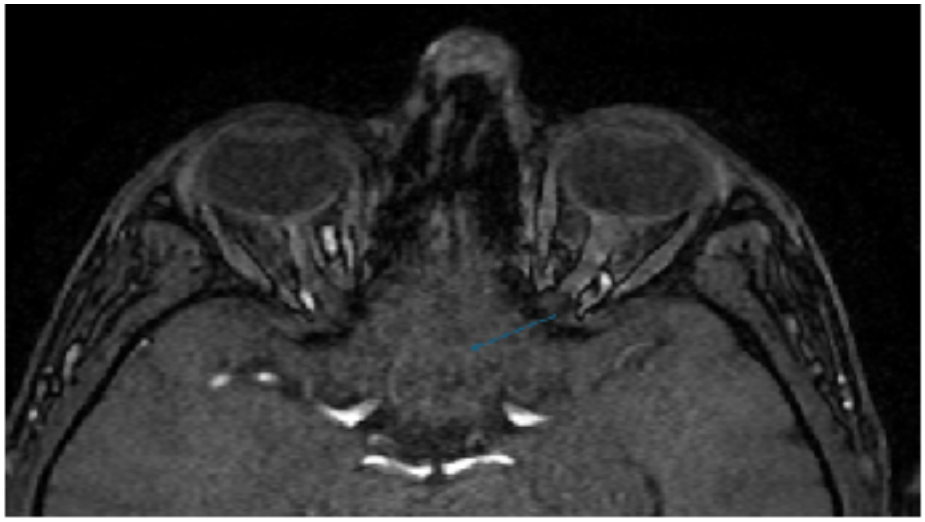


Figure 2: MRA.AVM axial view: A well-defined- irregular lesion (arrow) within the subcutaneous tissue of an anterior nasal area shows internal tortuous tunnel-like hyperintensities.

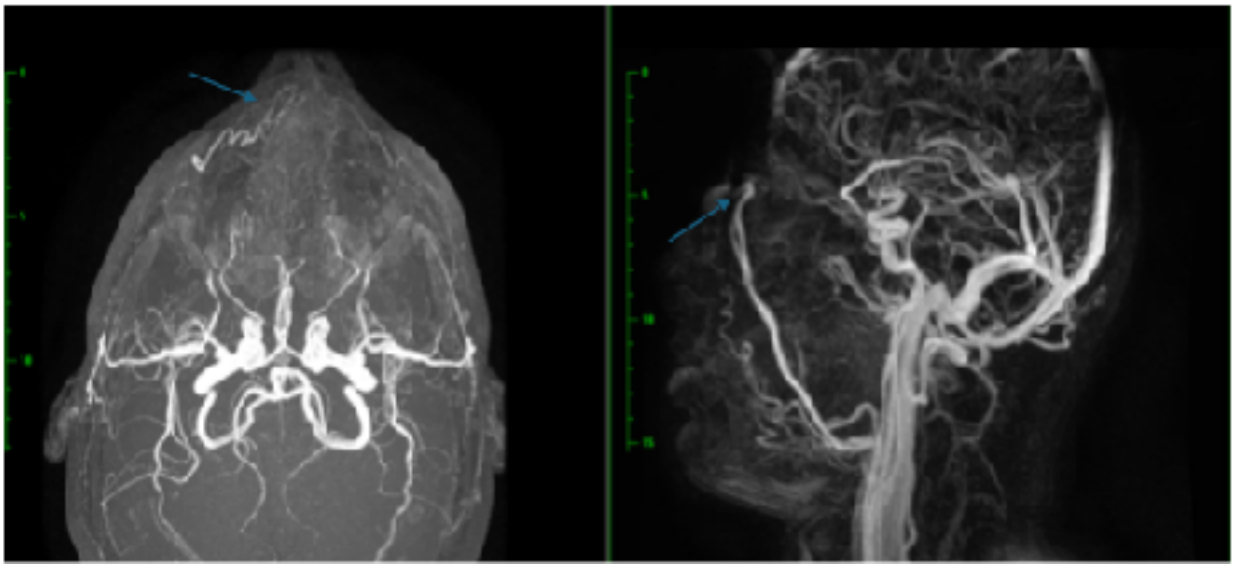


Figure 3: A. MRA dynamic scan showed the lesion is supplied by both angular arteries from ECA. (B: arrow). The right is more prominent (A: arrow).

After confirming that the lesion was confined to nasal dorsum, preoperative embolization to achieve revascularization of the tumor was decided followed by surgical excision. Embolization was done under local anesthesia with the right femoral artery catheter access.

Selective angiogram of bilateral internal and external carotid arteries (ICA & ECA) was performed and confirmed the blood supply from bilateral ophthalmic and facial arteries branches and venous drainage into bilateral venous ophthalmic and angular veins [Figure 4].

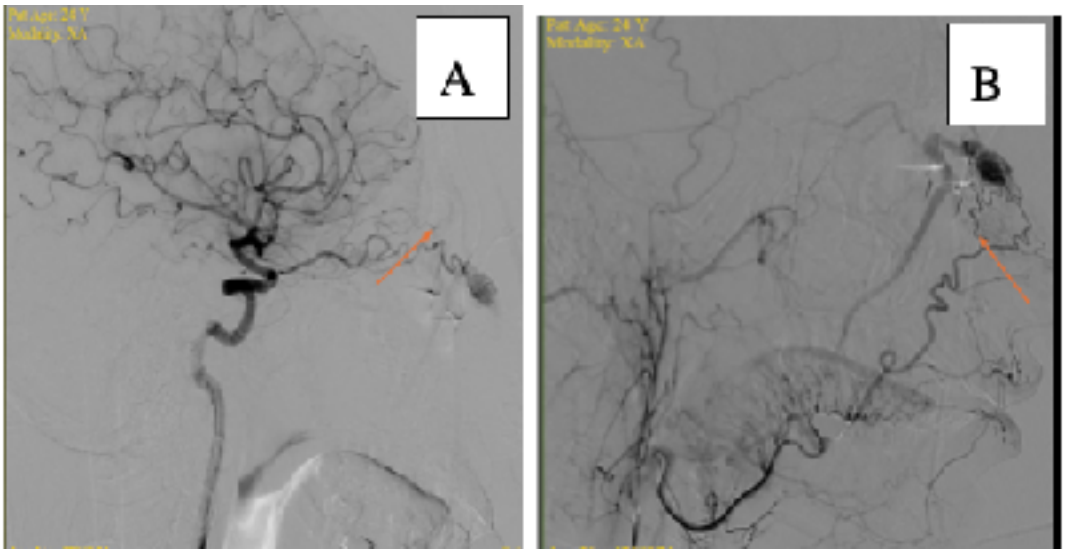


Figure 4: Pre-embolization angiography. A: ICA angiography with Rt ophthalmic artery feeding vessel (arrow). B: ECA angiography with.

Pre-operative embolization was performed by navigating the microcatheters into bilateral facial arteries branches and embolization was performed by injecting 33% and 25% Histoacryl (glue) respectively into the arteries [Figure 5]. Post embolization control angiogram showed almost 90% occlusion of AVM with minimal residual blood supply from right ophthalmic artery [Figure 6].

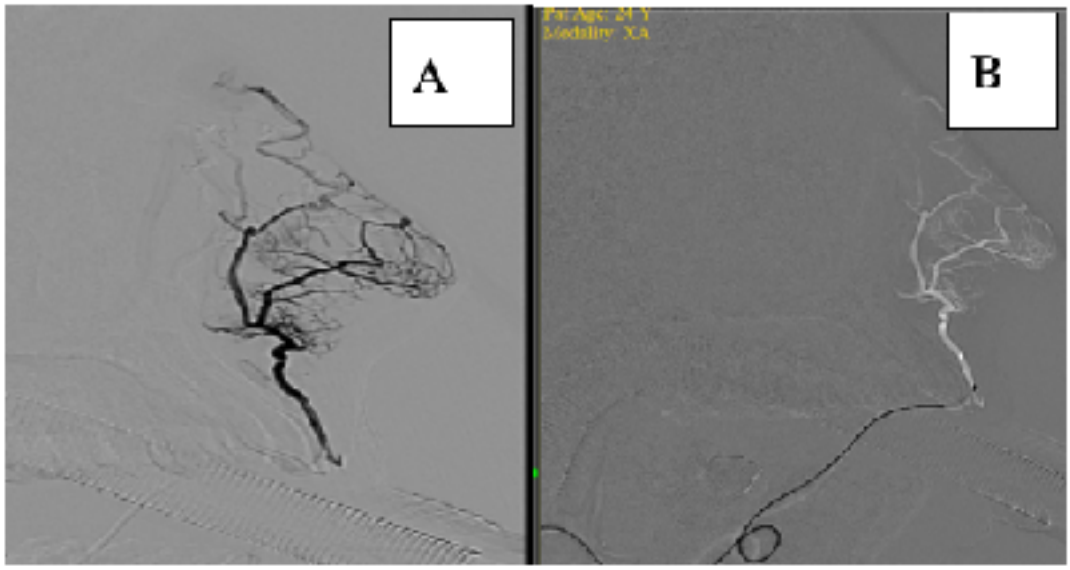


Figure 5: Selective Embolization of Right angular artery (A&B).

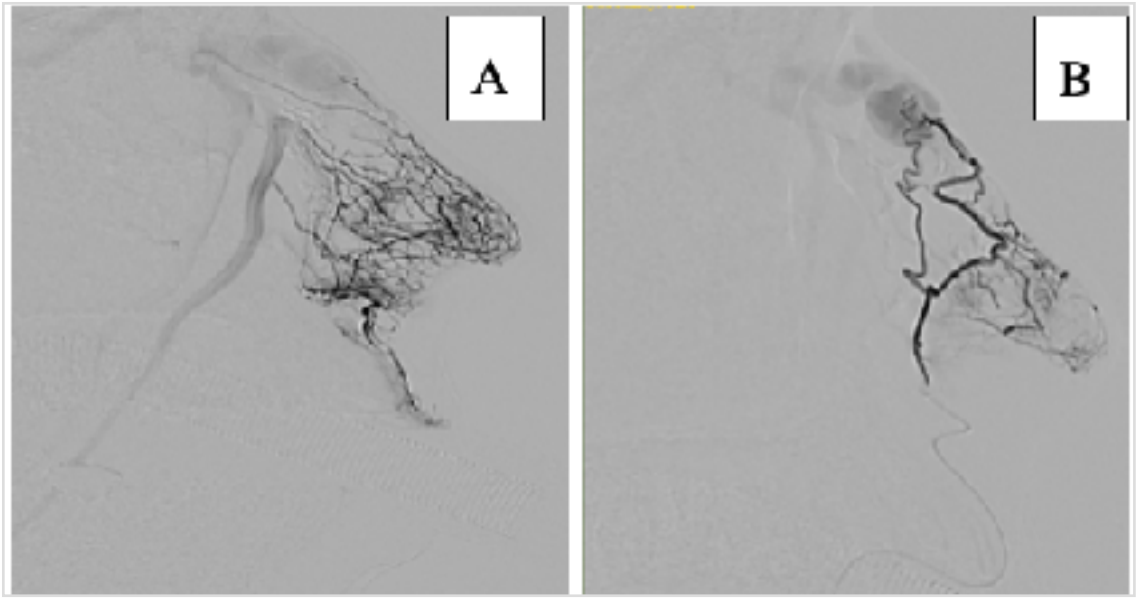
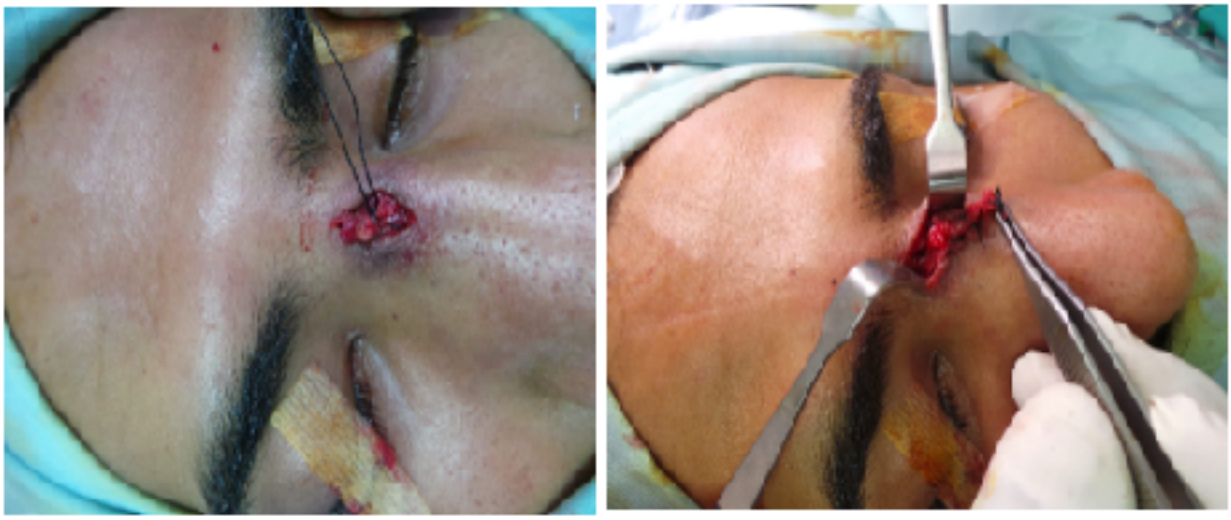


Figure 6: Post-embolization: Minimal residual blood supply seen.

The patient was taken to Operating room for mass excision 24-hours after embolization. Nasal endoscopy demonstrated no evidence of any defect of nasal mucosa. A vertical mid-line external nasal dorsum incision was

made. Dissection of the mass was done in a meticulous way. All encountered vessels were ligated and embolized



vessels were resected leaving an underlying 1.5 cm long- bone defect [Figure 7].
Figure 7: A. vertical mid-line nasal dorsum incision with ligation of encountered vessels. B. Meticulous dissection of AVMs lesion.

This allowed reconstruction to be performed with double cartilage graft harvested from nasal septum and shaped to camouflage the bone defect.

Histopathology examination of the lesion showed fragments of fibrocollaginous tissue containing numerous blood vessels of varying sizes and calibers, with some showing thick muscular walls. Some of the large vessels were partially occluded by thrombus. The features are compatible with vascular malformation (Fig.8).

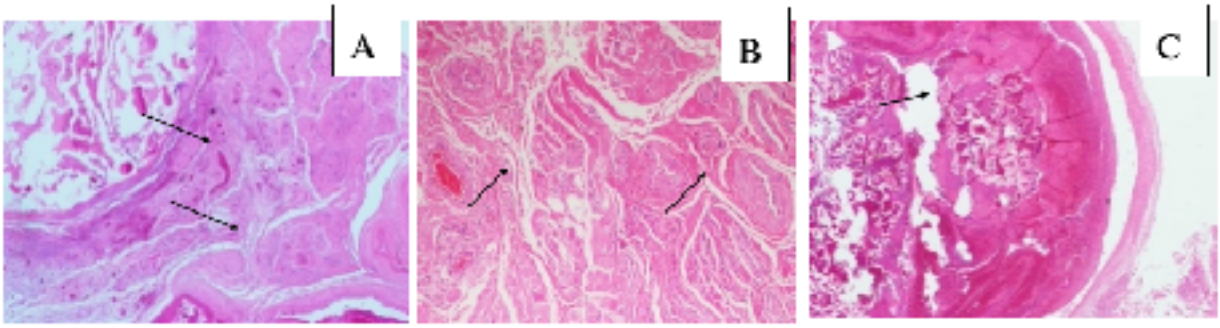


Figure 8: (A, B). Low (A) and High (B) power view C (H&E, 4x,20x) showing multiple blood vessels of varying sizes (arrows)(C). Low power view (H&E, 4x) showing a large blood vessel occluded by a thrombus.

Two weeks after surgery, there was a minimal bulge at the nasal dorsum with no evidence of communication intranasally. A subsequent follow-up showed no more swelling, a well-healed hidden scar and no evidence of recurrence.

Discussion

Arterio-venous malformation is a vascular anomaly characterized by the shunting of blood from arterial to venous circulation. The etiology and pathogenesis of AVMs remain unclear although they are suggested to result from a disturbance in vascular development during the 4–6th weeks of gestation.[4] There are four major categories of vascular malformations based on their flow characteristics: slow-flow (capillary malformation, venous

malformation, lymphatic malformation) and fast-flow (arteriovenous malformation). These lesions often have components of multiple malformations, such as a mixed lymphatico-venous malformation.[5]

These patients are at risk of expansion of A-V malformation, pain, ulceration or bleeding. They may also contain normal structure, causing disfigurement and vital structure obstruction. Moreover, large AVMs may eventually lead to high-output cardiac failure. In general, contrast-enhanced computed tomography and magnetic resonance imaging are performed to determine the size and extent of the mass. On computed tomography, the blood flow in the mass shows contrast enhancement. Magnetic resonance imaging demonstrates the soft tissue extension of the mass.[6] Transcatheter angiography is a particularly useful imaging modality for detailed evaluation of angioarchitecture of AVMs. It remains the gold standard, despite its invasiveness.[7]

There are different therapeutic methods for AVMs, including sclerotherapy, embolization, stereotactic radiation and surgery, which are used in combination. Preoperative embolization of high flow AVMs facilitates surgical resection, reducing the risk of intraoperative blood loss.[8]

These lesions are usually excised macroscopically. It is important to consider the cosmetic aspects, especially in cases of facial AVMs.

In this case, the lesion was confined to nasal dorsum, so surgical treatment was decided. However, it is associated with a risk of bleeding and if the lesion is not excised properly during surgery, there is a possibility of recurrence therefore, we considered 24-hour pre-operative embolization of the feeding vessels. The patient was young and there was a high possibility of disfigurement of nasal dorsum after excision of the mass. Therefore, we considered cosmetic management in pre-operative planning of the surgery. The patient was satisfied with the cosmetic aspect of the treatment; options of reconstructions were kept either using nasal septal cartilage graft or costal graft. Fortunately, the defect managed using double septal graft alone.

The recurrence of AVMs depends on many factors including site, stage and management plan. AVMs recurrence after embolization or resection is reported in up to 80% of cases. Incomplete resection and embolization can induce aggressive growth of the remaining nidus, and the risk of progression is up to 50% within the first 5 years and recurrences can occur for up to 10 years.[9] In this case, a close follow-up for the first year did not show any recurrence. A long-term post-treatment follow-up is recommended to recognize early recurrence. Our plan is to follow up annually for the next few years.

Conclusion

This case report emphasizes the importance of pre-operative imaging and planning in treating AVMs. A multidisciplinary approach is recommended to support decision making about the best therapeutic approach. Appropriate reconstruction should be considered according to aesthetic outcome.

Disclosure

The authors have nothing to disclose.

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