Journal of Neuroradiology (2012) **39**, 368—372

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CASE REPORT

Arteriovenous fistula of the filum terminale: Radiological diagnosis and therapeutic management by embolization

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KEYWORDS
Arteriovenous fistula;
Filum terminale;
Embolization;
MRI

Summary A 60-year-old man had progressive paraparesis, paresthesia of both lower limbs and sphincter dysfunction. He underwent MRI, which revealed perimedullar abnormal vascular channels associated with a hypersignal in the thoracolumbar cord. Because of the patient's age and symptomatology, a dural arteriovenous shunt was first suspected. MRA confirmed dilatation of the perimedullary venous channels, but also revealed an enlarged anterior spinal artery, a finding incompatible with a diagnosis of dural arteriovenous fistula. A lesion, vascularized by the anterior spinal axis and draining secondarily into the perimedullary veins, was thus suspected. Angiography diagnosed a microfistula of the filum terminale; selective distal catheterization of the arterial feeder from T11 to S1 was achieved, and the shunt closed by embolization with acrylic glue. The patient improved after endovascular treatment.

Introduction

Spinal-cord vascular malformations are rare conditions that may be difficult to properly diagnose. Although the morphology of the lesion is often simple (arteriovenous fistula [AVF] versus nidus-type arteriovenous malformation [AVM]), it has to be distinguished according to its localization. Also, four types of AV shunts may have consequences on the cord itself: paraspinal; epidural; dural and intradural [1]. The diagnosis should be suspected because of the patient's symptomatology, and confirmed by magnetic resonance imaging (MRI) and angiography (MRA). As MRI alone may sometimes fail to precisely assess the shunt zone, MRA is often of considerable help. Because the latter allows proper analysis of the regional and lesional vascular anatomy of the spinal cord, it can precisely diagnose the type of lesion and define the potential therapeutic modalities that can be proposed to the patient.

This report describes the case of a patient with a filum terminale AVF, and the diagnostic factors that allowed treatment with a satisfactory endovascular transarterial approach.

Case report

A 60-year-old male patient, with no particular previous medical history, was sent to our department because of progressive paraparesis, paresthesia in both lower limbs and a sphincter disorder involving urgent motions lasting

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http://dx.doi.org/10.1016/j.neurad.2012.05.004

Figure 1 Spinal-cord MRI (sagittal fast spin-echo [FSE] T2 sequence) shows the clearly defined dilated perimedullary veins (arrows) as an intramedullary hypersignal (arrowhead).

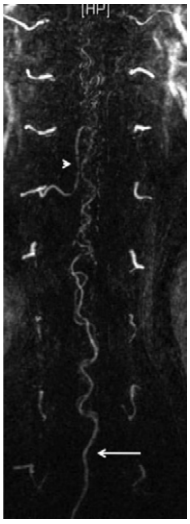

Figure 2 Spinal-cord MRA (arterial phase) shows the artery of Adamkiewicz, arising from the right T11 intercostal artery (arrowhead), as a dilated vein with a caudocranial trajectory that was already visible during the arterial phase (long arrows) and which persisted during the venous phase. A shunt located below the conus, vascularized by the anterior spinal artery and located anatomically on the filum terminale, was suspected. The shunt itself was not detected on these images as its location was beyond the field of view.

for several months. The association of these symptoms suggested a spinal-cord disorder, and MRI was performed (sagittal T1 and T2 fast spin-echo (FSE), axial T2 FSE and gadolinium-enhanced T1 FSE sequences).

MRI showed an intramedullary hypersignal at the level of the thoracolumbar cord predominating at the conus that was associated with dilated perimedullary vessels. This appearance evoked congestive veins (Fig. 1) responsible for venous ischemia.

Spinal-cord MRA was performed during the same procedure (Fig. 2) with a fast gradient-echo sequence and injection of gadolinium during two successive phases, each lasting 48 seconds (the K-space was filled using elliptical centric view ordering, filling the center lines and center slices first), thus obtaining arterial and venous images. This confirmed the vascular nature of the lesion, and demonstrated the dilated perimedullary veins as tubular venous structures located below the conus. These latter veins had already been detected during the arterial phase of the MRA, and appeared to flow in a craniocaudal direction. Their origin was difficult to depict, as it was located outside of the field of view. During the arterial phase of the MRA, the radiculomedullary artery of the lumbar enlargement (artery of Adamkiewicz [AK]) was seen to be dilated and arising from the right 11th thoracic vertebra (T11) intercostal artery. This artery had a long, tortuous trajectory and its distal extremity was also located below the conus. The lattermost portion thus corresponded anatomically to the artery of the filum terminale.

Selective spinal-cord angiography was performed under general anesthesia (Figs. 3 and 4), using a 4-F Cobra catheter (Terumo Europe, Leuven, Belgium), and confirmed that the right T11 intercostal artery gave rise to the radiculomedullary artery of the lumbar enlargement. This dilated artery could be followed over the whole of its trajectory to below the conus terminalis, where it became the artery of the filum terminale. An AV microfistula was detected in this artery at the level of the first sacral vertebra (S1). The lesion drained exclusively through the vein of the filum in a caudocranial direction and was secondarily causing congestion in the perimedullary veins. To verify that no other regional artery, mainly a dural artery, was vascularizing the lesion, the lateral and middle sacral arteries were also catheterized. However, no other arterial contributions to the shunt were detected, thereby eliminating the diagnosis of dural

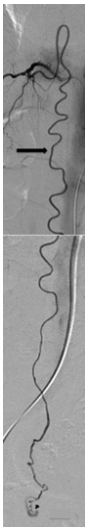

Figure 3 Spinal-cord angiography shows catheterization of the right T11 artery (arterial phase, anteroposterior [AP] view). The radiculomedullary artery of the lumbar enlargement (artery of Adamkiewicz) is enlarged (large arrow) and vascularized via the artery of the filum. There is also an arteriovenous microfistula at the level of S1 (arrowhead).