Pediatric Epilepsy Surgery

2nd Peds Epilepsy Surgery Reunion
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Introduction

• Announcements
• Volume and direction of program
• Types of Surgery
• Examples

Announcements

• Addition of Jorge Gonzalez-Martinez, MD PhD:
  – Residency and fellowships at CC
  – Primary specialty is epilepsy surgery
  – Secondary interests in functional and pediatric neurosurgery
• Philanthropic Support for program
  – Richard and Ellen Shusterman Chair in Epilepsy Surgery
  – Provide annual support for outcome studies in epilepsy surgery (adult and pediatric)

Pediatric Epilepsy Surgery Summary

Pediatric Epilepsy Surgery Case Mix, Jan - June 2006 n=44

Types of Surgery

• Resective (aka curative)
  – Traditional work up of the patient with focal epilepsy relating to underlying lesion
  – Hemispheric lesions with medically intractable epilepsy
• Palliative
  – Vagal nerve stimulation
  – Corpus callosotomy
  – Resective in some cases
Challenges in Pediatric Epilepsy

- EEG and localization of epileptic cortex
- Determination of timing of surgery related to cognitive development
- Size of patient at surgery
- Long term outcomes and follow-up
- Functional outcomes and assistance with development of the post surgery child

Clinical Case: MP

- 9 month old left handed male.
- Seizure onset day 1 of life.
- Right arm clonic seizures and asymmetric tonic stiffening R>L all extremities.
- Seizures occur 10-30 per day.
- Exam shows R hemiparesis with fisted R hand and developmental delay.

MP

A. Pre-op fast T-2 weighted sagittal MRI
B. Pre-op PET scan demonstrating hypometabolism L central region.
C. Intra-operative stereotaxis

MP

• Procedure: L frontoparietal central resection using stereotactic guidance and electrocorticography.
• EMG motor stimulation in dysplastic area provoked finger flexion.
• Patient remains seizure free with improved developmental progress since OR.

MP: Challenges

• Cortical dysplasia as substrate:
  — Unclear “margins”
  — Necessity to resect all of lesion to achieve seizure freedom
• Functional tissue in left brain:
  — Weakness of arm and hand
  — Language develops in right brain
• Plasticity allows some return of function but can it be better?
Patient JR

- 14 year old right handed male.
- Seizure onset age 10 months.
- Exam: subtle L arm weakness, diminished fine motor control.
- Failed 9 anticonvulsants.
- MRI: R posterior frontal cortical malformation.
- EEG: bifrontal sharp waves, non-localizable seizure onset.

Patient JR

- Procedure: Implantation of R hemispheric invasive electrodes followed by R frontal resection seven days later. Resection guided by plate electrodes, intra-operative ECoG & cortical stimulation.
- Outcome: only rare nocturnal seizures since OR. Transient L hand weakness.

Clinical Case: JR

*The area removed was abnormal on imaging and electrical studies. Subdural electrode stimulation identified it as primary hand motor area. The tissue was removed without neurologic deficit.

Challenges: JR

- MRI apparent lesion and relation to functional hand motor brain: How to preserve function?
- MRI apparent lesion and larger EEG abnormality: How to reconcile?
- When is end of plasticity and how to predict?
Summary

- Surgical technology is improving along with imaging and computing power.
- Understanding the natural history of epilepsy in the pediatric population has led to earlier surgery for the epilepsy patient.
- Much work needs to be done to better understand plasticity, functional and cognitive outcomes after surgery, and the appropriate timing of surgery.