Concepts in Epilepsy Surgery

Peter Konrad, MD, PhD
Director of Functional Neurosurgery
Vanderbilt University
Outline

► Pre-surgical Issues

► Functional Anatomy
  ▪ Standard Temporal Lobectomy
  ▪ Selective Amygdalo-hippocampectomy
  ▪ Lesionectomy / Corticectomy
  ▪ Multiple Sub-pial Transection
  ▪ Hemispherectomy

► Post-surgical Issues
Pre-surgical Issues

► Anesthetic risk
  - Adult: CHF, CAD, COPD
  - Pediatric: Size of resection, congenital anomalies

► Non-invasive diagnostics
  - Seizure localization
  - Eloquent cortex localization
  - Language memory dominance
Pre-surgical Issues (cont’d)

► Invasive diagnostics
  ▪ Electrodes
  ▪ WADA testing

► Goals:
  ▪ Resection vs.
  ▪ Disconnection vs.
  ▪ Modulation
Functional Anatomy: Pathways

- Short association fibers
- Long association fibers
- Commissural fibers
- Head of caudate nucleus
- Thalamus
- Subthalamic nucleus
- Corticopontine, corticobulbar, and corticospinal fibers
- Substantia nigra

- Sector of gyral segments
- Claustrum
- Putamen
- Globus pallidus
- Anterior commissure
Functional Anatomy: Pathways

- Interhemispheric paths
  - Commissures
- Intrahemispheric paths
  - Fasciculi
  - Association fibers
- Tracts
Functional Anatomy: Pathways

- Interhemispheric paths
  - Commissures
- Intrahemispheric paths
  - Fasciculi
  - Association fibers
- Tracts
CURATIVE / RESECTIVE PROCEDURES
Goals of Surgery

► Attempt cure by taking out the seizure focus
► Attempt to interrupt the spread of seizures

THE ROLE OF DIAGNOSTIC PROCEDURES:

Likelihood of success in reducing seizures

Risk of removing a part of the brain? (use WADA testing and functional assessments)
Functional Anatomy: Standard Temporal Lobectomy
Functional Anatomy: Standard Temporal Lobectomy

- Lateral cortex
- Mesial cortex
- Temporal horn
- Myers loop
- Vein of Labbe
- Amygdala
- Hippocampus
Functional Anatomy: Standard Temporal Lobectomy

- Anterior choroidal artery
- Optic nerve
- Oculomotor nerve
- Cerebral peduncle
- Middle cerebral artery
Functional Anatomy: Selective Amydalo-hippocampectomy

► Hippocampus:
  ▪ Dentate
  ▪ Alveus
  ▪ Fimbria
  ▪ Sommers cortex

► Parahippocampal gyrus

► Middle temporal gyrus
Functional Anatomy: Selective Amydalo-hippocampectomy

Approach corridor
Functional Anatomy: Selective Amydalo-hippocampectomy
Functional Anatomy: Lesionectomy / Corticectomy

- Lesion
- Peri-lesional tissue
- Approach corridor
DISRUPTIVE PROCEDURES
Functional Anatomy: Multiple Sub-pial Transection

- Cortex
- Projection fibers
- Association fibers
- Seizure focus
Functional Anatomy: Multiple Sub-pial Transection

- Cortex
- Projection fibers
- Association fibers
- Seizure focus
- Pial entry point
- Transection path
Functional Anatomy: Multiple Sub-pial Transection

- Cortex
- Projection fibers
- Association fibers
- Seizure focus
- Pial entry point
- Transection path

Functional Anatomy: Hemispherectomy

- Disconnection
- Temporal resection
- Polar disconnection
- Central cortical mantle resection
- Preservation of major arterial and venous channels
Functional Anatomy: Hemispherectomy

- Disconnection
- Temporal resection
- Polar disconnection
- Central cortical mantle resection
- Preservation of major arterial and venous channels (sub-pial)
Functional Anatomy: Hemispherectomy

- Callosotomy
- Sylvian fissure (superior)
- Lateral ventricle
- Body of caudate
- Insular cortex
Functional Anatomy: Hemispherectomy

- Callosotomy
- Sylvian fissure (superior)
- Lateral ventricle
- Body of caudate
- Insular cortex
Post-Surgical Issues

- Anesthesia wake-up
- Critical care observation
- Medications
- Mobilization
- Discharge Instructions
Post-Surgical Issues

► Engle Classification (2yr f/u):
  - I: No seizures or auras
  - II: Rare disabling seizures, < 3/yr
  - III: Greater than 80% reduction in frequency
  - IV: <80% reduction in seizure frequency

► Quality of life issues
Why Choose Surgery Over Meds?

Temporal Lobe Epilepsy:
- Surgery has 60-70% chance for a great outcome
- Risk for surgery is rare; seizures won't get worse
- Continued long term medications use has risk

Seizure control also includes better quality of life with reduced seizures
- What impact do meds have on thinking, pregnancy, fall risk, careers?