Stenting and idiopathic intracranial hypertension

TO THE EDITOR: We read with interest the article in the March issue by Kumpe et al. (Kumpe DA, Bennett JL, Seinfeld J, et al: Dural sinus stent placement for idiopathic intracranial hypertension. Clinical article. J Neurosurg 116:538–548, 2012) and note that their findings in 18 patients replicate our findings in 52 patients followed up for a mean of 2 years, which were published in the American Journal of Neuroradiology 6 months previously. Apparently due to publication delays, Kumpe et al. did not cite our article. There followed a misleading statement in the first paragraph of the editorial in the same issue that Kumpe's series is “the first report of anatomical and hemodynamic follow-up and clinical outcome in a series of patients treated with transverse sinus stenting for idiopathic intracranial hypertension (IIH).”

In our article we proposed that the mechanism of intracranial hypertension is venous hypertension due to absence of even one normally functioning transverse sinus, leading to reduced CSF absorption. Regardless of whether the stenosis is primary and intrinsic (for example, swollen arachnoid granulation or intraluminal band) or extrinsic due to the high intracranial pressure, by stenting the transverse sinus and relieving the transverse sinus stenosis, an abnormal positive biofeedback cycle is broken, CSF absorption is improved, and intracranial pressure is lowered.

Readers of the Journal of Neurosurgery might be interested to learn that we have replicated our work, having performed stenting in an additional 18 patients without any complications, giving a total of 70 patients with up to 10 years of follow-up. Of the 18 new cases, 9 patients had intrinsic stenosis of either the dominant transverse sinus, with the other side hypoplastic, or intrinsic stenoses of both sinuses; 5 had extrinsic stenosis; and 4 had a combination of both intrinsic and extrinsic stenoses. In the 14 patients who had lumbar punctures, the mean CSF pressure was 290 mm H2O (range 130–560 mm H2O). The mean superior sagittal sinus pressure before stenting was 31 mm Hg (range 13–68 mm Hg), equivalent to 589 mm H2O, which was reduced to 12 mm Hg after stenting. The mean gradient across the stenosis was 20 mm Hg (range 7–60 mm Hg), abolished by stenting in all patients.

Thirteen patients had papilledema at the time of stenting and 5 did not; 7 had peripheral visual field loss. In 3 patients the papilledema was so severe that there was also loss of visual acuity. Seventeen patients complained of headache before stenting, which improved or resolved in all but one patient. Eleven complained of pulsatile tinnitus, which resolved in all. The papilledema resolved in all patients, and the visual field normalized in all patients except the 3 patients with severe visual acuity and visual field loss. Two of these patients also had bilateral optic nerve sheath fenestrations before stenting. One patient experienced improvement in visual acuity and visual fields. The other developed bilateral optic atrophy and progressive visual loss. The patient then underwent repeat stenting due to ongoing headache and progressive visual loss, with a stenosis above the proximal end of the stent and a sagittal sinus pressure of 38 mm Hg and a gradient of 15 mm Hg. This patient had even higher pressures at the time of the first stenting (68 mm Hg in the sagittal sinus with a gradient across the stenosis of 60 mm Hg), a point we made in our original article about the association between very high pressures and the need for a second stent.

In summary, we believe that transverse sinus stenting is a safe and effective treatment in select patients with medically refractory IIH and that it is a viable alternative to CSF shunt diversion procedures, all of which have high complication and revision rates. While some patients will require a second stent placement due to stenosis developing proximal to the stent (6 of 52 patients in our first series and 1 of 18 in the second series), stenting is more cost-effective than repeated shunt revisions.

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Disclosure
The authors report no conflict of interest.

References

RESPONSE: We appreciate the comments of Ahmed et al. regarding their paper. Their excellent work contributes much to our understanding of the role of stenting in IIH. From personal communication the authors are aware of our and Dr. Burchiel’s inability to cite their work because of the publication delay.

We initially thought that all 18 patients in our series, 15 of whom underwent angiographic and hemodynamic follow-up, had intrinsic stenoses. This determination can be difficult. Based on the analysis of Ahmed et al., we performed a careful review of all images in our patients and found that 3 of these 18 patients had extrinsic compression and another 4 had extrinsic plus intrinsic stenoses. In the future, use of intravascular ultrasonography may facilitate this determination.

Our series currently comprises 23 patients (16 female and 7 male patients), all of whom had papilledema. All fe-
male patients had headaches, while none of the male patients had headaches at the time of stenting. Angiographic and hemodynamic follow-up are available for 20 patients (14 female and 6 male patients).

Of the 5 additional patients since our report, all had papilledema and elevated CSF pressure (33.5–45 cm H2O). One had extrinsic, 1 had extrinsic and intrinsic, and 3 had intrinsic stenoses in the stented sinus. The dominant sinus was stented in all but one of the patients. The smaller contralateral sinus had the same pattern of obstruction with or without additional extrinsic compression.

Our results mostly parallel those of Ahmed et al. There is 100% technical success. Papilledema is eliminated in all patients. Visual disturbances are stabilized or improved in all patients. Those with optic atrophy have not had improvement. Stents remain patent without formation of in-stent stenosis.

Among our patients, we have observed a higher percentage developing hemodynamic deterioration due to development of new stenoses above the stent. In our experience, 5 (25%) of 20 patients with hemodynamic follow-up developed hemodynamic deterioration. We found no higher pressure in the confluence of sinuses or superior sagittal sinus among the patients who developed hemodynamic deterioration compared with those who did not (mean 28.3 mm Hg [range 23–31 mm Hg] vs 30.2 [range 19–47 mm Hg]), and these patients did not have a higher initial pressure gradient (mean 20.0 mm Hg [range 14–23 mm Hg] vs 21.8 mm Hg [range 10–42 mm Hg]). All patients who had intrinsic stenoses had hemodynamic success. All hemodynamic deteriorations occurred among our 14 female patients. More specifically, deterioration occurred in 100% of female patients (3 of 3) who had extrinsic stenoses only and 50% of females (2 of 4) who had extrinsic plus possible intrinsic lesions. These 5 female patients were all “typical” patients with IIH, ranging in age from 17 to 30 years old, with a body mass index (BMI) of 29–37.9 in 4 patients; the 17-year-old girl had a BMI of 25. Her BMI has subsequently increased to 29.3. Two of 3 patients who underwent additional stenting in the transverse sinus developed new stenoses and recurrent gradients above the second stent in the posterior sagittal sinus. A third stenting procedure in the posterior sagittal sinus in 1 patient successfully eliminated the gradient at the 2-month follow-up. This experience suggests that hemodynamic deterioration with redevelopment of stenosis above the stent will likely occur in “typical” patients with IIH (females of childbearing age, those who are overweight/obese) who have purely extrinsic compression on the transverse/sigmoid junction region. As opposed to the experience reported by Ahmed et al.,1 we have had mixed success with performing restenting in these patients.

Our joint experience strongly supports the statement made by Ahmed et al. in their letter that “transverse sinus stenting is a safe and effective treatment in select patients with medically refractory IIH” and is more cost-effective than shunt procedures.

Further research is needed to establish which patients are best suited for stenting and how stenting may affect CSF absorption. Whether stenting is the optimal approach in the specific group of “typical” patients with extrinsic compression only, and the extent of stent coverage necessary to produce a successful long-term outcome, are additional subjects for future investigations.