Pulsatile tinnitus due to lateral sinus stenoses
Pathophysiology, diagnosis and treatment

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Disclosures

- None

Main messages

- 1- Pulsatile tinnitus (PT) are totally different than continuous tinnitus and consequently, one must recognize the pulsatility during consultation by imitation of the sound

- 2- Stenosis of the lateral sinus is the first cause of PT in young woman

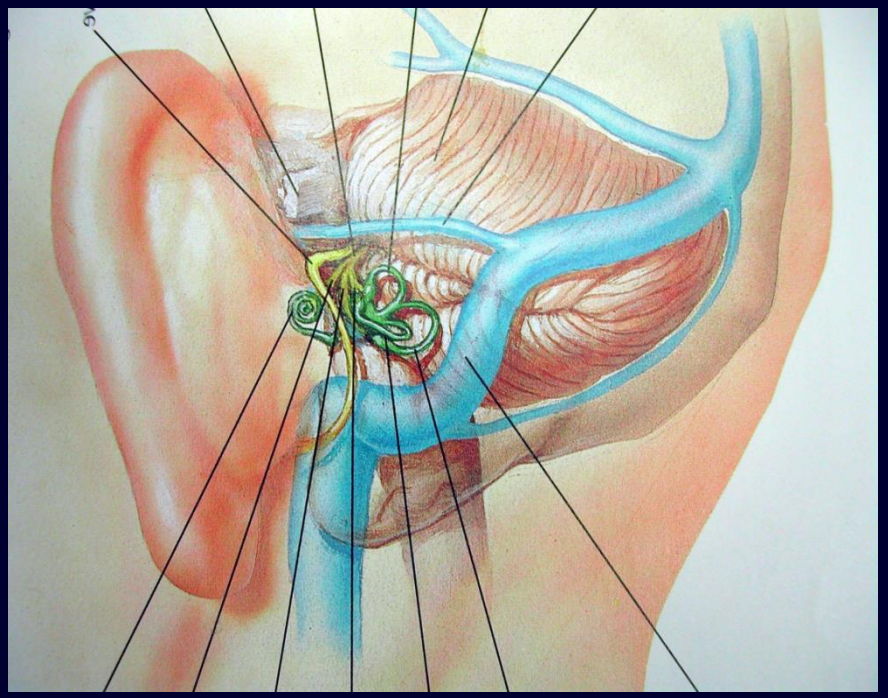
Tinnitus : simple auditory perception without external sound

- Either that there is no sound to hear : continuous tinnitus : disorder of the inner ear (95 %)

- Or that the sound is « intimate » : pulsation close to the inner ear : pulsatile tinnitus (5%)

A pulsatile tinnitus is the normal perception of an abnormal flow : the sensory organ is not involved

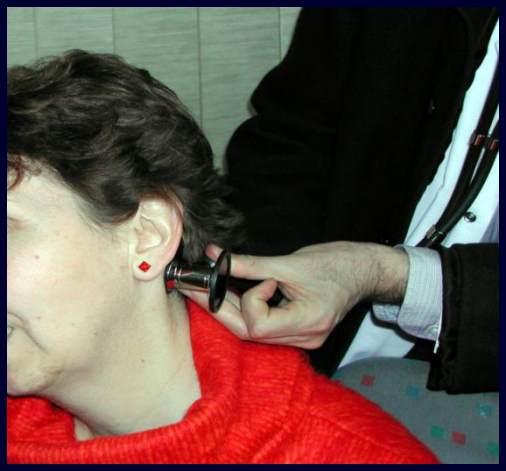
- Disease is located in first approximation in the lateral sinus



- Clinical and radiological investigations must be vascular

How do we examine a pulsatile tinnitus ?

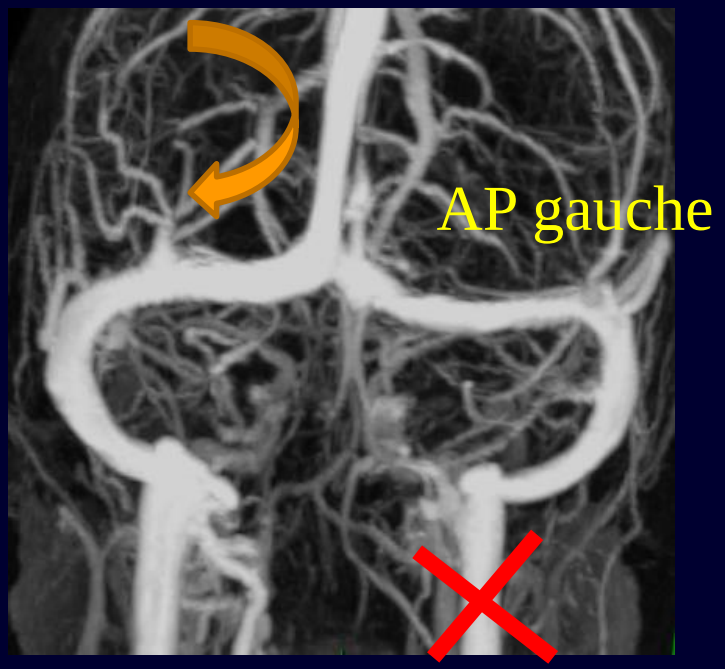
- Auscultation of the skull : negative in venous pulsatile



- Compression of cervical vessels : in venous pulsatile tinnitus, sound is interrupted by the compression of the ipsilateral internal jugular vein

Venous pulsatile tinnitus

- Compressing the internal jugular vein stop the drainage into the ispilateral sinus and therefore stops the flow in the vessel where the sound originates
- Stenosis of the lateral sinus is the first cause of venous pulsatile tinnitus



Stenosis of the lateral sinus is a disease that has been recognized in the late 90

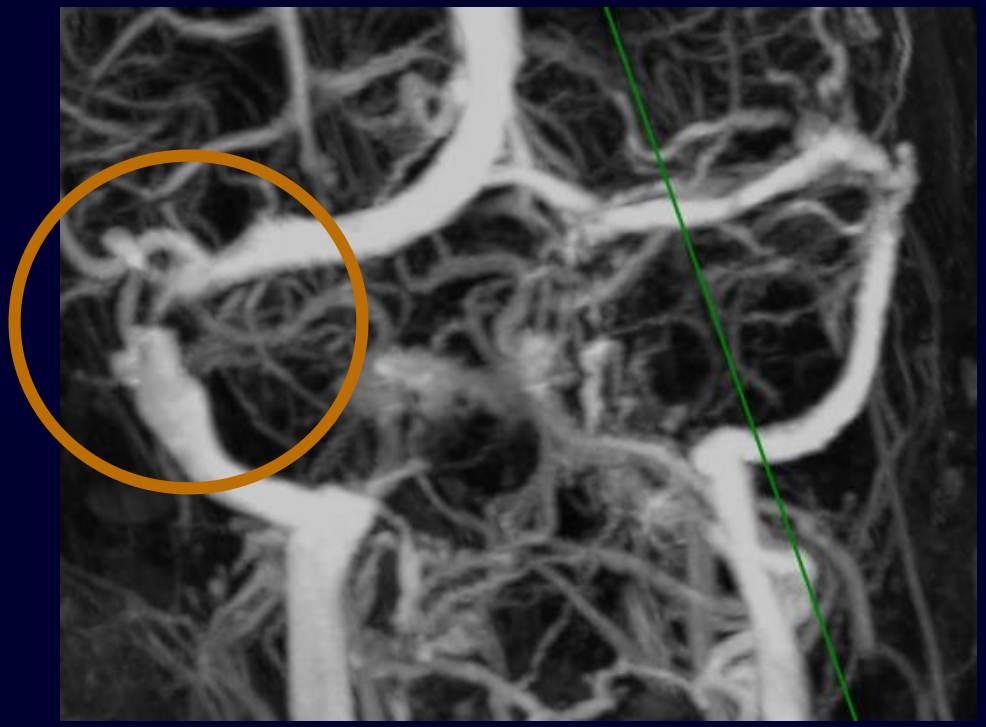
- It is a true disease that affects the wall of the sinus and it should be called « primitive sinus stenosis » (different than stenosis after recanalization of a sinus thrombosis)
- Its frequency has increased during the two last decades, in parallel with the increase of obesity
- It can lead to different symptoms including pulsatile tinnitus or intracranial hypertension

How to recognize those stenosis ?

Angio MR or Angio CT

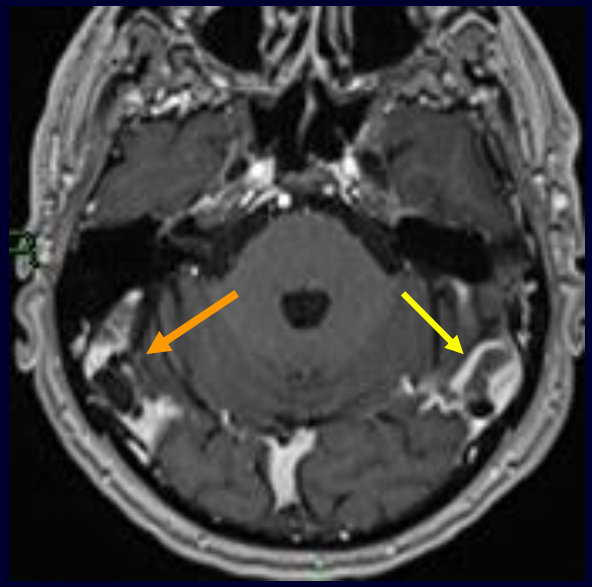
Normal

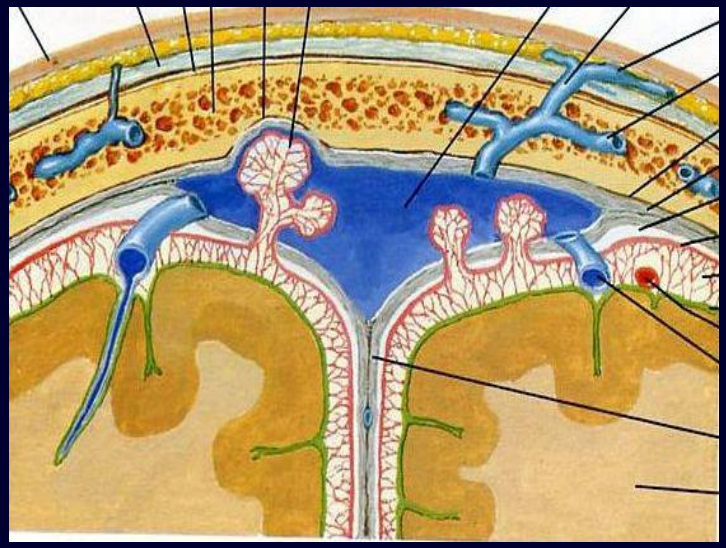
Stenosis

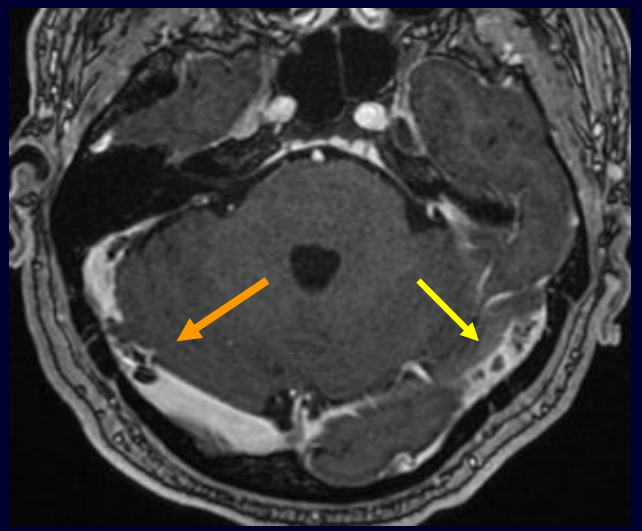


Granulation or « intrinsic stenosis »

- Endoluminal defect following the CSF signal (hyposignal T1)
- On the transverse sinus
- Without mass effect on the parenchyma

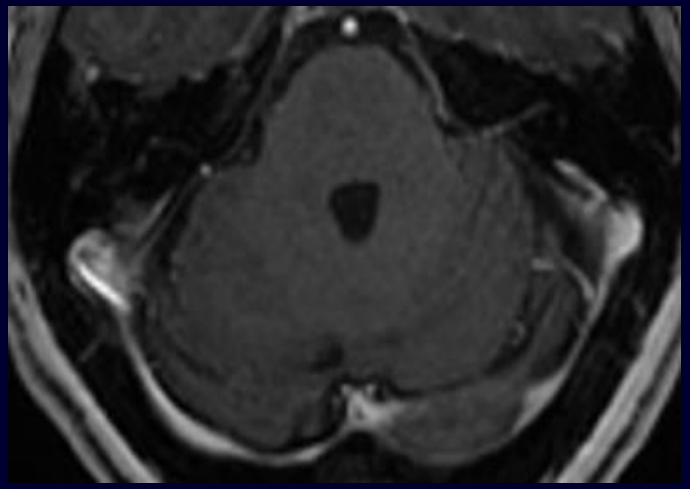


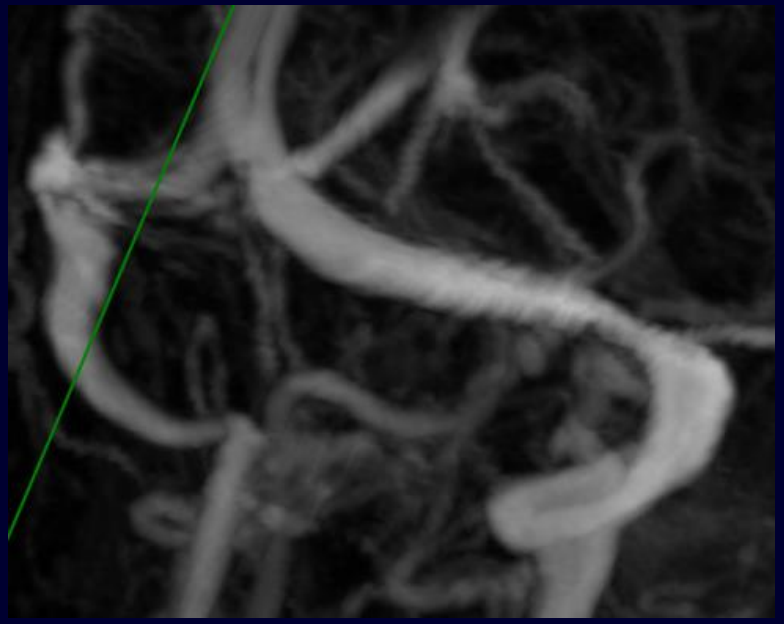




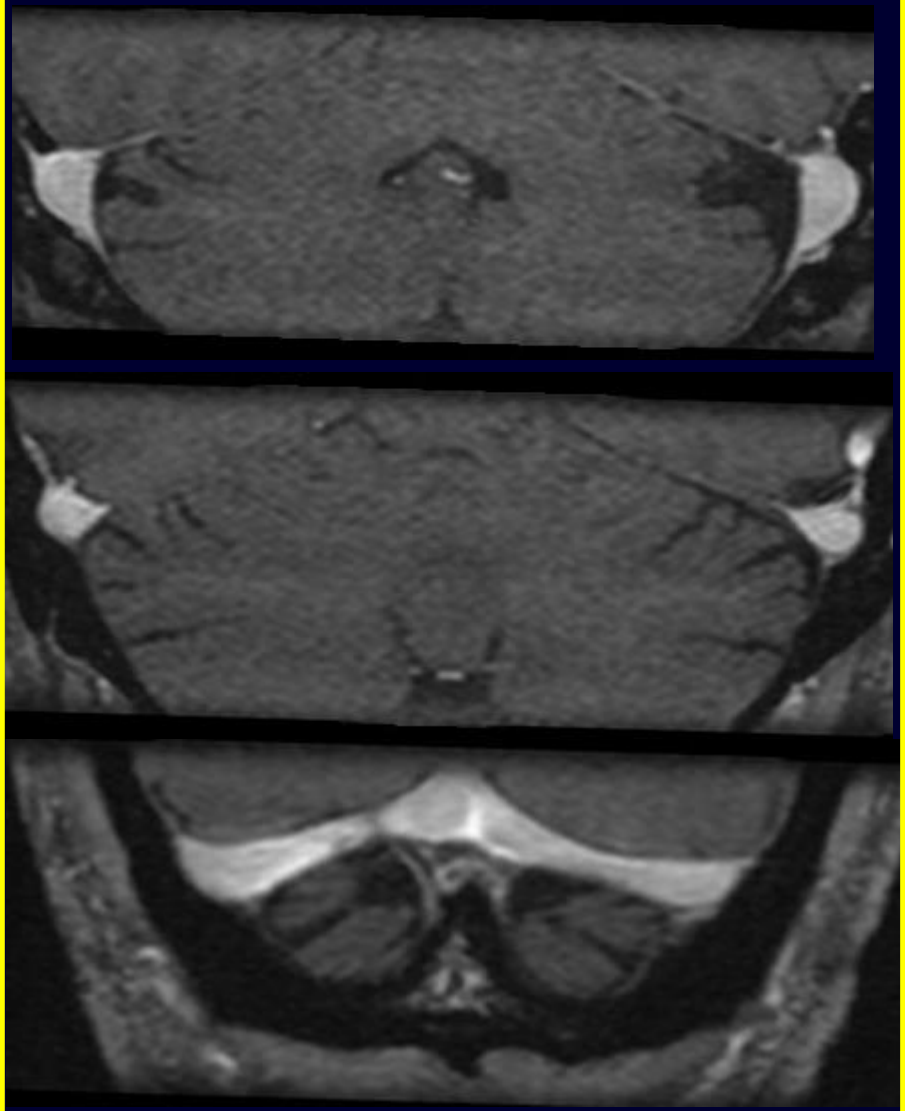
Extrinsic stenosis

- No endoluminal defect
- Long stenosis
- Better seen in coronal views

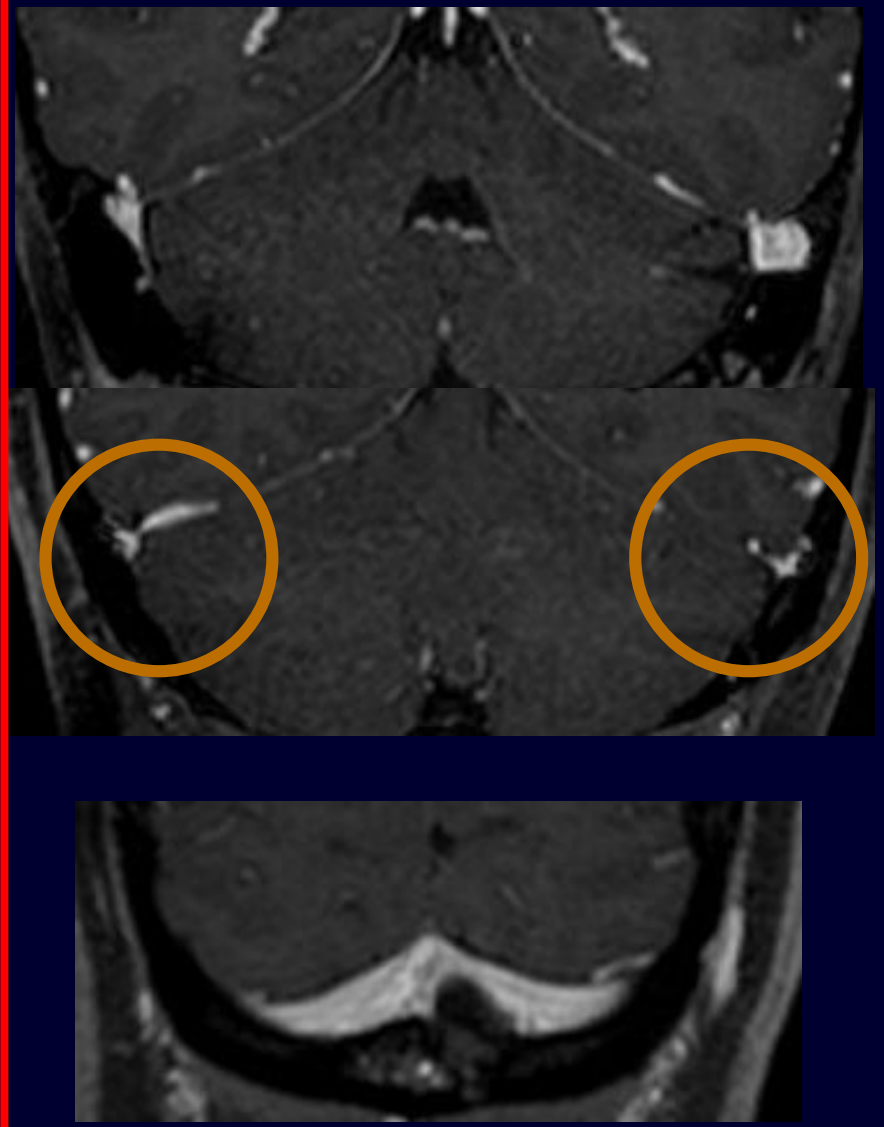




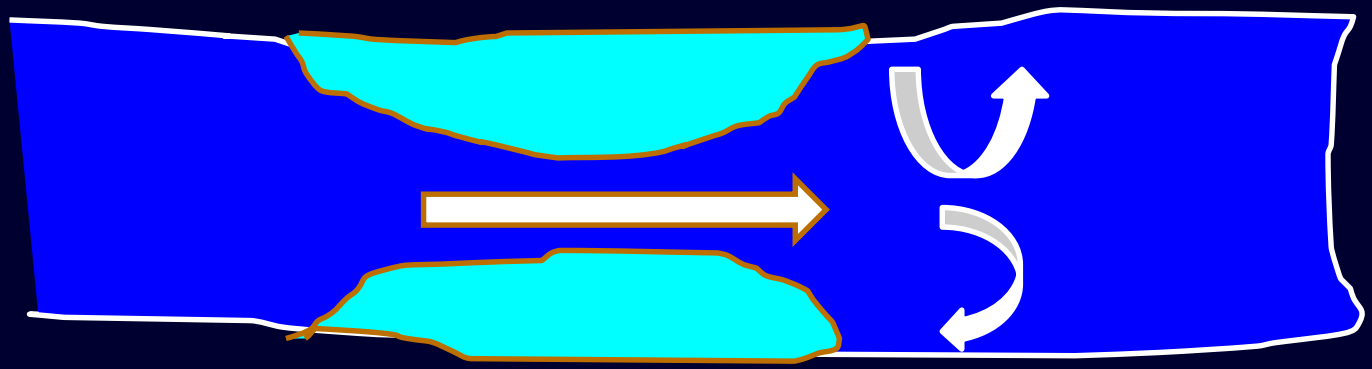
Normal

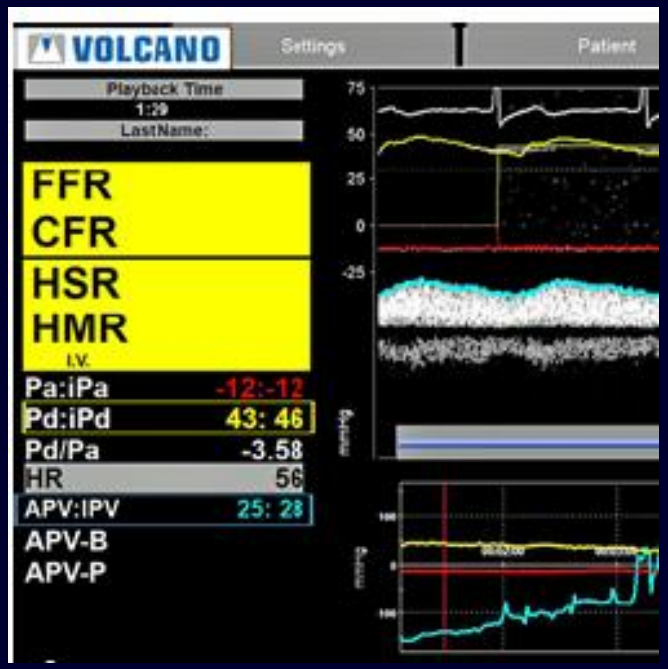


Extrinsic

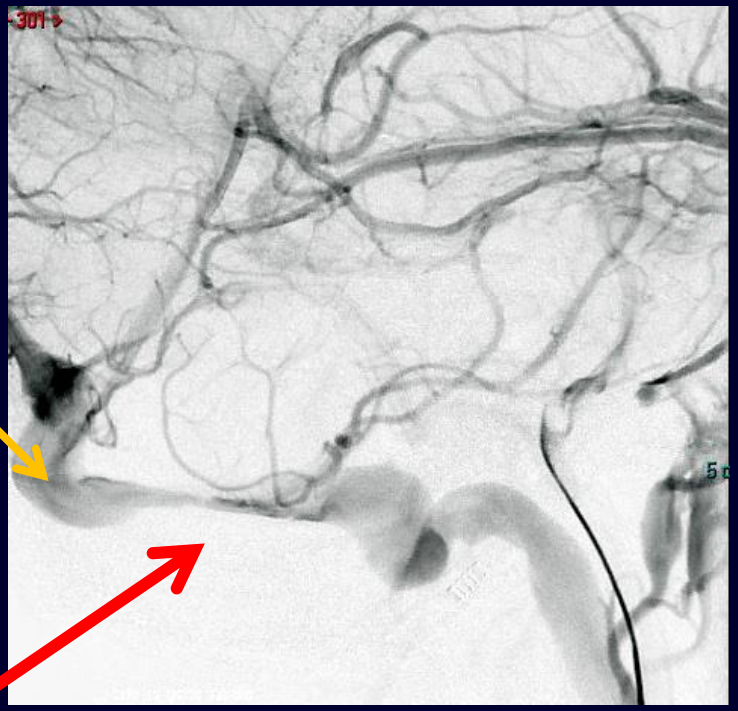


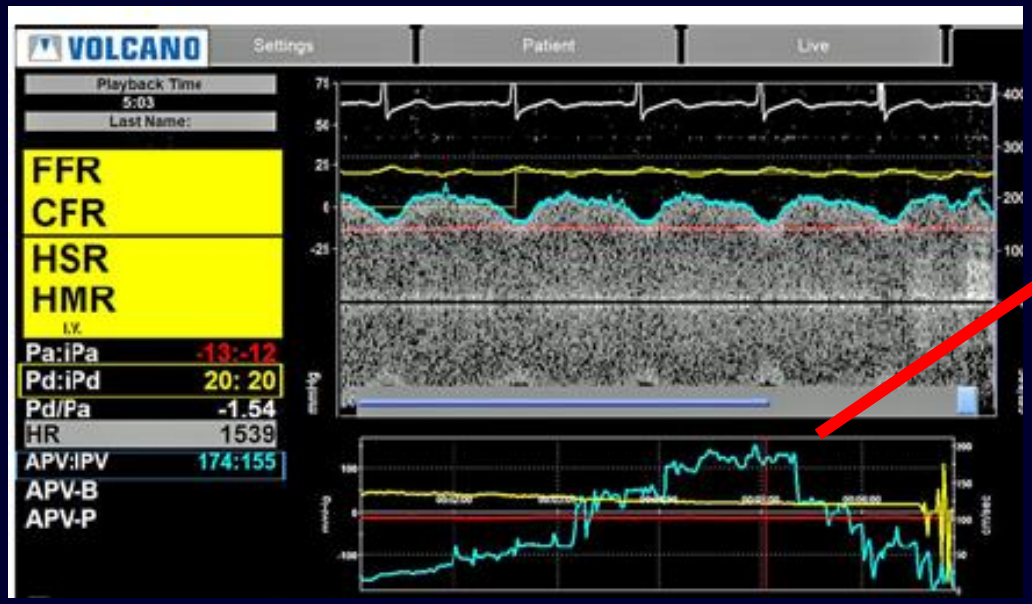
Pathophysiology of PT : acceleration of the flow in front of the stenosis (up to 10 times) creates turbulences downstream by inner ear





20 cm/s to 170 cm/s





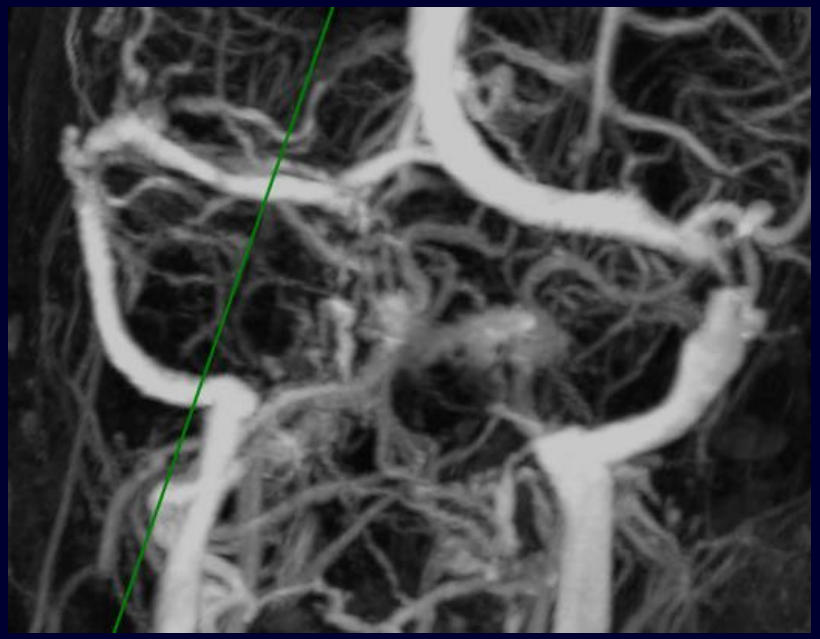
Assessment of blood flow velocities and venous pressures using a dual-sensor guidewire in symptomatic dural sinus stenoses

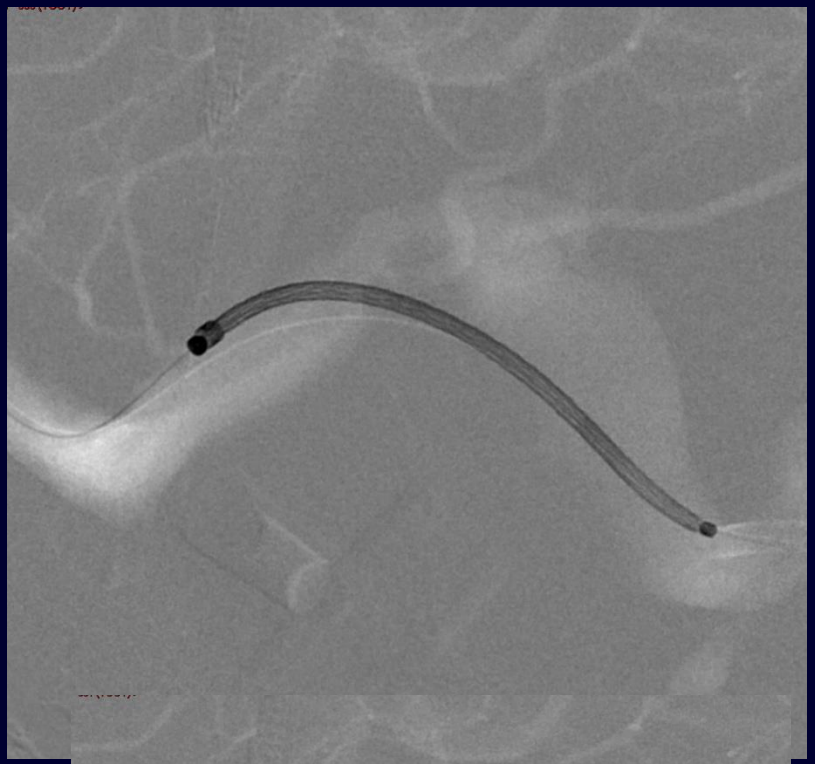
Stéphanie Lenck, MD,[1] Fabrice Vallée, MD,[2] Vittorio Civelli, MD,[1] Jean-Pierre Saint-Maurice, MD,[1] Patrick Nicholson, MD,[3] Alex Hong, MD,[2] and Emmanuel Houdart, MD[1]

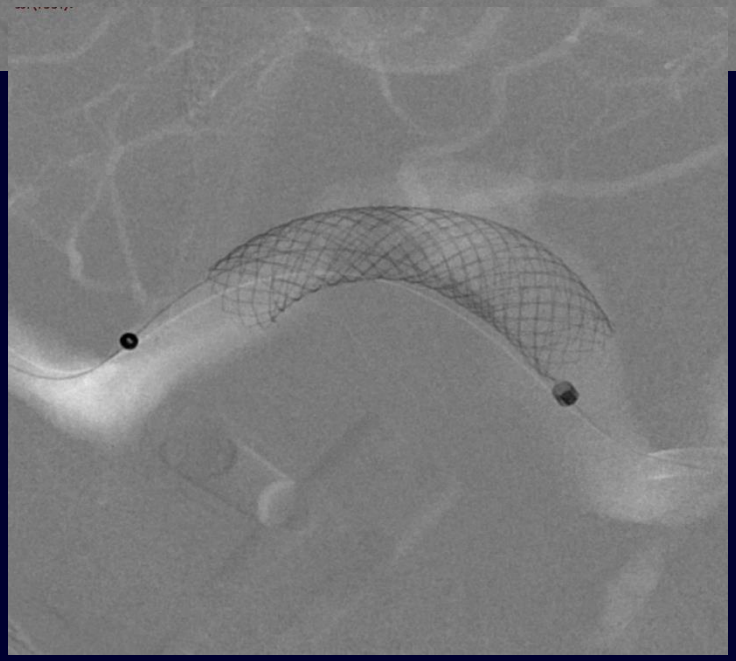
This cause is now treatable by stenting of the stenosis

- 28 yo woman with left venous pulsatile tinnitus

- Endovascular Doppler found acceleration of the flow up to 8 times in front of the stenosis





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Intial

Post

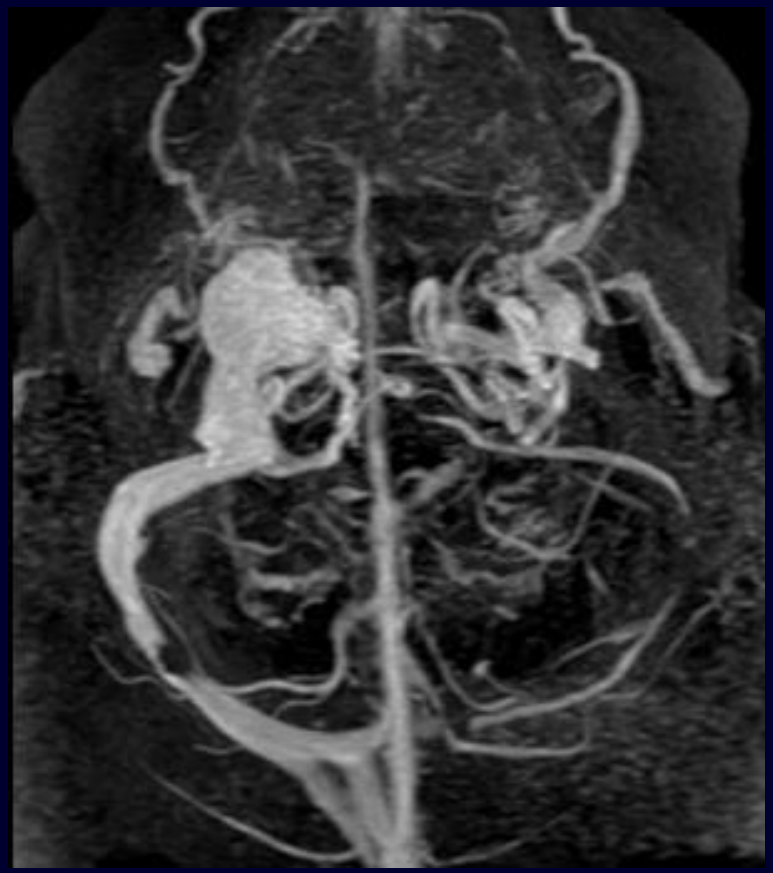
- On / Off effect on the tinnitus

IIH : idiopathic intracranial hypertension is the second manifestation of those stenosis

- Headaches, visual troubles (visual eclipse, diplopia)
- CSF : pressure > 20 cm H2O
- Papilledema i.e objective sign to confirm the cure of the disease

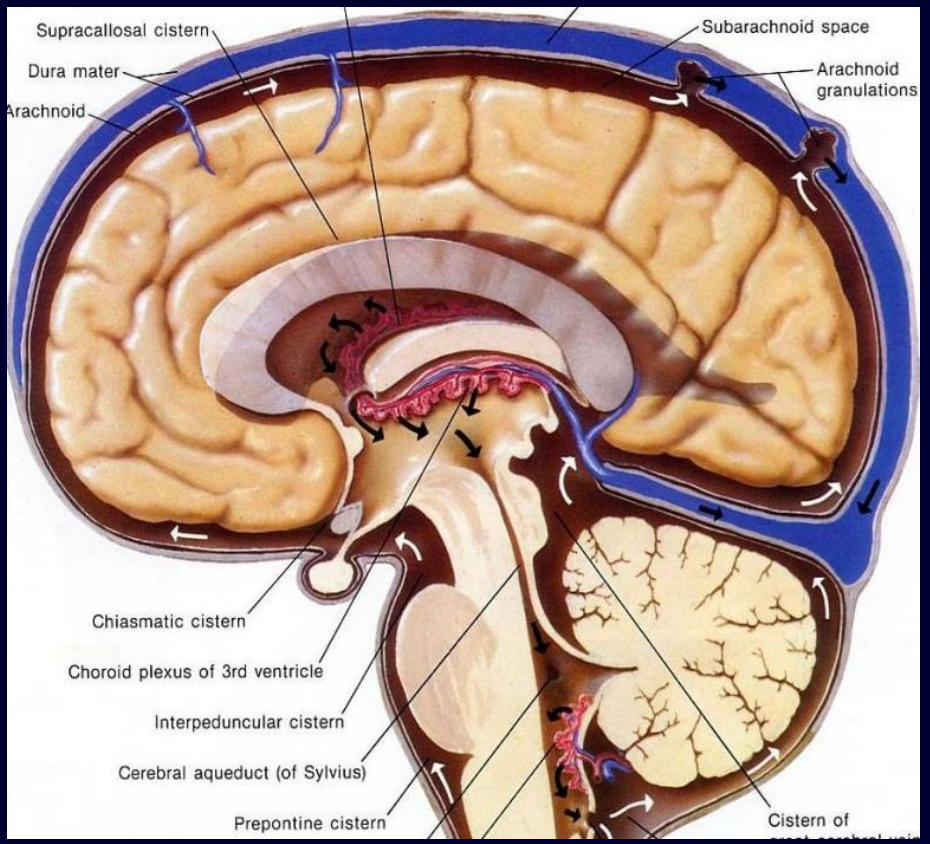
It appeared in late 90 that IIH was constantly associated to sinus stenosis

- And with an elevation of the pressure above the stenosis i.e into the superior sagittal sinus (SSS)

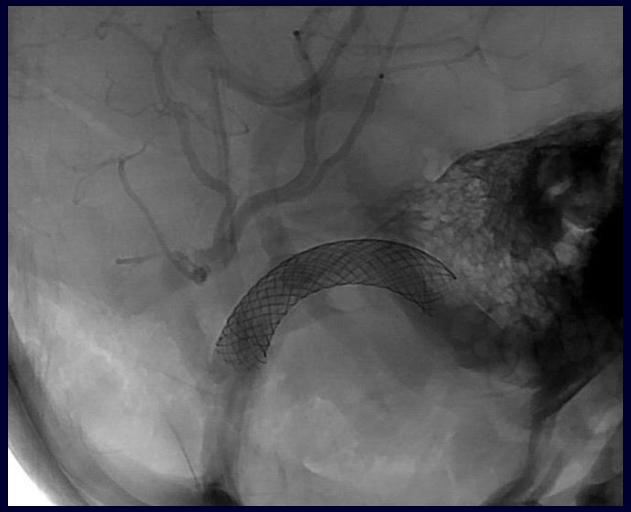


And, we know that SSS participates to the CSF drainage

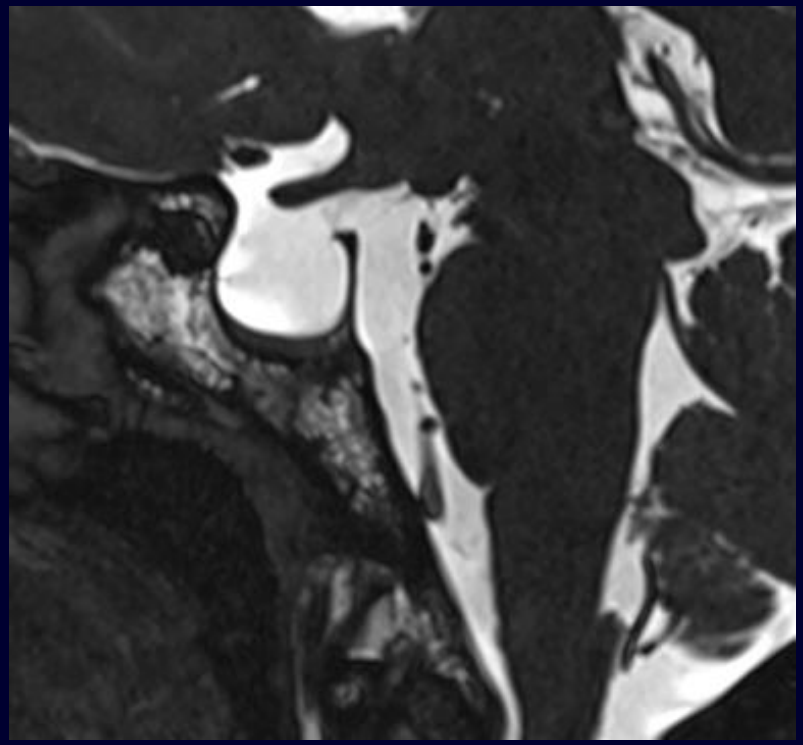
- Therefore, an elevated SSS pressure can lead to reduce CSF drainage and finally elevation of the intracranial pressure
- Supports the treatment by stenting

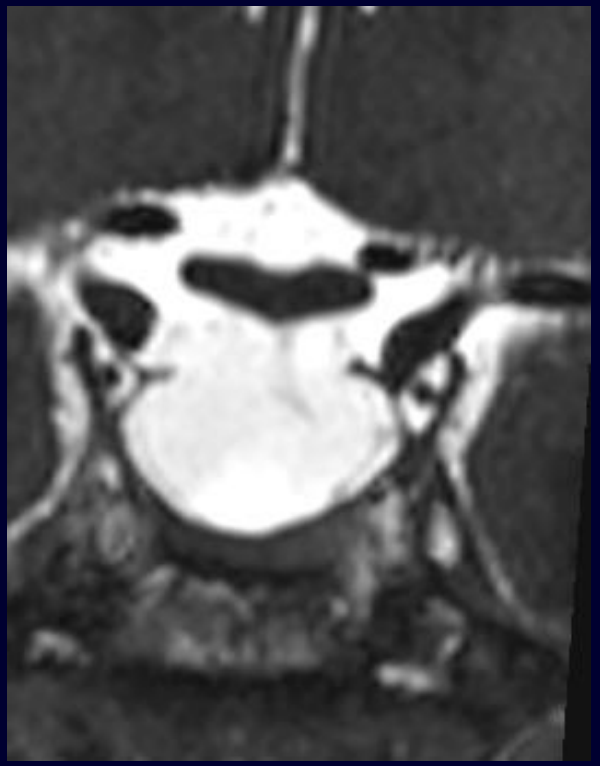


Stenting solves the IIH (with disappearance of papilledema)

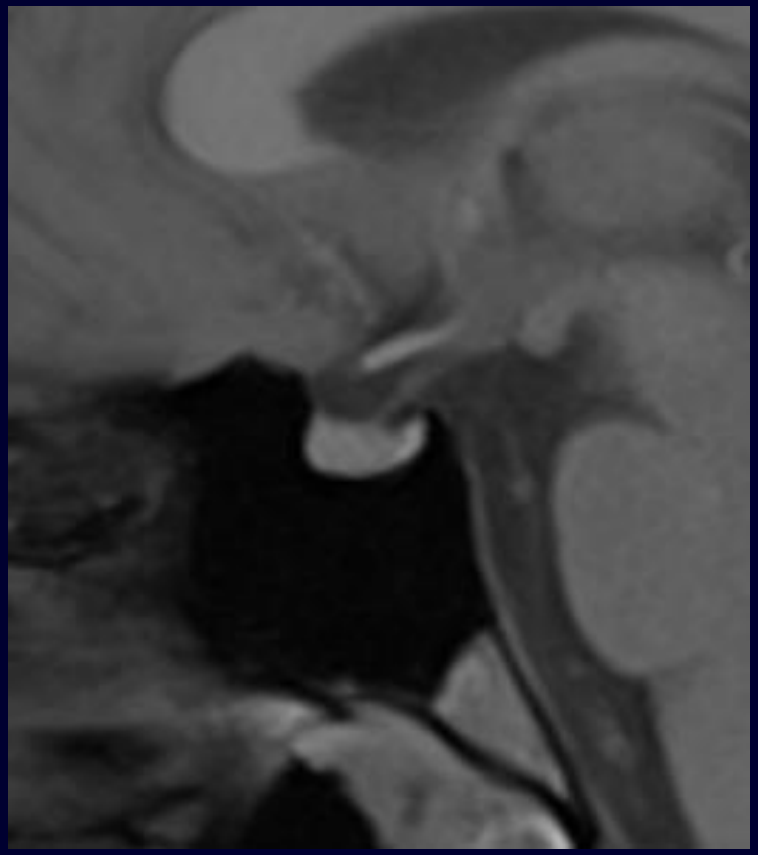


Indirect sign of the lateral sinus stenosis : empty sella and dilation of the sheath of the cranial nerves (third nerves here)

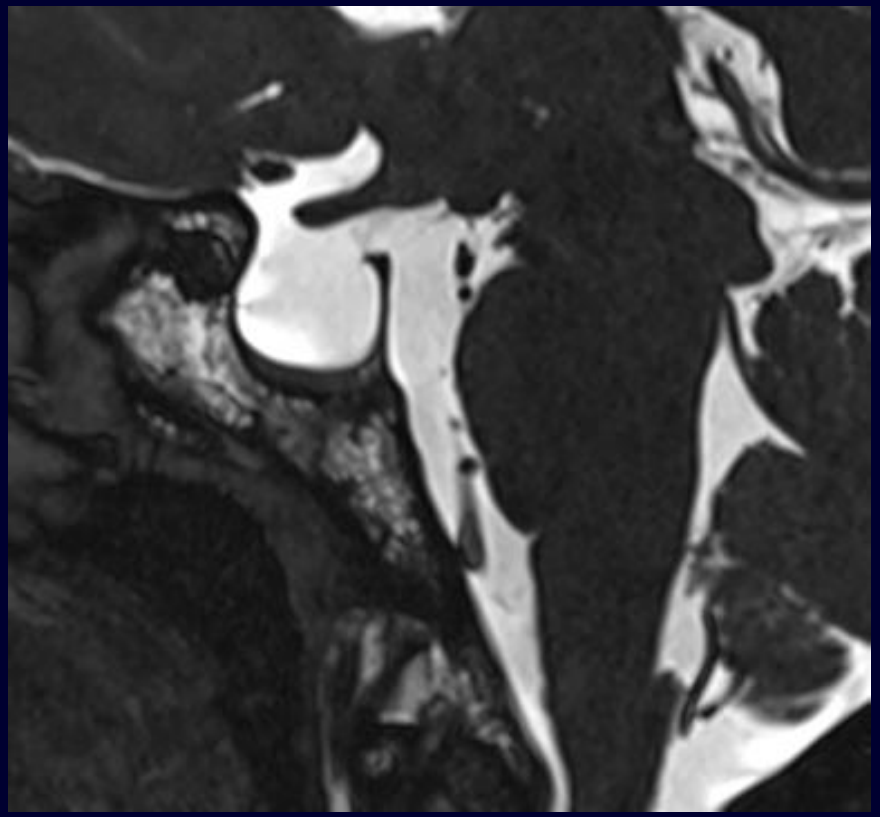




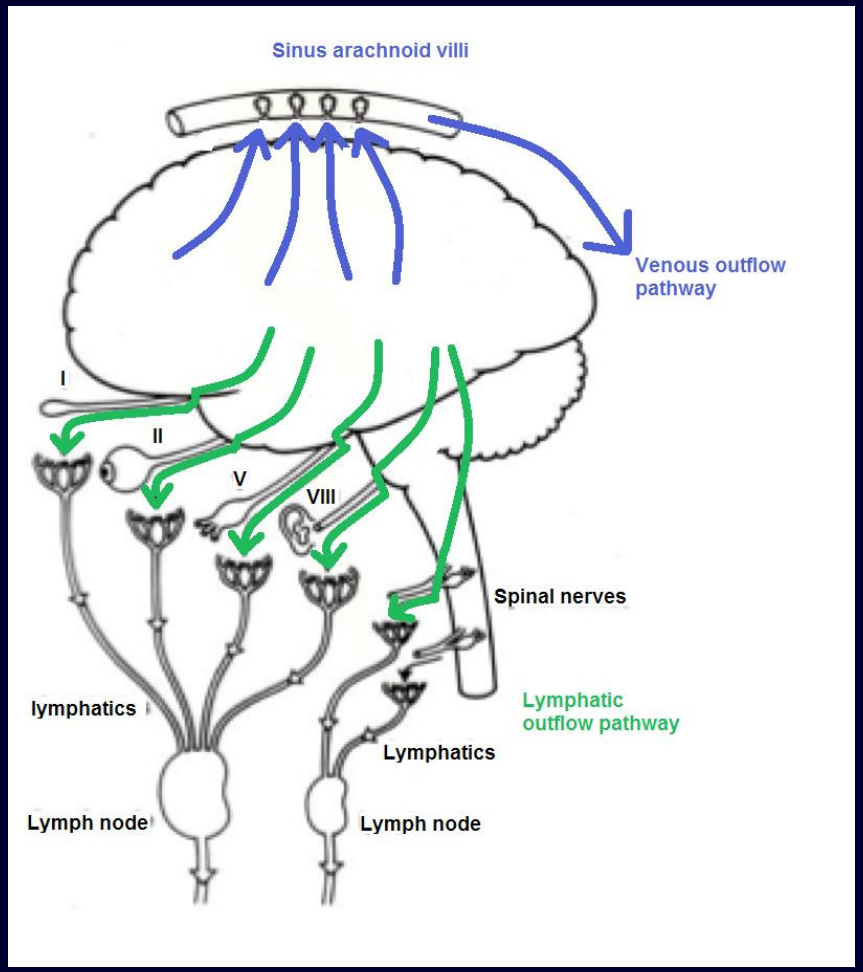
Normal



Empty sella



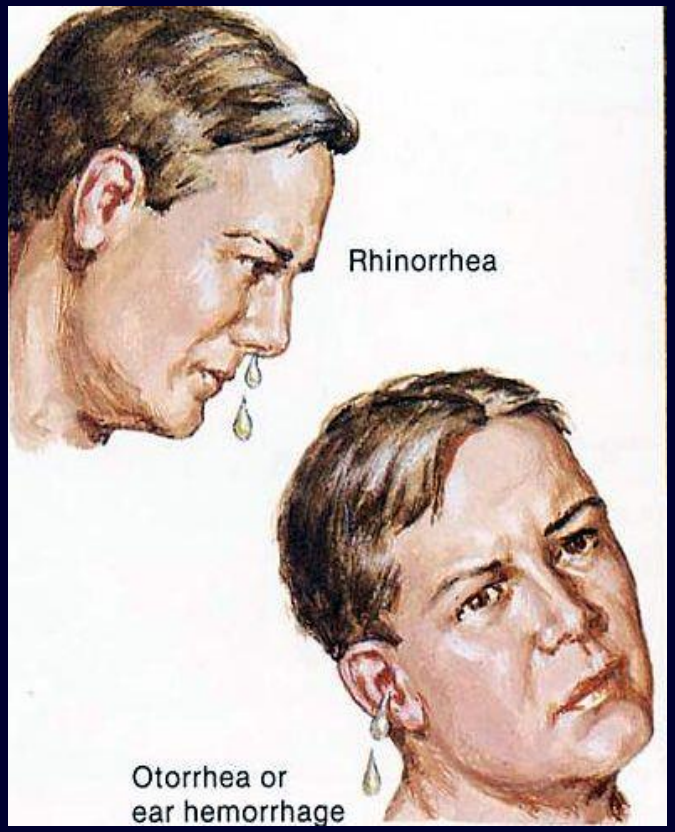
Hyperpressure into SSS leads CSF to drain into accessories spaces



- In case of elevated venous pressure in SSS those accessories ways are over used explaining the visibility of the CSF around cranial nerves

And sometimes, this leads to spontaneous CSF leakage, last presentation of lateral sinus stenosis

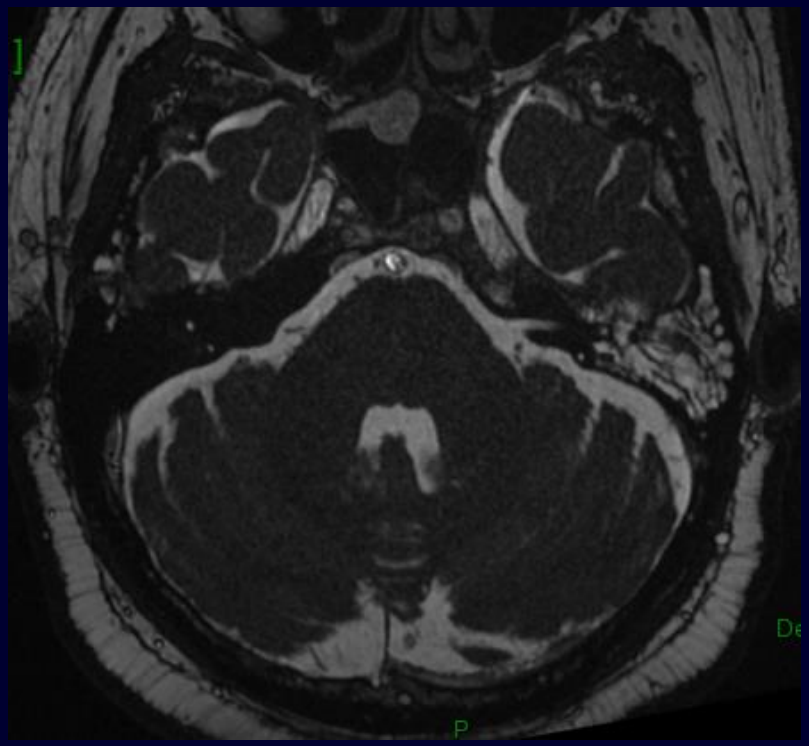
- Due to sponatenous dura-mater perforation
- Seen by ENT
- Rhinorrhea, otorrhea, meningitis



Epidemiology of *spontaneous* CSF leaks

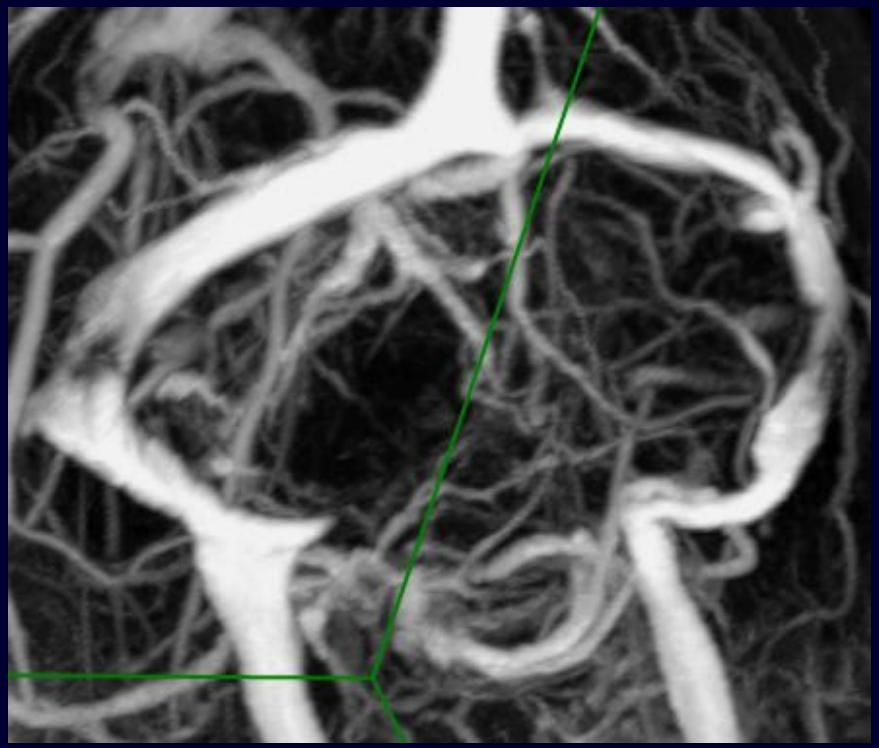
- *Nelson et al. The rising incidence of spontaneous CSF leaks in the US and the association with obesity. Otol Neurotol 2015; 36(3): 476-80*
- Their frequency increased these last 20 years in parallel with obesity
- 3 % of all leaks before 2000 to about 20 % nowadays

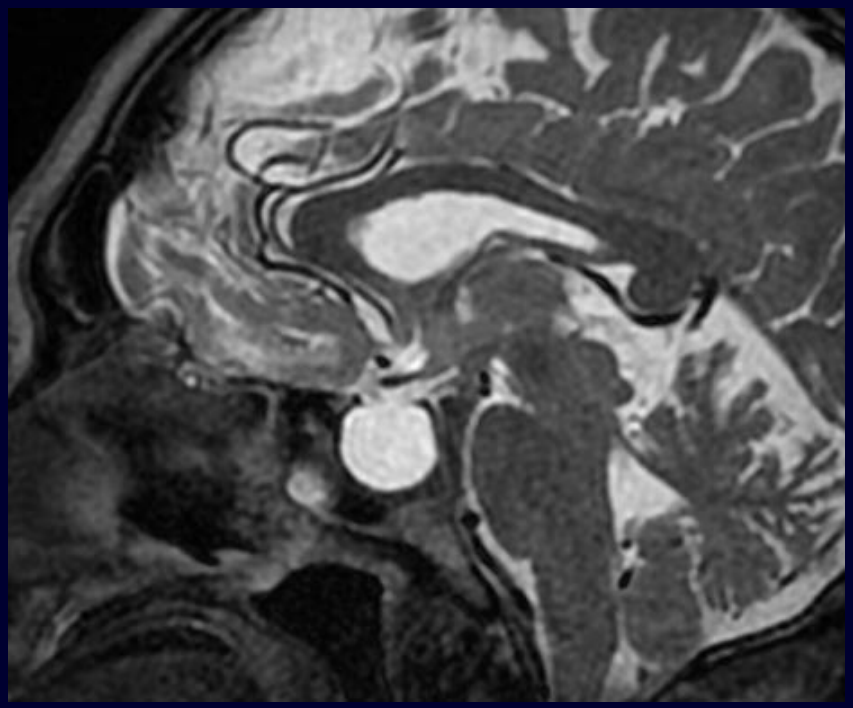
Spontaneous left otorrhea



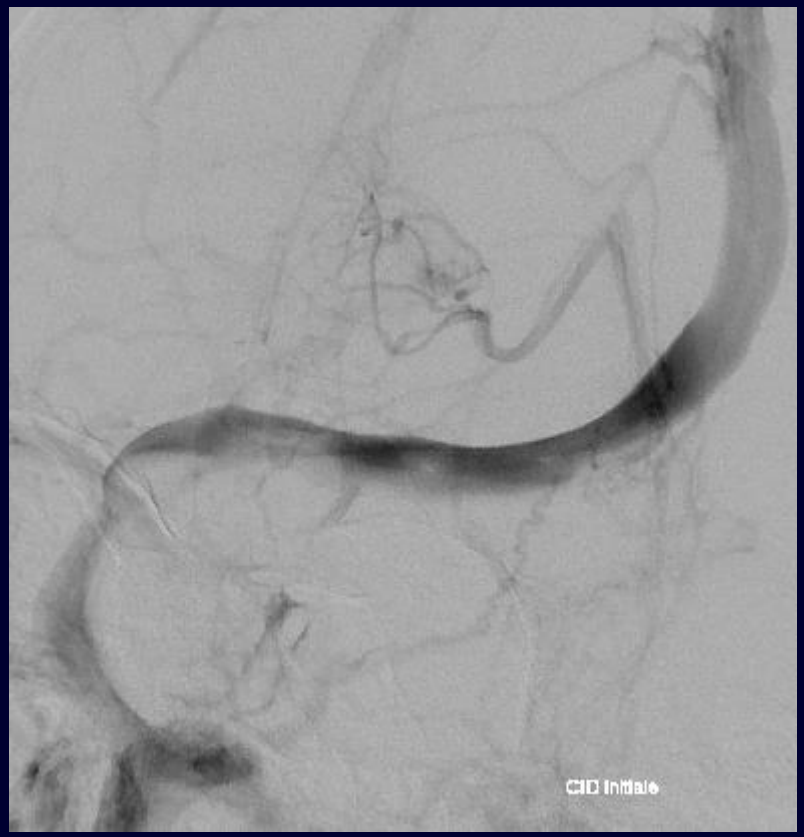
- That was surgically fixed
- Our ENT surgeons, now, look at lateral sinus stenosis facing such patient

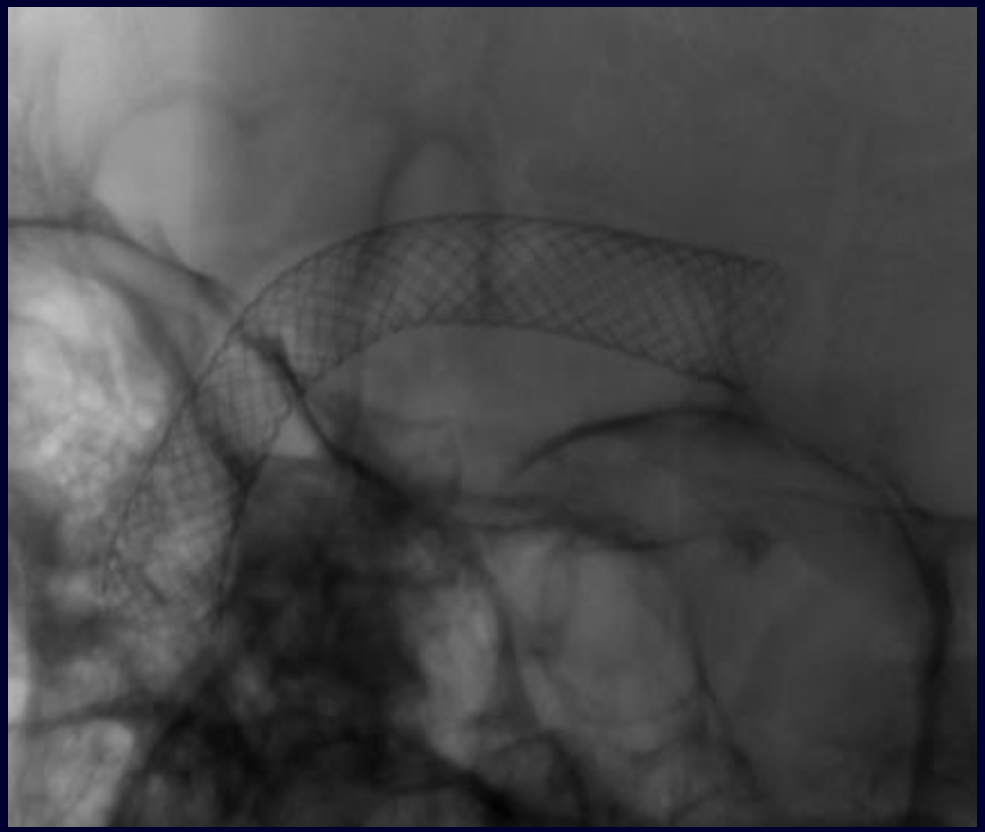
Stenosis and empty sella





Stenting of the lateral sinus is performed to prevent against recurrent CSF leakage





To conclude

- Pulsatile tinnitus must be recognized because most of them are curable
- There are many causes of pulsatile tinnitus, however, venous stenosis is the leading cause in young women and is treatable
- Primitive lateral stenosis is a new pathologic entity whose frequency increases with overweight