

Venous sinus stenting for Idiopathic Intracranial Hypertension

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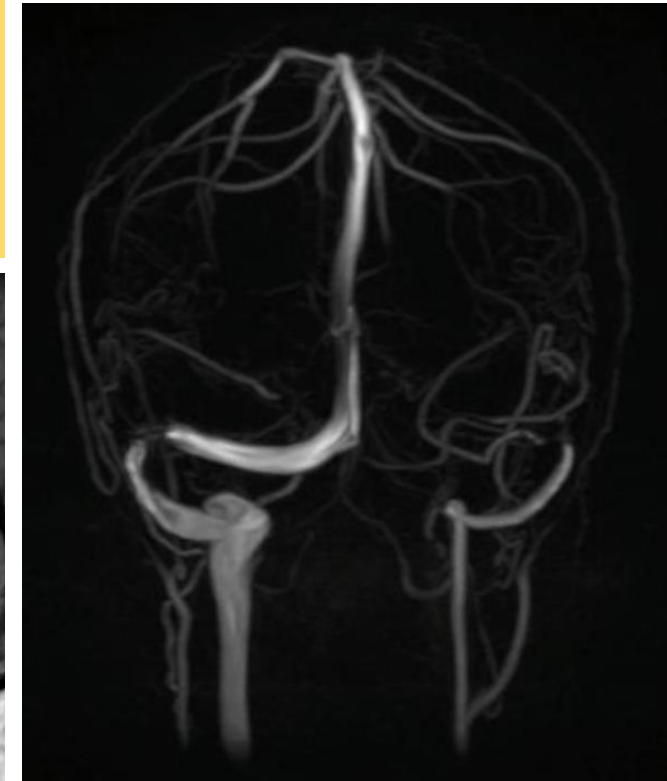
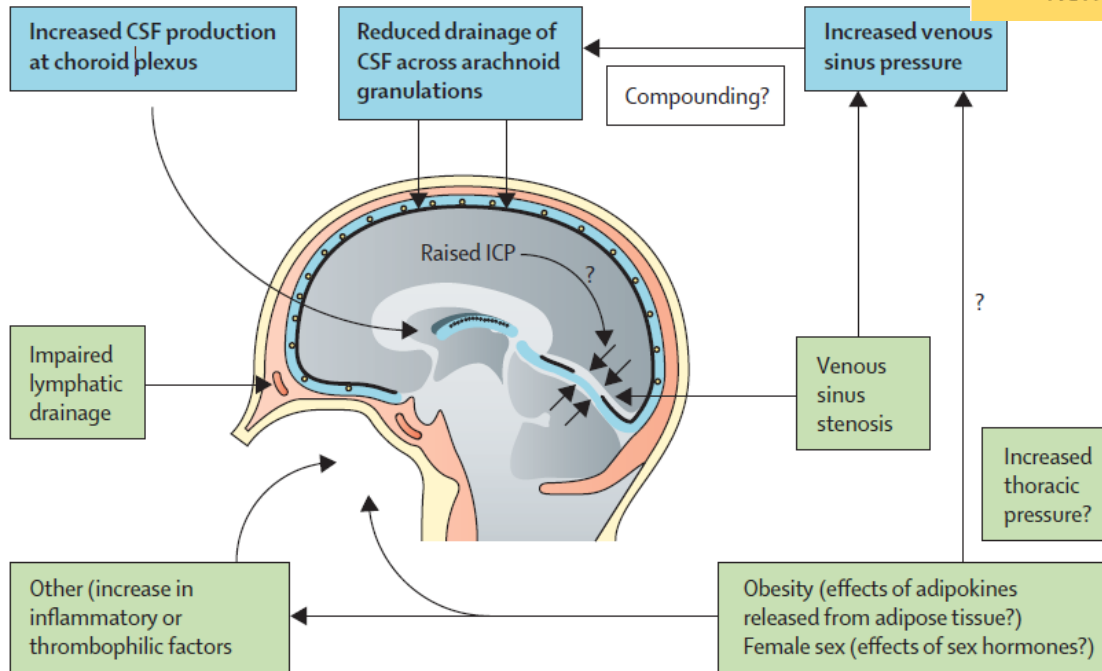
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INTRODUCTION

- **Idiopathic intracranial hypertension (IIH)** is a disorder characterized by elevated CSF pressure of unknown underlying aetiology.
- Common symptoms include – Headache / Nausea / Transient visual loss / Pulsatile tinnitus.
- Diagnosis - **Modified Dandy Criteria**

Revised criteria (2013) (Ref. Markey et al)

- Symptoms of raised ICP – headache, nausea, vomiting, transient visual disturbances) and papilledema.
- No localizing neurologic signs otherwise, with the single exception being unilateral or bilateral VI nerve paresis.
- Neuroimaging: Normal to small symmetric ventricles, no hydrocephalus, and no abnormal meningeal enhancement or venous sinus thrombosis on MRI or MR venography (CECT can be used if MRI unavailable).
- Increased opening CSF pressure in cm H₂O (>20 in non-obese, 25 in obese, 28 in children)
- Normal CSF composition.



Imaging findings in IIH: prominent optic nerve sheaths (edema), empty sella sign, Venous sinus stenosis on MR venogram

Treatment options

- Weight loss / lifestyle modifications
- Medical management - Acetazolamide
- Surgical interventions - Optic nerve sheath fenestration (ONSF), CSF shunting: Ventriculoperitoneal shunt or a Lumboperitoneal shunt. ONSF - significant failure rates & complications (retinal artery occlusion, neuropathy, hemorrhage, or ophthalmoplegia)
- VP shunts - significant infections.
- Dural Venous Sinus stenting

Aims and Objectives

- Demonstrate the safety and efficacy of venous sinus stenting in documented cases with venous sinus stenosis and trans stenotic pressure gradient **> 8mm Hg.**

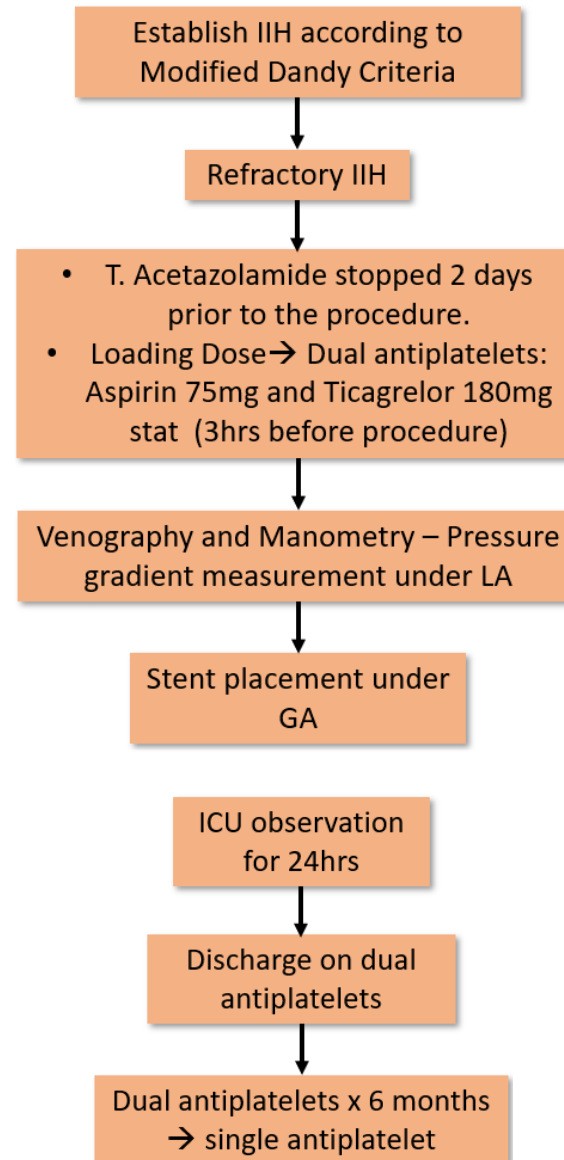
Methodology

Inclusion Criteria:

- Diagnosed cases of IIH according to Modified Dandy Criteria
- Symptoms refractory to medical management (>6months of Acetazolamide)
- Documented venous sinus stenosis with trans-stenotic pressure gradient > 8mm Hg

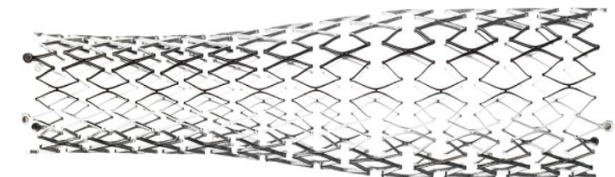
Exclusion Criteria:

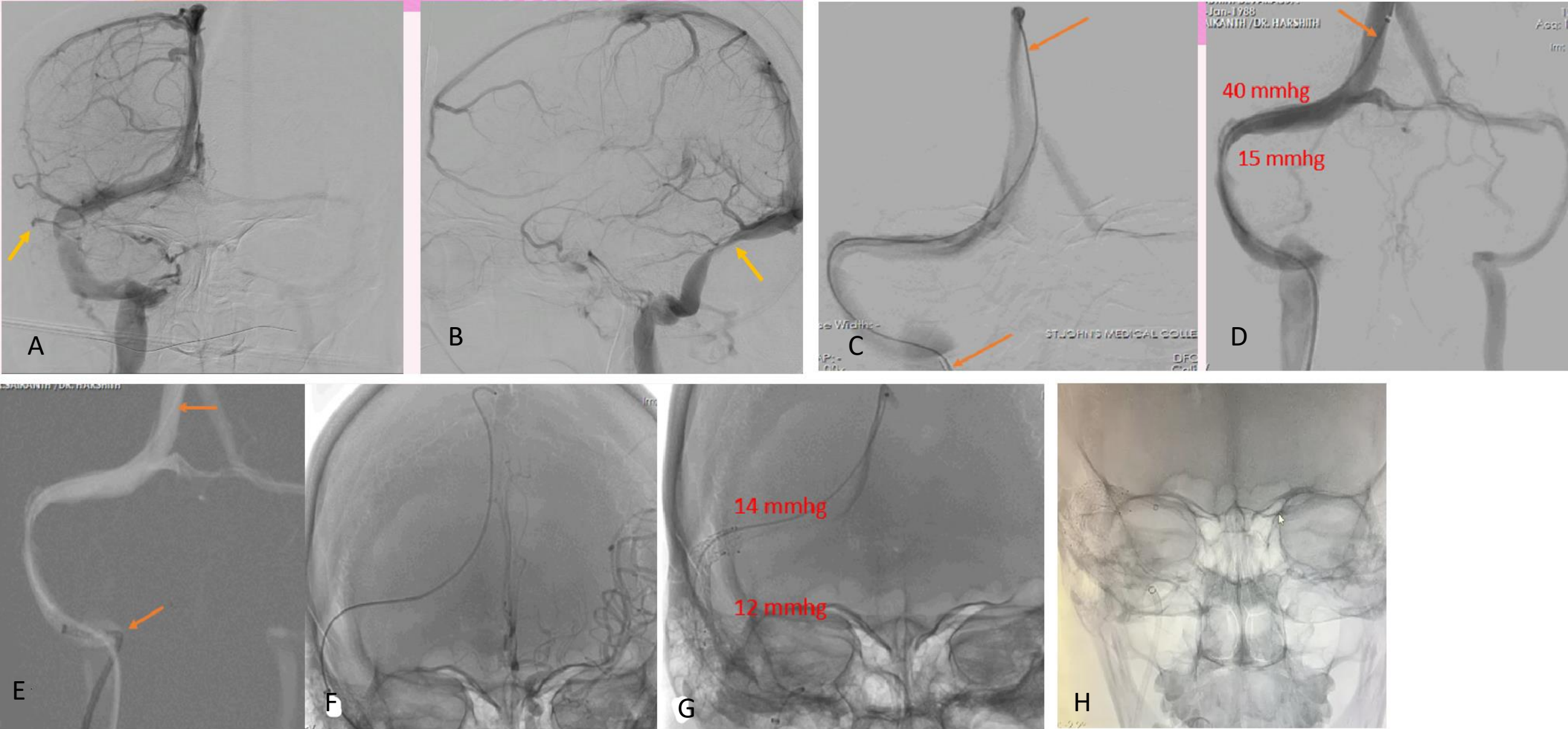
- Uncorrectable coagulopathy
- Contraindications to dual antiplatelet therapy



Access and Hardware:

- Right femoral /IJV venous 8F short sheath, Cerebase guide sheath with 5F vertebral catheter and terumo wire (femoral access)
- Left femoral arterial 5F short sheath, 5F vertebral catheter with terumo wire - angiographic runs
- Microcatheter - Phenom 27
- Intermediate catheter - Cat 5
- Stent - Protégé 8 x 60mm





A, B: AP and lateral venograms showing dominant right transverse sinus with focal stenosis. **C, D:** stenosis crossed with the help of microcatheter – microwire combination and pressure gradient measurement done – 25mmHg gradient present. **E, F, G:** 8 x 60mm self expandable stent deployed across the stenotic segment followed by post stenting pressure gradient measurement which shows significant decrease in the pressures.

Results

- In our study a total of **10 patients** (8 females and 2 males) were included, with ages ranging from 20 to 37 , (mean age 30.5 years). The average BMI of the patients was 30.8 (range 29 to 35).
- The most common symptom was **headache** in all the patients (n = 10; 100%) and visual disturbances (n = 10; 100%). This was followed by tinnitus (n = 8; 80%). The mean duration of symptoms was 11.6 months. The most common identifiable co-morbidity in these patients was Vitamin D deficiency (n = 6, 60%) in this study.
- All patients underwent **opening CSF pressure measurement** in the lateral decubitus position which was more than **25 cm** of H₂O in all patients.
- Endovascular transverse sinus stenting was done via the **femoral** route in 5 patients and via **jugular** access in 5 patients. Trans-stenotic pressure gradient measurement was done under local anaesthesia which revealed **significant pressure gradient (>8 mmHg)** in all patients (range 13 to 28 mmHg; avg - 18.7 mmHg). **Post stenting significant drop in the pressure was noted with average post-stenting transverse sinus pressure being 1.8 mmHg.**
- All patients developed transient Headache (100%) which resolved with analgesics within 2-3 days. No other significant complications were encountered.
- Patients were followed up at 3, 6 and 12 months post procedure and had complete resolution of symptoms in 9 patients and mild residual visual symptoms and mild papilledema in 1 patient. No significant complications were encountered in the follow up period.

Parameters / Patients	1	2	3	4	5	6	7	8	9	10
Age(years)	32	34	29	37	33	34	20	24	28	34
BMI(kg/m2)	30	35	32	30	34	29	29	30	29	30
Sex	F	F	F	F	F	F	F	F	M	M
Duration of symptoms (months)	12	11	11	12	14	8	8	9	15	16
Co-morbidities	Vit D & B12 deficiency	Hypothyroidism	Vit D deficiency	DM	Vit D deficiency	Vit D deficiency	Vit D & B12 deficiency	Nil	Vit D deficiency	Nil
Clinical assessment										
• Headache (H)	H:30-40 min	H:>60min	H: 30 min	H: 30 min	H: 60 min	H: 60 min	H: 60min	H: 60 min	H: 30 min	H: 60 min
• Blurring of vision (V)	V: Blurring of far vision	V: Diplopia	V: Diplopia	V: Yes	V: Yes	V: Yes	V: Yes	V: Yes	V: Yes	V: Yes
• Papilledema (P)	P: Mild	P: moderate	P: Severe	P: mild	P: mild	P: mild	P: mild	P: mild	P: moderate	P: mild
• Tinnitus (T)	T: No	T- Yes	T- Yes	T- Yes	T- Yes	T- Yes	T- Yes	T- Yes	T- No	T- Yes
• CSF pressure (C) - cm H2O	C: 45	C: 75	C: 100	C: 50	C: 40	C: 40	C: 40	C: 50	C: 40	C: 60
Catheter venogram (TS stenosis)	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present
Pre procedural : pressure gradient [in cm H2O]	25	14	18	15	22	14	14	13	24	28
Post-procedural: : pressure gradient [in cm H2O]	2	1	2	2	1	2	2	1	2	3
Post-procedural assessment 24 hours later	H&V: A	H&V: A	H&V: A	H: A; V: residual	H&V: A	H&V: A	H&V: A	H&V: A	H&V: A	H&V: A
	P:No	P:No	P:No	P: mild	P:No	P:No	P: NO	P: NO	P: NO	P: NO
3 months	A	A	A	A	A	A	A	A	A	A
6 months	A	A	A	A	A	NA	NA	NA	NA	NA

Discussion

- In our study, all patients (6 patients) with IIH had high SSS pressure and stenosis of the dominant transverse sinus with clinical signs/symptoms.
- Stent placement across the transverse sinus stenosis resulted in immediate normalisation of venous pressure gradient and symptomatic relief.
- Complete resolution of papilledema was found in 5 patients at 3 months follow up and 1 patient at 6 months follow up.
- No significant post-procedural complications were encountered.

Conclusion

- Venous sinus stenting can be used in the treatment in medically refractory IIH for symptomatic relief and disease control with good safety profile
- Our study showed significant improvement in headache and papilledema.
- Larger randomised studies are necessary to provide data to evaluate the durability , safety and efficacy of VSS before it is applied more widely.

References:

1. Markey KA, Mollan SP, Jensen RH, et al. *Understanding idiopathic intracranial hypertension: mechanisms, management, and future directions. Lancet Neurol* 2016;15:78–91.
2. Higgins JN, Cousins C, Owler BK, et al. *Idiopathic intracranial hypertension: 12 cases treated by venous sinus stenting. J Neurol Neurosurg Psychiatry* 2003;74:1662–6.
3. Liu KC, Starke RM, Durst CR, et al. *Venous sinus stenting for reduction of intracranial pressure in IIH: a prospective pilot study. J Neurosurg* 2017;127:1126–33.
4. Drocton GT, Copelan A, Eisenmenger L, et al. , 2021, *Venous sinus stenting as a treatment approach in patients with idiopathic intra-cranial hypertension and encephaloceles. Interv Neuroradiol*, 27: 129–136. 10.1177/1591019920956860 [PubMed: 32954924]
5. *Venous sinus stenting for idiopathic intracranial hypertension: a systematic review and meta-analysis* Patrick Nicholson et al. *J NeuroIntervent Surg* 2018;0:1–7.