Seizure onset: both arms and legs extended, scalp EEG: Cz onset
Implanted electrodes:
- 4 x 8 centimeter electrode pad over the right hemisphere,
- 2 interhemispheric electrode strips
Implanted electrodes: 
- 4 x 8 centimeter electrode pad over the right hemisphere,
- 2 interhemispheric electrode strips seen on CT

Open circles: midline electrodes
Filled circles: surface electrodes
Extrapolated plain of lesion at midline
Electrocorticogram (ECOG) : epileptic spikes at P31, P32
Electrocorticogram (ECOG) : spike and wave discharge at P31, P32 resembles the epileptogenic discharge at Cz on the scalp
Electrocorticogram (ECOG) : seizure
How to remove the epileptic focus without hurting the patient

• Identify eloquent cortex and don’t remove it.
  – SSEP to locate sensory cortex
  – Electrical stimulation of cortex to locate sensory, motor and language cortex
Median nerve SSEP to locate sensory cortex: Phase reversal between P8 and P16 suggests Rolandic fissure is between them.
Left Posterior Tibial Nerve SSEP: midline electrodes LP1, RP1
Cortical Stimulation: to identify sensory, motor or language areas

Cortical stimulation at P16 produced left hand flexion
Cortical Stimulation: may produce a brief afterdischarge
CORTICAL STIMULATION
P6-P8 Left thumb tingling, twitch
P16-P1 Left hand flexion
P23-P1 head turn left
P24-P1 Left hand clonic flexion
P31-P1 head turn left
P32-P1 left hand flexion
P31-P32 all limbs extended (like a seizure)
RP1-P1 left leg extension
RP2-P1 all limbs extended
RP1-RP2 all limbs extended
RP3-RP4 head turn left
LP1-LP2 Right foot inversion

Open circles: midline electrodes
Filled circles: surface electrodes

EEG
- Seizure onset
- Seizure onset
- Interictal discharge P16, P31, P32

SSEP
- Hand
- Foot
EEG, ECOG, SSEP and cortical stimulation along with neuroimaging guided surgical resection of the supplementary motor cortex
Developing technologies:
- Automatic spike & seizure detection
- Artifact reduction
- Trending
AUTOMATIC SPIKE DETECTION

Persyst vs Xltek
AUTOMATIC SPIKE DETECTION
hemispheric lateralization
AUTOMATIC SPIKE DETECTION

Electrode localization
AUTOMATIC SPIKE DETECTION

spike review
AUTOMATIC SPIKE DETECTION

some misses and false detections by different detectors
AUTOMATIC SEIZURE DETECTION

• Background trends
• Artifact reduction
• Seizure detection
Right front-temporal rhythmic slowing seen in spectrogram
Sz 1 identified by Persyst and Xltek
Note effect of Persyst artifact removal
Sz 2 identified by Persyst and Xltek
Note effect of Persyst artifact removal
Clinical Sz 3 Not identified by Persyst and Xltek
Note effect of Persyst artifact removal
Clinical Sz 3 Not identified by Persyst and Xltek

Note effect of Persyst artifact removal
No Sz: False detection by Xltek
PT 7 TONIC SEIZURE#2

generalized desync - no detection by Xltek
• Misses are concentrated in
  – *Tonic seizures*
  – *Brief seizures*
  – *EEG desynchronization*
  – ? frontal seizures
  – ? high level of interictal epileptiform activity
Thank You
• Appendix
  – Common artifacts
  – Seizures
Common Artifacts

• Electrocardiogram (EKG), pulse
• Blink and other eye movements
• Muscle
• Movement
• 60 Hz
Eye Blink
Eye Movement; rapid eye movement (REM) sleep
Eye blinks, chewing, muscle
Artifacts: EKG at T9, muscle
PT 6- ABSENCE SEIZURE – easily detected in the EEG - good chance of being elicited in a routine EEG
Epileptic seizure
Epileptic seizure