Hypertension Intracrânienne Bénigne
Le point de vue du Neuroradiologue !

Pr. C. Cognard, AC. Januel, Ph. Tall, M. Dupuy, E. Schmit

Toulouse

Le liquide céphalo-rachidien et ses pathologies
Mises au point et actualités
FNRL, Carcassonne  Juin 2008
Historique des sténoses veineuses et HIC Bénignes

- Foley reported 60 cases of IIH
- Brain 1955;78: 1-41
- Which he divided into three groups
- “Otitic cases” where thrombosis of the major lateral sinus was the probable cause.
Thrombosis of the dural venous sinuses as a cause of pseudotumor cerebri.

Ray BS, Dunbar HS. Ann Surg 1951

- Sagittal sinus venography in 4 patients with IIH
- Thrombosis in the posterior half of the SSS or dominant TS.
- Technique: insertion a catheter into the anterior SSS through a burr-hole.
- Normal venous pressure: 100 to 150 mm of saline
- 4 patients the SSS pressure: 200 to 500 mm of saline.
- 2 patients had history of peripheral thrombophlebitis and one mastoiditis.
Stent et HIC
Venous sinus stenting for refractory benign intracranial hypertension
J Nicholas P Higgins, Brian K Owler, Claire Cousins, John D Pickard
Lancet 2002; 359: 228–230

- 1er cas de stent

- “The difficulty in making the diagnosis of sinus stenosis raises the possibility that this mechanism might have been considerably underestimated as a cause of benign intracranial hypertension and suggests that the relation between this disorder and sinus thrombosis may be closer than previously recognised.”
Idiopathic intracranial hypertension: 12 cases treated by venous sinus stenting
J N P Higgins, C Cousins, B K Owler, N Sarkies, J D Pickard
J Neurol Neurosurg Psychiatry 2003;74:1662–1666

- 12 patients with refractory IIH had stenting of sinuses after venography and manometry had shown intracranial venous hypertension proximal to stenoses in the lateral sinuses
- Five patients were rendered asymptomatic, two improved, and five unchanged.
- No consistent relation between venous pressure reductions and symptom relief, although there was a trend towards a greater reduction in pressure or lower sagittal sinus pressures with improvement.
<table>
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<th>Case No</th>
<th>Torcular before stenting (mm Hg)</th>
<th>Jugular bulb before stenting (mm Hg)</th>
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<th>Symptoms</th>
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The last column indicates total subsequent clinical follow up.

*Ventriculoperitoneal shunt in situ.
†Papilloedema resolved before stenting.
Endovascular treatment of idiopathic intracranial hypertension
Clinical and radiologic outcome of 10 consecutive patients
A. Donnet, MD, P. Metellus, MD, O. Levrier, MD, C. Mekkaoui, PhD
S. Fuentes, MD, H. Dufour, MD, J. Conrath, MD, F. Grisoli, MD
Neurology 70 February 19, 2008

• Ten consecutive patients with refractory IIH
• Intrasinus pressures were invariably reduced by stenting
• Mean follow-up of 17 months (6 to 36 months).
• Headache: 6 patients asymptomatic, 2 improved, 2 unchanged
• Papilledema disappeared in all patients.
• CSF pressure was normalized at 3-month follow-up in all cases.
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<th>Papilledema and visual obscur</th>
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<th>Stenosis location</th>
<th>CSF pressure, cm H₂O</th>
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BMI = body mass index; R = right; L = left; TS = transverse sinus; RT = right transverse sinus; B = bilateral.
The importance of venous sinus disease in the etiology of idiopathic intracranial hypertension is probably underestimated.

Patients with IIH in whom a venous sinus stenosis is demonstrated by a noninvasive radiologic workup should be evaluated with direct retrograde cerebral venography and manometry.

In patients with a lesion of the venous sinuses who experienced medical treatment failure, endovascular stent placement seems to be an interesting alternative to classic surgical approaches.
Quelle est la Fréquence des sténoses veineuses au cours des HIC bénignes ?
Cerebral venography and manometry in idiopathic intracranial hypertension
J.O. King, MD, FRACP; P.J. Mitchell, MB, FRACR; K.R. Thomson, MB, FRACR; and B.M. Tress, MD,
NEUROLOGY 1995;45:2224-2228

- Cerebral venography and manometry in 9 patients with IIH
- Venous hypertension in the SSS and proximal TS
- With a significant drop in venous pressure at the level of the lateral third of the transverse sinus.
- The abnormality, clearly demonstrated by manometry, was not well shown on the venous phase of cerebral angiography
## Table. Details of patients studied by cerebral venography and manometry

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**Idiopathic intracranial hypertension**

**Minocycline-induced intracranial hypertension**

**Viral meningitis**

**Pulsatile tinnitus**

**SSS** Superior sagittal sinus.

**IJV** Internal jugular vein.

**TS** Transverse sinus.

**NA** Not available.
Elevated intracranial venous pressure as a universal mechanism in pseudotumor cerebri of varying etiologies
Dean G. Karahalios, MD; Harold L. Rekate, MD; Mazen H. Khayata, MD; and Paul J. Apostolides, MD
NEUROLOGY 1996; 46:198-202

- 10 patients with IIH: 5 with venous stenosis, 5 without
- Pressure measurements in 8 patients: all showed elevated pressures.
- Pressure in SSS ranged from 13 to 24 mm Hg (mean, 16.6 mm Hg).
- Patients with obstruction have a higher pressure
- Five patients without stenosis had elevated right atrial pressures (range, 6 to 22 mm Hg; mean, 11.8 mm Hg),
Idiopathic intracranial hypertension
The prevalence and morphology of sinovenous stenosis
R.I. Farb, MD; I. Vanek, MD; J.N. Scott, MD; D.J. Mikulis, MD; R.A. Willinsky, MD; G. Tomlinson, PhD; and K.G. terBrugge, MD
NEUROLOGY May 2003; 60

- 29 patients with IIH and 59 control patients ATECO MRV
- Three readers in a randomized blinded fashion
- Substantial bilateral stenoses in 27 of 29 patients with IIH and in only 4 of 59 control patients
- Authors identified IIH patients with sensitivity and specificity of 93%
Two types of narrowing encountered:

1) The long smooth tapered narrowing of external compression caused by brain parenchyma.

2) The acutely margined apparent intraluminal filling defect of an enlarged, partially obstructing, intraluminal arachnoid granulation swollen by elevated CSF pressures.
The results presented here demonstrate that over 90% of patients with IIH have transverse sinuses that appear stenotic compared with those of normal patients.

Patients with IIH and these dural sinus narrowings should no longer be considered the exception but rather the rule for this disease.
MR venography in idiopathic intracranial hypertension: unappreciated and misunderstood.

J N P Higgins, J H Gillard, B K Owler, K Harkness and J D Pickard

*J. Neurol. Neurosurg. Psychiatry* 2004;75;621-625

- 20 patients with idiopathic intracranial hypertension
- 40 asymptomatic volunteers, matched for age and sex
- Bilateral lateral sinus flow gaps were seen in 13 of 20 patients with idiopathic intracranial hypertension and in none of 40 controls.
Quelle est la Fréquence des sténoses veineuses en l’absence d’HIC bénigne ?
Cerebral MR venography of transverse sinuses in subjects with normal CSF pressure
F. Bono, MD; M.R. Lupo, MD; A. Lavano, MD; L. Mangone, MD; F. Fera, MD; K. Pardatscher, MD; and A. Quattrone, MD
NEUROLOGY 2003; 61:1267–1270

- **MR venography in 111 subjects with normal CSF pressure**

- **Disturbance of venous outflow:**
  - in one transverse sinus: 30%,
  - both TS occurred in 2/111 individuals.

- “Subjects with flow gaps in both TS should undergo lumbar puncture to exclude increased CSF pressure”
Ou est l’œuf ou est la poule ?
Changes in the appearance of venous sinuses after treatment of disordered intracranial pressure

Devra B. Baryshnik, MD; and Richard I. Farb, MD

NEUROLOGY April 2004

- 2 cases
- A ventriculoperitoneal shunt was inserted, resulting in symptom resolution.
- MRV revealed normal-appearing venous sinuses with resolution of dural sinus narrowing
Lateral sinus stenoses in idiopathic intracranial hypertension resolving after CSF diversion

J. Nicholas P. Higgins, FRCR; and John D. Pickard,
NEUROLOGY May 2004

• 29YO woman, 12-month history of increasing headache.

• Venography: 27 mm Hg in SSS, pressure gradients of 16 mm Hg across stenotic lesions. Jugular bulb pressures were 8 mm Hg.

• Balloon angioplasty (lateral sinuses) with no clinical impact.

• Lumboperitoneal shunt inserted.

• Venography: sinus stenoses resolved. SSS pressure 10 mm Hg.
Resolution of transverse sinus stenosis in idiopathic intracranial hypertension after L-P shunt
A. McGonigal, MRCP; I. Bone, FRCP; and E. Teasdale, FRCR

NEUROLOGY 62 February 2004

- CT venogram repeated 6 days after shunt insertion
- marked reduction in the degree of transverse sinus narrowing bilaterally
Transverse sinus stenoses persist after normalization of the CSF pressure in IIH
F. Bono, MD; C. Giliberto, MD; C. Mastrandrea, MD; D. Cristiano, MD; A. Lavano, MD;
F. Fera, MD; and A. Quattrone, MD
NEUROLOGY 2005;65:1090–1093

- 14 consecutive patients with IIH with bilateral TS stenosis on MR venography (MRV) under medical treatment
- Follow-up 6-years
- During follow-up, repeated lumbar punctures and MRV (always performed before each LP)
- TS stenosis persisted in all the patients
- In 9 of 14 patients, CSF pressure normalized during medical treatment.
Ou est l’œuf ou est la poule ?

- In IIH, there is a pre-presentation clinical status in which the raised intracranial pressure of unknown origin (first event) remains asymptomatic or poorly symptomatic.

- During this phase, progressively, the dural walls of the lateral sinuses slowly stretch and collapse, yielding to a long, smooth, extraluminal compression or a focal protrusion of the arachnoid granulation.

- This intraluminal or extraluminal obstruction leads secondarily to a flow-limiting stenosis (second event), resulting in an upstream increased venous pressure responsible for a pressure gradient.
L’obésité !
Obesity does not induce abnormal CSF pressure in subjects with normal cerebral MR venography

F. Bono, MD; M.R. Lupo, MD; P. Serra, PhD; C. Cantafio, MD; A. Lucisano, MD; A. Lavano, MD; F. Fera, MD; K. Pardatscher, MD; and A. Quattrone, MD
NEUROLOGY 59 November 2002

- Obesity has been shown to increase lumbar CSF pressure in healthy subjects!

- Lumbar CSF opening pressure in 18 obese, 33 overweight, and 49 non-overweight subjects with normal MRI and MR venography

- No subject had a CSF pressure above 200 mm H2O.

- Obesity does not cause abnormal CSF pressure in subjects with normal MRV.
84 consecutive patients (67 women, 17 men) undergoing surgery for morbid obesity and five non-obese patients having other abdominal procedures

Measurements obtained on patients lying in the supine position on the operating table.

Intra-abdominal pressure estimated from urinary bladder pressure via bladder catheterization and manometry at end-expiration

Urinary bladder pressure highly correlated to abdominal diameter
This theory fails to explain the fact that the incidence in IIH does not change during pregnancy, where the fetus compresses the inferior vena cava, producing venous hypertension! Pressure that would then decrease venous return from the brain to the heart.

Although the incidence of IIH has doubled since the late 1980s, coincident with the increased prevalence of obesity in the United States, one would expect a more dramatic rise in IIH cases given the premise of this theory!
Mais le traitement de l’obésité améliore l’HIC !

Effects of surgically induced weight loss on idiopathic intracranial hypertension in morbid obesity
H.J. Sugerman, MD; W.L. Felton 111, MD; J.B. Salvant, Jr., MD; A. Sismanis, MD; and J.M. Kellum, MD
NEUROLOGY 1995;45: 1655-1659

Effects of weight loss on the course of idiopathic intracranial hypertension in women
M.J. Kupersmith, MD; L. Gamell, MD; R. Turbin, MD; V. Peck, MD; P. Spiegel, MD; and M. Wall, MD
NEUROLOGY 1998;50:1094-1098
BEL. AUD

- 14/09/1983
- Acouphènes Dt depuis 6 mois
- Céphalées
- Œdème papillaire bilatéral
- IRM avril 2006
  - Hypoplasie Sinus Sigmoidal Gauche
  - Sinus Latéral Droit dominant
  - Ventricules de taille normale
## Pressions

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Impossible de faire progresser le stent
Au niveau de la sténose..

ANGIOPLASTIE
Ballon VIATRAC 14+ 7/20 6 atm
Carotid wall stent
9/40
## Post-stenting

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Jim. Cyn.

- 2002: 18 ans HIC
- Dérivation LP révisée à trois reprises
- Persistance céphalées
- OP, BAV
- Juillet 2007 manométrie
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6F
PRECISE
TERUMO DESTINATION+ 6F
8F+ 6F
CAROTID WALL STENT
Evolution:

- Amélioration des céphalées et tb visuels pendant 1 mois
- Anneau gastrique puis By-pass chirurgical
- Puis OP, Céphalées, IV unilatéral
- PL: 38 cm d’eau
- Mai 2008: manométrie
JANVIER 2008
## AVANT TTT

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<td>SLS</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>AMONT STENOSE</td>
<td>21</td>
<td>19</td>
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<tr>
<td>AVAL STENOSE</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>GOLFE</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>JUGULAIRE</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>
## Pressions

<table>
<thead>
<tr>
<th></th>
<th>Droite</th>
<th>Gauche</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLS</td>
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</tr>
<tr>
<td>Torcular</td>
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</tr>
<tr>
<td>SL Pré Sténose</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>SL Post Sténose</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Jugulaire</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>
SATR. Sal.

- 31 ans
- Céphalées depuis 2001
- Nausées, vomissements
- Œdème papillaire grade 3
- PL: Pression de 65 cm d’eau
- Prise de poids lors de la 1ère grossesse
- Diamox
- 2ème grossesse 25 Kg
- Céphalées pas d’OP
- PL: 65 cm d’eau
SERIE TOULOUSAINE

A PROPOS DE 9 CAS
DEMOGRAPHIE

• N = 9
• 8 femmes
• Age moyen 33 ans (13 à 59 ans)
• Durée d’évolution moyenne 45,7 mois (6 à 168 mois)
CLINIQUE

• Céphalées N = 9
• Baisse acuité visuelle N = 9
• Acouphènes pulsatiles N = 2
• Œdème papillaire bilatéral N = 9
PRISE EN CHARGE

Traitement médicamenteux $N = 9$

Associé

- Dérivations lombopéritonéales $N = 3$
- Ponctions lombaires itératives $N = 3$
VENOGRAPHIE CEREBRALE RETROGRADE

N = 5

• **Stenose sinus dural**
  100% procédures : 1/3 moyen sinus transverse/jonction sinus sigmoïde
  60% procédures : sténose bilatérale

• **Gradient:** N = 4
  moyenne 18,5mmHg (10 à 30 mmHg)
STENTING

• N = 5

Sinus transverses
Gauches N = 3
Droit N = 2

Stents
Carotid wall stent 9mm/40mm N =2
Carotid wall stent 8mm/30mm N =1
Precise 8mm/40mm N = 2
RESULTATS

• Suivi 10 mois (4 à 14 mois)

• Amendement:
cephalées : 75 %
symptômes visuels: 50%
acouphènes: 100%

• Cas d’une patiente stentée en controlatéral

• Problème du manque de données objectives: fond d’œil, pression LCR.....