E-QUID: ANSWER / Neuroradiology

Intracranial hypotension

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Case report

A 55-year-old woman suffering from lumbar and sciatic pain on alternating sides for over 10 years. Several operations on her spine were carried out abroad: C4-C5 and C5-C6 disc prostheses and the insertion of interspinous spacers 5 years ago in L3-L4, L4-L5 and L5-S1 without significant efficacy. A saccoradiculography was carried out without complications. It revealed the impairment of several discs without lumbar canal stenosis, and dynamic instability in L3-L4 and L4-L5. Since recent imaging was not available, a spinal MRI was carried out the next day (Figs. 1–3).

What is your diagnosis?

After reading the case report, which of the following proposals is your diagnosis:

- epidural hematoma;
- intracranial hypotension;
- epidural injection of iodine contrast agent;
- dural arteriovenous fistula with perimedullary venous drainage.

Diagnosis

Intracranial hypotension.
Figure 1. MRI of the cervical spine. T2-weighted sagittal section (TR/TE: 3427/102).

Figure 2. MRI of the lumbar spine. T1-weighted sagittal sections (left image, TR/TE: 456/10) and T2-weighted sagittal sections (right image, TR/TE: 3046/105).

Figure 3. MRI of the lumbar spine. T1-weighted axial section with fat saturation (TR/TE: 761/9.208) after intravenous injection of gadolinium.

Figure 4. MRI of the cervical spine. T2-weighted sagittal section (TR/TE: 3427/102). Appearance of posterior epidural collection of fluid (arrow). Metal artefact of disc prostheses (star).

Comments

The MRI (Signa HDxt, General Electric, Fairfield, Connecticut, USA) reveals a posterior extradural collection of fluid that is well visible at the cervicodorsal level (Figs. 4 and 5). It is associated with the seeming adhesion of the roots of the cauda equina (Fig. 6). After the injection of gadolinium (Dotarem, Guerbet, Roissy, France), we note the dilation of the epidural venous plexus (Figs. 7 and 8). The appearance indicates a Monro-Kellie phenomenon compensating for the intracranial hypotension related to the recent sacrococathigraphy. Upon questioning, the patient reported headaches, mainly with prolonged standing. It remains moderate and spontaneously disappears after a few days.
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Figure 5. MRI of the cervical spine. 3D Cosmic T2-weighted 3D 1.6 mm axial section (TR/TE: 6.464/3.14). Appearance of posterior epidural collection of fluid (arrows).

Discussion

The diagnosis of intracranial hypotension is based on the brain MRI that, in particular, looks for a Dura Mater aspect [1]. However, the spinal manifestations of intracranial hypotension are not as well known. Nevertheless, it’s useful to know how to look for them since intracranial manifestations are less constant and less specific than spinal manifestations [1]. In addition, with so-called spontaneous intracranial hypotension, the spinal MRI not only indicates this diagnosis, but also helps in the search for the location of the leak of CSF (cerebrospinal fluid). The MRI also sometimes helps find the cause of this so-called spontaneous intracranial hypotension: transdural disc herniation, transdural osteophytes, rupture of radicular cyst or arachnoid diverticula [1].

The sign most often found is the presence of, sometimes excessive, collections of epidural fluid, over several spinal levels. The origin is controversial: it may consist of a direct leak of CSF or a transudate coming from epidural venous dilations usually accompanying intracranial hypotension. These collections are sometimes found at a distance from the place of the CSF leak and are even classically visible in C1-C2, in interspinal position [2]. These collections of

Figure 6. MRI of the lumbar spine. T1-weighted sagittal sections (left image) and T2-weighted sagittal sections (right image). Appearance of adhesion of the roots of the cauda equina (arrow) due to the low intradural pressure.

Figure 7. MRI of the lumbar spine. T1-weighted sagittal (left image) and parasagittal sections (right image) with fat saturation (TR/TE: 851/9.488) after intravenous injection of gadolinium. Thickening and intense enhancement after gadolinium injection of the anterior epidural space (venous plexus).

Figure 8. MRI of the lumbar spine. T1-weighted axial section with fat saturation (TR/TE: 761/9.208) after intravenous injection of gadolinium. Enlargement of the epidural venous plexus with scalloped appearance of the anterior epidural space (arrows) attesting to the Monro-Kellie phenomenon.
fluid present a distinct T2 liquid hypersignal and are not usually enhanced as opposed to epidural venous dilations that are also very often found both during spontaneous intracranial hypotension or secondary to a dural puncture [2]. This dilation is related to an adaptation of the cerebromeningeal system that is trying to compensate for the drop in pressure of the CSF, by increasing the cerebral, medullar and meningeal venous pressure (Monro-Kellie doctrine) [1,2]. This dilation also accounts for the presence of meningeal thickening and intense enhancement after the injection of gadolinium, similar to the appearance of Dura Mater at the cerebral level. This enlargement may be massive, pseudotumoral, and may eventually be responsible for a true mass effect on the dural sac [3]. The thickened and scalloped appearance of the anterior epidural space may even take on the appearance of a "curtain tieback", classically accompanying infectious or tumoral epiduritis [1]. This appearance is related to the presence of a fibrous septum (medium septum) extended between the posterior periosteum of the vertebral body and dural sac, as well as lateral expansions (lateral membranes), that form an anatomic barrier to the posterior expansion of the pathological process [4,5]. These vertebromeningeal ligaments also account for the curtain tieback appearance of the epidural lipomatosis [6].

The highly limited and especially, very symmetrical nature in axial section, of this pseudo-epiduritis, helps correct the diagnosis. In case of doubt, a complementary brain MRI may be carried out to search for signs of intracranial hypotension: diffuse regular pachymeningitis, subdural collection, low position of cerebellar tonsils, disappearance of cerebral cisterns, small ventricles (in particular V3) [7].

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References


