High Flow Arterio-Venous Malformation: Which Imaging Technique is Better?

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Summary: *High flow vascular malformations comprise of arteriovenous malformations and acquired arteriovenous shunts/fistula. They can be quiescient, expansile, complicated or decompensated depending on their clinical stage. In management of high flow malformations, the key is to identify the feeder vessels. Digital Subtraction Angiography (DSA) is the ideal diagnostic technique to identify the feeder vessels prior to endovascular coiling or direct ligation of these vessels.*

Vascular malformations need to be understood differently from the acquired arteriovenous shunts and fistulae in terms of pathogenesis and hemodynamics[1]. They derive either from the arterial system, venous system, lymphatic system or a combination of the above.

The Orbital Society has classified Vascular malformations as[2]:

Type I: NO FLOW comprising of Lymphangiomas and Combined Veno-Lymphatic malformations

Type II: LOW FLOW comprising of predominantly venous malformations encompassing distensible, non-distensible and the combined lymphatic-venous distensible malformations.

Type III: HIGH FLOW comprised of arteriovenous malformations and the acquired arteriovenous shunts.

Based on clinical activity, SCHOBINGER[3] classified "High Flow AV Malformations" as :

I: QUIESCENT: Staining pink blue, Warm to touch, AV shunt on Doppler

II: EXPANSILE: Besides above findings, also show enlargement, pulsatile to touch,

thrill on palpation, bruit audible along with tortuous veins

III: Have further COMPLICATIONS manifested as dystrophic skin, ulceration, persistent pain, bleeding, necrosis and bony lytic lesions.

IV: DECOMPENSATION: The shunt finally leads to congestive cardiac failure due to increased cardiac output and left ventricular hypertrophy.

CASE PROFILE

A 28-year-old female, presented to us with a painless pulsatile mass located at the root of the nose and partially extending onto the medial orbit on either side (Figure 1). Thrill was palpable over the mass and on auscultation a clear bruit was heard. The mass in left orbit and on lateral wall of nose was clearly visible on MRI scans (Figure 2).

Patient underwent pre-op CT-Angiography, which confirmed a high-flow AVM localized to glabella and medial orbit with bilateral facial arteries as possible feeder vessels (Figure 3).

Combined surgery with ENT surgeons was undertaken where both the facial arteries were ligated, right one near the ala of nose and left one near the mandible (Figure 4). There was no perceptible change in the pulsations of the mass. The further surgical intervention was deferred. Post facial artery ligation a repeat CT angiography showed no change in size of AVM (Figure 5). The left facial artery and also vein were ligated again at the level of ala of nose, which led to an increase in the size of the mass and in the thrust of the pulsations. This confirmed that the facial vein is the draining vessel for the high-flow AVM

Figure 1: *Pre-op clinical photo showing painless pulsatile mass located at the root of the nose and partially extending onto the medial orbit on either side.*

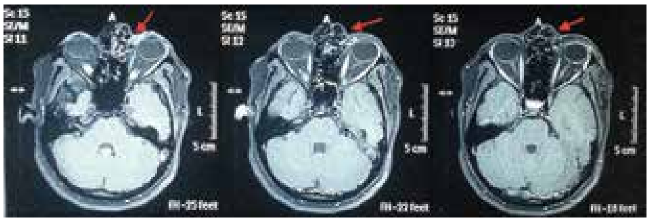

Figure 2: *Pre-op MRI scans showing the mass involving left medial orbit and lateral wall of nose.*

Figure 3: *Pre-op CT-Angiography, which confirmed a high-flow AVM localized to glabella and medial orbit with bilateral facial arteries as possible feeder vessel.*

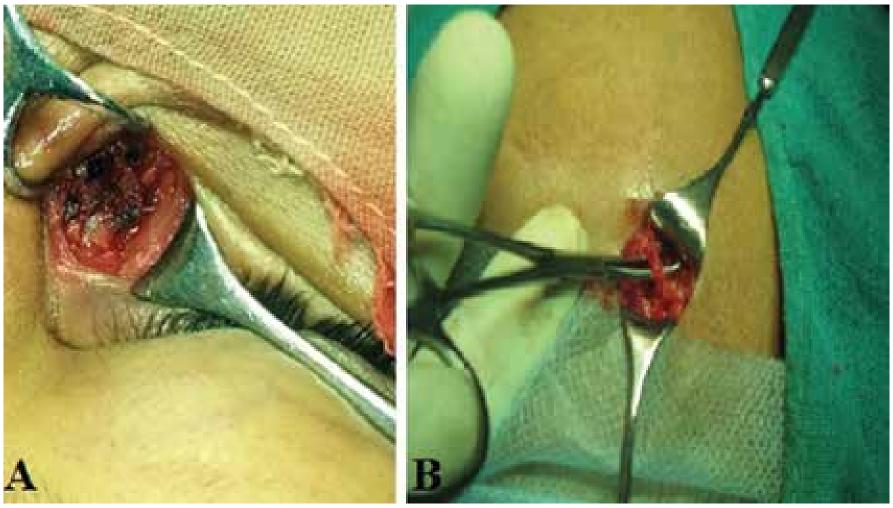

Figure 4: *Intra-op clinical photo of combined surgery with ENT surgeons, where both the facial arteries were ligated.* ***4(A):*** *Right facial artery ligation near the ala of nose.* ***4(B):*** *Left facial artery ligation near the mandible.*

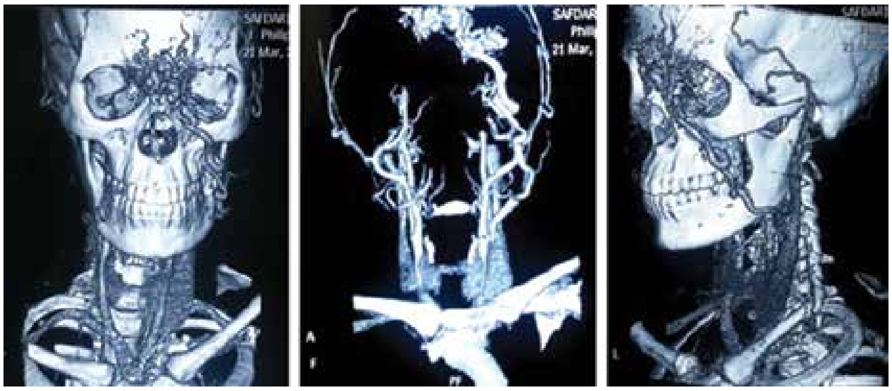

Figure 5: *Post facial artery ligation a repeat CT angiography showed no change in size of AVM.*

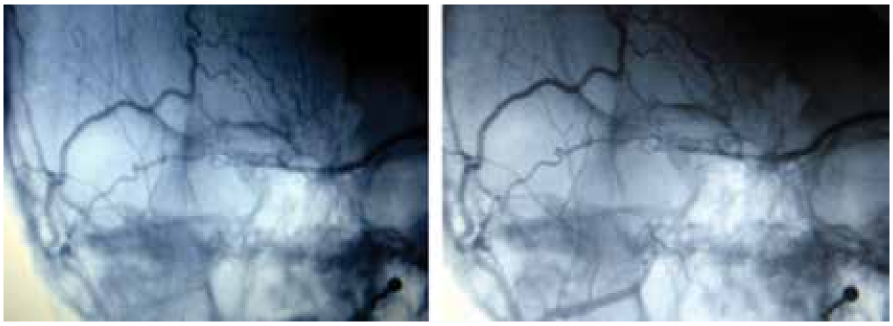

Figure 6: *Digital-Subtraction-Angiography (DSA) clearly indicating aberrant branches from superficial temporal artery and External Carotid Artery as main feeder vessels along with multiple feeder vessels from other branches of External Carotid Artery.*

Figure 7: ***(A)*** *Left External Carotid ligation.* ***(B)*** *Excised mass with cyano-acrylate glue* ***(C)*** *Post op day one.* ***(D)*** *Clinical photograph at two months post op.*

and facial artery is not the feeder vessel.

Finally Digital-Subtraction-Angiography (DSA) was done which clearly indicated aberrant branches from Left superficial temporal artery and External Carotid Artery (ECA) as main feeder vessel along with multiple feeder vessels from other branches of External Carotid Artery (Figure 6).

Due to functional difficulties in intravascular coiling of multiple small feeder vessels[4,5], External Carotid Artery was ligated resulting in prompt decrease in size of mass and decrease in strength of pulsations and the mass was excised at the same sitting using Cyano-acrylate glue (Figure 7).

COMMENT

Since CT-Angiography and MR-Angiography may not be able to accurately delineate feeder vessels in a case of High Flow AV Malformation, it could be imperative to perform Digital Subtraction Angiography (DSA), which will be able to identify feeder vessels much more accurately.

REFERNCES

1. Kohout MP, Hansen M, Prebaz JJ, Mulliken JB. Arterio venous malformation of the head and neck: natural history and management. Plast Reconstr Surg. 1998;102:643–54.
2. Jackson IT, Carreno R, Potparic Z, Hussain K. Haemangiomas, vascular malformations and lympho-venous malformations: Classification and methods of treatment. Plast Reconstr Surg. 1993;91:1216–30.
3. Young AE, Mulliken JB. Arteriovenous malformations. In: Mulliken JB, ed. Vascular Birthmarks: Haemangiomas and Malformations. Philadelphia: WB Saunders, 1988:228 – 45
4. Do YS, Park KB, Cho SK. How do we treat arteriovenous malformations (tips and tricks)? Tech Vasc Interv Radiol 2007;10:291–98.
5. Lee BB, Bergan JJ. Advanced management of congenital vascular malformations: a multidisciplinary approach. Cardiovasc Surg 2002;10:523–33.

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