Extracranial Arteriovenous Malformation Of The Scalp: Value Of Computed Tomographic Angiography

O Godwin, O Ayotunde, O Millicent, O Yvonne

Citation

O Godwin, O Ayotunde, O Millicent, O Yvonne. *Extracranial Arteriovenous Malformation Of The Scalp: Value Of Computed Tomographic Angiography*. The Internet Journal of Radiology. 2005 Volume 5 Number 1.

Abstract

We report a rare case of scalp arteriovenous malformation (AVM). A 19-year-old man presented with an eight-year history of a pulsatile palpable mass on his left parieto-occipital scalp. He complained of occasional headaches because of bruit. Computed tomography angiography (CTA) for the scalp vessels showed AVM over the left occipital region. Usefulness of CTA in the diagnosis of vascular lesions on the scalp was highlighted.

INTRODUCTION

The genesis of Arteriovenous Malformations (AVMs) is faulty differentiation of the primitive vessel complex. There is persistence of primitive arteriovenous interconnections which are normally replaced by an intervening capillary bed.[1] The feeding arteries and veins of these lesions are in fact, normal vessels of the region. As a result of abnormal haemodynamics they become progressively dilated and tortuous. Occasionally the veins undergo aneurysmal dilatation resulting from the increased pressure. These lesions are rare and known as cirsoid aneurysms of the scalp. They attain a certain size, becoming manifest as a visible pulsating swelling.[2, 3]

They are normally supplied by the superficial temporal artery and occipital arteries. Occasionally they are supplied by dural arteries which penetrate the cranial vault. Venous blood drains mainly through scalp veins or via dural sinuses.[4]

The rarity of this lesion and the use of a non invasive CT technique in demonstrating it prompted this report.

CASE REPORT

We report the case of a 19-year-old Nigerian male referred to our hospital with an 8-year history of occipital scalp swelling and occasional headaches. The swelling had been gradually increasing in size and was now pulsatile. There was no previous history of trauma or head injury. There were also no visual disturbances or paresis.

On examination he was found to have a pulsatile soft tissue swelling over the left occipital region which was not attached to the underlying bone and was seen to extend toward the vertex. A bruit was also demonstrated over the swelling.

There was however no differential warmth in this area. Review of other systems was essentially within normal limits.

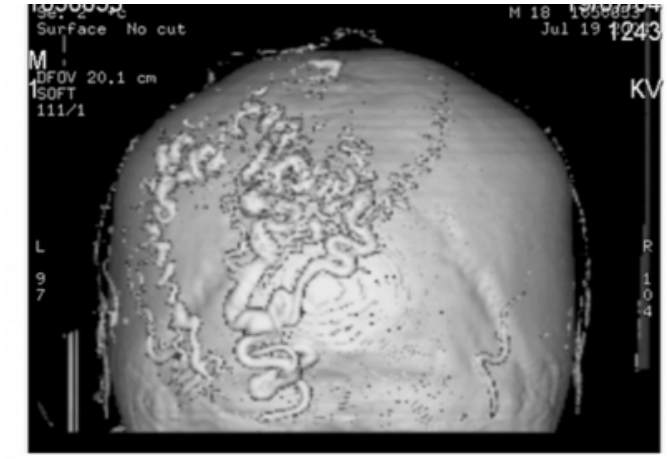
Haematological and biochemical parameters were also normal and his chest radiograph showed no abnormality.

A Computed tomography (CT) showed soft tissue swelling over the occipital bone extending toward the vertex (Fig.1). This was followed by CT angiography (Fig.2 and 3) which showed the occipital scalp swelling to contain tortuous dilated contrast filled vessels .These were seen to form a racemose baggy network with simultaneous early filling of venous circulation in the scalp indicating an arterovenous fistula. The feeding artery was the occipital branch of the left external carotid artery. The main draining veins could not be demonstrated. The 3D-maximum intensity projection (MIP) image (Fig.4) showed normal intracerebral circulation. A detailed study of the carotid circulation showed no abnormality in both carotids.

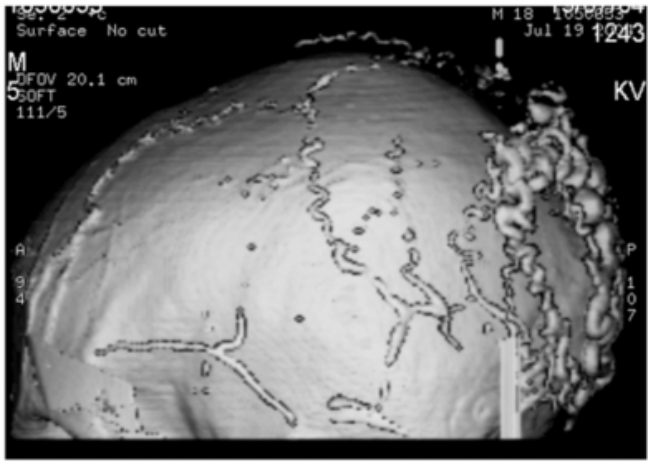
Patient was offered surgery but defaulted and was lost to follow up.

Figure 1

Figure 1: Shaded Surface Display (SSD) images in posterior (a) and left lateral (b) projections showing dilated tortuous occipital vessels with no underlying bony abnormality.



a.



b.

Figure 2

Figure 2: Sagittal MIP image, showing dilated tortuous arteriovenuos malformation of the left occipital vessels. There is early filling of the superior sagittal sinus. The intracranial vessels are however normal

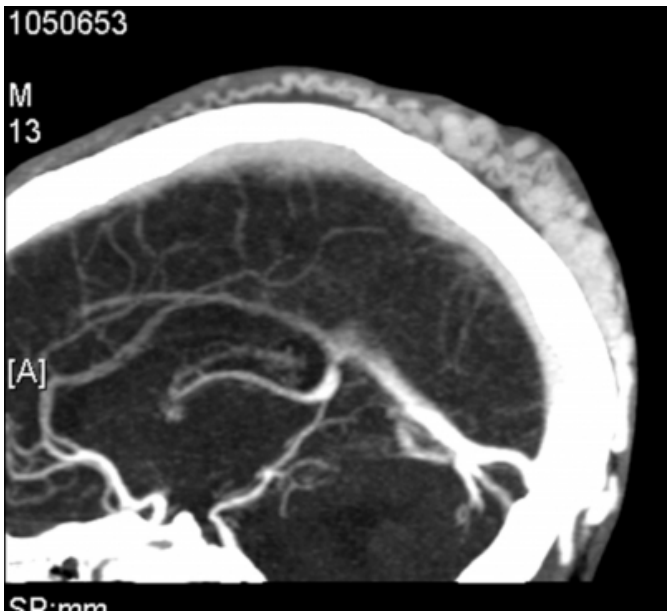
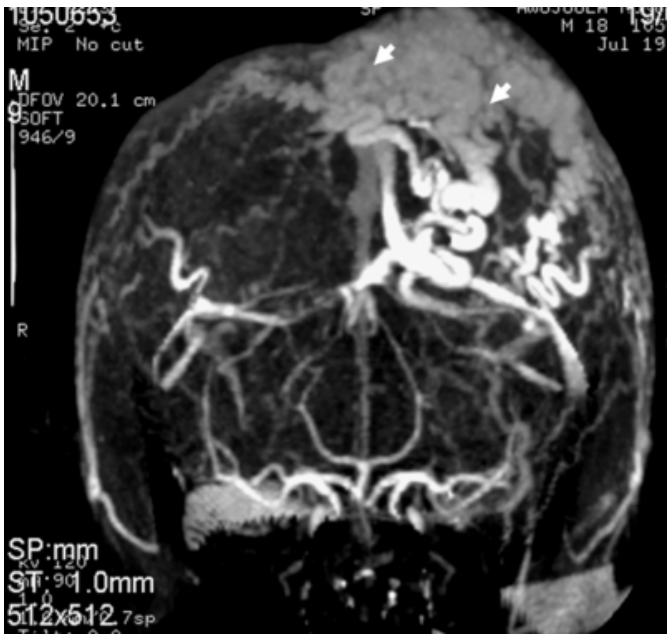


Figure 3

Figure 3: Posterior-anterior 3D CTA image, showing the left occipital scalp arteriovenous fistulous connection. Note the tortuous dilated contrast filled vessels forming a racemose baggy network (arrow heads) with simultaneous early filling of venous circulation in the scalp.



DISCUSSION

An arteriovenous malformation (AVM) of the face or scalp is an abnormal fistulous connection between the feeding

arteries and draining veins, without an intervening capillary bed within the subcutaneous layer. The draining veins are grossly dilated and tortuous and may show variceal dilatation.[5, 6] The dilatation of vascular channels often results in deformity of the scalp and face that is usually not life threatening but can cause substantial cosmetic and social disturbances.[7]

Krayenbuhl and Yasargil in a review of 800 cases of AVMs from literature and their own clinical material found extracranial AVMs to account for only 8.1% of the cases. [8]

Autopsy data suggest that there is an overall frequency of detection of AVMs in 4.3% of the population.[9] The detection rate for symptomatic cases was 1.2 per 100 000 person-years.[10]

Because the face and scalp have a rich arterial network fed by branches of the external carotid artery, the arterial system that supplies an AVM frequently is multiple and complex. In particular, facial lesions around the midline usually are supplied by bilateral arteries, whereas forehead lesions frequently are supplied by the supraorbital branch of the ophthalmic artery, as well as by branches of the external carotid artery. The case presented suggests a unilateral supply by the left external carotid however the possibility of a dual supply could not be ruled out.

In a report by Fisher-Jeffes, et al[11] in twenty-four patients with cirsoid aneurysms of the scalp, the lesions were related to trauma in nine patients (38%). Each of the patients presented with a pulsatile scalp swelling with a bruit. No focal neurological deficits or intracerebral involvement were noted in any of the patients.

These classical features were all seen in our patient who also had no history of trauma or neurological deficits.

Total excision of the extracranial malformation demands a complete knowledge of the feeding artery, the draining vein and nidus of AVM. Thus, selective external and internal carotid angiographic studies are usually necessary. Catheter angiography has been the gold standard in imaging the neurovasculature. However it is expensive, invasive, time consuming and requiring high skills for intra-arterial manipulation of catheters with an associated risk of 1.5 to 2% morbidity and mortality[12]. On the other hand, recent developments of CT scanners with multi-slice technology have provided significant improvements in vascular applications allowing non invasive vascular evaluation.

Advantages of CT angiography (CTA) include shorter acquisition times, retrospective creation of thinner sections from source data, improved 3D rendering with diminished artifacts. CTA can also provide a very high temporal resolution and the visualization of the related adjacent bony structures, which may be important in surgical planning[13]. Even though CTA has some drawbacks, such as the use of contrast material and the lack of information about blood flow direction, it can be used as a diagnostic alternative for extracranial and intracranial vascular diseases; more so in centers lacking DSA facilities such as ours.

CONCLUSION

A case of scalp AVM in a 19-year-old Nigerian male is presented. CTA enabled excellent non invasive visualization of the arteriovenous malformation. CTA can also be used as an alternative to DSA for the diagnosis of extracranial vascular diseases, such as scalp AVM.

CORRESPONDENCE TO

Dr Ogunseyinde O.A Department of Radiology, University College Hospital, Ibadan. PMB 5116 Ibadan, Nigeria. Email: roguns@comui.edu.ng

References

1. McCormick WF. The pathology of vascular "arteriovenous" malformations. J.Neurosurg. 1966; 24:807-816.
2. Dandy WE. Arteriovenuos aneurysms of the scalp and face .Arch.surg. 1946; 52:1-32.
3. Elkin DC. Cirsoid aneurysm of the scalp. Report of four cases. Ann Surg. 1946; 123:591-600.
4. Voselsang H. Angioma racemosum arteriale demonstrated by serial angiography. Acta radiol. (Stockh.) 1962; 57:232-236.
5. Fisher-Jeffes ND, Domingo Z, Madden M, De Villiers JC. Arteriovenous malformations of the scalp. Neurosurgery. 1995; 36:656-660.
6. Coleman CC, Hoopes JE. Congenital arteriovenous anomalies of the head and neck. Plast Reconstr Surg. 1971; 47:354-364.
7. Stillman RM, Powers JC, Fitzgerald JF. Cosmetic excision of an isolated extracranial arteriovenous malformation using Gelfoam embolization. Br J Surg. 1977; 64:784-785.
8. Peter Huber: Krayenbuhl / Yasargil Cerebral Angiography; 2nd completely rev. ed. Thieme Medical Publishers, Inc. New York. 1982; p373.
9. McCormick WF, Schochet SS Jr. Atlas of Cerebrovascular Disease. Philadelphia, Pa: WB Saunders Co; 1976:422.
10. Brown RD, Wiebers DO, Torner JC, O'Fallon WM. Incidence and prevalence of intracranial vascular malformations in Olmsted County, Minnesota, 1965 to 1992. Neurology. 1996; 46:949-952.
11. Fisher-Jeffes ND, Domingo Z, Madden M, de Villiers JC. Arteriovenous malformations of the scalp. Neurosurgery. 1995;36:656-60
12. Waugh JR, Sacharia N. Arteriographic complications in

the DSA era. Radiology 1992; 182: 243-6.
13. Teksam M, McKinney A, Truwit CL. Multi-slice CT angiography in evaluation of extracranial-intracranial bypass. Eur J Radiol 2004; 52:217-220.

Author Information

Ogbole I. Godwin, FMCR
Department of Radiology, University College Hospital Ibadan

Ogunseyinde O. Ayotunde, FWACS, FMCR
Department of Radiology, University College Hospital Ibadan

Obajimi O. Millicent, FWACS, FMCR
Department of Radiology, University College Hospital Ibadan

Osuagwu U. Yvonne, MBBS
Department of Radiology, University College Hospital Ibadan