

EVOKED POTENTIALS OVERVIEW

MSET Spring Meeting:
Alpha Neuroscience Institute
May 5, 2012

EVOKED POTENTIALS Assessment

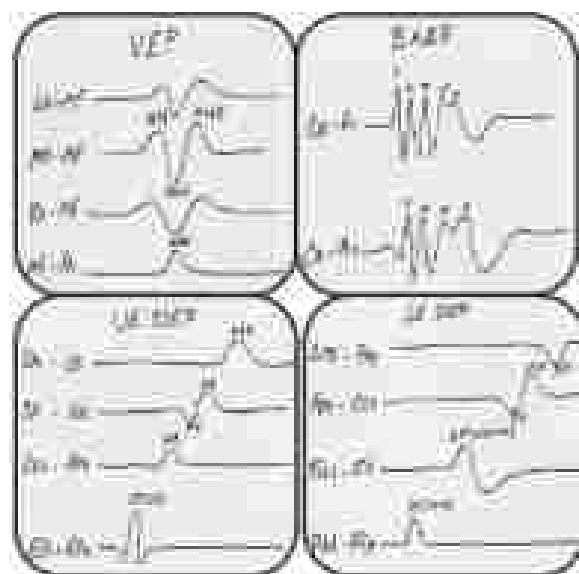
- Nervous system response to sensory stimulus
- Sensory Assessment
 - Peripheral apparatus
 - Central nervous system
- Afferent pathway

Modalities

- Visual Evoked Potential (VEP)
- Brainstem Auditory Evoked Potential (BAEP)
- Somatosensory Evoked Potential (SSEP)
 - Upper extremity
 - Lower extremity

CONCEPT

- STIMULATION
 - Peripheral Nerves
 - VEP
 - Retina of Eye
 - BAEP
 - Auditory Nerve of Ear
 - UE SSEP
 - Median or Ulnar Nerve of Arm
 - LE SSEP
 - Posterior Tibial or Common Peroneal Nerve of Leg



Evoked Potentials Characterized By

- Latency
- Amplitude
- Interspike
- Polarity
- Morphology

Evoked Potentials

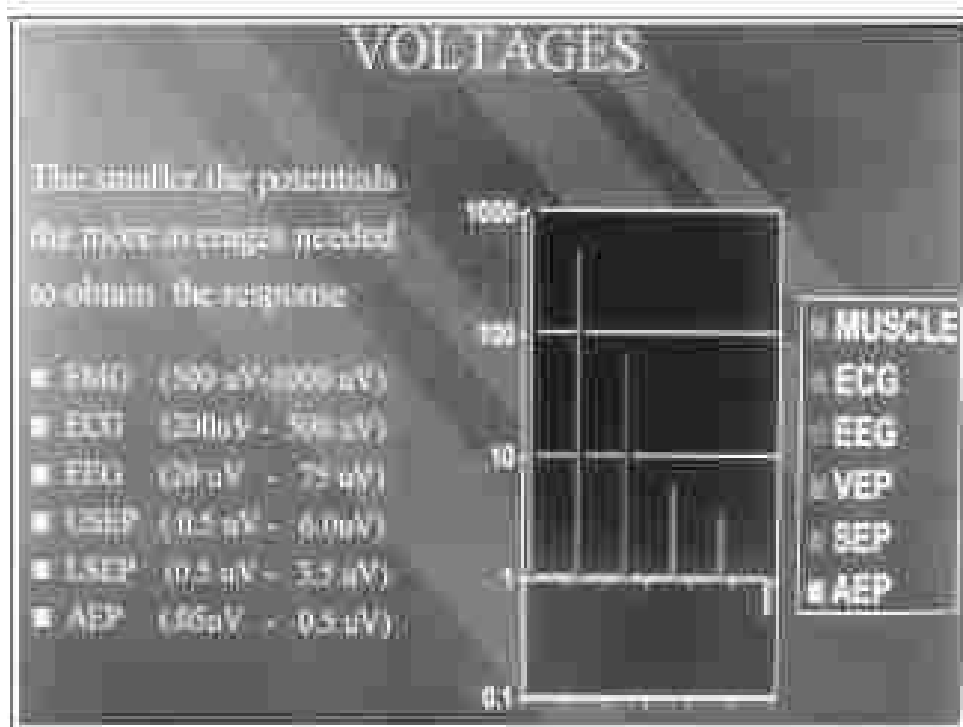
- Nervous system activity time-locked to a stimulus
- Multiple responses averaged to extract the signal from noise

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Noise

- EEG
- EMG
- ECG
- EKG
- Extraneous

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Near Field

- Recording Electrode close to Generator Site
- Localized Scalp Distribution
- $\sim 10 \mu$ v

Far Field

- Recording Electrode at a distance from Generator Site
- Wide-Scalp Distribution
- $\sim 1 \mu$ v

Stimulus Types

- VEP Alternating Checkerboard
TV Pattern
- BAEP Earphone Generated
Broadband Clicks
- SEP Electrical Pulsations

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Stimulus Characteristics

- Intensity Strength of Stimulus
- Duration Length of Stimulus
- Rate Number of times a
Stimulus is
administered
in a
second
- Repetitions
(Sweeps)
resolve Number of stimuli
presented to
adequately
waveforms

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Averaging

- Extracts Responses Time-Locked to Stimulus (Signal) from on-going Background Activity (Noise)
- Enhances Signal by reducing Noise

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Averaging

- Repeated Presentation of Sensory Stimuli
- Response Recorded w/in Analysis Time
- Converts Continuous Voltage Fluctuations (Analog Signal) into a Sequence of Numbers (Digital Signal)
- Individual Responses Added
- Sum of Responses Divided by Total Number of Responses

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Number of Sweeps

- VEP 50 – 200
- BAEP 1,000 – 4,000
- SEP 500 - 2000

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Trial

- Total Number of Sweeps Needed to Produce a Replicable EP
- Completed Trial = No Change in:
 - Latency
 - Amplitude
 - Morphology

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Replication

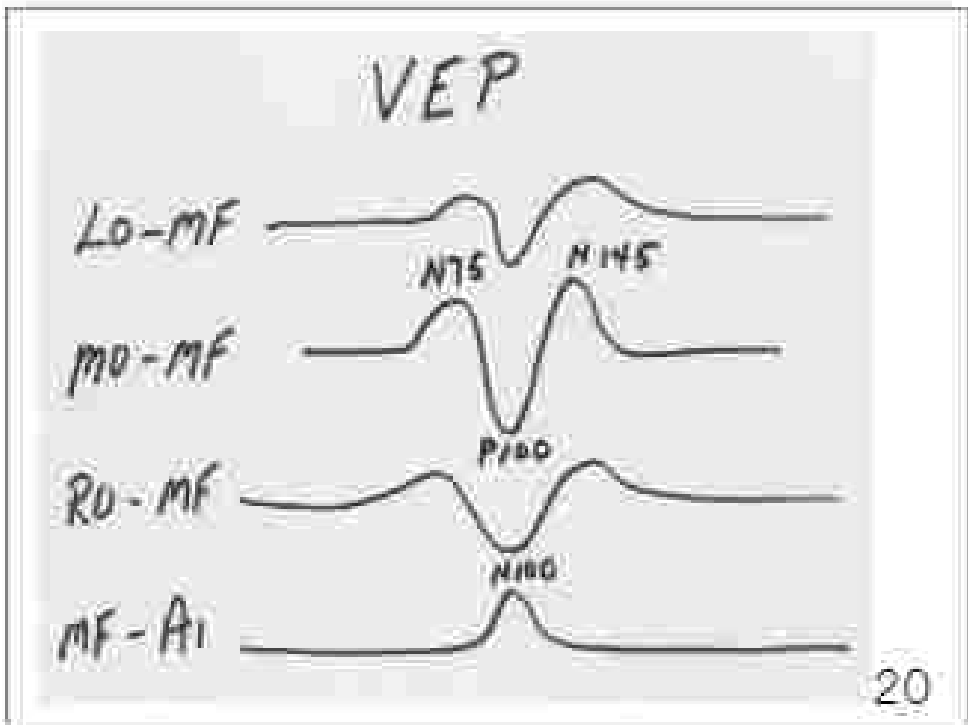
- Separate Superimposed Trials Match
 - Latency
 - Within 1% of Analysis Time
 - Amplitude
 - Within 18% of Each Other

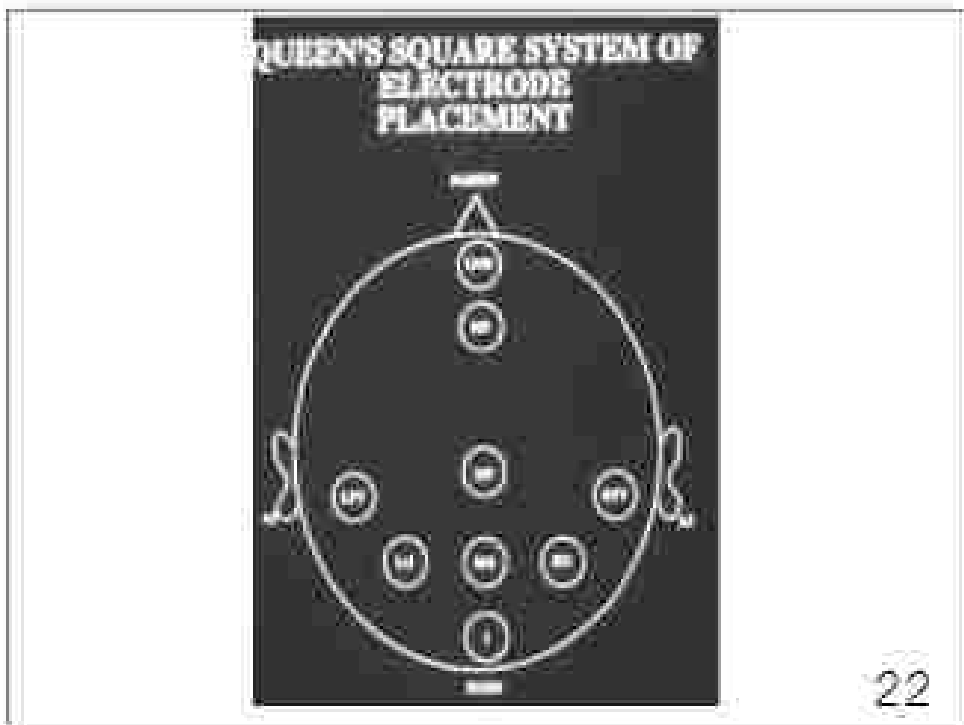
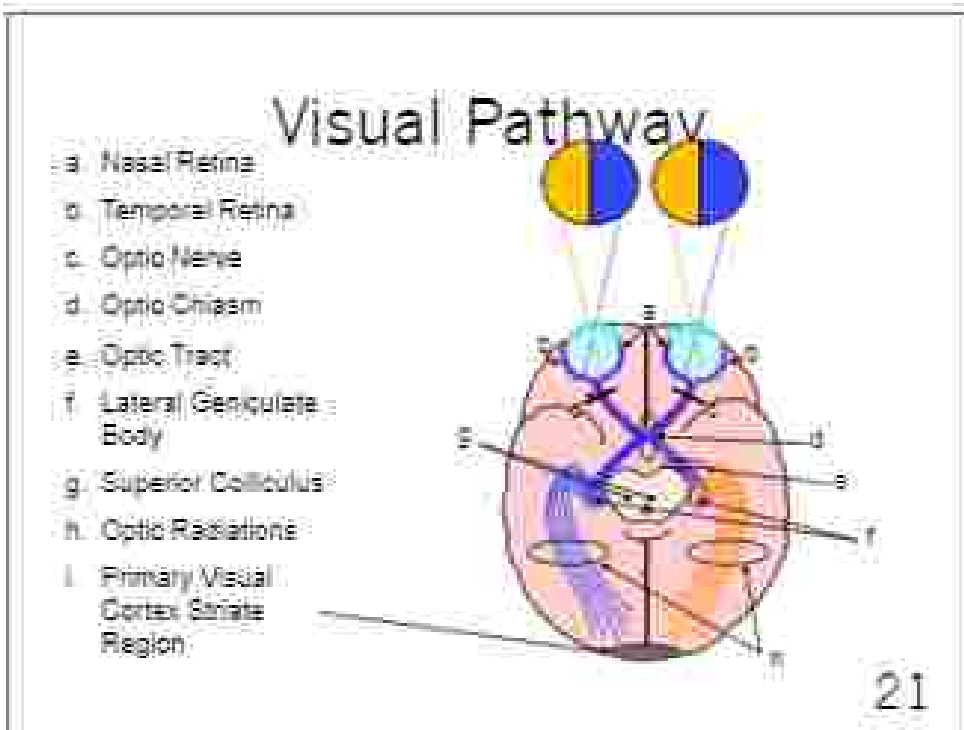
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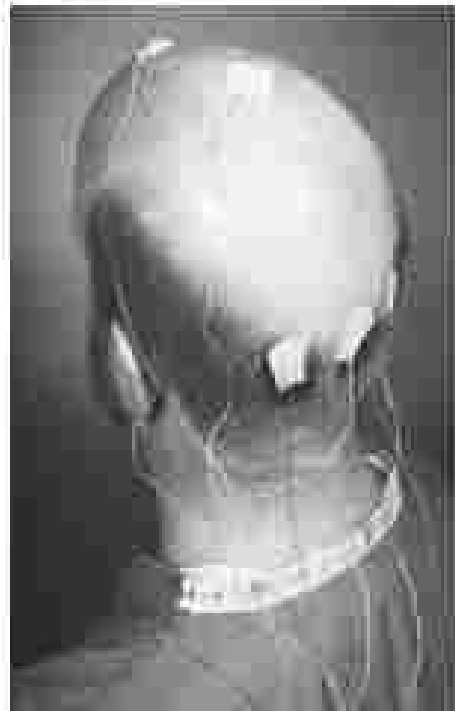
Assessment

- Latency
- Amplitude

Visual Evoked Potential VEP





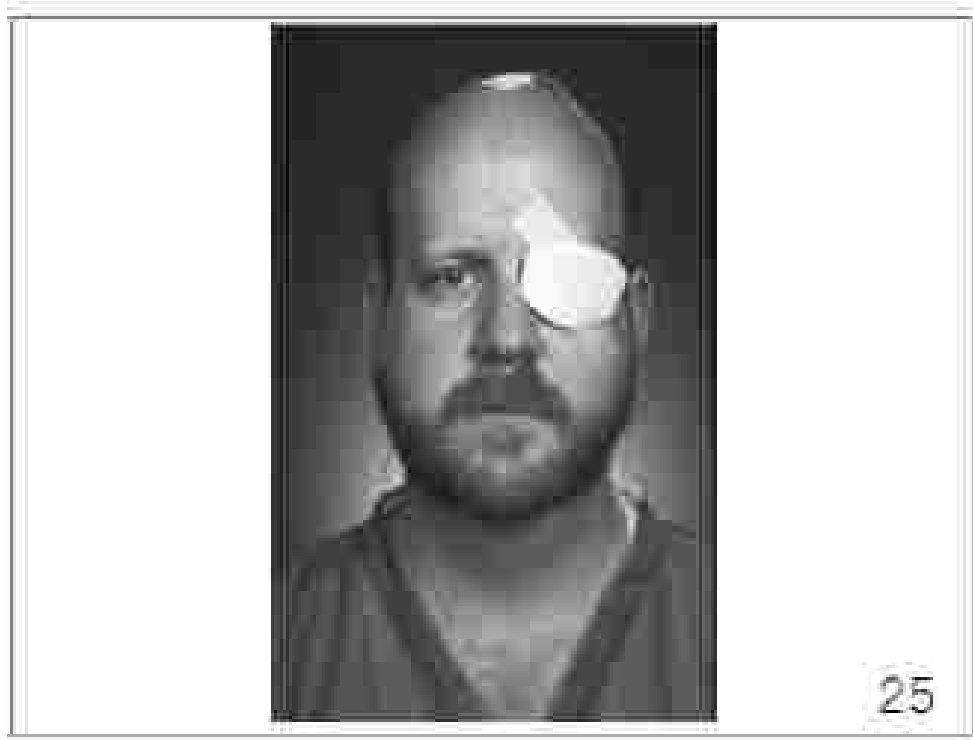


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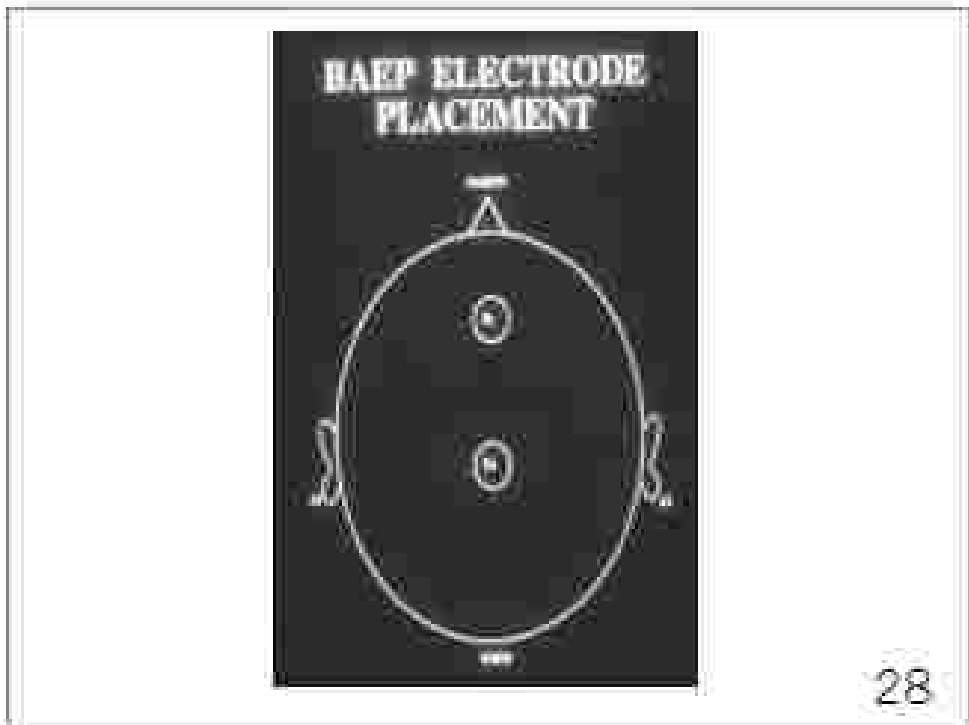
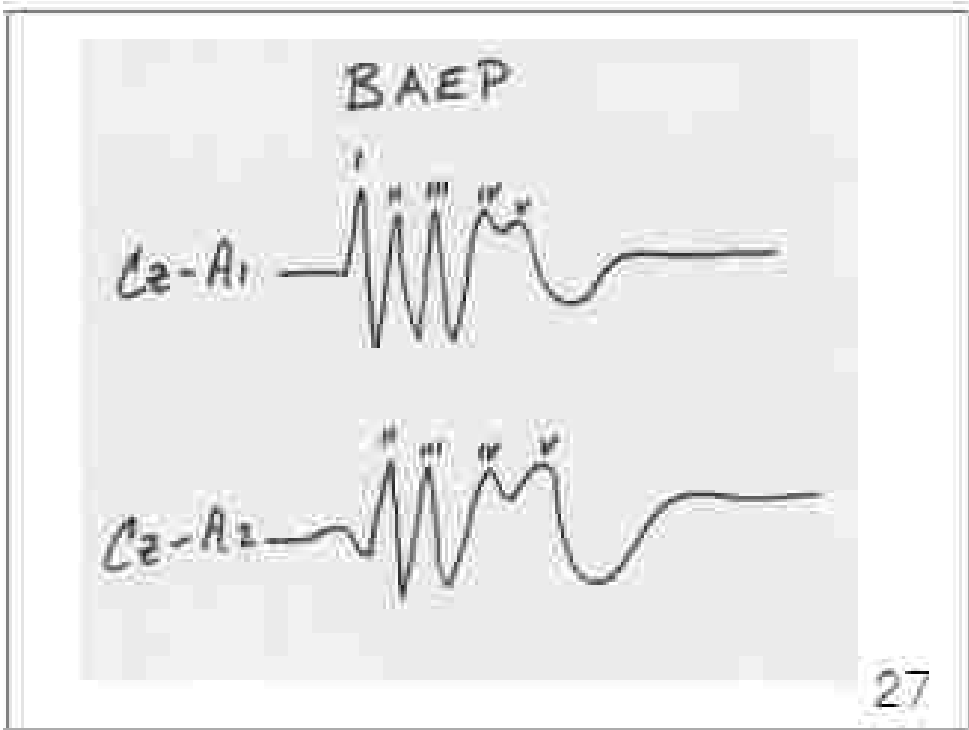
Visual Angle

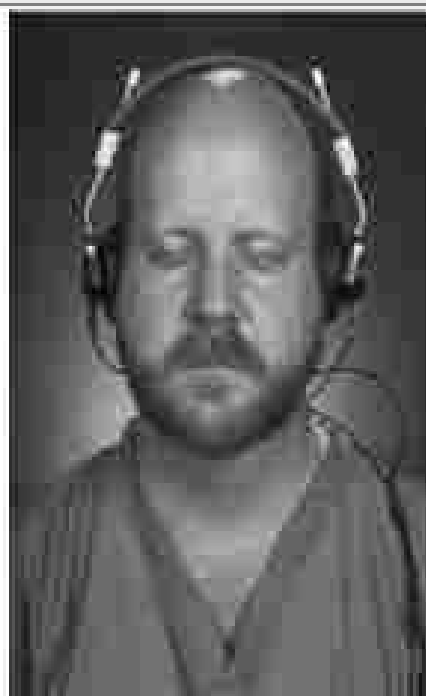
- Size of image of one light or dark square at retina.
- Angle between line of sight of the extremities of an object.

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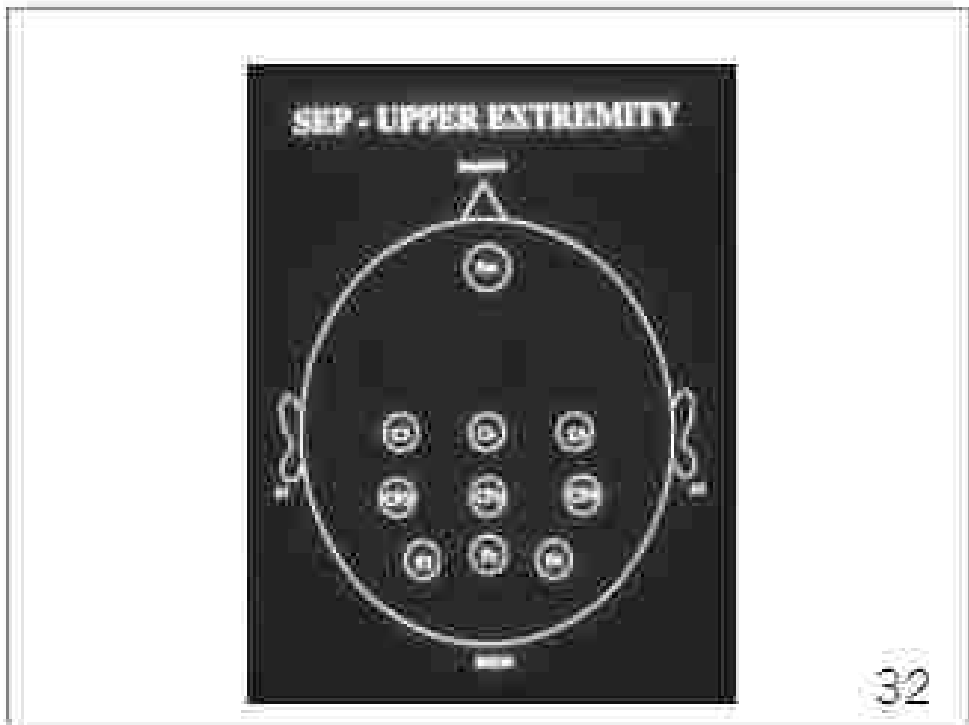
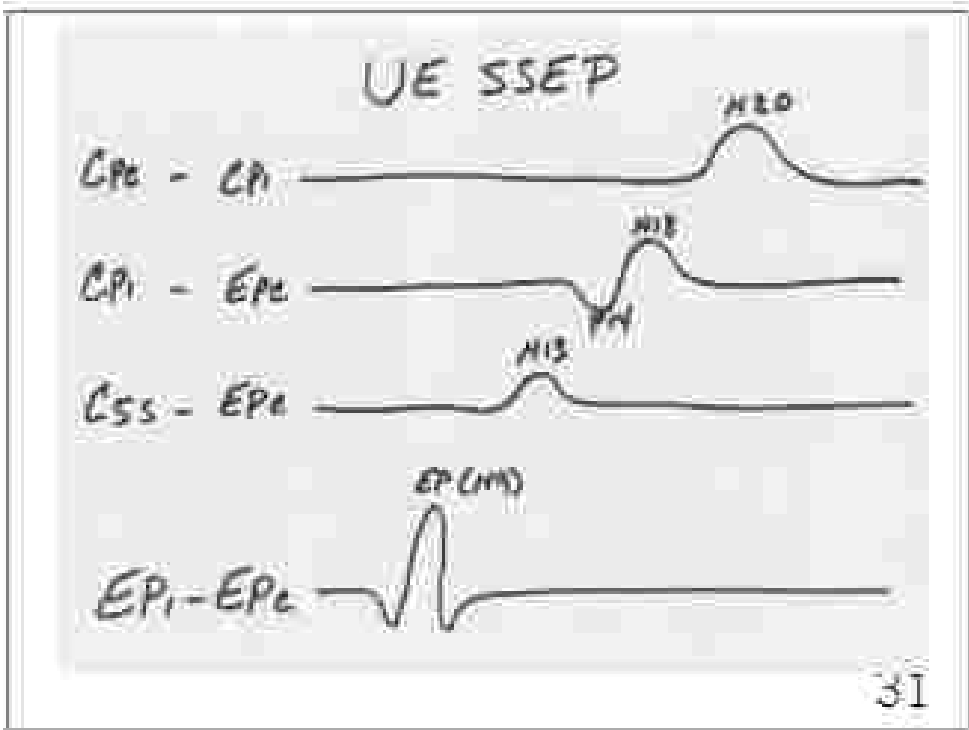
Potentials
BAEP

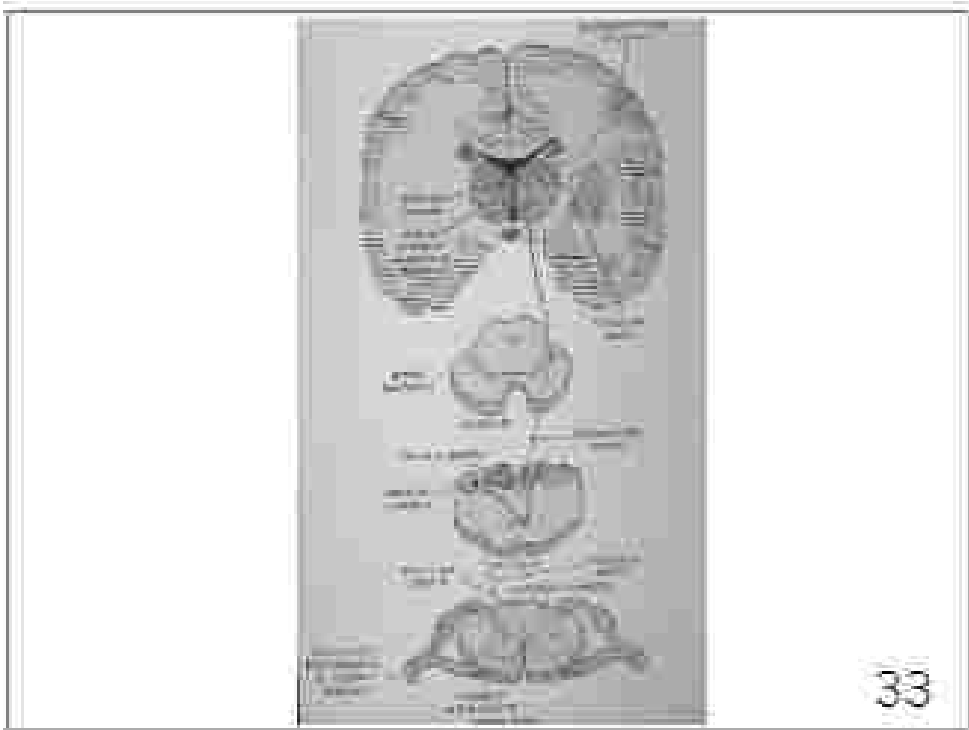




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UE & LE Somatosensory
Evoked Potential SSEP





100
100

