

Venous Sinus Stenting for IIH With Spontaneous CSF Leak: \geq Two-Year Paired Outcomes from a Single-Center Cohort

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Introduction

- Elevated intracranial pressure, often attributable to idiopathic intracranial hypertension (IIH), is a known risk factor for spontaneous cerebrospinal fluid (sCSF) leak
- Venous sinus stenting (VSS) is an alternative to ventriculoperitoneal shunting (VPS) and is increasingly used for IIH with sCSF leak (Figure 1)
- We have previously reported short-term patient-reported outcomes after VSS for IIH with sCSF leak, yet there is limited long-term data on its impact on patient symptoms and quality of life

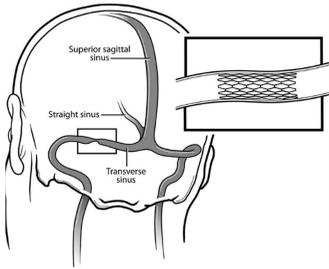


Figure 1. Venous sinus stenting for intracranial venous outflow obstruction. The image shows placement of an endovascular stent across a stenotic segment of the transverse sinus, with the inset showing an expanded view of the deployed stent. The stent improves venous outflow from the superior sagittal and straight sinuses, reducing venous hypertension

Objective

- To evaluate paired pre- versus post-stent changes in symptoms, treatment dependence, and need for CSF diversion among patients with IIH and spontaneous CSF leak

Methods

- This study updates a previously reported 6-month cohort of patients with IIH and sCSF leak who underwent VSS between January 2022 and August 2023 (Table 1)
- Retrospective chart review of paired binary endpoints (headache, tinnitus, vision symptoms, papilledema, acetazolamide use, post-stent VPS) at mean 2.89-year follow-up was performed
- A composite measure of success assessing the number of patients who required neither acetazolamide nor VPS post-stent was also explored
- Stent placement was indicated for a trans-stenotic pressure gradient (TSPG) $>$ 8 mmHg on MRV or $>$ 50% stenosis unilaterally or bilaterally on MRI

Results

Table 1. Baseline Characteristics

Variable	Average (SD), N (%)
Age	45.5 (12.1)
BMI	43.5 (11.4)
Gender	
Female	10 (100%)
Male	0 (0%)
Ethnicity	
Caucasian	8 (80%)
Asian	1 (10%)
African American	1 (10%)
Location of Leak	
Anterior	8 (80%)
Lateral	2 (20%)
LPOP Before Skull Base Repair	30.7 (14.6), n = 10
LPOP After Skull Base Repair	43.2 (6.1), n = 3
LPOP After Stent Placement	22.0 (1.4), n = 2
Stent Placement	
Unilateral	8 (80%)
Bilateral	2 (20%)

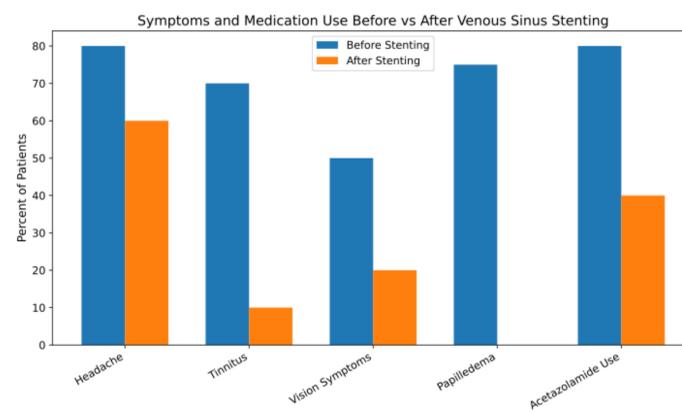


Figure 2. Rates of symptoms before (blue) and after (orange) VSS at an average follow-up time of 2.89 years from stent placement.

The number of patients with each outcome before and after stenting (Figure 2):

- Headache** in 8/10 before vs 6/10 after (improved 2, worsened 0; McNemar $p=0.50$)
 - In the 6/10 patients with persistent headache, 3 received VPS, 1 required neurology referral, and 2 deemed symptoms manageable without further intervention.
- Tinnitus** in 7/10 before vs 1/10 after (improved 6, worsened 0; $p=0.031$)
- Vision symptoms** in 5/10 before vs 2/10 after (improved 5, worsened 2; $p=0.45$)
- Papilledema** in 3/4 before vs 0/4 after (improved 3, worsened 0; $p=0.25$)
- Acetazolamide use** in 8/10 before vs 4/10 after (5 discontinued, 1 initiated; $p=0.22$)
- VPS after stenting** occurred in 3/10, with an average time to shunt of 1.1 years from stent
 - Reasons for shunt included persistent headache (3/3)
- A **composite success** (off acetazolamide and no post-stent VPS) was achieved in 6/10
- Patients who required VPS were older on average than those who did not (53.7 vs 42.0 years respectively)
- No evidence of post-treatment sCSF leak or stent complications were observed

Discussion

- In this cohort, VSS was associated with durable improvement in select symptoms at a mean follow-up of 2.9 years
- The most consistent long-term benefit was observed in **tinnitus**, whereas headache, visual symptoms, papilledema, and acetazolamide dependence demonstrated more heterogeneous responses
- Restoration of venous outflow through stenting may directly address the underlying hemodynamic abnormality driving tinnitus in IIH
- Headache and visual symptoms are multifactorial and may not fully resolve with venous stenting alone
- Nearly one-third of patients required VPS following VSS, underscoring that VSS alone may be insufficient for symptom control in a subset of patients
- VSS alone may be insufficient to manage headache
- VSS may serve as one component of a staged or adjunctive treatment strategy, particularly in patients with radiographic venous sinus stenosis and prominent venous symptoms
- Age-related factors, disease chronicity, or reduced physiologic reserve may influence long-term response to VSS, though this requires confirmation in larger cohorts
- No patients in this series experienced recurrent sCSF leak or stent-related complications, suggesting safety of VSS
- While reassuring, this finding should be interpreted cautiously given the small sample size and retrospective design

Conclusion

- These results highlight the complexity of managing IIH in the setting of sCSF leak
- While VSS may provide durable benefit for select symptoms, a minority of patients may require VPS for symptom control of IIH
- Larger, prospective studies are needed to better define patient selection criteria, optimal sequencing of interventions, and long-term outcomes of venous sinus stenting in this unique and understudied population