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Case Report

Dural arteriovenous fistula at the foramen magnum: Report of a case and clinical-anatomical review

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ABSTRACT

Arterial supply and venous drainage at the foramen magnum is variable. Two main forms of clinical presentation, intracranial and spinal, can be differentiated when a dural arteriovenous fistula (DAVF) is found at this level.

We describe a case of a 68-year-old patient with a progressive paraparesis, diagnosed of dural arteriovenous fistula located at the posterior lip of foramen magnum. We review, in this setting, the vascular radiological anatomy of those fistulas and its important correlation with neurologic clinical symptoms.

Fístula dural arteriovenosa en el agujero occipital: caso clínico y revisión clínico-anatómica

Palabras clave:
Fístula dural arteriovenosa
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RESUMEN

El aporte arterial y el drenaje venoso en el agujero magno son variables. Dos formas principales de presentación clínica, intracraneal y medular pueden ser diferenciadas en las fístulas durales arteriovenosas encontradas a este nivel. Se presenta el caso de un paciente de 68 años que, tras un cuadro de paraparesia progresiva, se diagnostica de una fístula dural arteriovenosa dural localizada en el borde posterior del agujero magno. A propósito de este caso se revisa la anatomía radiológica y vascular de estas fístulas y su importante correlación con los síntomas neurológicos.

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Dural arteriovenous fistulas (DAVFs) are one of the most common vascular disorders of the spinal cord. They reach up to 70% of all of them. They do not appear until adulthood. The origin of the fistula can be found from the sacrum to the foramen magnum. At this level, DAVFs are rare, that is, they are only 2% of them.[1] Arterial supply of these fistulas comes from meningeal branches of the vertebral and external carotid artery. However, its venous drainage is very important because it is variable and it is related with two main forms of clinical presentation that can be well differentiated: intracranial and spinal. When the presentation is intracranial, venous drainage takes place in ascending route into venous sinus. When the presentation is spinal, there is a descending drainage rout and a slow and insidious clinical picture of myelopathy is seen. This is a less common initial presentation and diagnosis is often missed or delayed because symptoms are nonspecific.

Case report

History and examination

We present the case of a 68-year-old man who came with initial diagnosis of left meralgia paresthetica. In addition to pain, the patient referred progressive weakness of his legs during 18 months. That was more evident when walking on inclined planes, and it later associated sphincter disorder. On exploration, hyperreflexia was manifest in both lower extremities with an increased reflexogenic area and atrophy of the right quadriceps. The patient did not refer any relevant related history. The patient provided a magnetic resonance imaging (MRI) of the lumbar spine in which only signs of lumbar spondylosis were found. Given these symptoms, brain and cervical MRI were performed. Aside from degenerative changes, multiple serpiginous hypointense structures were found inside the dural sac and pial surface, mainly between C5 and D1. That was compatible with arteriovenous malformation. Following these findings, a spinal cord and cerebral arteriography was done showing a DAVF at the foramen magnum, which drained into the anterior spinal vein. Afferents arose from the posterior meningeal branches of the right occipital and vertebral arteries. They penetrated into the spinal canal between the occipital bone and C1. A magnetic resonance angiography was also performed, finding a serpiginous vessel that originated in the right vertebral artery and drained into the anterior spinal vein, in the arterial phase (Fig. 1).

Treatment

DAVF was embolized, as a step prior to surgery, with Glubran diluted with lipiodol through the occipital artery branch of the external carotid. The study of the right vertebral artery showed the origin of the perimedullary vein, although no blood flow was observed inside. The control at the end of the procedure showed a total occlusion of the fistula (Fig. 2).

Evolution after treatment

The clinical response was favorable, with gradual improvement of motor deficit, regaining the ability to walk soon after hospital discharge. Two months later, the patient got significant improvement. The patient continued with rehabilitation and he had an almost complete recovery. One year after treatment, control arteriography was performed showing persistent occlusion of the DAVF.

Discussion

It is believed that spinal DAVFs (SDAVFs) are an acquired pathology, although its exact etiology is unknown. Arteriovenous communication occurs between a dural branch of the radicular artery, with the nest of vessels located in the dura near the radicular exit, and a vein, which drains intradurally into the venous perimedullary plexus.[2,3] Dural arteriovenous fistulas (DAVFs) at the craniocervical junction are uncommon but they produce clinical important abnormalities. These lesions have two main forms of clinical presentation; acute subarachnoid hemorrhage (SAH) and myelopathy.[4] However, there are another less common clinical forms; brainstem dysfunction, radiculopathy, cranial nerve palsy and occipital neuralgia.[5]

At the foramen magnum, the posterior meningeal artery arises from the posterosuperior surface of the vertebral artery, during its course around the lateral mass of the atlas, and penetrates the dura before reaching the posterior border of the foramen magnum. It supplies the dura of the posterolateral and posterior part of the posterior fossa, and anastomoses with the meningeal branches of the ascending pharyngeal and occipital arteries.[6] The meningeal branch of the occipital artery is inconstant and if it is present, it enters the skull through the mastoid foramen. In our case, posterior meningeal branches of the right vertebral and right occipital arteries supplied the DAVF, which drained into the anterior spinal vein.

Venous structures in the foramen magnum region are divided into extradural veins, dural venous sinuses and intradural veins. These three groups have their anastomoses through the bridging and emissary veins. The intradural veins in the region of the foramen magnum drain the lower part of the cerebellum and brainstem, the upper part of the spinal cord, and the cerebellomedullary fissure. The veins of the medulla and spinal cord form longitudinal plexiform channels which anastomose at the foramen magnum. The median anterior medullary vein courses on the anterior median sulcus of the medulla and it continuous with the median anterior spinal vein that courses in the anterior median spinal fissure deep to the anterior spinal artery.[6] As mention before, the venous drainage is very important because it is variable and it is related with two main forms of clinical presentation that can be well differentiated.[4]

When the presentation is intracranial, patients suddenly develop subarachnoid hemorrhage (most frequently presentation). When the presentation is spinal, they present slow and insidious clinical picture of myelopathy.

The 6 cases of arteriovenous fistula at the craniocervical junction with subarachnoid hemorrhage described by Kai et al.[4] were all characterized by intracranial venous sinus drainage. In their review of 41 previous cases, it is interesting to note that all of those that presented subarachnoid

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