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Intracranial hypertension caused by a meningioma compressing the transverse sinus

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ABSTRACT

We report a 55-year-old woman with intracranial hypertension due to unilateral extrinsic compression of the left transverse sinus by a meningioma. Because of the high risk of the conventional neurosurgical intervention, she underwent an endovascular procedure consisting of a transstenotic stent placement in the left transverse sinus. One month after stenting, her ophthalmological examination revealed complete regression of the bilateral papilledema, with persistent improvement at 1 year. Cerebral venous-stenting could be a safe alternative for patients suffering from intracranial hypertension caused by extrinsic sinus compression.

1. Introduction

Intracranial hypertension (ICH), defined as an increase of the intracranial pressure >20 cm H_2O, manifests as headaches, vomiting and visual symptoms (transient visual obscurations, loss of visual acuity, horizontal diplopia).[1] This visual loss is usually slow and insidious, but can sometimes be of sudden onset.[2] The main causes of ICH are sinus venous thrombosis and drug intake (vitamin A, corticoids) but it can be idiopathic. We describe a woman with ICH caused by a meningioma compressing the left transverse sinus (TS) that was treated with sinus venous-stenting.

2. Case report

A 55-year-old Martinican woman, with no remarkable medical history, except for severe myopia, was admitted to the Neurology Department to investigate bilateral papilledema found incidentally during a routine ophthalmological examination. She was not taking any medications. She denied having headaches, reduced visual acuity or transient visual obscurations. She was not overweight (body mass index: 21).

Visual acuity was normal under adequate correction (20/20, both eyes). Visual field assessment showed bilateral enlarged blind spots with central scotoma. Fundoscopy confirmed bilateral grade-IV papilledema with juxta-papillary retinal hemorrhages (Fig. 1a).

Routine blood analyses were normal. The contrast CT scan of the brain revealed multiple calcified extraparenchymal lesions suggestive of multiple meningiomas (Fig. 2). Brain MRI (Fig. 3) showed fluid accumulation in the optic nerve sheaths and reduced ventricle size. There were at least seven intracranial but extraparenchymal lesions, in contact with the meninges, and enhanced by gadolinium injection, highly suggestive of meningiomatosis. The meningioma adjacent to the superior sagittal sinus (SSS) compressed the left TS. Multi-detector CT venography showed a complete segmental obstruction of the left TS.

The diagnosis of ICH was confirmed by measuring the cerebrospinal fluid (CSF) pressure at 28 cm H_2O; CSF composition was normal. Due to the high risk of damaging the left TS during surgical resection of the compressive meningioma, we opted for radioguided endovascular venous stent insertion to relieve ICH.

3. Stenting procedure and follow-up

The stent was inserted under local anesthesia. Clopidogrel was given for 3 days before and was continued in combination with heparin during the endovascular procedure. First, a conventional intra-arterial catheter angiogram was performed. During the venous phase of arteriography, a 30-mm long occlusion of the left TS was seen. We chose the venous access closest to the lesion by direct puncture of the internal jugular vein under ultrasonography guidance. Indeed, this approach provides the maximum "push" to pass the junction of the jugular vein–transverse sinus and the compressed part of the sinus. A 6F trocar was directed into the TS through a percutaneous puncture of the left internal jugular. A 5F vertebral catheter mounted on a standard guidewire (0.035 Terumo Standard Guide Wire M, Terumo Medical Corporation, Somerset, NJ, USA) was used to pass through the occluded TS. A larger catheter provides more "push" to get through the transverse sinus obstruction. The angiographic series of the SSS obtained using the catheter confirmed left TS occlusion. A self-expanding stent

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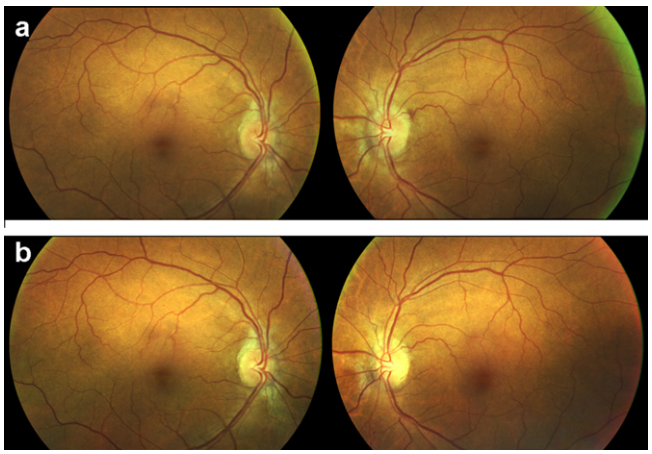

Fig. 1. Fundoscopy (a) before surgery showing bilateral papillary blood congestion accompanied by a peripapillary hemorrhage crossing the 2 o'clock meridian in the left eye: note the moderate bilateral papillary edema; and (b) 1 month after the venous stenting procedure showing the clear-cut regression of the bilateral papillary edema and the disappearance of the peripapillary hemorrhage. (This figure is available in colour at www.sciencedirect.com.)

(8 mm × 40 mm Astron Pulsar Stent Device: Biotronik; Berlin, Germany) easily crossed through the compressed zone and spanned the confluence of sinuses into the left TS, causing a transient left-side headache. Angiographic control was satisfactory with no need for additional balloon angioplasty (Fig. 4). The procedure lasted 50 minutes.

After TS stenting, the patient was monitored overnight in the intensive care unit and discharged 48 hours later. Clopidogrel was continued for 3 months, the presumed time required for endothelialization of the stent.

At the 1-month follow-up visit, fundoscopy showed a clear-cut regression of the papilledema and the disappearance of the peripapillary hemorrhage (Fig. 1b). At 3 months, the regression was complete and the patency of the stent was demonstrated by CT angiography (Fig. 5). Fundoscopy at 1 year confirmed the persistence of the improvement with a stability of the meningioma compressing the left TS on the 1-year CT scan.

4. Discussion

Fortuitously discovered papilledema can sometimes be the sign leading to ICH diagnosis,[3] especially in children.[4] These forms without headaches carry the same vision-loss risk as those with headaches; they can lead insidiously to permanent visual impairment, due to prolonged papilledema with secondary optic atrophy, and thus require treatment.[5]

We postulated that our patient's ICH resulted from the unilateral compression of the left TS by the meningioma, causing venous obstruction, but not from the tumor itself because of its small size and the absence of surrounding edema. The elevated pressure in the venous sinus created an inverse pressure gradient at the level of the arachnoid granulation and prevented CSF resorption, leading to ICH. This ICH-triggering mechanism has been previously described in extrinsic median compression of the superior longitudinal sinus by benign or malignant tumors.[6,7] But Damak demonstrated that unilateral intrinsic obstruction with isolated lateral sinus thrombosis was sufficient to cause ICH-induced bilateral papilledema in 22% of their 62 patients, particularly when associated with contralateral hypoplasia or extension to the torcular of Herophilus.[8]

Ideal treatment of our patient would have been complete resection of the compressive meningioma. However, despite advances in microsurgical techniques,[9] meningiomas adjacent to the posterior

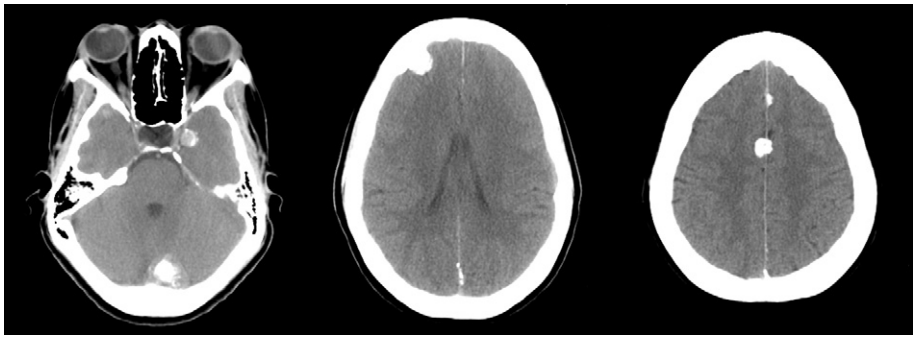

Fig. 2. Axial contrast-enhanced CT scan showing multiple meningiomas, most of them totally calcified (falx cerebri, right frontal) or partially calcified (right temporal, left temporal, posterior adjacent to confluence of sinuses).

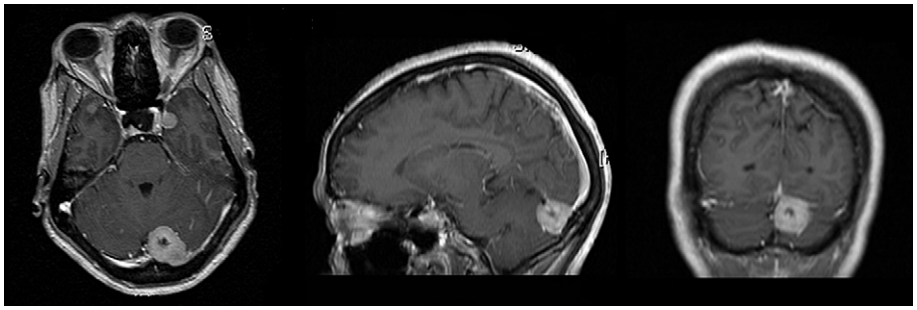

Fig. 3. T1-weighted cerebral MRI showing a well-defined occlusion-causing meningioma, intensely enhanced after intravenous gadolinium injection, next to the left transverse sinus and confluence of the sinuses (left to right: axial, sagittal and coronal).