

Management of Chiari I Malformation or Anomaly

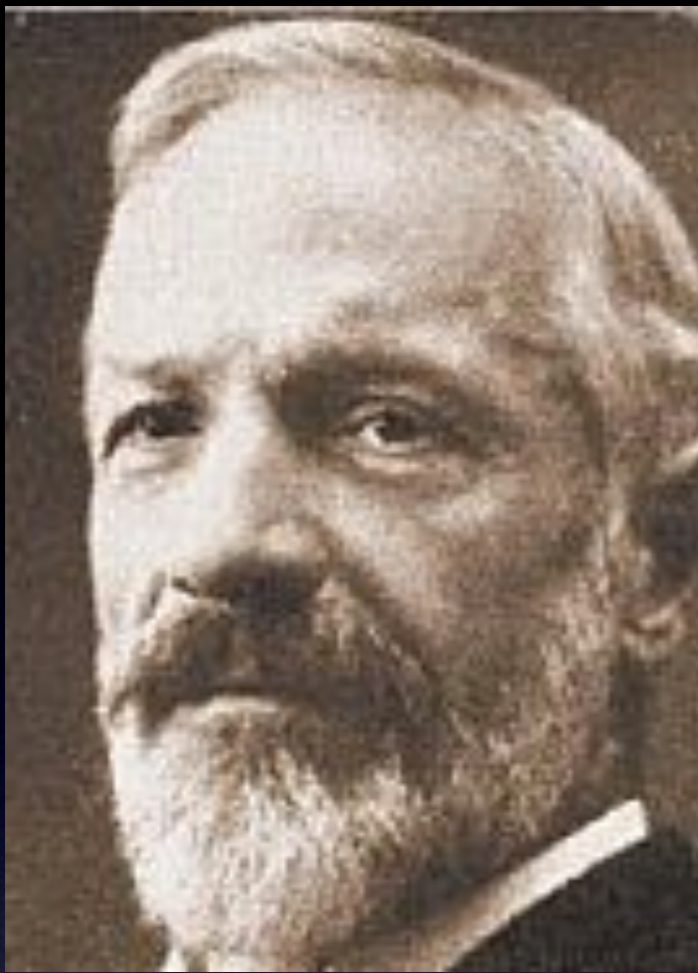
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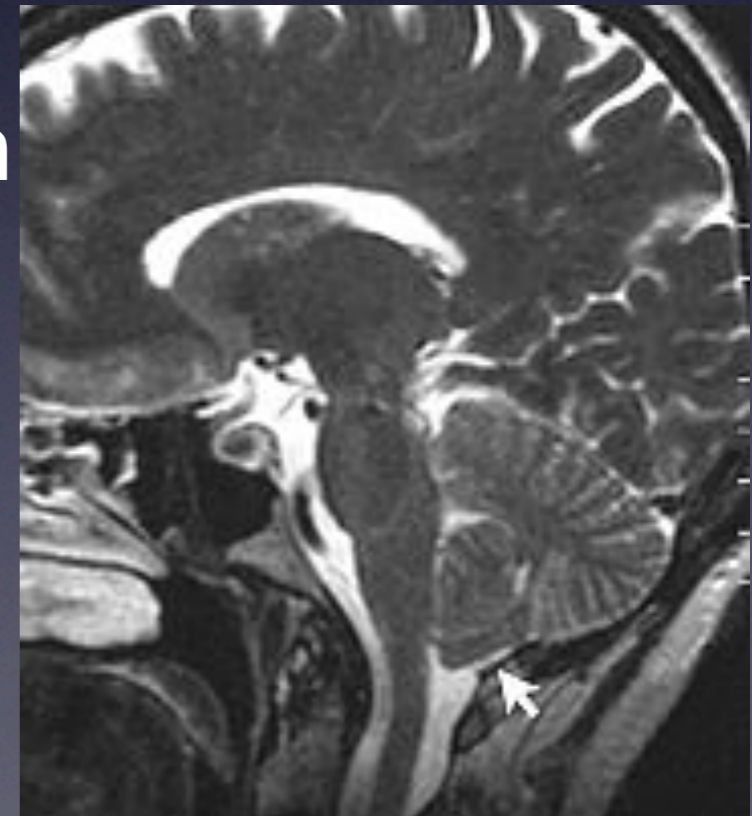
Hofstra Northshore LIJ College of Medicine

I have no conflicts of
Interest related to this
presentation

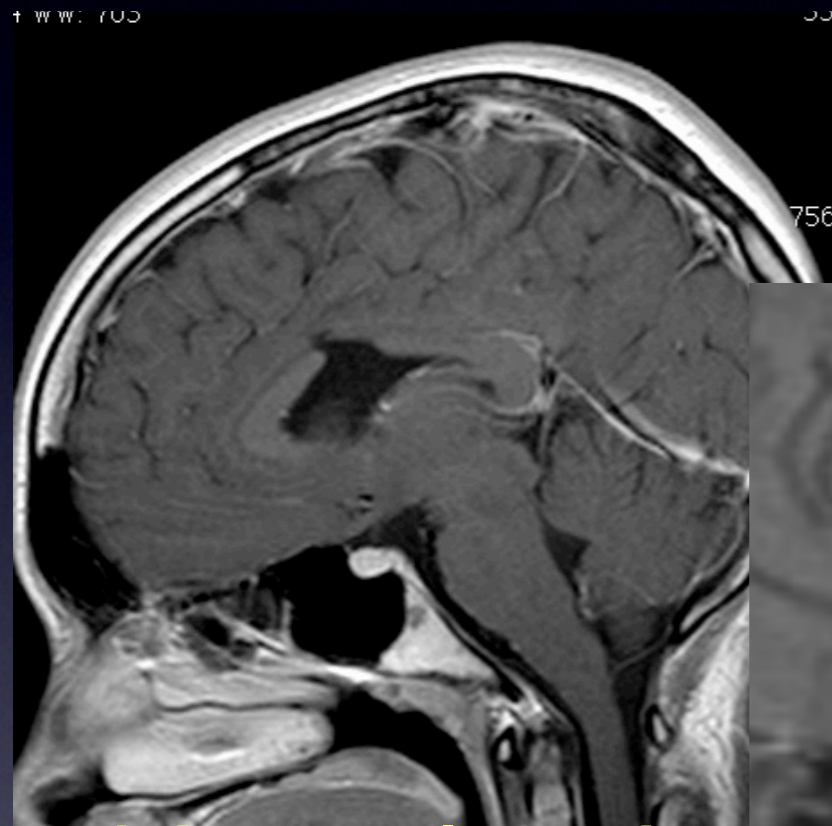


The Chiari I Malformation

An Unfortunate Name That
Inevitably Leads To Confusion

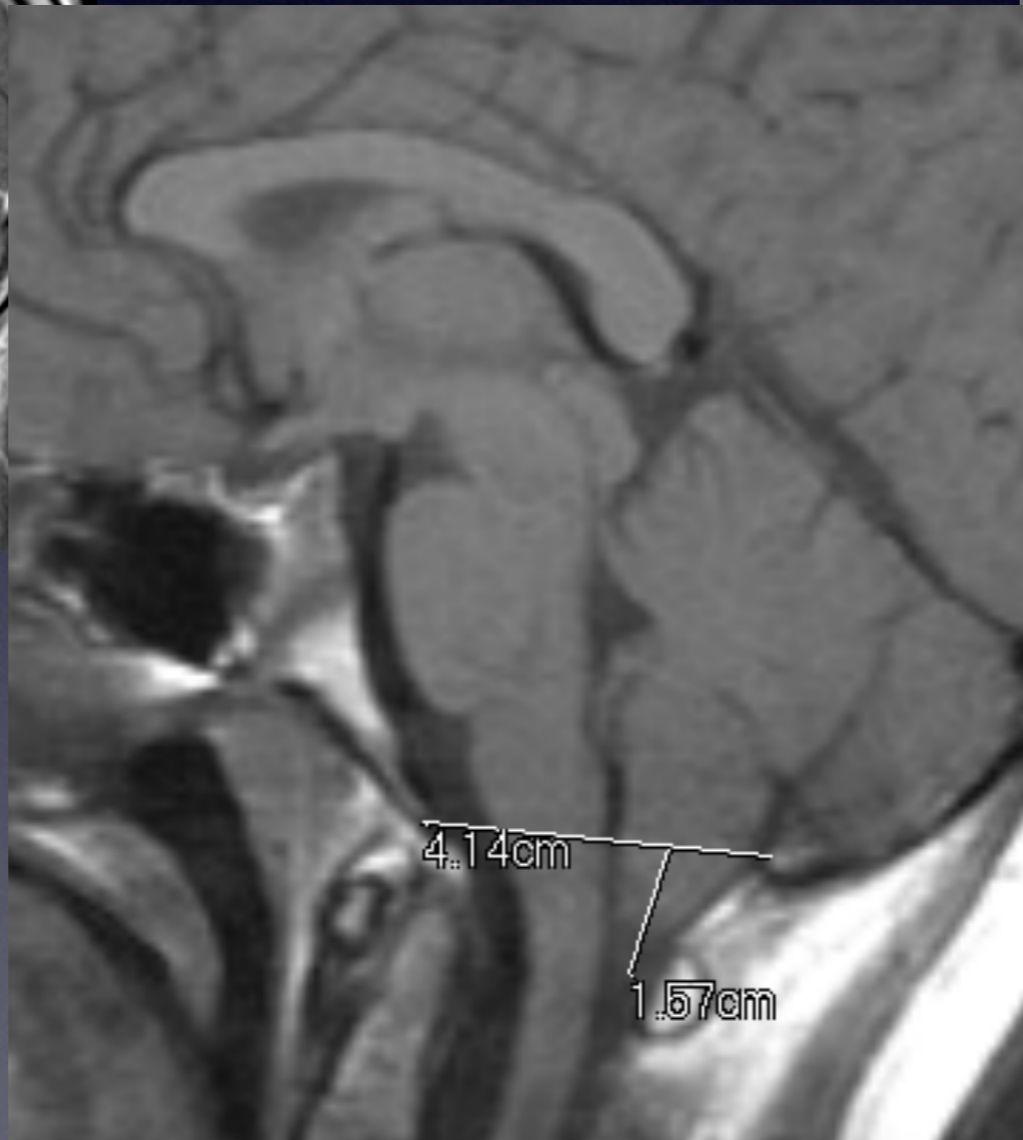


Part of the Problem Relates to Definition

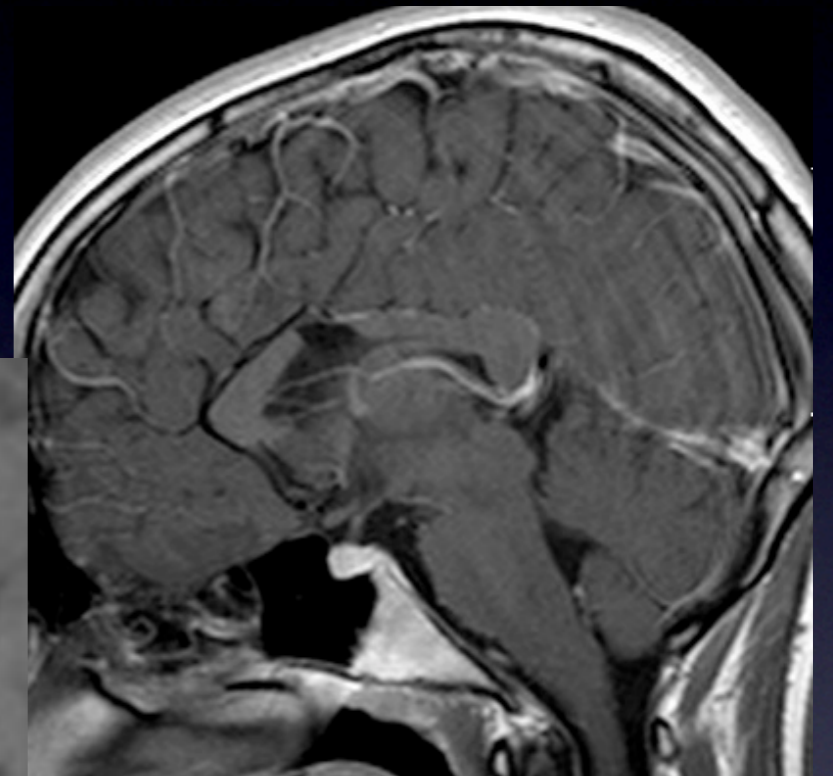


Normal with
Cistern

Chiari I



4.14cm
1.57cm



Normal
No Cistern

The Cisterna Magna

- A potential space filled with spinal fluid behind the cerebellar vermis
- A point of mixing of CSF from the fourth ventricle, spinal subarachnoid space and cortical subarachnoid space

What Constitutes Success



Success!!!



Why The Name Is So Terrible

- Giving a condition the name X malformation implies that it
 - Has a single definable cause
 - Began before birth
 - Does predictable things to the patient or the patient's brain.

Chiari Malformation

Wikipedia

- Arnold Chiari **malformation** or often simply Chiari **malformation** is a **malformation** of the brain. It consists of a downward displacement of the cerebellar tonsils through the foramen magnum
- NIH
- Chiari malformations are structural defects in the cerebellum. They can be caused by caused by defects in the spinal cord and brain that occur during fetal development

<http://webclipart.guide@about.com>

- Almost everything is controversial
 - Definition of Chiari I
 - Causes of Chiari I
 - Is it malformative
 - What makes the patient a candidate for surgery?
 - Relationship to Fibromyalgia
 - What is the appropriate surgical treatment?
 - What defines success or failure?

Chiari Malformation Diagnosis

There is general agreement among neuroradiologists that the diagnosis of Chiari I involves a descent of the Cerebellar tonsils greater than 5 mm

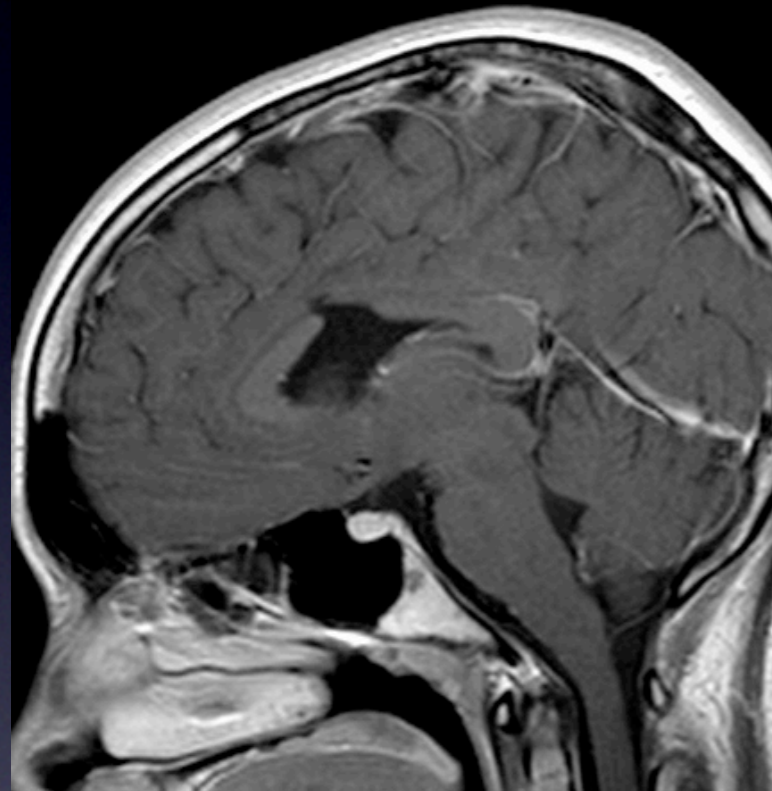
Why 5 mm?

What causes the problem?

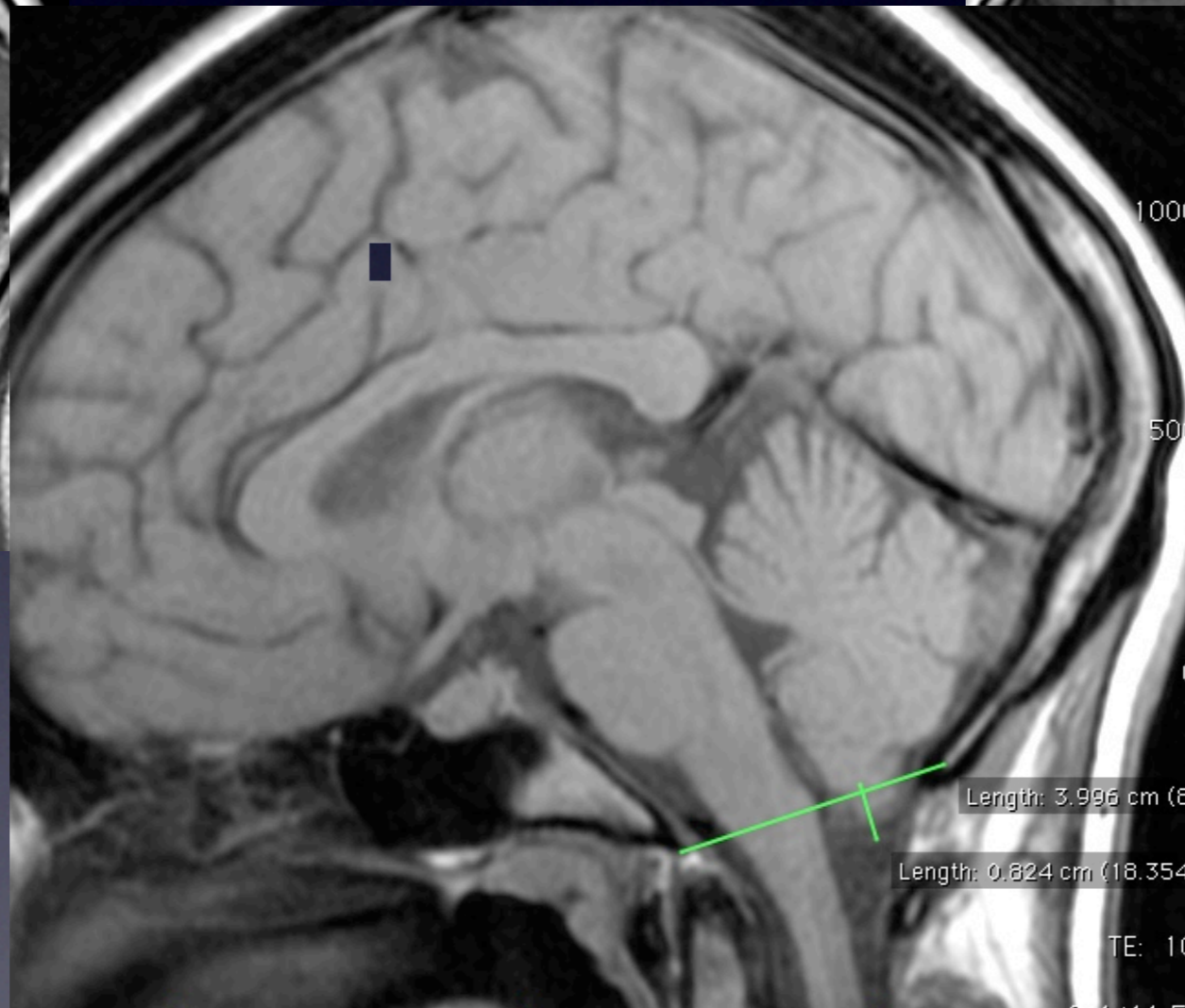


Part of the Problem Relates to Definition

Chiari I



Normal with
Cistern



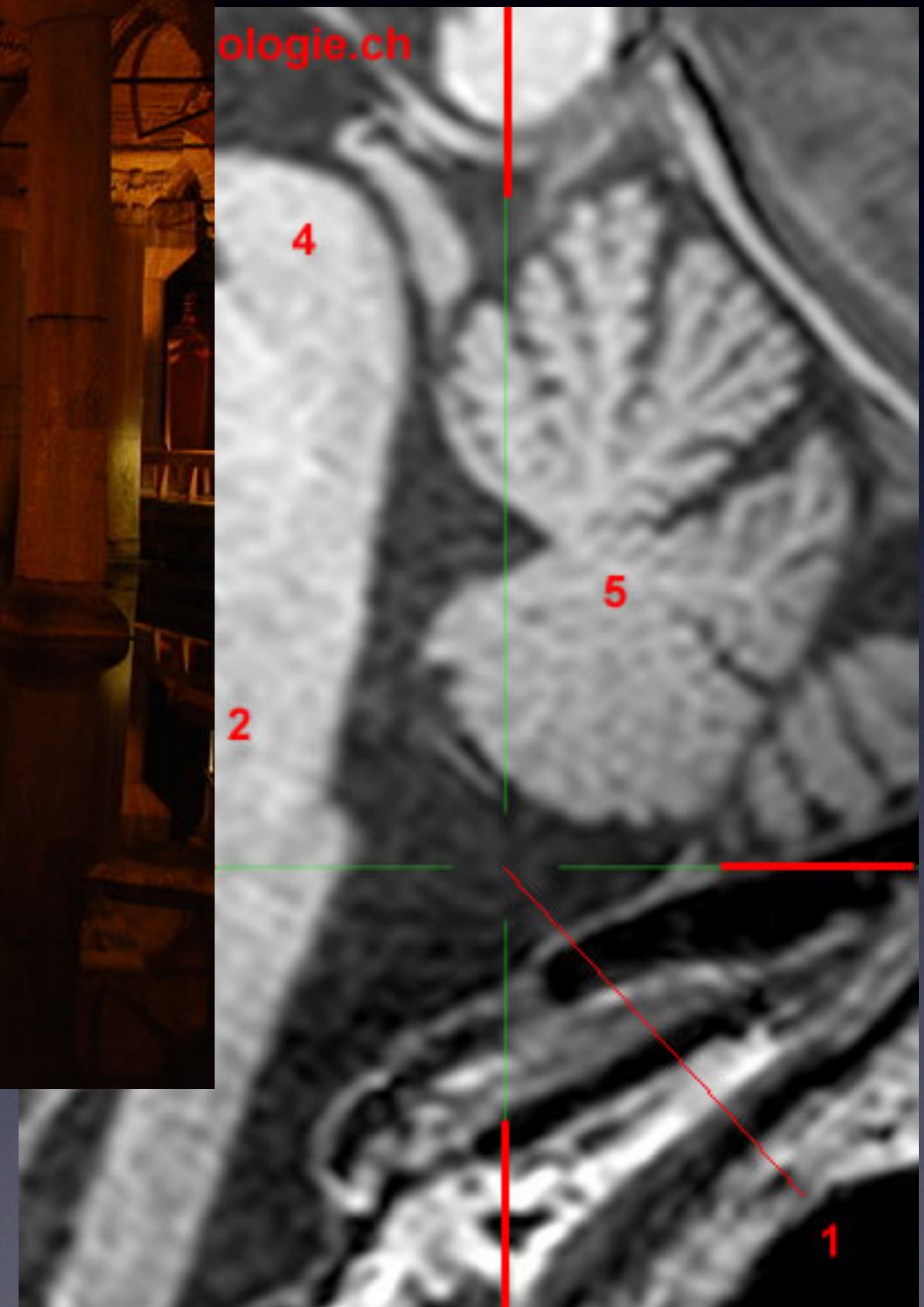
Normal
No Cistern

Length: 3.996 cm (81.1 mm)

Length: 0.624 cm (18.354 mm)

TE: 10

What's Missing



Cisterna Basilica Istanbul
From Memet Ozek

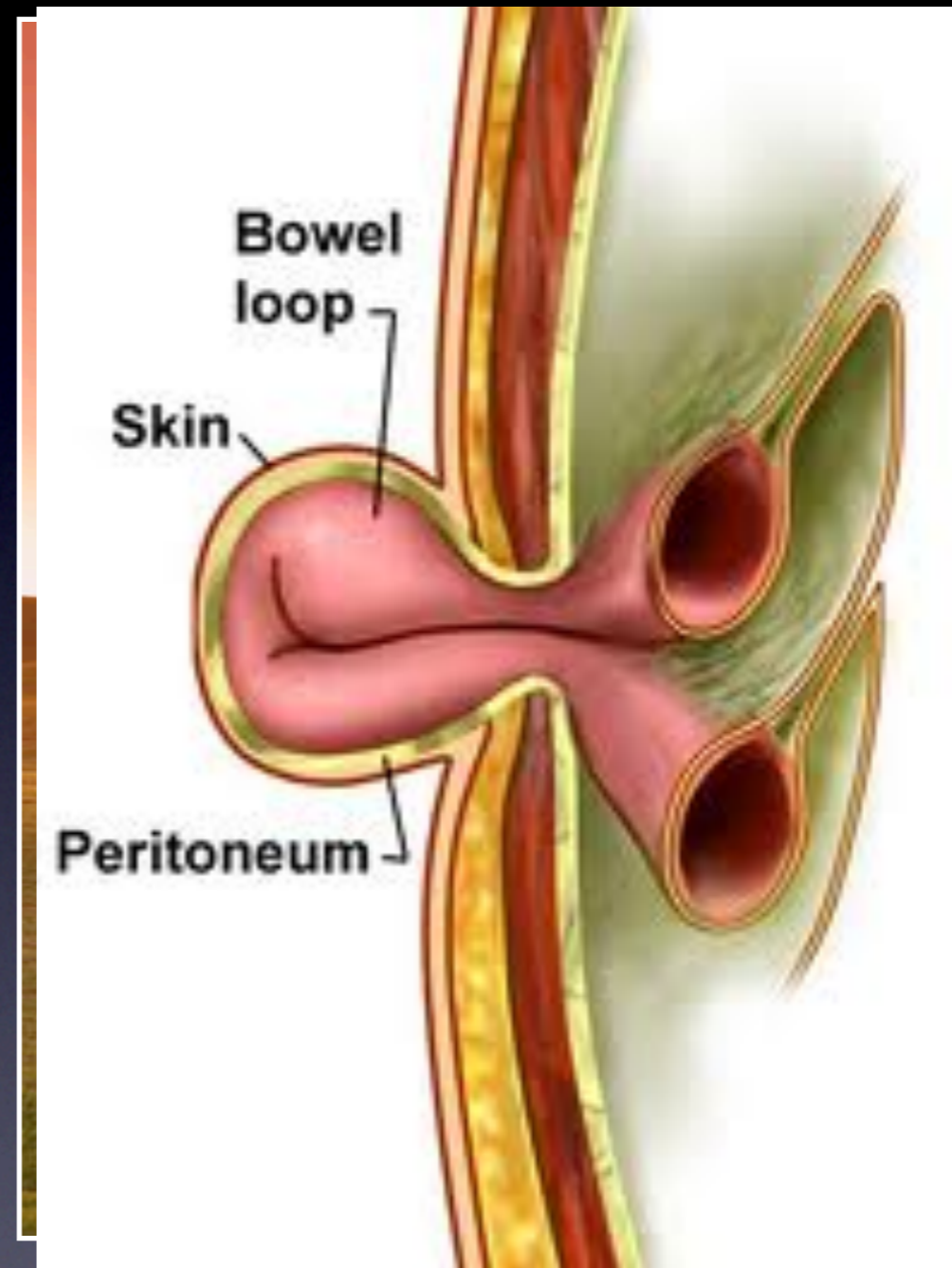
Why is the Cisterna Magna Important?

- Serves as a hydraulic capacitor
- Stores CSF for its critical role in the distribution of intracranial pressure transients
- Buffers the brain and spinal cord from compression at the time of neck movement

Hindbrain Herniation

Begins with a hole that is
incompletely covered

Next comes a force pushing
or pulling something through
the hole



Step 1

- Skin incision from overlying the spinous process of C2 to vertex well above theinion
- Care is taken to preserve the pericranium above the nuchal line
- Harvest the pericranial patch about 4 cm in diameter

Why the Pericranium

- Use of pericranial patch requires the incision to extend above the nuchal line
- The tissue is more elastic and thicker than available manufactured patches
- Since changing to the pericranium there has been a dramatic decline in chemical meningitis and a measureable decline in pseudotmeningocele

Step 2

- Craniectomy of Squamous portion of occipital bone. 3X3 CM at Foramen Magnum
- C1 Laminectomy
- Open Dura from just above C2 to above the Marginal Sinus then create a “Y”

Caution

- In order to stop bleeding in sinuses, even the marginal sinus it is essential to compress the two leaves of the dura that create the sinus together.
- In operating on babies the posterior fossa dura may be a large venous lake

Remember
Manufactured Patches
Derived from Biological
Materials Must be
Soaked for 30 minutes

The Patch

- Use braided suture (I prefer 4-0 Neurolon)
- Place stay sutures in the three corners of the dural opening.
- Running suture
- Multiple valvsalva maneuvers

The Chiari Plate

- Place three 2-0 Ethibond sutures in the patch and leave long
- Bend the Chiari plate to create a dome
- Screw the plate to the edges of the bone to cover the decompression
- Bring the Ethibond through the interstices of the plate and fix the patch to the back of the plate

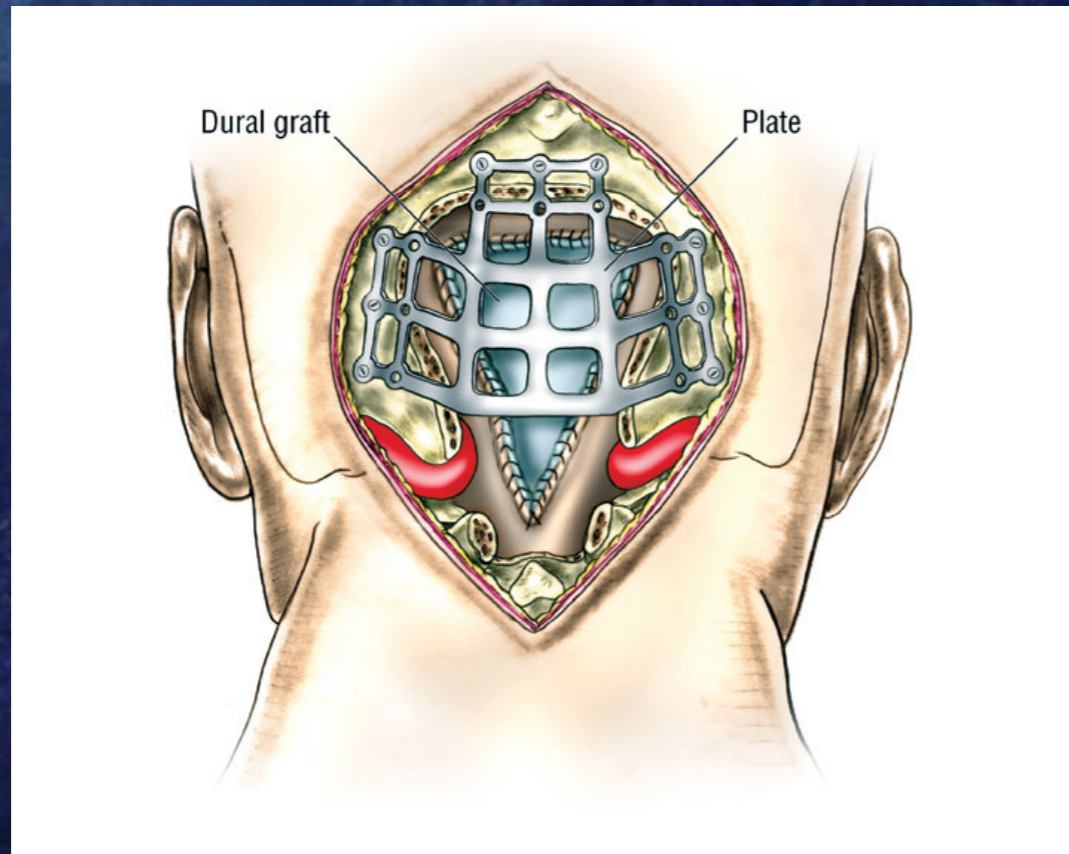
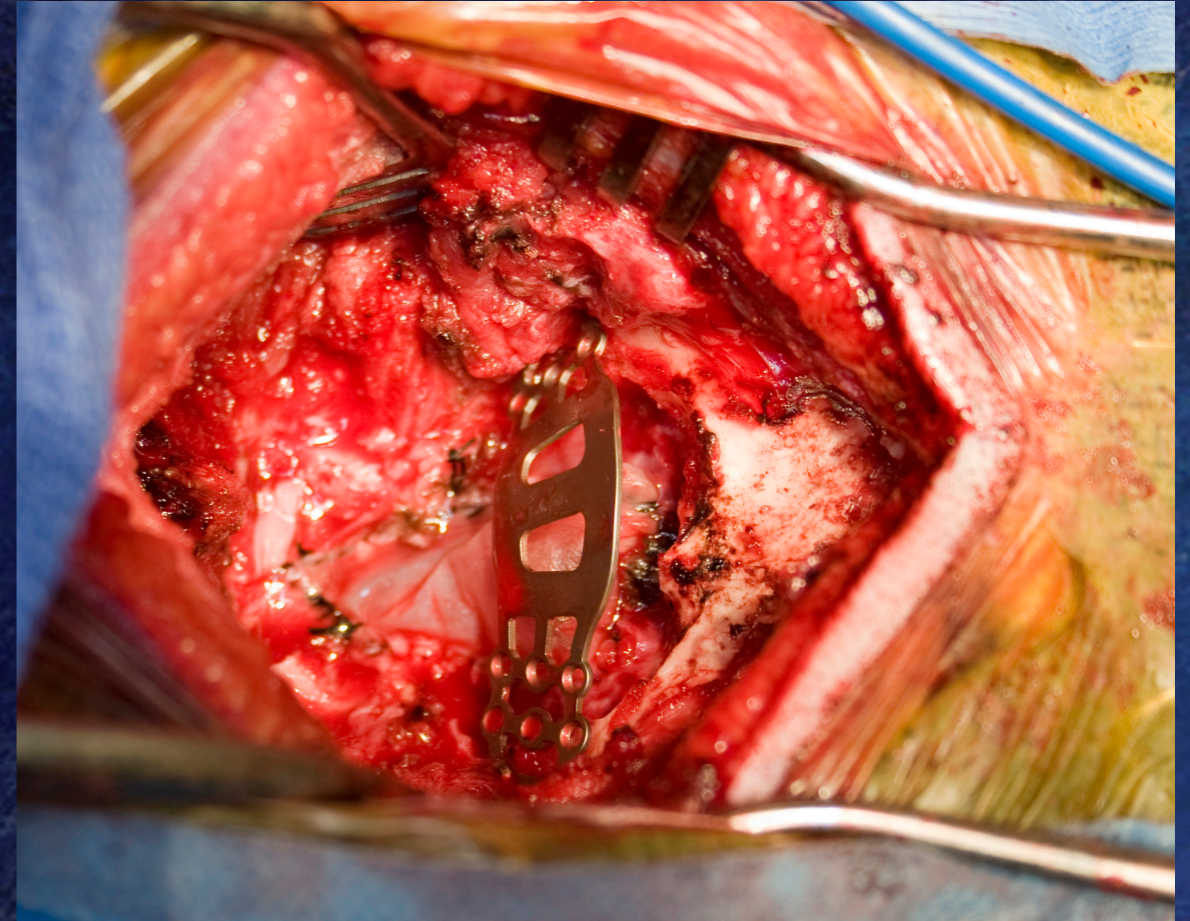
Why the Plate

- The dome creates a space behind the cerebellar tonsils (Neo cisterna magna)
- It prevents the nuchal muscles from pushing into the repair
- Prevents pressure on posterior fossa in recumbancy
- You don't have to “shrink” the tonsils

My Surgical Approach

- If you decide upfront that the goal of surgery is to recreate a cisterna magna then it is a simple thing to analyze the outcome
- Limited suboccipital craniectomy (2X3 CM)
- C1 Laminectomy
- Always open the dura unless there is a clear bony cause of the herniation
- Generous pericranial patch
- Posterior fossa reconstruction with plate

Posterior Fossa Reconstruction





6 months postoperative

Conclusions

- All hindbrain hernia conditions have a root cause
- While sometimes the cause is still obscure it is essential to look for it as the management differs with different causes
- We will eventually be able to determine the cause in all cases

Conclusions 2

What is success?

Successful management of the hindbrain hernia requires the creation or recreation of a cisterna magna

