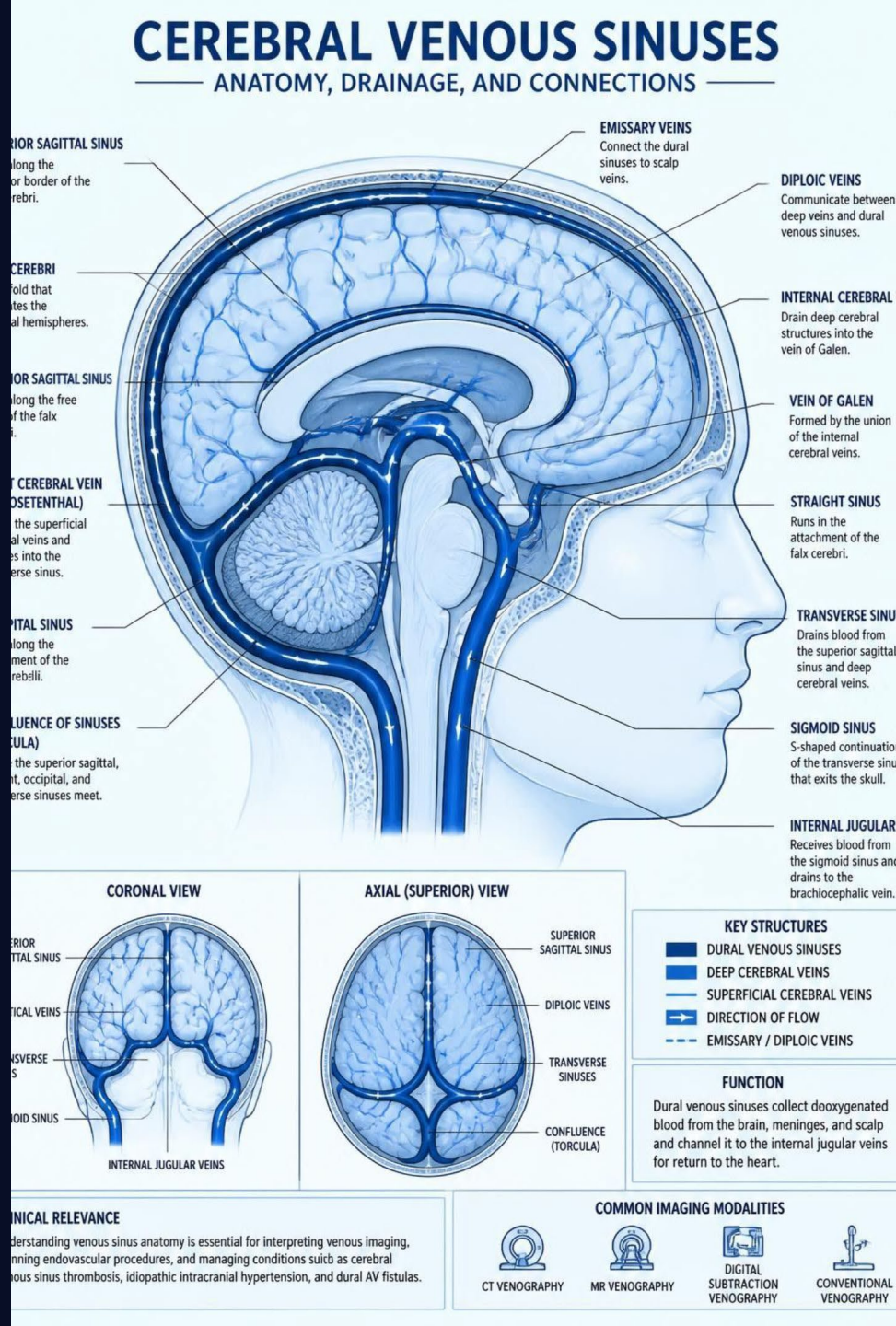
The Role of Cerebral Venous Drainage Pathways in Lateralization of Venous Sinus Stenting

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Background and Rationale

Venous sinus stenting is an established treatment for symptomatic dural venous sinus stenosis (DVSS), with stent laterality usually guided by trans-stenotic pressure gradients. However, venous drainage anatomy—especially preferential drainage of the superior sagittal sinus (SSS) and straight sinus (SS)—may affect outcomes beyond gradient resolution. This study evaluates whether variant SSS/SS drainage patterns are associated with clinical response after venous sinus stenting.

Study Design and Methods

Cohort

- Retrospective single-center study of 30 DVSS patients treated with venous sinus stenting.

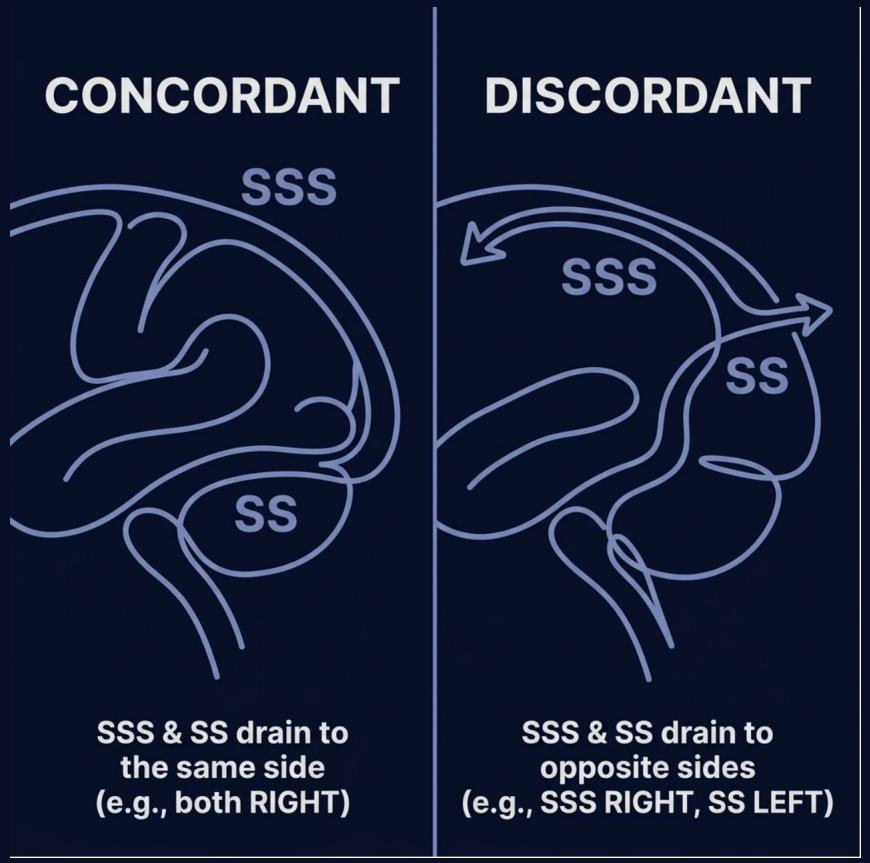
Imaging

- MR/CT angiography and venography reviewed for stenosis subtype, laterality, and SSS/SS drainage.

Outcomes

- THI, HIT-6, and intraprocedural pressure gradients were recorded.

Anatomic Classification: Concordant vs. Discordant



Drainage Pattern Definitions

Concordant: SSS and straight sinus drain to the *same* transverse sinus side.

Discordant: SSS and straight sinus drain to *opposite* transverse sinus sides.

This classification captures whether dominant venous inflow converges on a single stented pathway or is split across hemispheres —a factor not captured by pressure gradient alone.

Cohort Characteristics

30

Total Patients

Underwent venous sinus stenting for symptomatic DVSS

17

IIH Spectrum

Headache, papilledema, and/or tinnitus (57%)

13

Isolated Tinnitus

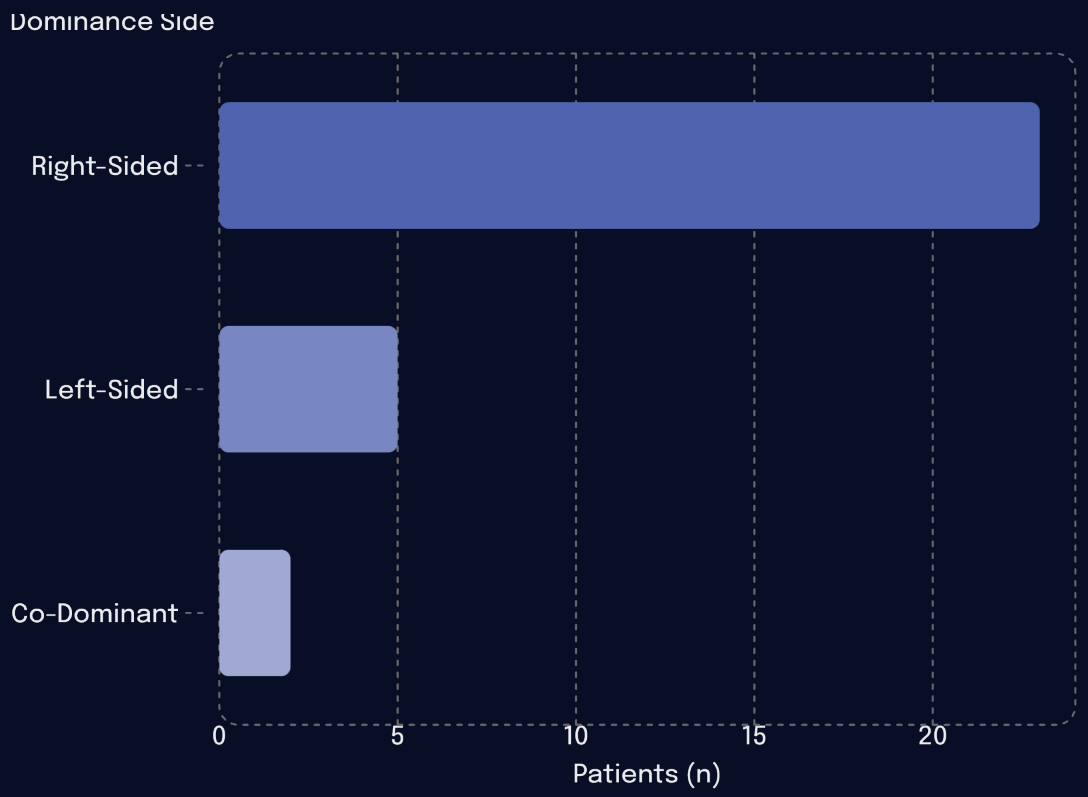
Pulsatile tinnitus without IIH features (43%)

13

Discordant

Patients with discordant SSS/SS drainage patterns (43%)

Transverse Sinus Dominance Distribution



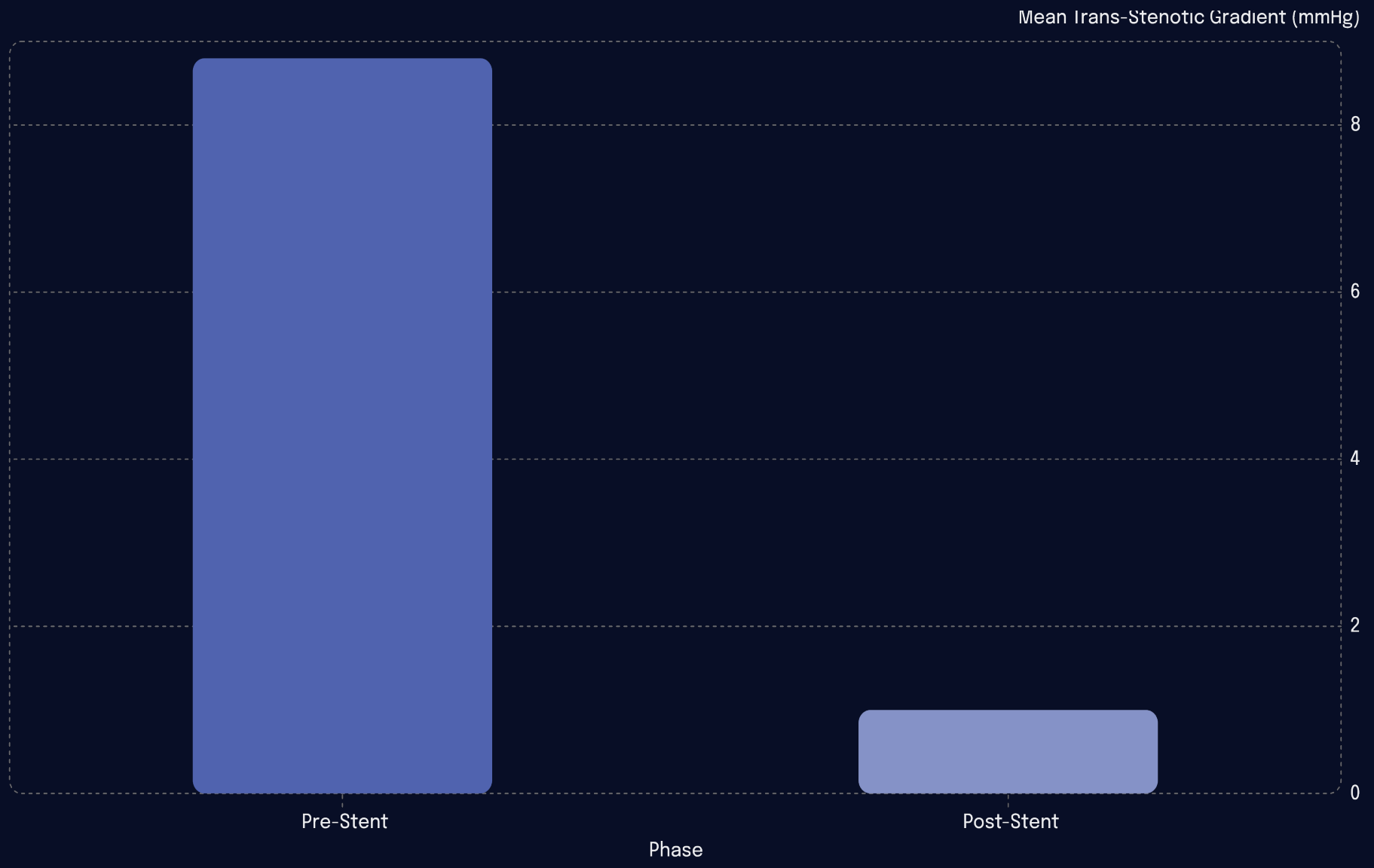
Right-Sided Predominance

Transverse sinus dominance was overwhelmingly right-sided: **77% right** (23/30), **17% left** (5/30), and **6% co-dominant** (2/30).

This aligns with established population norms and informed stent laterality decisions in the majority of cases. Stent placement was guided by hemodynamically significant trans-stenotic pressure gradients.

Procedural Outcomes: Pressure Gradient Resolution

All 30 patients demonstrated **significant reduction in trans-stenotic pressure gradient**, from **8.8 ± 1.74 mmHg** pre-stent to **1 ± 0.85 mmHg** post-stent — confirming technical success across the entire cohort. All patients also achieved clinically significant improvement in tinnitus, with mean post-THI scores approaching zero.



Clinical Outcomes by Drainage Pattern

Discordant —Persistent IIH Symptoms

A significant proportion of discordant patients with IIH-spectrum presentation reported **persistent headache** after technically successful stenting and gradient resolution.

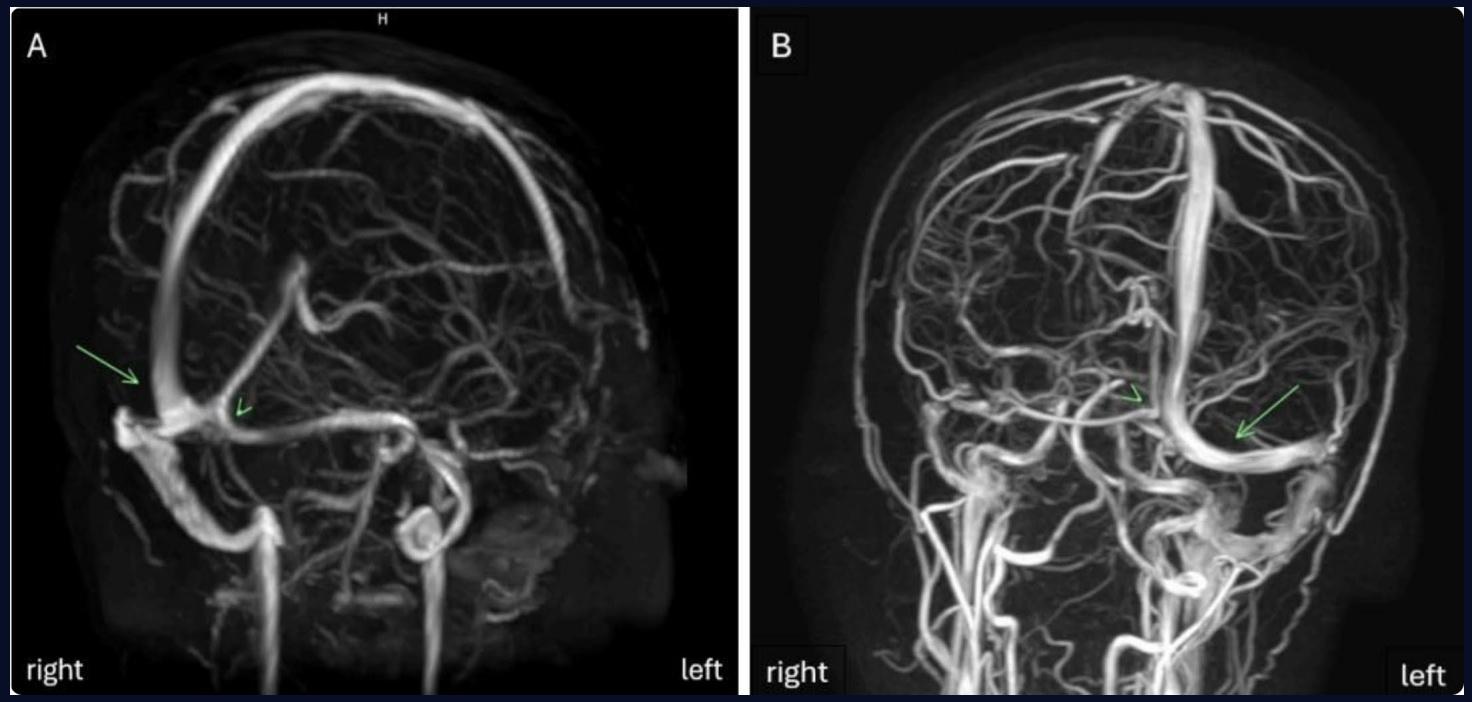
Discordant —Isolated Tinnitus

The **4 discordant patients** with favorable outcomes had **isolated pulsatile tinnitus** rather than IIH symptomatology.

Concordant —Favorable Response

Of **17 concordant patients**, only **4 reported significant persistent symptoms**, suggesting better clinical alignment between stent laterality and venous inflow.

Figure 1: Discordant Drainage Patterns on MR Venography



Representative Discordant Cases

Panel A: Right-sided SSS drainage (arrow) with left-sided straight sinus drainage (arrowhead).

Panel B: Left-sided SSS drainage (arrow) with right-sided straight sinus drainage (arrowhead).

These patterns illustrate how SSS and SS inflow may converge on *opposite* transverse sinuses—a configuration not captured by pressure gradient measurement alone, and one that may explain persistent symptoms in select patients.

Conclusions & Future Directions

Key Findings

Patients with **discordant SSS/SS drainage patterns** were more likely to have persistent IIH-related symptoms, especially headache, despite successful stenting and gradient normalization.

Concordant drainage patterns were linked to better outcomes. This suggests venous inflow architecture may influence treatment response.

Next Steps

- Longer follow-up for discordant patients
- Subgroup analysis by presentation type
- Larger multi-center validation cohorts
- Map drainage patterns before procedures