Acta Neurochir (Wien) (2007) 149: 965–967
DOI 10.1007/s00701-007-1250-x
Printed in The Netherlands

Acta Neurochirurgica

Brief Report of Special Case

Dural arteriovenous fistula presenting as brainstem ischaemia

A. Lagares[1], A. Perez-Nuñez[1], R. Alday[1], A. Ramos[2], J. Campollo[2], R. D. Lobato[1]

[1] Department of Neurosurgery, Hospital 12 de Octubre, Madrid, Spain
[2] Department of Neuroradiology, Hospital 12 de Octubre, Madrid, Spain

Received 21 February 2007; Accepted 21 June 2007; Published online 24 July 2007

Summary

Dural arteriovenous fistulas presenting with ascending myelopathy are characterised by the presence of an abnormal retrograde drainage through spinal veins. The authors present a case of cranial dural arteriovenous fistula causing brainstem dysfunction secondary to venous hypertension, treated by surgical interruption of the pial venous drainage which resulted in complete clinical and radiological resolution of the brainstem lesion.

Keywords: Dural arteriovenous fistula; brainstem oedema; venous hypertension; surgery.

Case report

A 65-year-old man was admitted to our hospital suffering from dizziness. He was admitted to the Neurological ward of another hospital three months before because of a vermian haematoma that resolved spontaneously. At that time he was investigated with cranial MR which demonstrated only the presence of a haematoma. By mistake, MSA or DSA were not performed in the diagnostic work-up. At the second admission a cranial CT only revealed a small cerebellar hypodensity and a diagnosis of cerebellar infarction was made. A few hours after admission he developed progressive tetraparesis, swallowing difficulties and later, respiratory insufficiency which required intubation. An urgent MR was performed (Fig. 1) which revealed the presence of a dilated posterior fossa vein, connected to the spinal cord veins and associated with hyperintensity in the brainstem in T2 and fluid-attenuation inversion-recovery (FLAIR) sequences and suggestive of congestive vasogenic oedema in the diffusion MR. Cerebral angiography demonstrated a dural arteriovenous fistula close to the torcula with drainage through a dilated inferior vermian vein and retrograde flow into the petrosal and perimedullary veins.

The fistula was treated with surgery through a posterior fossa craniectomy. After opening the dura a dilated and arterialised right hemispheric cerebellar vein was identified and clipped. Two weeks later the MR demonstrated complete resolution of the brainstem hyperintensity. Six months after surgery the patient is able to walk without help and check angiography as well as MR demonstrated complete resolution of the fistula.

Discussion

Intracranial dural arteriovenous fistulas draining to perimedullary veins are classified as type V dural arteriovenous fistulas [1, 2]. The majority of the intracranial dural arteriovenous fistulas with perimedullary venous drainage reported in the literature were located on the dura mater of the posterior fossa, although in four case re-

Correspondence: Alfonso Lagares, Servicio de Neurocirugía, Hospital 12 de Octubre, Crta. De Andalucia km 5,4, Madrid 28041, Spain.
e-mail: algadoc@yahoo.com

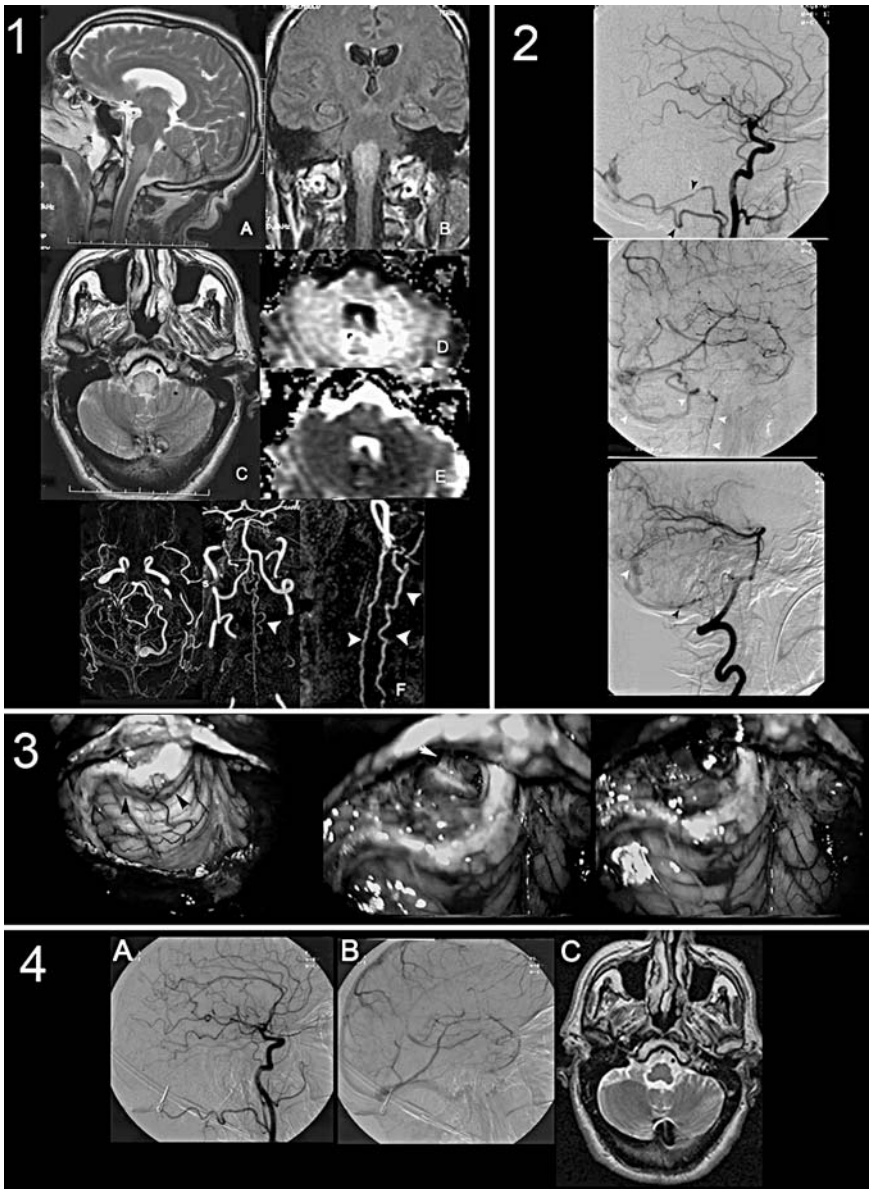

Fig. 1. *1* Urgent MR showing a hyperintense medullary lesion in sagittal and axial T2 (A and C) and coronal FLAIR (B) weighted images. This lesion presents a decreased exponential diffusion (D) and an increase in ADC corresponding to an area of vasogenic oedema (E). MR angiography (F) demonstrated a venous varix in the posterior fossa that drained through dilated perimedullary veins (*white arrowheads*). *2* Right carotid angiography lateral view (*upper*), venogram lateral view (*middle*) and vertebral lateral view (*lower*) showing a dural fistula located in the torcular area, fed by branches of the occipital and posterior meningeal artery as well as meningeal branches of the vertebral artery (*black arrowheads*) and with drainage through a dilated inferior vermian vein with retrograde flow into the petrosal and perimedullary veins (*white arrowheads*). *3* Intraoperative photographs (*left*) showing a dilated arterialised cerebellar vein (*black arrowheads*) which was dissected from the tentorium. The vein (*white arrowhead*) was connected to a venous varix (*middle*). Following the application of two clips parallel to the tentorium (*right*) the abnormal pial venous drainage was interrupted and the vein lost its bulge and became dark. *4* Postoperative angiography (A, B) and MR (C) showing complete resolution of the hyperintensity in the brainstem and occlusion of the fistula

ports they were located in the cavernous sinus [3]. These arteriovenous fistulas are a rare cause of ascending myelopathy [1, 2]. They normally present aggressively, like other dural fistulas with leptomeningeal venous drainage, and therefore can present with either parenchymal haemorrhage or neurological dysfunction. Their clinical course is usually progressive but an acute onset of symptoms is also possible [5]. Ascending paraparesis or paraplegia is always seen, associated in the majority of the patients with sphincter dysfunction. Quadriparesis or

bulbar dysfunction associated with dysautonomic signs is less frequent.

The most plausible mechanism for the neurological dysfunction in these patients is venous congestion due to venous hypertension. Disappearance of clinical and imaging changes related to oedema following leptomeningeal venous disconnection of the dural arteriovenous fistulas with perimedullary drainage has been demonstrated [5]. The existence of an increase in the apparent diffusion coefficient (ADC) in the area where the hyperintensity in T2 weighted images was located denotes that such a lesion was mainly due to reversible congestive vasogenic oedema and the disappearance of the lesions after venous disconnection supports this finding. Brainstem dysfunction seems to be related to the involvement of the anterior pontomesencephalic vein, which is connected to the petrosal vein superiorly and to the anterior spinal vein inferiorly [4].

Surgical interruption of leptomeningeal venous drainage has been proposed as the ideal treatment for dural arteriovenous fistulas with leptomeningeal drainage, especially in those with single drainage [5]. However, both endovascular and surgical treatment produce good results.

References

1. Brunereau L, Gobin YP, Meder JF, Cognard C, Tubiana JM, Merland JJ (1996) Intracranial dural arteriovenous fistulas with spinal venous drainage: relation between clinical presentation and angiographic findings. AJNR Am J Neuroradiol 17: 1549–1554
2. Gobin YP, Rogopoulos A, Aymard A, Khayata M, Reizine D, Chiras J, Merland JJ (1992) Endovascular treatment of intracranial dural arteriovenous fistulas with spinal perimedullary venous drainage. J Neurosurg 77: 718–723
3. Iwasaki M, Murakami K, Tomita T, Numagami Y, Nishijima M (2006) Cavernous sinus dural arteriovenous fistula complicated by pontine venous congestion. A case report. Surg Neurol 65: 516–518
4. Li J, Ezura M, Takahashi A, Yoshimoto T (2004) Intracranial dural arteriovenous fistula with venous reflux to the brainstem and spinal cord mimicking brainstem infarction – case report. Neurol Med Chir (Tokyo) 44: 24–28
5. Ricolfi F, Manelfe C, Meder JF, Arrue P, Decq P, Brugieres P, Cognard C, Gaston A (1999) Intracranial dural arteriovenous fistulae with perimedullary venous drainage. Anatomical, clinical and therapeutic considerations. Neuroradiology 41: 803–812

Comment

The authors report a single case. That case is quite rare and it highlights the fact that those dural AVFs and arterialisation of the draining vein can present with either parenchymal haemorrhage or ischaemia.

C. Cognard
Toulouse