ENDOVASCULAR STENTING OF UNILATERAL TRANSVERSE SINUS STENOSIS FOR TREATMENT OF IDIOPATHIC INTRACRANIAL HYPERTENSION

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Idiopathic Intracranial Hypertension (IIH)

- IIH = raised ICP with normal CSF, normal imaging and the absence of neurological signs.
- It is a diagnosis of exclusion.
- Age = 20 -44
- Female : Male = 9:1
The potential mechanisms proposed in the literature for the raised intracranial pressure in IIH include:

- CSF Outflow Reduction.
- Intracranial Venous Hypertension.
- Increased Cerebral Volume.
- Increased CSF Production.
- Associated Medical Disorders.
PATHOPHYSIOLOGY

• Two possible causes
  – Rise in sagittal sinus pressure
    • Possibly from extracellular edema -> causes partial compression of the major venous sinuses
  – Low conductance of CSF outflow
Sinus Stenosis: Blockage or compression?

J N P Higgins, C Cousins, B K Owler, N Sarkies and J D Pickard
Idiopathic intracranial hypertension: 12 cases treated by venous sinus stenting
*Journal of Neurology Neurosurgery and Psychiatry* 2003;74:1662-1666
SINUS STENOSIS

• TS stenosis may play a role in the pathophysiology of IIH in by causing partial venous outflow obstruction.

• The etiology of lateral sinus stenosis remains uncertain.

• Congenital asymmetry between the TSs has been found in anatomic studies.

• The right lateral sinus is larger or dominant in up to 73% of cases, and partial or total agenesis of portions of a TS are observed in up to 23% of cases.
The important question is whether those venous abnormalities are cause or consequence of increased intracranial pressure.
Venous abnormalities are cause of increased intracranial pressure

- Fixed stenoses (for example postthrombotic fibrotic changes) obstruct the venous outflow

- A pressure gradient across the stenosis should be measured

- No effect of therapeutic reduction of CSF pressure on sinus diameter.

- Reconstruction of the venous lumen with endovascular stents would be effective in lowering elevated CSF pressure.
Venous abnormalities are consequence of increased intracranial pressure.

- Elevated intracranial CSF pressure could lead to a secondary narrowing of the sinus lumen by compression.
- Can be reversed by lumbar puncture or shunt surgery procedures or can be avoided by stenting the whole entire sinus.
• MRV before and after maximal CSF diversion should be performed in all patients with suspected IIH to distinguish reversible and fixed stenoses of the transverse sinuses, aiding in the choice of therapy.
Grading the patency of the transverse and sigmoid sinus.
Grading the patency of the transverse and sigmoid sinus.

- 0 = discontinuity (gap) or aplastic segment
- 1 = hypoplasia or severe stenosis within a segment of the conduit estimated as less than 25% of the cross sectional diameter of the lumen of the distal superior sagittal sinus
- 2 = moderately stenosed segment of the conduit (25–50%)
- 3 = mildly narrowed segment (50–75%)
- 4 = no significant narrowing seen (75–100%).
Patients with IIH
1. Resistant to medical treatment and lumbar tapping after one year
2. Progressive deterioration of visual acuity

MRV

Lumbar tapping

MRV
CASE 1

• A 33-year-old obese female.
• Bilateral severe papilledema with bilateral reduced visual acuity
• Severe headache
• Elevated CSF pressure (31 cm H2O).
• Unsuccessful treatment with acetazolamide
• Stenosis of right transverse sinus in MRV
MRV Before Treatment
Intracranial Pressure Measurements

- SSS: 46 mmHg,
- Torcular: 45 mmHg
- Proximal lateral sinus: 45 mmHg
- Distal right lateral sinus: 48 mmHg.
- Pre-stenotic pressure = 56 mmHg,
- Post-stenotic pressure = 35 mmHg
- Sigmoid sinus pressure = 22 mmHg
- Jugular = 20 mm Hg.
- Trans-stenotic pressure gradient = 20 mm Hg.
Endovascular technique
MRV After Treatment
CT Venography
Fundus Examination Before and After Treatment
CASE 2

- A 28-year-old obese female
- Bilateral severe papilledema with bilateral reduced visual acuity
- Severe headache
- Elevated CSF pressure (30 cm H2O).
- Unsuccessful treatment with acetazolamide
- Aplasia of the left transverse sinus associated with stenosis of the right transverse sinus at the junction with sigmoid sinus.
MRV Before Treatment
Intracranial Pressure Measurements

- Superior sagittal sinus: 52 mm long
- Torcular: 58 mm long
- Lateral sinus above the stenosis 54 mm long
- Lateral sinus distal to the stenosis 44 mm long
- Sagittal sinus: 40mm long
- Jugular: 34mm long
- Trans-stenotic gradient: 10 mm long.
Endovascular technique
Materials used for sinus stenting

- New compliant guide catheters 6F or coaxial guiding platform.

- Stent TSUNAMI 6 x 18 mm (TERUMO)
MRV After Treatment
CONCLUSION

• Restoring the patency of stenotic TSs with a stent in patients with refractory BIH resulted in resolution or significant improvement in headache and papilledema in the treated patient.

• Venous sinus stenting remains controversial.

• However, in selected cases, seems promising, with good outcomes reported from others and ourselves.

• Requires further evaluation.
THANK YOU