Introduction to Neurosurgical Subspecialties:

Pediatric Neurosurgery

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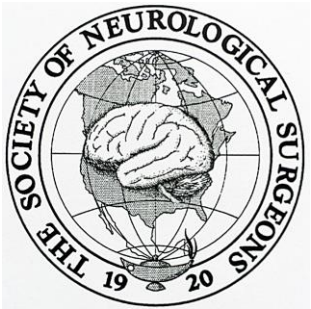


THE SOCIETY OF NEUROLOGICAL SURGEONS

Pediatric Neurosurgery

- Pediatric neurosurgeons treat children with:
  - Brain tumors
  - Spina bifida / spinal dysraphism
  - Spasticity
  - Brachial plexus injury
  - Hydrocephalus
  - Epilepsy
  - Spinal deformities / tumors
  - Brain and spine trauma
- Pediatric neurosurgery crosses the entire spectrum of neurosurgical subspecialties

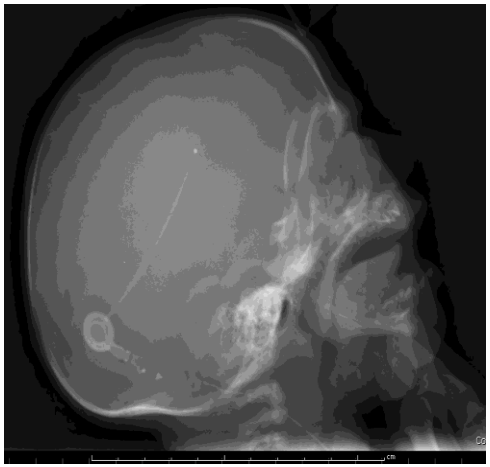
Pediatric Neurosurgery

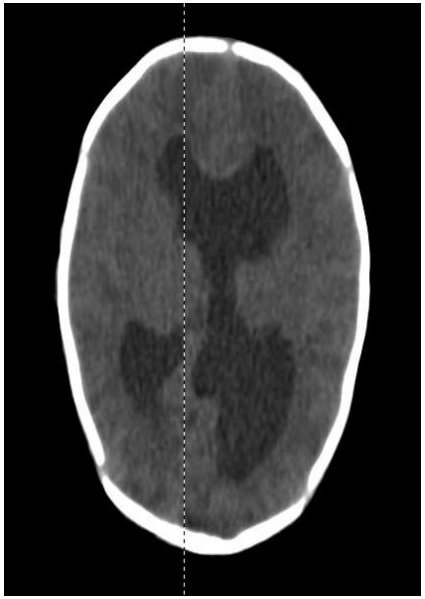
- Fellowship for pediatric neurosurgery is typically required

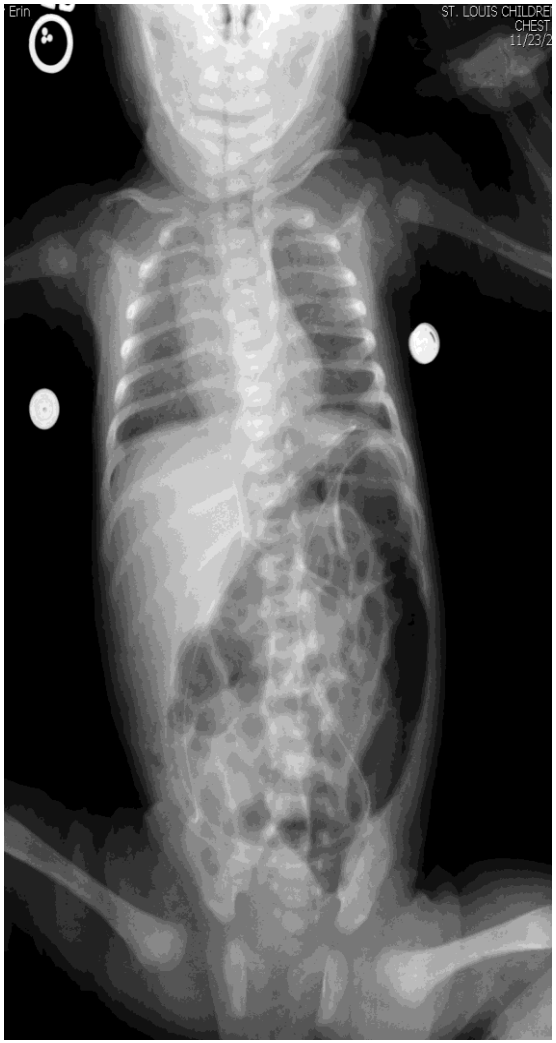
Hydrocephalus

- Causes:
  - Communicating
    - Idiopathic, post-hemorrhagic, post-infectious, congenital
  - Obstructive
    - Tumors, cysts, aqueductal stenosis, ventricular loculations

Hydrocephalus Treatment:
Ventriculoperitoneal Shunt

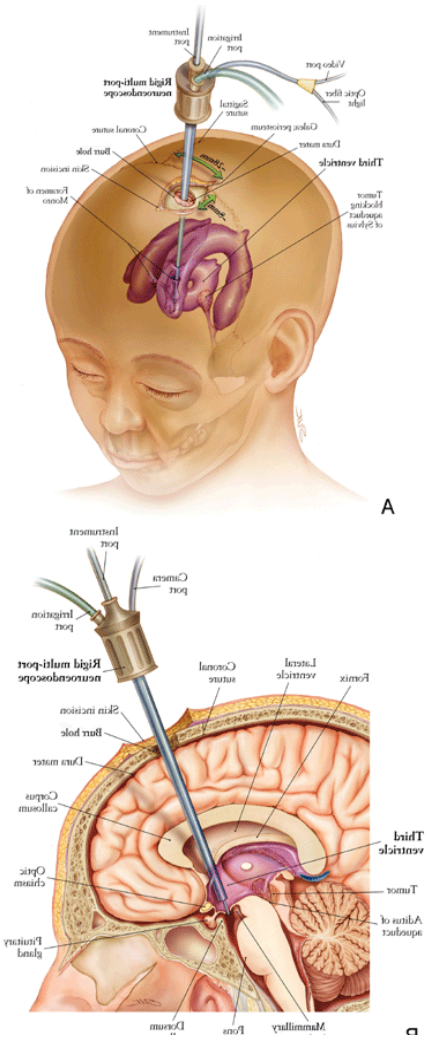


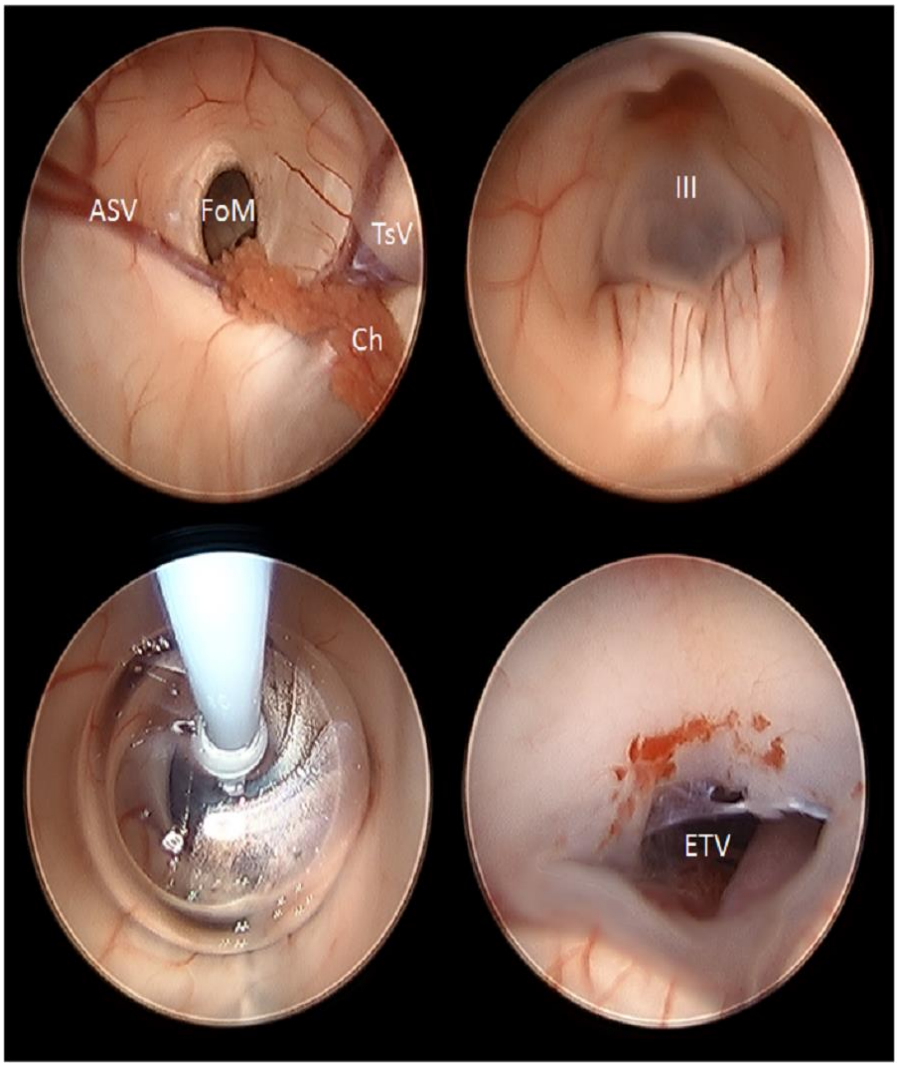




Hydrocephalus Treatment:

Endoscopic Third Ventriculostomy (ETV) ETV

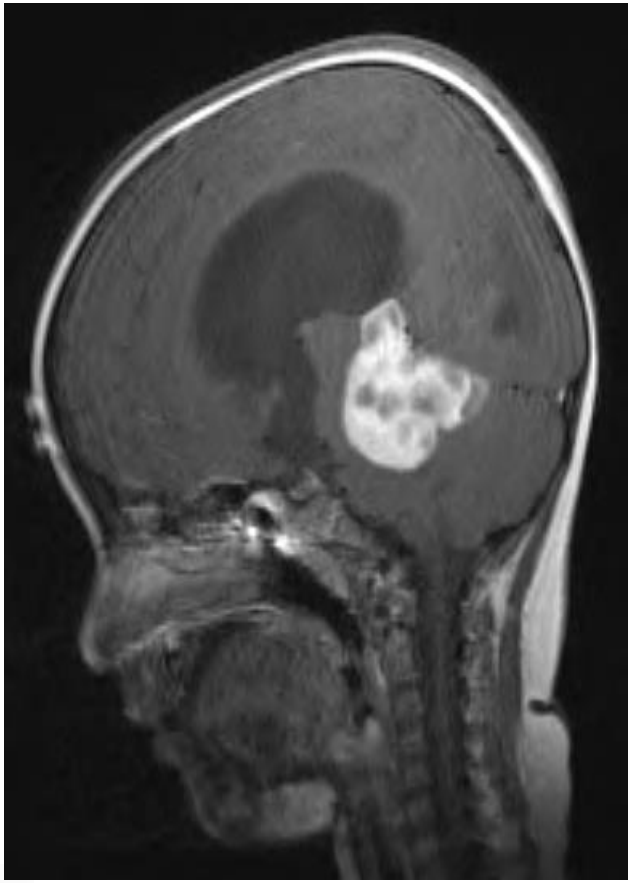


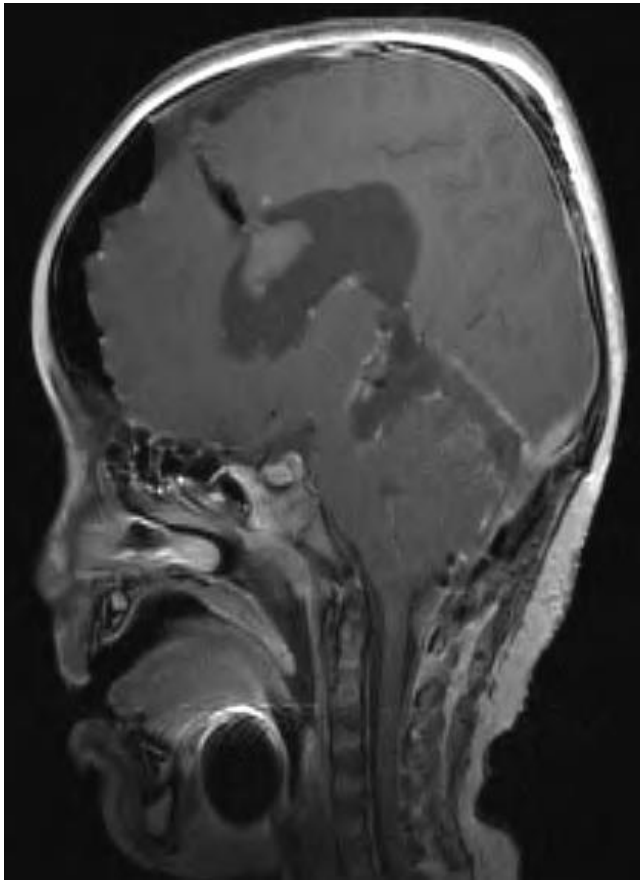


Brain tumor

- Infratentorial (2/3)
  - Medulloblastoma -- malignant
  - Juvenile pilocytic astrocytoma (JPA) -- benign
  - Ependymoma – benign or malignant
  - Brainstem tumors – benign or malignant
  - Atypical teratoid rhabdoid tumor (ATRT) -- malignant
- Supratentorial (1/3)
  - JPA
  - Ependymoma
  - Glioma/astrocytoma
  - Ganglioglioma, Dysembryoplastic NeuroEpithelial Tumor (DNET)
  - Craniopharyngioma
  - Many others

Brain Tumors--Astrocytoma





Pre-op

Post-op

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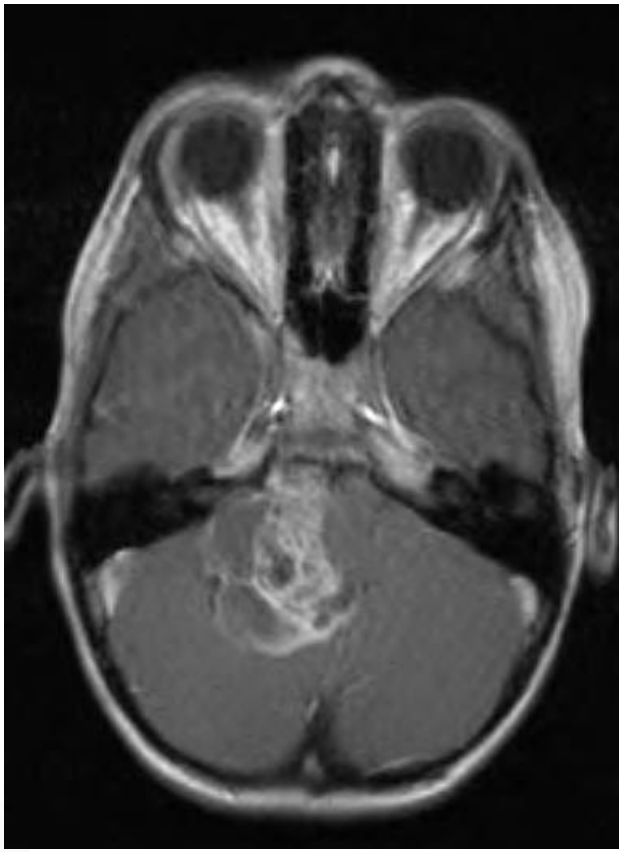
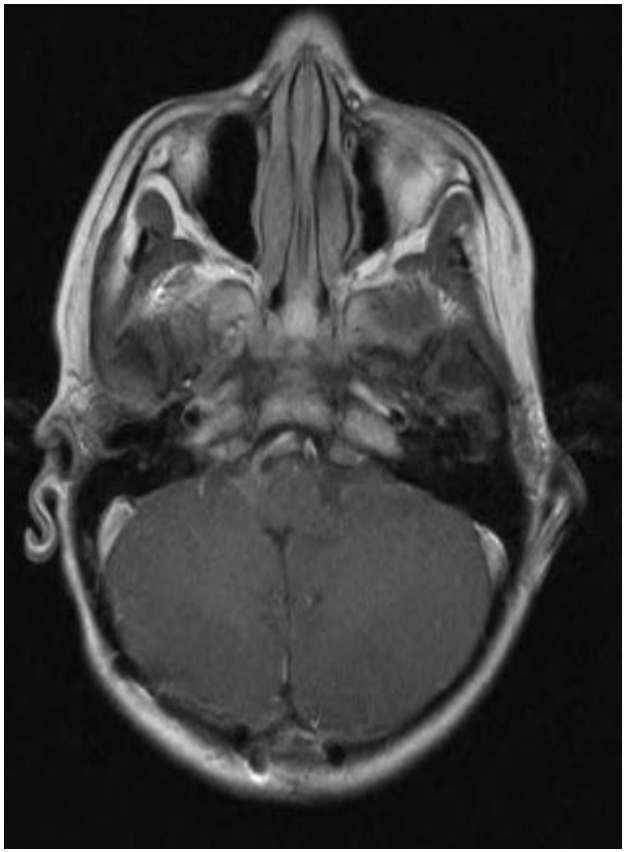
Brain Tumors--Ependymoma





Pre-op

Post-op

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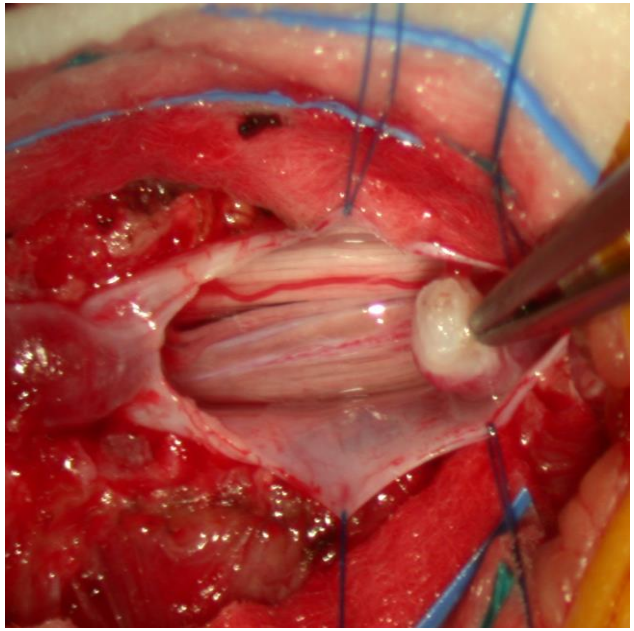
Spina bifida/spinal dysraphism

- Closed neural tube defects
  - Tethered spinal cord
    - fatty filum, dermal sinus tract, diastematomyelia, lipomyelomeningocele
- Open neural tube defects
  - Myelomeningocele and variants (myelocystocele)
  - Associated with hydrocephalus, type II Chiari malformation, syringomyelia, urologic and orthopedic disorders

Dermal sinus tract with tethered cord



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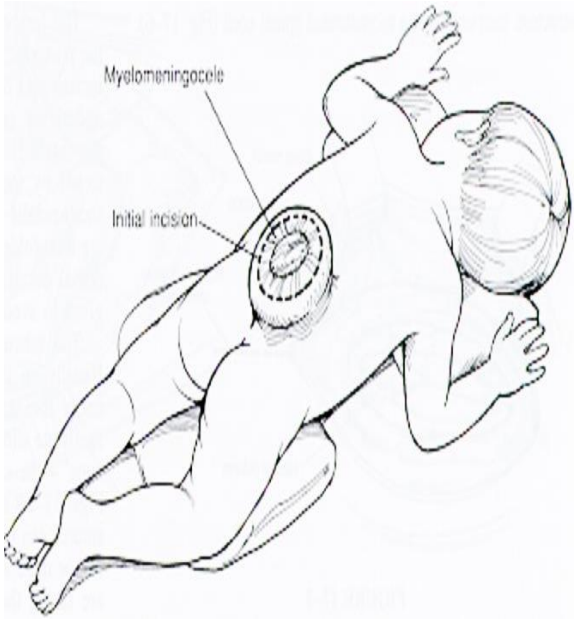
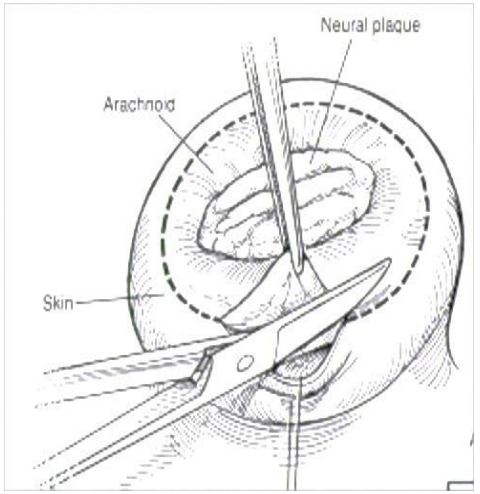
Myelomeningocele / NTD





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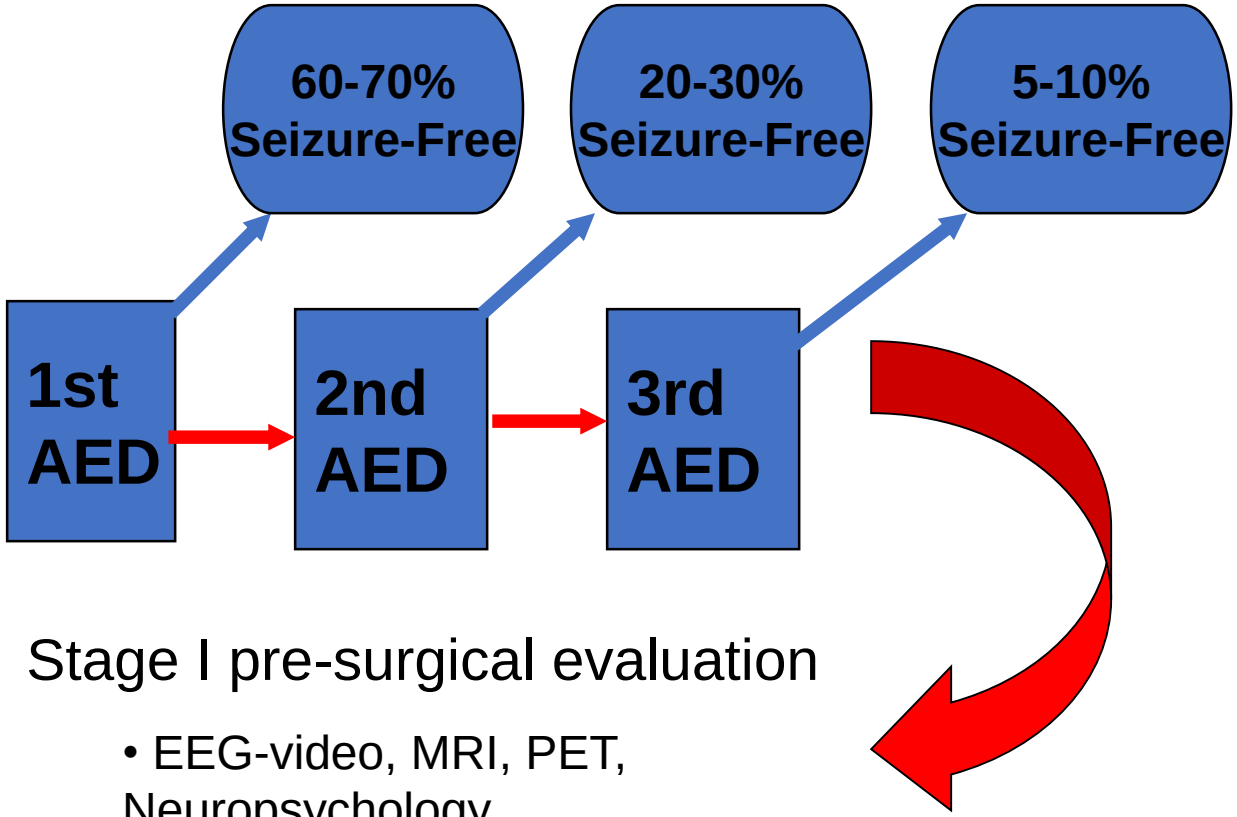
Epilepsy Surgery

- Epilepsy is predominantly a disease of the young
- Majority of patients have seizure onset in childhood
- Substrates include cortical dysplasia/neuronal migrational disorders, tuberous sclerosis, lesional/structural causes such as tumors, vascular lesions, trauma, stroke

Response to AEDs among children

(AED = anti-epileptic drug)

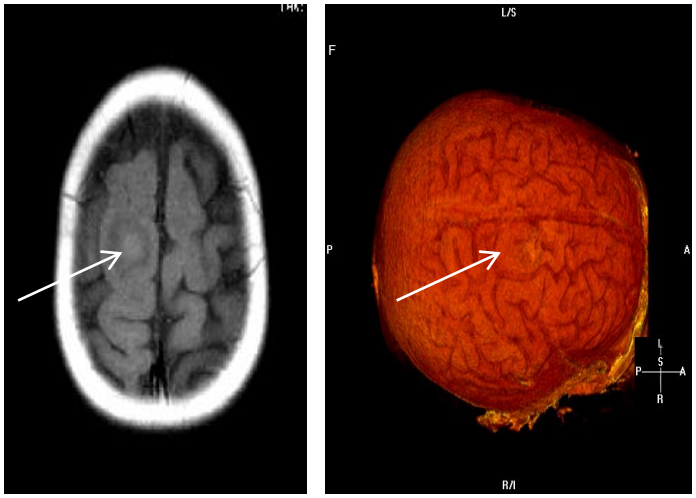


Stage I pre-surgical evaluation

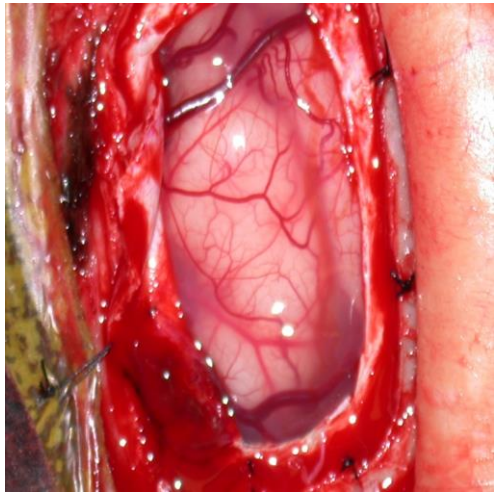
- EEG-video, MRI, PET, Neuropsychology
- Epilepsy Surgery Conference

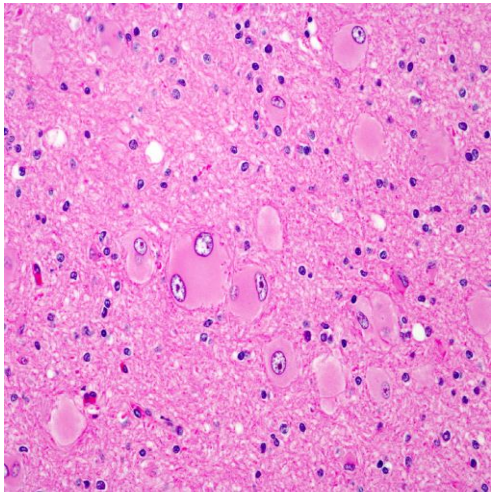
Lesionectomy

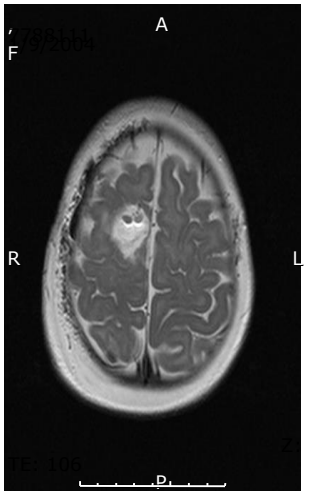
6 mo old with partial seizures



Focal Cortical Dysplasia







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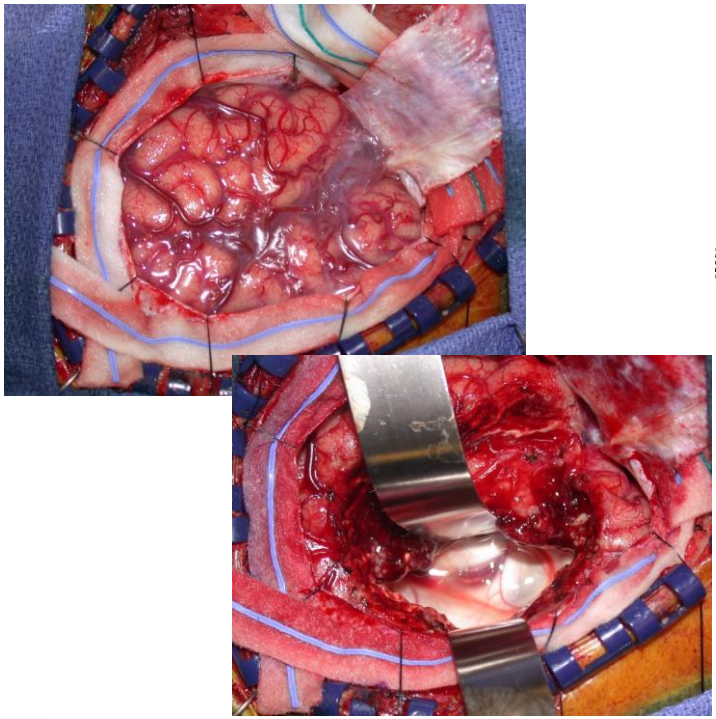
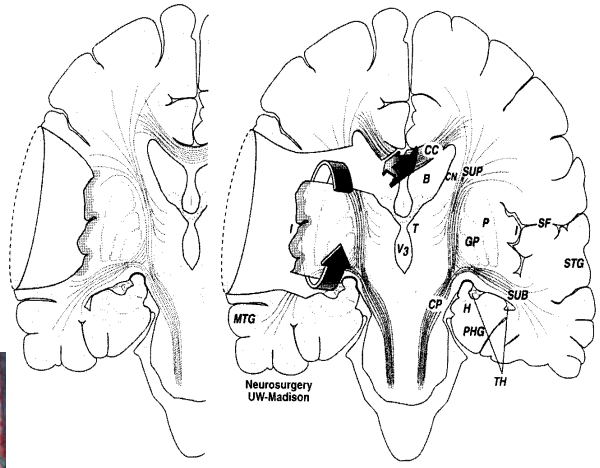
Peri-insular Hemispherotomy

7 year old with intractable seizures





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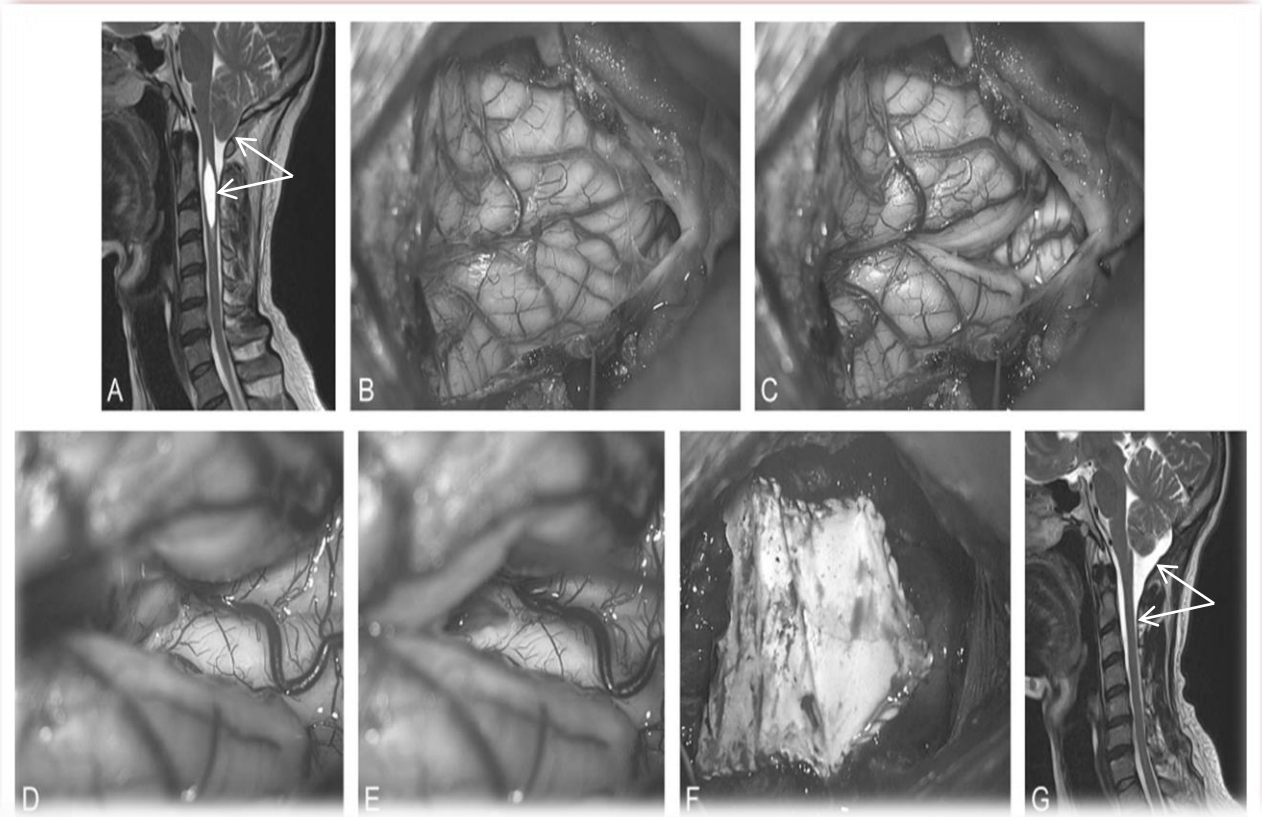
Chiari malformation

- Type I is most common
  - Herniation of hindbrain (cerebellar tonsils) into upper cervical canal
  - Usually asymptomatic
  - Associated with suboccipital post-tussive headache
  - Syringomyelia and scoliosis
  - Posterior decompression +/- duraplasty are main surgical options
- Type II associated with myelomeningocele only

Suboccipital craniectomy / duroplasty for Type 1 Chiari with syrinx



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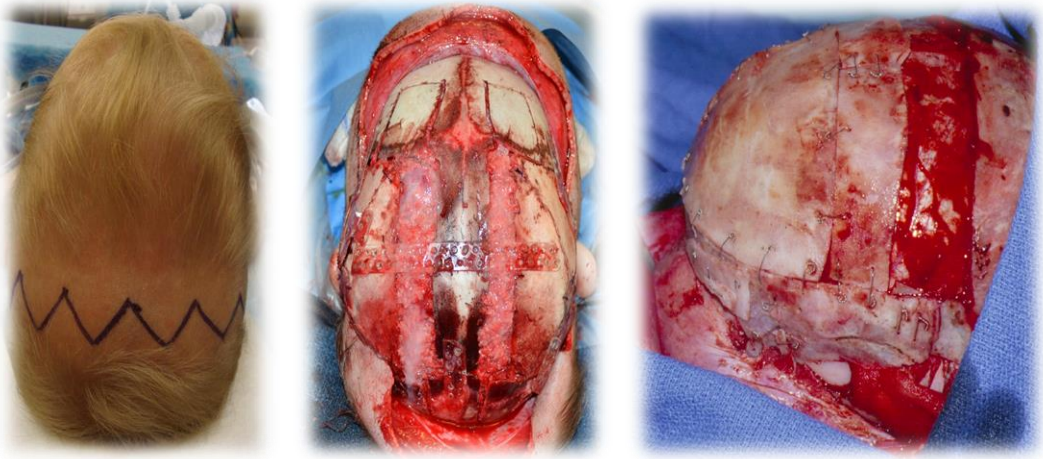
Craniosynostosis

- Affects 1:2500 children
- Premature fusion of one or more cranial vault sutures
- Sagittal most common, followed by metopic/coronal and then lamboid
- Not to be confused with benign positional plagiocephaly
- Surgical options include traditional open vault and facial reconstructions and minimally invasive endoscopic strip craniectomies with custom molding helmet therapy for children < 6 months of age

Craniosynostosis

Open Surgery



Endoscopic Surgery

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Conclusions

- Pediatric neurosurgeons do procedures that span the spectrum of neurosurgical operations
- Even more than adult neurosurgery, pediatric neurosurgeons have ”families as patients”