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High Flow Congenital Arteriovenous Malformation of the Right Deltoid Muscle in a Pediatric Patient: A Case Report

Suhaila Ahmed[1], Mohammad Seddiq Faghih[1], Avdullah Qafani[2], Ayman Al-Sibaie[2], Mohammad Zaid[3], Alaa Eddin Nwilati[4], Michael George Shahoud[5], Mamoun Shafaamri[6], Masoud Shafiei[7], Deena Al Qedrah[8]
Department of Vascular Surgery, Rashid Hospital, Dubai, United Arab Emirates

INTRODUCTION

Congenital arteriovenous malformations (AVMs) are rare high-flow vascular anomalies present from birth, caused by direct artery-to-vein connections bypassing the capillary bed (1). These lesions can lead to rapid growth, pain, bleeding, and functional impairment, with risks influenced by hormonal changes, trauma, or increased blood flow. Causes include spontaneous formation, hemangioma complications, surgical interventions, and genetic factors like EPHB4 mutations (2).

Diagnosis involves clinical assessment, Doppler ultrasound, MRI, and angiography, the gold standard for planning embolization (3,4). Treatment typically combines embolization and surgical resection, performed within 2–8 weeks to minimize recurrence (5,6). Recurrence rates (10%–50%) are higher with incomplete resection or untreated feeders (7). Regular follow-up with imaging is essential, particularly for pediatric patients at risk during growth spurts (8).

AIM

To describe the diagnosis and management of a high-flow congenital AVM in the right deltoid muscle of a pediatric patient, highlighting key challenges and outcomes.

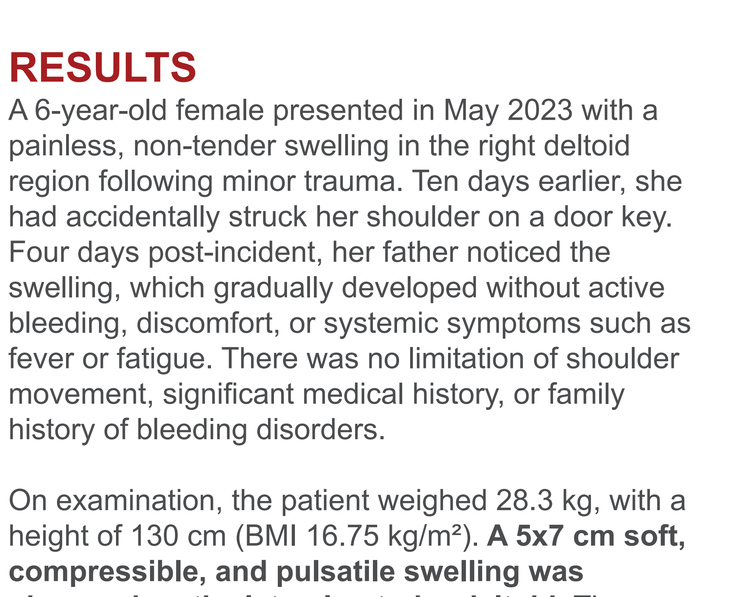
METHODS

This case was reviewed retrospectively, including clinical records, imaging studies, and treatment details. Diagnosis utilized Doppler ultrasound, MRI, and angiography. Management involved preoperative embolization followed by surgical resection within the optimal post-embolization window. Follow-up imaging monitored for recurrence and outcomes.

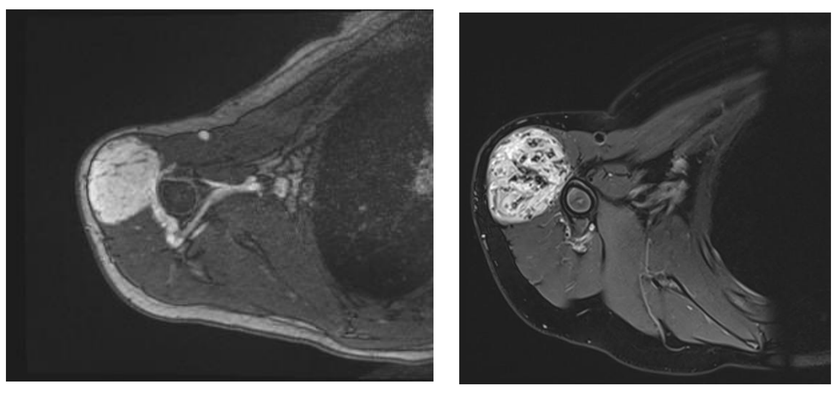
RESULTS

A 6-year-old female presented in May 2023 with a painless, non-tender swelling in the right deltoid region following minor trauma. Ten days earlier, she had accidentally struck her shoulder on a door key. Four days post-incident, her father noticed the swelling, which gradually developed without active bleeding, discomfort, or systemic symptoms such as fever or fatigue. There was no limitation of shoulder movement, significant medical history, or family history of bleeding disorders.

On examination, the patient weighed 28.3 kg, with a height of 130 cm (BMI 16.75 kg/m²). **A 5x7 cm soft, compressible, and pulsatile swelling was observed on the lateral-anterior deltoid.** The mass was mobile, warm, non-tender, with intact radial and ulnar pulses, no neurovascular compromise, and no lymphadenopathy.

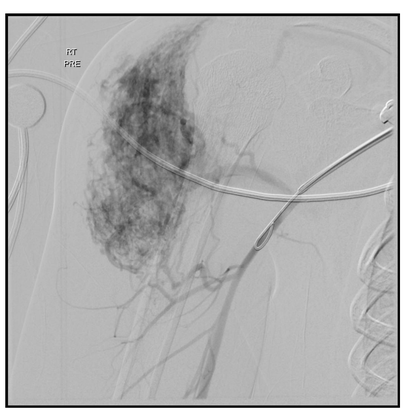


Ultrasound in May 2023: *Identified a high-flow AVM within the right deltoid muscle, with no evidence of hematoma or fluid collection. Doppler ultrasound showed high diastolic venous flow and arterial flow consistent with an AVM.*

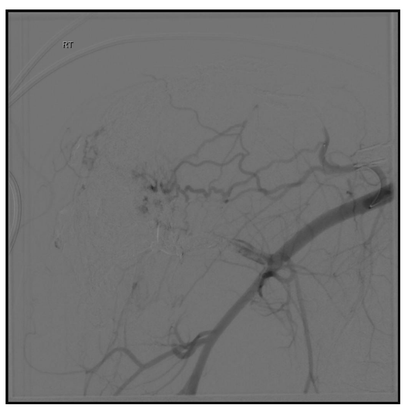


MRI (Right Humerus with Contrast) in August 2023: *revealed a large fusiform area with mixed signals occupying the entire right deltoid muscle, with regions of high signal indicating fatty deposition. Within the muscle, multiple tubular structures were observed, comprising both arterial and venous channels, with tortuous vessels connecting to the right axillary artery and vein. These findings confirmed the presence of an intramuscular arteriovenous malformation (AVM), likely congenital, confined to the right deltoid muscle. The lesion measured 8.5 x 4.1 x 4.7 cm, with no extension into surrounding tissues.*

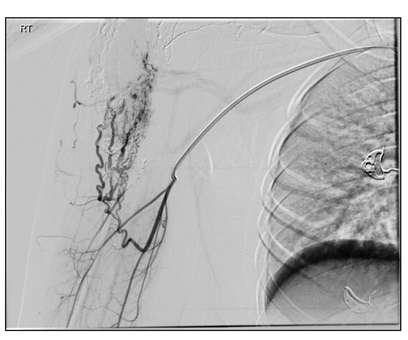
Treatment



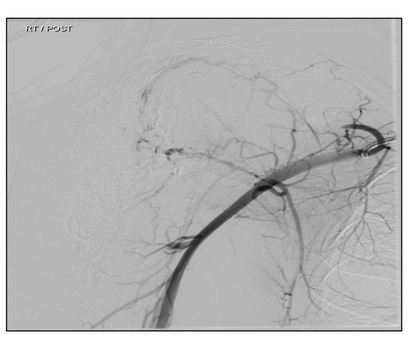
Angiography done in January 2024: Revealed four feeder vessels to the AVM targeted for embolization



First Embolization: *In January 2024, super-selective embolization was performed using Onyx and squid chemical embolization. The procedure was well tolerated with no immediate complications. By July 2024, recurrence was observed associated with pain, especially during shoulder movement. Repeat MRI in July 2024 showed no significant change in the AVM size or enhancement.*

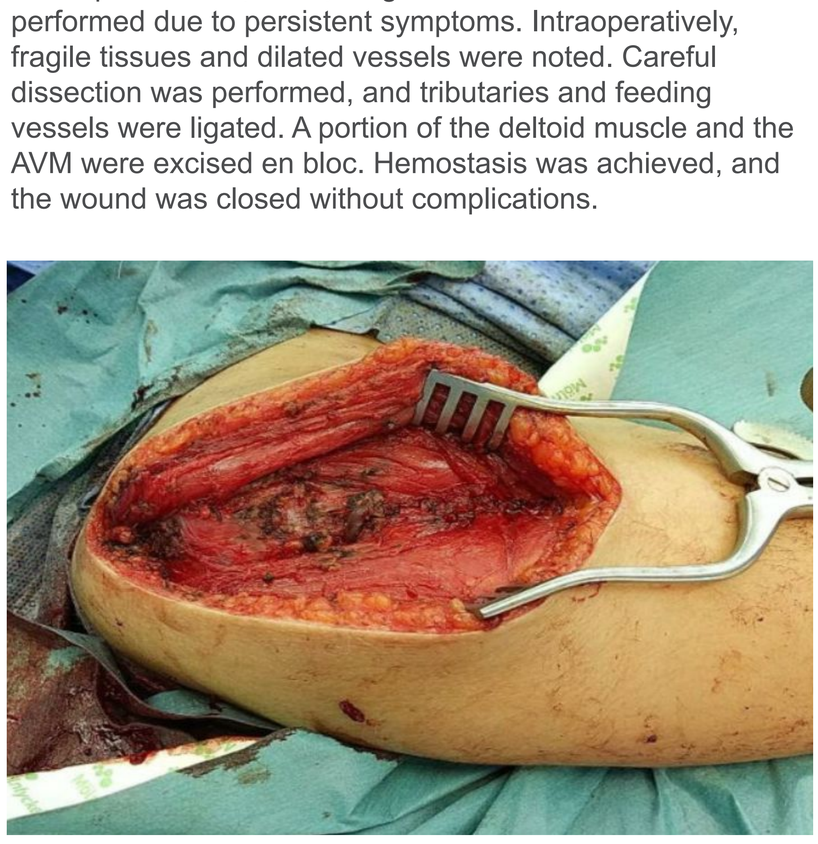


Second Embolization: *On September 10, 2024, a second embolization targeted the feeding arteries using Histoacryl and Lipiodol as embolizing agents.*

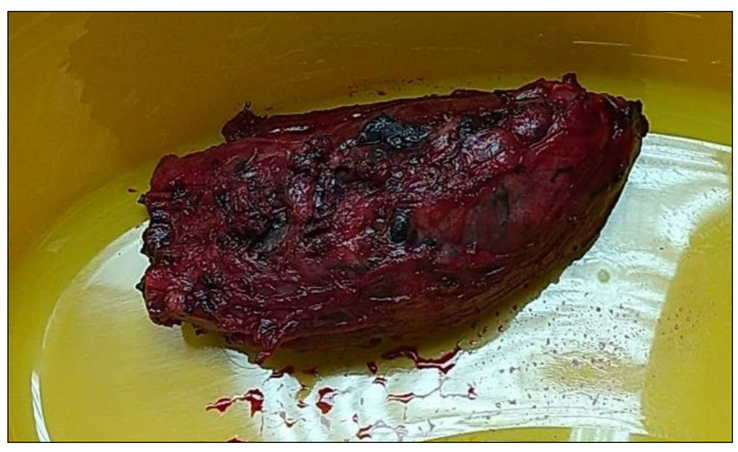


Post-procedure angiography demonstrated a 20% reduction in the AVM size.

On September 11, 2024, surgical resection of the AVM was performed due to persistent symptoms. Intraoperatively, fragile tissues and dilated vessels were noted. Careful dissection was performed, and tributaries and feeding vessels were ligated. A portion of the deltoid muscle and the AVM were excised en bloc. Hemostasis was achieved, and the wound was closed without complications.



Surgical field



Excised specimen

Following surgery, the patient reported moderate pain in the right shoulder, rated at 6/10, which was managed with diclofenac sodium, ibuprofen, and paracetamol. By September 14, 2024, her pain level reduced to 4/10, accompanied by improved shoulder mobility, with intact abduction and adduction. By September 15, 2024, the pain further decreased to 2/10. The patient was discharged with instructions to undergo a physiotherapy evaluation for rehabilitation and to attend a follow-up visit at the vascular clinic in two days.

On September 17, 2024, the patient attended a routine check-up at the vascular clinic. She reported mild pain at the surgical site. Examination revealed an intact dressing on the right upper arm, with preserved shoulder abduction and adduction. The patient was advised to continue dressing changes every other day. An ultrasound was scheduled for four weeks later to monitor for recurrence or residual arteriovenous malformation (AVM).

The follow-up ultrasound showed no recurrence or residual AVM. Histopathological analysis of the excised tissue confirmed an AVM with no malignancy. The physiotherapy evaluation recommended skilled physical therapy to enhance joint function. Subsequent assessments showed significant improvement following physiotherapy, and the patient was discharged with a home exercise program for continued recovery.

CONCLUSIONS

This case of a high-flow congenital arteriovenous malformation (AVM) in a pediatric patient emphasizes the complexities of its diagnosis and management. Successful treatment relies on early identification, embolization, and surgical resection, supported by advanced imaging techniques and a multidisciplinary approach. However, significant gaps persist in understanding the long-term outcomes, genetic underpinnings, and psychosocial impact of AVMs. Advancing research in these areas is crucial to improving treatment strategies and enhancing patient quality of life**. This highlights the importance of continued innovation and comprehensive care in the management of congenital AVMs.**

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