Introduction to Neurosurgical Subspecialties:

Pediatric Neurosurgery

Brian L. Hoh, MD\textsuperscript{1} and Gregory J. Zipfel, MD\textsuperscript{2}

\textsuperscript{1}University of Florida, \textsuperscript{2}Washington University
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
Myelomeningocele / NTD
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)

1st AED: 60-70% Seizure-Free
2nd AED: 20-30% Seizure-Free
3rd AED: 5-10% Seizure-Free

Stage I pre-surgical evaluation
- EEG-video, MRI, PET, Neuropsychology
- Epilepsy Surgery Conference
Lesionectomy
6 mo old with partial seizures

Focal Cortical Dysplasia
Peri-insular Hemispherotomy
7 year old with intractable seizures
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
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"