

Pial arteriovenous fistula

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Section: Interventional radiology

Area of Interest: Neuroradiology brain Interventional vascular

Procedure: Diagnostic procedure

Procedure: Computer Applications-3D

Procedure: Embolisation

Procedure: Catheters

Imaging Technique: CT

Imaging Technique: Catheter arteriography

Special Focus: Blood Arteriovenous malformations

Fistula Case Type: Clinical Cases

Authors: Moussa A, Abdelrady M

Patient: 12 years, female

Clinical History:

A 12-year-old female patient presented at the ED with sudden severe headache. The patient was fully conscious and neurological examination revealed right upper and lower limb paresis with no other neurological deficits.

Imaging Findings:

Non-contrast CT of the brain revealed a large left parieto-occipital haematoma with a surrounding oedema.

CT angiography revealed a large venous pouch in the left parieto-occipital region, with arterial supply from distal branches of the left middle cerebral artery.

Digital subtraction angiography revealed an arteriovenous lesion receiving supply from distal branches of the left middle cerebral artery with venous drainage into a dilated venous pouch related to the dural venous sinuses.

Post-embolisation digital subtraction angiography revealed occlusion of the arteriovenous lesion with no filling of the venous pouch on venous phase images.

Discussion:

Pial arteriovenous fistulae are rare intracranial vascular malformations that account for approximately 1.6% of all intracranial vascular malformations. They differ from arteriovenous malformations in that they lack a nidus between the supplying artery or arteries and the draining vein, and they differ from dural arteriovenous fistulae in that they receive arterial supply from pial or cortical arteries, and in that they are not located in the dura matter. [1] Pial arteriovenous fistulae can be congenital or acquired. Congenital pial arteriovenous fistulae likely occur due to failure of regression of arteriovenous shunts that form during the transient stages of vascular genesis. Acquired pial arteriovenous fistulae can occur after trauma or at the site of brain surgery or can occur after cerebral vein thrombosis as a result of reconstruction of blood flow. [2]

Patients may present signs of arterial steal due to high-flow, such as heart failure or seizures, or present signs of increased intracranial pressure due to the expanding venous pouch or intracranial haemorrhage. On imaging, pial

arteriovenous fistulae are difficult to detect on CT. On CT or MR angiography, the feeding arteries and draining vein can be detected, and the absence of a nidus should immediately raise suspicion of a pial arteriovenous fistula. Digital subtraction angiography is the gold standard for imaging, as it allows accurate assessment of the haemodynamic characteristics of the lesion. [2] In this patient, the presence of a large intracranial haematoma raised the suspicion of an underlying lesion, and the CT angiography clinched the diagnosis for an arteriovenous fistula. Digital subtraction angiography confirmed the diagnosis of pial arteriovenous fistula and allowed treatment in the same session.

Management of pial arteriovenous fistulae needs urgent surgical or endovascular treatment, as conservative management is associated with a high mortality due to subsequent bleeding. [3] Endovascular treatment is done through an arterial or venous approach and involves occlusion of the fistula. Embolisation is done through injection of liquid embolics, most commonly Lipidol/N-Butyl cyanoacrylate mixture and targeting occlusion of the fistula itself rather than just the feeding vessels. This is because just occlusion of the feeding vessels may result in recurrence of the fistula with recruitment of new feeding vessels. Surgical treatment is usually reserved for cases in which arterial embolisation is considered dangerous because the supplying artery cannot be occluded adequately. [2]

Differential Diagnosis List: Pial arteriovenous fistula, Arteriovenous malformation, Dural arteriovenous fistula

Final Diagnosis: Pial arteriovenous fistula

References:

Alurkar A, Karanam LSP, Nayak S, Ghanta RK (2016) Intracranial Pial Arteriovenous Fistulae: Diagnosis and Treatment Techniques in Pediatric Patients with Review of Literature. Journal of Clinical Imaging Science 6:2 (PMID: [26958432](#))

Yu J, Shi L, Lv X, Wu Z, Yang H (2016) Intracranial non-galenic pial arteriovenous fistula: A review of the literature. Interventional Neuroradiology 22(5):557-568 (PMID: [27388601](#))

Lee JS, Oh CW, Bang JS, Kwon O-K, Hwang G (2012) Intracranial Pial Arteriovenous Fistula Presenting with Hemorrhage: A Case Report. Journal of Cerebrovascular and Endovascular Neurosurgery 14(4):305-308 (PMID: [23346547](#))

Figure 1

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Description: Non-contrast CT of the brain showing an intra-parenchymal haematoma in the left parieto-occipital region with surrounding oedema **Origin:** Moussa A, Department of Radiology, Ain Shams University, Cairo, Egypt

Figure 2

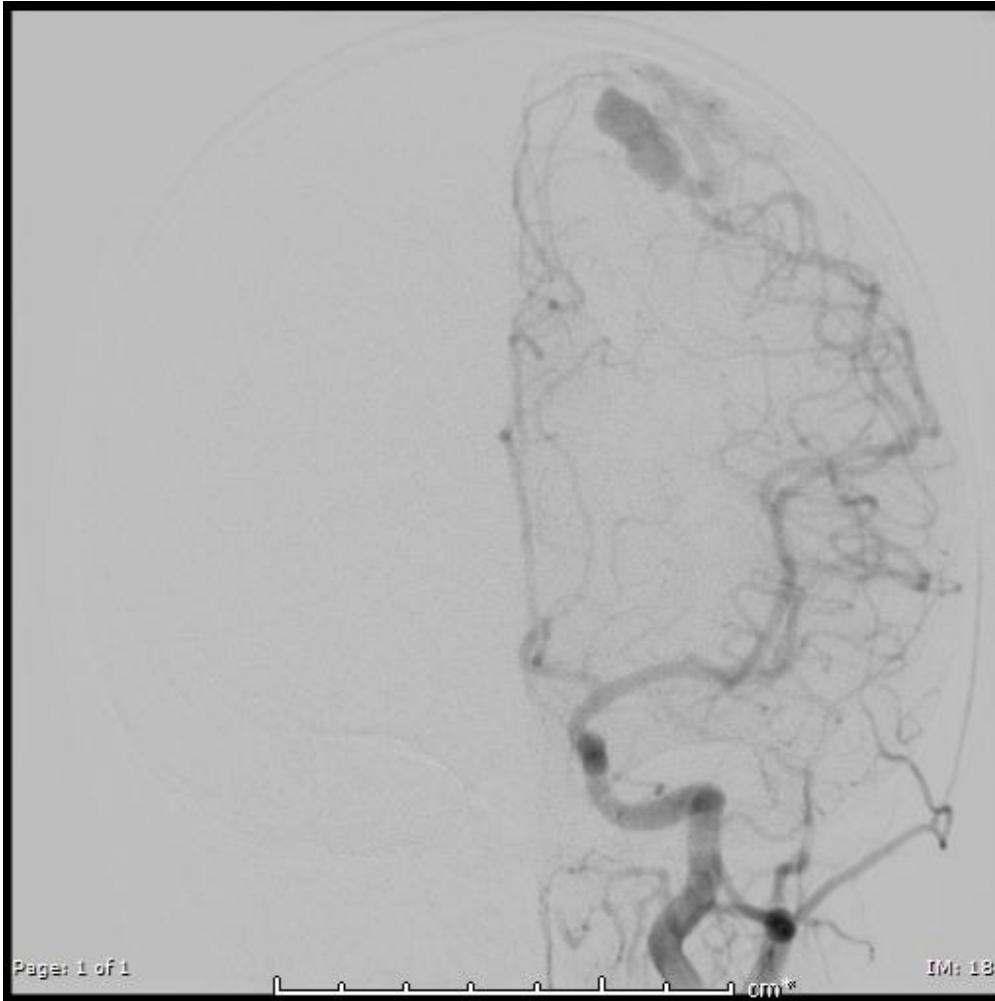
a



Description: CT angiography maximum intensity projection image showing a large vascular structure in the left parietal region receiving arterial supply from the distal branches of the left middle cerebral artery **Origin:** Moussa A, Department of Radiology, Ain Shams University, Cairo, Egypt

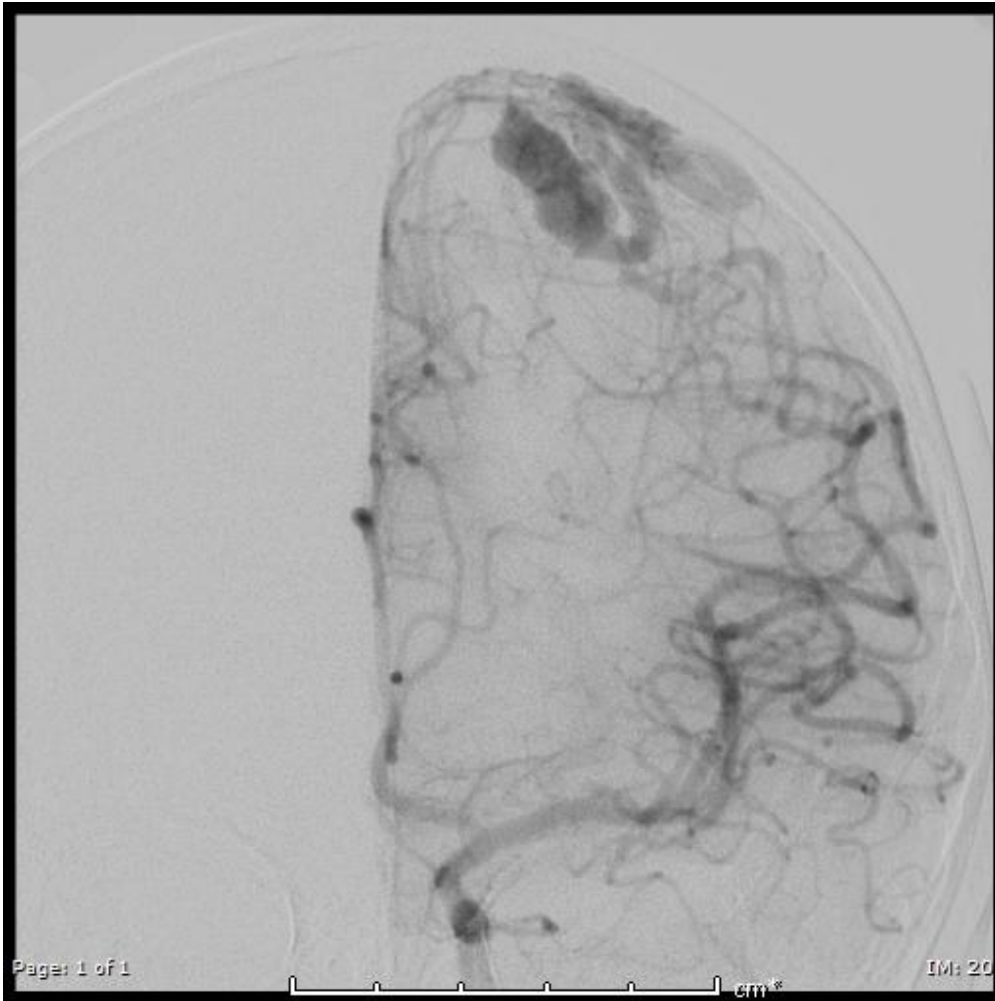
Figure 3

a



Description: Digital subtraction angiography (early arterial phase) in the Towne's view showing a venous pouch receiving arterial supply from distal branches of the left middle cerebral artery. **Origin:** Moussa A, Department of Radiology, Ain Shams University, Cairo, Egypt

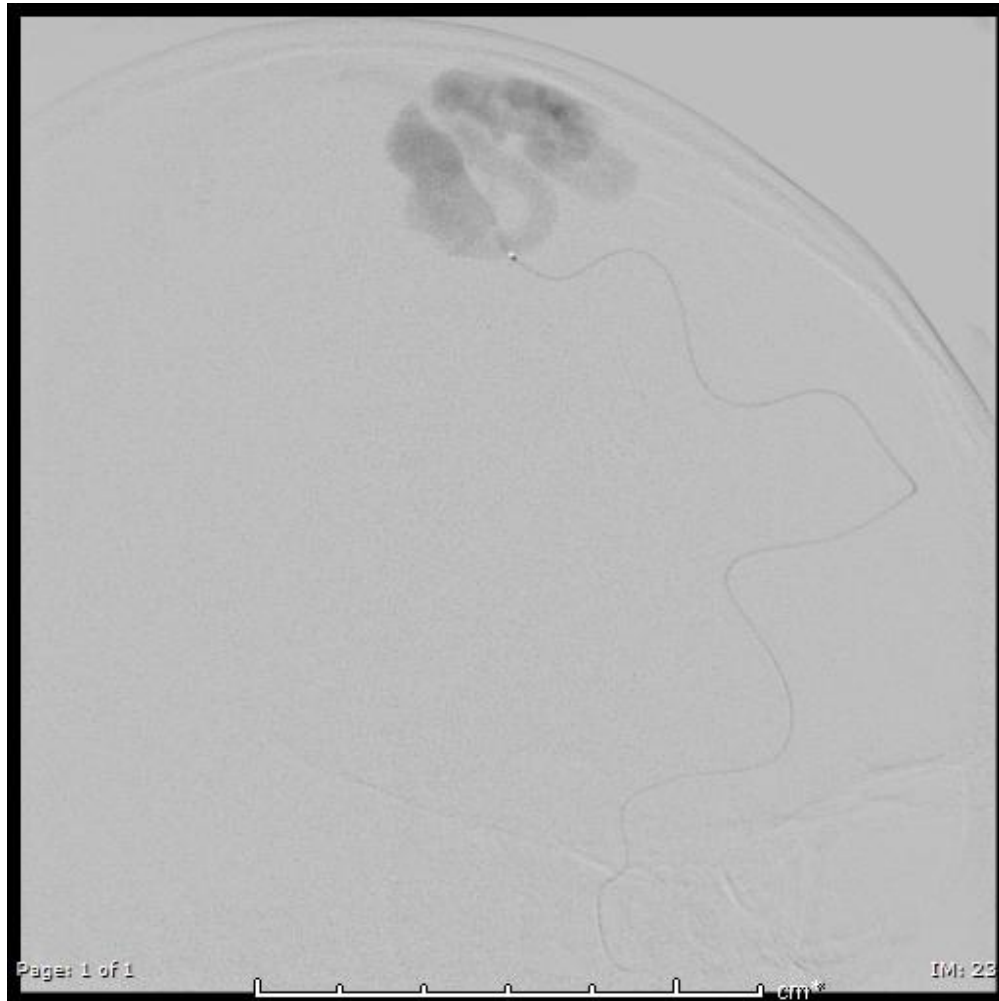
b



Description: Digital subtraction angiography (late arterial phase) in the Towne's view showing the venous pouch and drainage of the fistula, with no intervening nidus, which confirms the diagnosis of pial arteriovenous fistula. **Origin:** Moussa A, Department of Radiology, Ain Shams University, Cairo, Egypt

Figure 4

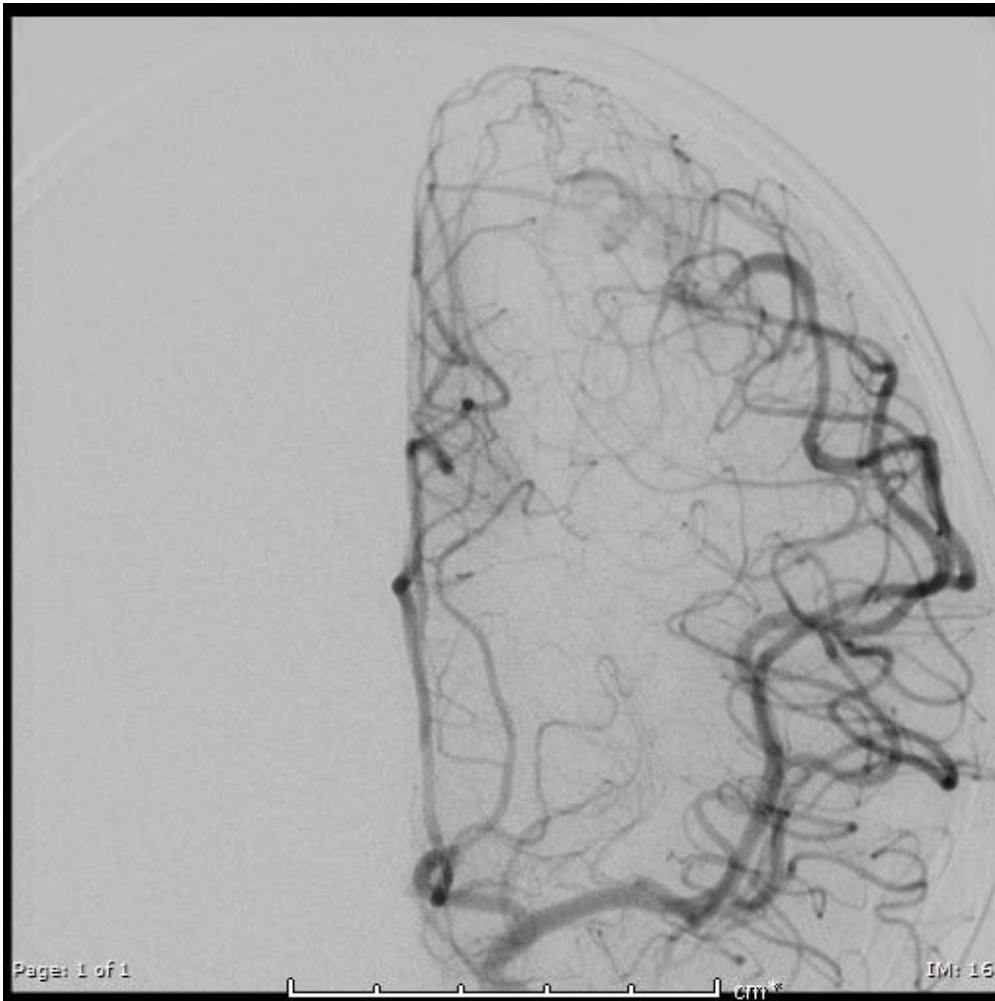
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Description: Digital subtraction angiography showing selective catheterisation of the supplying artery of the pial arteriovenous fistula and embolisation using liquid embolics. **Origin:** Moussa A, Department of Radiology, Ain Shams University, Cairo, Egypt

Figure 5

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Description: Digital subtraction angiography (arterial phase) after embolisation of the pial arteriovenous fistula showing no filling of the venous pouch indicating successful embolisation. **Origin:** Moussa A, Department of Radiology, Ain Shams University, Cairo, Egypt