

SPINAL CORD
CYSTS AND CAVITATIONS

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OBJECTIVES

- ✻ Definitions
- ✻ Pathophysiology/Classification
- ✻ Clinical Presentation
- ✻ Management

“SYRINX”



- ✿ Greek mythological character
- ✿ Fluid filled cyst within spinal cord



Syringohydromyelia:

- ✿ Syringomyelia: fluid collections outside of central canal
- ✿ Hydromyelia: fluid collections enlarging central canal, congenital, almost always benign. Usually lined by ependymal cells.



PATHOPHYSIOLOGY

Rare, poorly understood natural history

Associated w/:

- ✻ Trauma
- ✻ Chiari malformations
- ✻ Tumour
- ✻ Vascular malformations
- ✻ Arachnoiditis
- ✻ Occult Spinal Dysraphisms

TRADITIONAL CLASSIFICATION



Communicating

Chiari Malformations
Spinal Dysraphisms



Non-Communicating

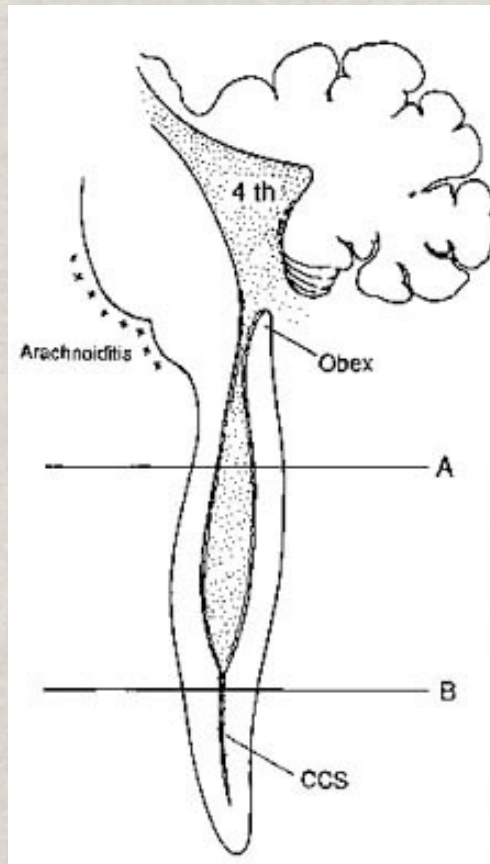
Trauma
Tumour
Vascular Malformations
Arachnoiditis

ANATOMICAL CLASSIFICATION

Classification of syringomyelia

- I communicating syringomyelia
 - central canal dilations
 - 1) communicating hydrocephalus (posthemorrhagic, postmeningitic)
 - 2) complex hindbrain malformations (Chiari II, encephalocele)
 - 3) Dandy–Walker cyst
 - II noncommunicating syringomyelia
 - central canal/paracentral syringes
 - 1) Chiari malformations
 - 2) basilar invagination
 - 3) spinal arachnoiditis (posttraumatic, postmeningitic)
 - 4) extramedullary compressions (spondylosis, tumors, cysts)
 - 5) tethered cord
 - 6) acquired tonsillar herniation (hydrocephalus, intracranial mass lesions, craniosynostosis)
 - primary parenchymal cavitations
 - 1) spinal cord trauma
 - 2) ischemia/infarction
 - 3) intramedullary hemorrhage
 - III atrophic cavitations (syringomyelia *ex vacuo*)
 - IV neoplastic cavitations
-

COMMUNICATING SYRINX'S CAUSED BY OBSTRUCTION BELOW 4TH VENTRICLE



Communicating central canal dilatations are caused by obstructions of the CSF pathways **distal to 4th Ventricle**

Etiology:

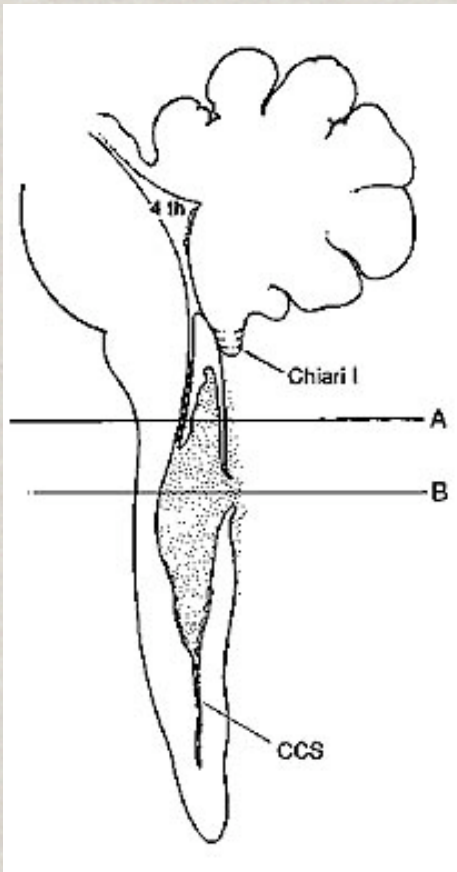
- ✿ Postmeningitic/Post hemorrhagic hydrocephalus
- ✿ Basilar/Medullary Arachnoiditis
- ✿ Chiari II Malformations
- ✿ Encephalocele
- ✿ Dandy-Walker Cysts

Natural Hx:

- ✿ Length defined by canal stenosis
- ✿ Congenital lesions may be contiguous (myelomenigocele)
- ✿ Rare to rupture/dissect paracentrally
- ✿ Most cases asymptomatic w/minor neuro findings



NON-COMMUNICATING SYRINX'S CAUSED BY OBSTRUCTION @ FORAMEN MAGNUM



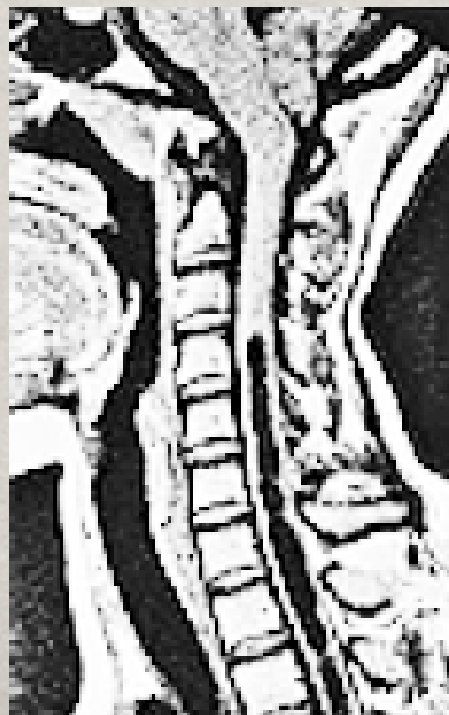
Non-Communicating central canal dilatations are caused by obstructions of the CSF pathways at or **below foramen magnum**.

Etiology:

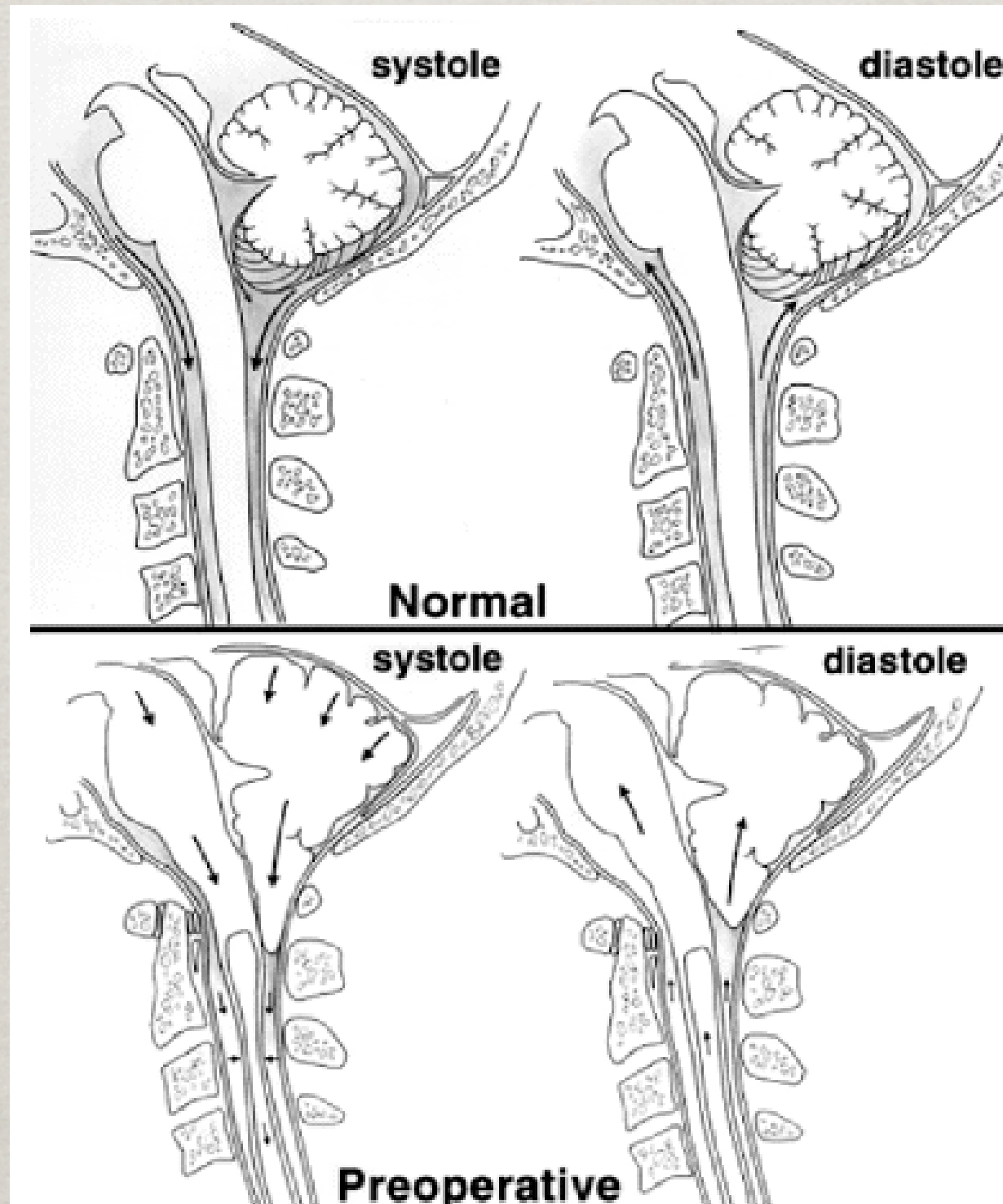
- ✿ Chiari I malformations/ Basilar Invagination
- ✿ Spinal Arachnoiditis
- ✿ Extramedullary compression (spondylosis, tumor, cysts)
- ✿ Tethered cord
- ✿ Acquired Tonsillar herniation

Natural Hx:

- ✿ Length defined by force of arterial pulse wave in subarachnoid space “cord diverticuli” via Virchow-Robin spaces
- ✿ Isolated cavities flanked by spinal canal stenosis
- ✿ Commonly rupture/dissect paracentrally longitudinally along white-matter tracts
- ✿ Symptomatic w/ progressive neuro findings



PROPOSED MECHANISM OF
NON-COMMUNICATING SYRINX 2° TO FORAMEN MAGNUM OBSTRUCTION
HEISS-OLDFIELD THEORY



ALTERNATE THEORIES

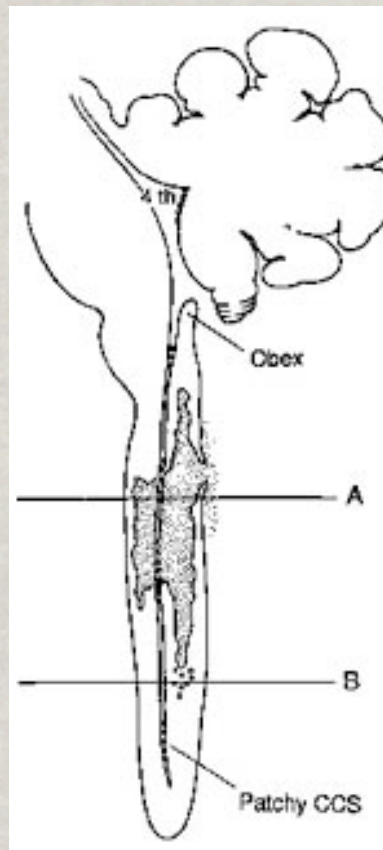
Hydrodynamic: Water-Hammer theory (aka Theory of Gardner).

- ✿ systolic pulsations transmitted from intracranial cavity down thru central canal
- ✿ Now disproven with MRI studies

Williams Theory:

- ✿ Valsalva maneuvers raise CSF pressure causing hydrodissection thru spinal cord tissue

NON-COMMUNICATING 1° PARENCHYMAL SYRINX'S CAUSED BY CORD INJURY



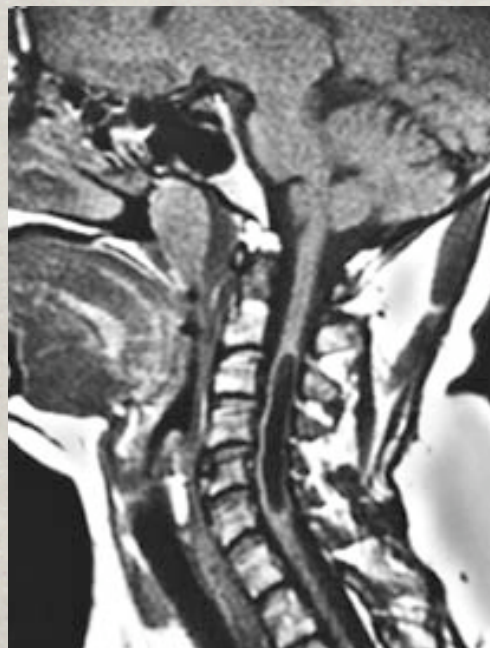
Tubular cavitations of the spinal cord that originate within the spinal cord parenchyma. No communication w/central canal or 4th Ventricle.

Etiology:

- ✿ Trauma
- ✿ Ischemia/Infarction
- ✿ Spontaneous intramedullary hemorrhage

Natural Hx:

- ✿ Length defined by focal arachnoiditis @ time of injury drives CSF into interstitial spaces (thru virchow-robin spaces -similar to Heiss-Oldfield theory)
- ✿ Typically arise in watershed areas of spinal cord, dorsal and lateral to the central canal.
- ✿ Commonly rupture/dissect paracentrally w/ longitudinal extension along white matter tracts.
- ✿ Symptomatic w/ progressive neuro findings



ATROPHIC CAVITATIONS ARE CAUSED BY SPINAL CORD DEGENERATION



Degenerative changes with cord atrophy leads to formation of microcysts, intramedullary clefts and localized dilatations of the spinal canal aka Syringomyelia ex vacuo.

Etiology:

- ✿ Spondylolysis
- ✿ Old Trauma

Natural Hx:

- ✿ Length defined by area of myelomalacia
- ✿ May or may not communicate w/central canal
- ✿ Can be symptomatic w/ progressive neuro findings

NEOPLASTIC CAVITATIONS



Syrinx-like cavities may form from cystic degeneration of intramedullary tumors. Cysts contain proteinaceous fluid NOT CSF.

Etiology:

- ✱ Astrocytomas
- ✱ Ependymomas
- ✱ Oligodendroglioma
- ✱ Spinal metastases

Natural Hx:

- ✱ Length defined by tumor volume and necrosis that starts centrally and extends rostral and caudal.
- ✱ Typically arise in watershed areas of spinal cord, dorsal and lateral to the central canal.
- ✱ Commonly rupture/dissect paracentrally thru to subarachnoid space.
- ✱ Symptomatic w/ progressive neuro findings



CLINICAL PRESENTATION

Symptoms

- ✿ Pain/Numbness
- ✿ Weakness/Fatigue
- ✿ Stiffness
- ✿ H/A
- ✿ Exacerbation w/valsalva
- ✿ Loss of temperature sensation

Signs

- ✿ loss of pain and temperature sensation in chest and arms
- ✿ Dissociated sensory loss
- ✿ motor limb weakness U/E>L/E
- ✿ Spasticity
- ✿ Ataxia
- ✿ Cord Syndromes

Syndrome	Motor	Sensory
Brown-Sequard	Ipsi paresis	Contra loss of pain and temp Ipsi loss of vibration and proprio Preserved tactile sensation
Anterior Spinal Cord	Bilateral paresis	Loss of pain and temp Preserved vibration and proprio
Posterior Spinal Cord	Preserved	Loss of 2pt, vibration and proprio Preserved pain, temp, and tactile
Central Cord	Variable segmental amyotrophy	Bilateral loss of pain and temp Preserved touch, vibration, and proprio

MANAGEMENT PRINCIPLES

- ✱ Severe chronic pain
- ✱ Progressive neurological deficit
- ✱ Medical vs. Surgical

SURGICAL GOALS

Prevent worsening neurological deficit!

Extramedullary decompression (Chiari's, Arachnoiditis)

- ✱ Occipital-C1 posterior decompression w/ duroplasty
- ✱ Laminectomy +/- duroplasty

Intramedullary decompression

- ✱ cyst drainage (Post-traumatic cysts)
- ✱ tumor debulking

Shunting

- ✱ VP Shunt (hydrocephalic cases)
- ✱ Syringo-pleural/peritoneal (post-traumatic cysts)

HURLBERT'S CLASSIFICATION

Determine whether Syringo- vs. Hydro- myelia (central vs. paracentral)

Syringomyelia 1° vs 2°

1° = Idiopathic dx of exclusion

2° = Etiology:

- ✻ Chiari I or II
- ✻ Post Traumatic
- ✻ Tumour
- ✻ Vascular Malformation
- ✻ Arachnoiditis

MANAGEMENT PRINCIPLES

Hx/PHx:

Be sure to ask for features of Chiari I/II and Myelomenigocele,
Tethered cord, trauma, tumour, infection

Imaging:

MR Head

MR C-T-L spine

Management:

Mechanism

Location

Expansion/Progression

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- ✻ Milhorat TH. *Classification of Syringomyelia*. Neurosurg Focus 8(3) Article 1 2000.
- ✻ Heiss JD et al. *Elucidating the Pathophysiology of Syringomyelia*. Neurosurg Focus 7(2) Article 4, 1999.
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- ✻ Rengachary SS and Ellenbogen RG. *Chapter 12 Chiari Malformations and Syringohydromyelia*. Elsevier 2005 p182-195.