

Endovascular treatment of sigmoid sinus stenosis in benign intracranial hypertension

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Sinovenous stenosis is suggested to be related to benign intracranial hypertension. Endovascular treatment is effective in improving vision by overcoming these stenoses. We reported a case of benign intracranial hypertension with underlying right sigmoid sinus stenosis and left hypoplastic transverse sinus. Angioplasty for the right sigmoid sinus stenosis was carried out and the patient's vision improved. However, the intracranial pressure was still high approximately 1 year after angioplasty.

Introduction

Benign intracranial hypertension (BIH), or pseudotumour cerebri, also known as idiopathic intracranial hypertension, is a neurological disease that is characterized by increased intracranial pressure in the absence of intracranial mass lesions or venous thrombosis. It is a disease that is predominant in young, obese women, especially in the age group of 20–45 years.

With the advancement of imaging technology, underlying abnormalities can be found. Treatment of underlying vascular abnormality helps to improve vision.

We reported a case of BIH caused by stenosis of the right sigmoid sinus and hypoplastic left transverse sinus that was treated by angioplasty.

Case presentation

In May 1994, a 34-year-old woman with a past history of gestational diabetes presented with a 1-month history of on-and-off headache and blurred vision. There were no other focal neurological symptoms or convulsions. She then developed a gradual onset of blurred vision.

Private computed tomography (CT) of the brain in May 1994 was normal. A lumbar puncture (LP) was carried out. Opening pressure was 32 cm cerebrospinal fluid (CSF). Cerebrospinal fluid examinations were normal. No causes of raised intracranial pressure were identified in contrast CT of the brain in May 1994.

Contrast magnetic resonance imaging and CT venography in July 1994 showed her right jugular vein was larger than her left counterpart. The pituitary fossa was filled with CSF. Diagnosis of BIH was made. Diamox and a weight reduction program were initiated with little effect. Conservative management with repeated lumbar puncture for CSF drainage was used as preferred by the patient. A CT venogram in April 2008 confirmed right sigmoid sinus stenosis and left hypoplastic transverse sinus. The stenosis measured 2.5 mm wide and 25 mm long. The calibres of the sigmoid sinus proximal to and distal to the stenosis were 6 mm and 9 mm, respectively.

Assessment in June 2008 revealed visual acuity (VA) of both eyes was 6/9 with slight blurring of the disc and swelling at the right disc margin. Visual fields of both eyes were full.

A diagnostic angiogram in June 2008 (Fig. 1) showed narrowing seen in the proximal right sigmoid sinus. The left sigmoid sinus was not opacified.

Balloon angioplasty was carried out. A total of 3000 units of heparin were given intravenously as a single dose. A 6-F Guider catheter was inserted into the right upper jugular vein as the guiding catheter to canalize the right sigmoid sinus.

Pressure at the right jugular bulb was 7 cm CSF and pressure at the distal transverse sinus just proximal to the stenosis was 19 cm CSF. The pre-angioplasty venogram is shown in Figure 2. A 9-mm balloon catheter was used to dilate the stenotic segment of the right proximal sigmoid sinus after measurement. The postangioplasty venogram showed an opening up of the stenotic right sigmoid sinus (Fig. 3). The pressure at the sigmoid sinus was 18 cm CSF immediately after dilation.

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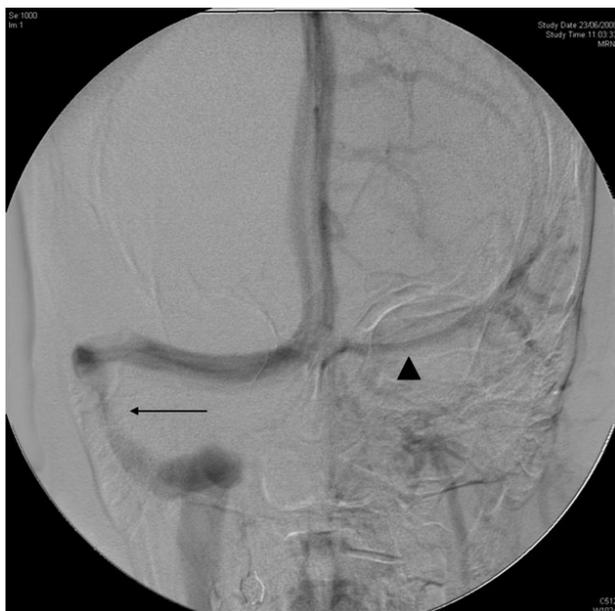


Fig. 1. Diagnostic angiogram showing a right sigmoid sinus stenosis (arrow) and a left hypoplastic transverse sinus (arrowhead).



Fig. 3. Postangioplasty venogram showing obliteration of the right sigmoid sinus stenosis.

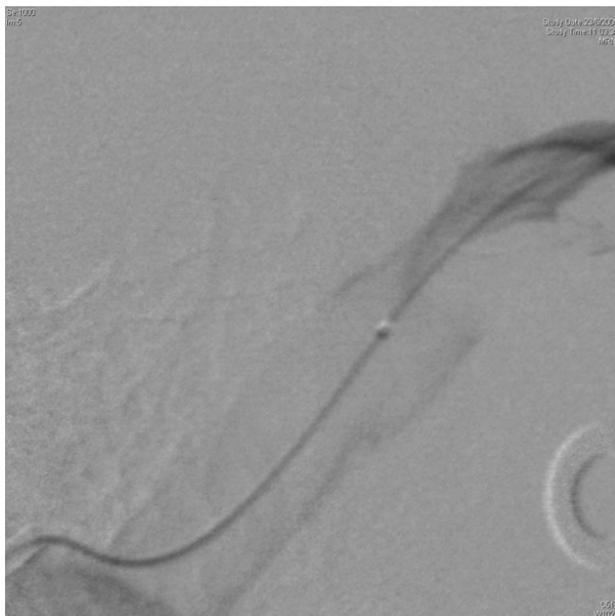


Fig. 2. Pre-angioplasty venogram showing the right sigmoid sinus stenosis.

Headache and vision were improved after balloon angioplasty.

Repeated assessment in April 2009 suggested improvement of VA of the right eye and left eye (0.8 and 1.0, respectively). Fundi examination showed

that there were no swellings of bilateral discs. Blurring of vision was presumably the result of previous papilloedema.

A LP was carried out in July 09 with opening pressure of 36 cm CSF. The option of ventriculoperitoneal shunting was offered again in view of persistent high opening pressure. There was no recurrence of vision impairment or severe headache.

Discussion

The most common presenting symptom of BIH is headache, as seen in this patient. Papilloedema is one of the most important clinical signs that one must look for. If papilloedema is left untreated, it can lead to permanent blindness.

The diagnostic criteria, Dandy's criteria, have been further amended in recent years as a result of technological advancements. However, the pathophysiology is still unclear. Many BIH cases are found to have underlying cerebral venous abnormalities. The commonest abnormalities are stenoses at the transverse sinus or sigmoid sinus. Farb *et al.*¹ found that approximately 93% of the BIH group had sinovenous stenoses at one site or another on imaging versus approximately 7% in the non-BIH group. Higgins *et al.*² found a statistical correlation between BIH and the presence of marked stenosis at the junction between the transverse sinus and the sigmoid sinus. However, both studies had a relatively small population size. The

present patient also had right sigmoid sinus stenosis as well as hypoplastic left transverse sinus.

The conventional treatment approaches for BIH include conservative and surgical approaches. Conservative approaches include medications for relieving ICP, and symptomatic control and repeated lumbar puncture for CSF drainage. Surgical approaches include optic nerve sheath decompression and fenestration, and CSF diversion procedures. Optic nerve sheath decompression and fenestration is used to protect the optic nerve, but it is unable to lower the ICP. For CSF diversion, the mainstream approach is ventriculoperitoneal shunting.

Endovascular treatment is becoming more and more popular for tackling underlying intracerebral sinus stenosis in BIH patients. Ogungbo *et al.*³ and Rajpal *et al.*⁴ reported an improvement of vision in their patients, but they did not mention whether there were improvements in ICP.

In the present patient, her vision improved after angioplasty. The ICP was still high despite a patent right sigmoid sinus after angioplasty. There are several observations for this. The first observation is that angioplasty does improve vision. It might work without influencing ICP, just like optic nerve sheath decompression and fenestration. The second observation is that BIH could have been a multifactorial event for this patient, like obesity, though the mechanism of this is still unknown.⁵ Therefore, curing a vascular abnormality alone might not be sufficient to normalize ICP. Balloon angioplasty was used in the present case instead of stent-assisted angioplasty. It was because of the surgeon's preference, as he believes that easier thrombosis in venous stenting is a result of slower flow in veins. Further evidence-based research on the duration of patency of venous stents would be appreciated.

Conclusion

From the literature review, it appears that sinovenous stenosis, particularly at the sigmoid sinus and trans-

verse sinus, is common in BIH patients. The current findings in Western studies make sinovenous stenosis at least one of the likely causes of raised ICP in BIH. It is suggested that CT or magnetic resonance venography be carried out in all BIH cases to find out whether there are any underlying sinovenous abnormalities. Endovascular treatments tackling these stenoses, though still investigational, seem to provide clinical improvement, at least temporarily. Longer follow up is also recommended to observe the durability of the treatment effect. Further studies are recommended for studying the pathophysiology of visual impairment in BIH.

Acknowledgements

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References

1. Farb RI, Vanek I, Scott JN *et al.* Idiopathic intracranial hypertension – the prevalence and morphology of sinovenous stenosis. *Neurology* 2003; **60**: 1418–24.
2. Higgins JN, Tipper G, Varley M, Pickard JD. Transverse sinus stenoses in benign intracranial hypertension demonstrated on CT venography. *Br. J. Neurosurg.* 2005; **19**: 137–40.
3. Ogungbo B, Roy D, Gholkar A, Mendelow AD. Endovascular stenting of the transverse sinus in a patient presenting with benign intracranial hypertension. *Br. J. Neurosurg.* 2003; **17**: 565–8.
4. Rajpal S, Niemann DB, Turk AS. Transverse sinus stent placement as treatment for benign intracranial hypertension in a young male – Case report and review of the literature. *J. Neurosurg. (Pediatrics)* 2005; **102**: 342–6.
5. Ooi LY, Walker BR, Bodkin PA, Whittle IR. Idiopathic intracranial hypertension: can studies of obesity provide the key to understanding pathogenesis? *Br. J. Neurosurg.* 2008; **22**: 187–94.