

A Rare Case of Arteriovenous Malformation of the Hand

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ABSTRACT

Arteriovenous malformations (AVMs) of the hand are rare, high-flow vascular anomalies in which arterial blood flows directly into the venous system, bypassing the capillary bed. We report the case of a 20-year-old male who presented with a gradually progressive, painful swelling over the palmar aspect of the right hand of three months' duration. Local examination revealed a solitary, compressible, blanchable swelling over the thenar eminence with prominent overlying veins, erythema, and a positive expansile impulse. Magnetic resonance angiography and digital subtraction angiography (DSA) demonstrated a high-flow lesion fed by branches of the radial artery, with early opacification of a venous network in the thenar eminence draining into the cephalic vein. Surgical exploration revealed dilated, branched veins and capillaries extending from the subcutaneous plane into the intramuscular and intermuscular planes, involving the thenar muscles and lumbricals, with multiple feeding arteries arising from a remnant of the median artery, the vasa nervosum of the median nerve, and branches of the radial artery. The lesion was excised, and the patient remained stable in the

postoperative period. This case highlights the diagnostic and therapeutic challenges posed by hand AVMs and underscores the importance of an individualized, multidisciplinary approach to their management.

Keywords: Arteriovenous malformation; Hand; Vascular anomaly; Thenar eminence; Digital subtraction angiography; Surgical excision; Peripheral Arteriovenous Malformation

INTRODUCTION

Arteriovenous malformations (AVMs) are high-flow vascular anomalies consisting of an abnormal vascular network in which arterial blood flow connects directly to venous drainage, bypassing the intervening capillary bed. AVMs of the hand are rare, accounting for less than 1% of all AVMs occurring in the body. [1,2] They pose a significant diagnostic and therapeutic challenge given the functional importance of the hand and the high recurrence rate associated with these lesions. We report a rare case of an AVM involving the thenar eminence of the right hand in a young male patient, along with its clinical presentation, radiological features, and surgical management.

CASE REPORT

A 20-year-old male presented with complaints of swelling over the palmar aspect of the right hand of three months' duration. The swelling was insidious in onset and gradually progressive to its present size of about 6×6 cm, and was associated with pain over the dorsal aspect of the palm.



Figure 1: Preoperative clinical photograph of the right hand showing a swelling over the thenar eminence with prominent overlying veins.

On local examination, a solitary swelling measuring about 4×3 cm was noted over the thenar eminence, with erythema and prominent veins over the swelling. The swelling was cystic in consistency, compressible, and blanchable, with a positive expansile impulse. Palpable pulsations and a thrill were noted, with capillary refill within one second.



Figure 2: Digital subtraction angiogram (DSA) of the right hand showing a high-flow vascular malformation in the thenar eminence fed by branches of the radial artery.

Investigations:

- Soft tissue ultrasound scan of the right hand
- MRI of the right hand with angiogram
- Digital subtraction angiography (DSA) of the right upper limb

MR angiography showed a lesion fed by branches of the radial artery, with early opacification of a venous network in the thenar eminence draining into the cephalic vein. These findings correlated with the time-of-flight (TOF) angiography obtained on DSA (Figure 2).

RESULTS

Intraoperatively, dilated and branched veins and capillaries were noted in the subcutaneous plane, extending deep into the intramuscular and intermuscular planes and involving the thenar muscles and lumbricals. Multiple feeding arteries were identified, arising from a remnant of the median artery, the vasa nervosum of the median nerve, and branches of the radial artery (Figure 3). The

abnormal vascular mass was carefully excised in-toto. The patient remained hemodynamically stable in the postoperative period, with a well-perfused hand and intact capillary refill in the digits.



Figure 3: Intraoperative photograph showing the surgical field over the palmar aspect of the right hand after excision of the arteriovenous malformation, with feeding vessels looped and controlled.

DISCUSSION

Arteriovenous malformations are rare congenital vascular anomalies characterised by a direct connection between arteries and veins, bypassing the capillary bed. A persistent median artery, as identified intraoperatively in this patient, occurs in about 4%–27% of individuals, with more recent series reporting rates as high as 43%, and may act as an additional feeding vessel in such lesions. [7,8] AVMs of the hand are particularly uncommon, accounting for less than 1% of AVMs occurring throughout the body, and their location makes both diagnosis and treatment technically demanding. [1,5]

Cross-sectional imaging plays a central role in preoperative planning. MRI and MR angiography help delineate the extent and characteristics of the lesion, while digital subtraction angiography remains the gold standard for defining the feeding arteries and draining veins.[1] Endovascular embolization, either as a stand-alone treatment or as an adjunct prior to surgery, can also be considered in selected cases. [3,6] AVMs have a high tendency to recur, particularly when excision is incomplete or embolization is inadequate. [2,4] Complete surgical excision, as performed in this patient, remains the most effective way to achieve durable control of the lesion, although this must be balanced against the risk of injury to the adjacent neurovascular and musculo-tendinous structures of the hand.

CONCLUSION

The risk of significant intraoperative bleeding makes surgical resection of hand AVMs a challenging and stressful procedure. However, this risk can be mitigated by the availability of efficient equipment to control such bleeding and the expertise of the treating surgical team. The occasional necessity for amputation in advanced cases highlights the severity that these lesions can reach and underscores the need for an individualized treatment approach for each patient.

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Declaration by Authors

Patient's consent: Written informed consent was obtained from the patient for publication of this case report and any accompanying images. Patient confidentiality has been maintained throughout.

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