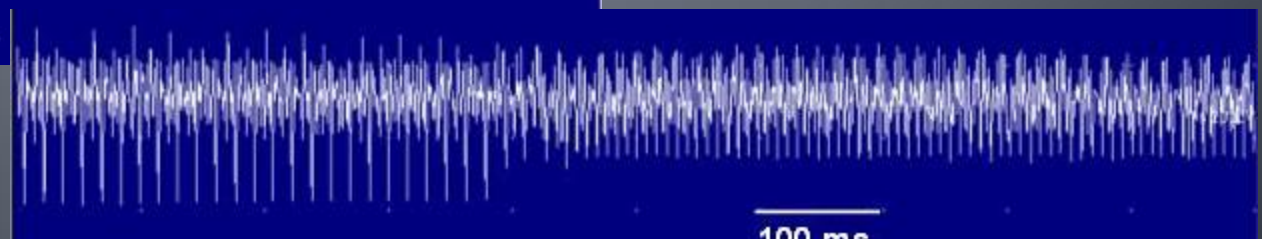
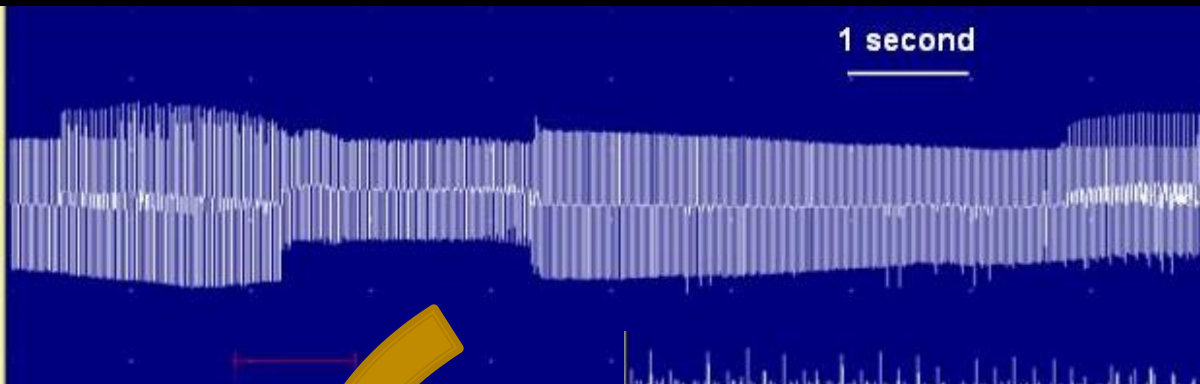
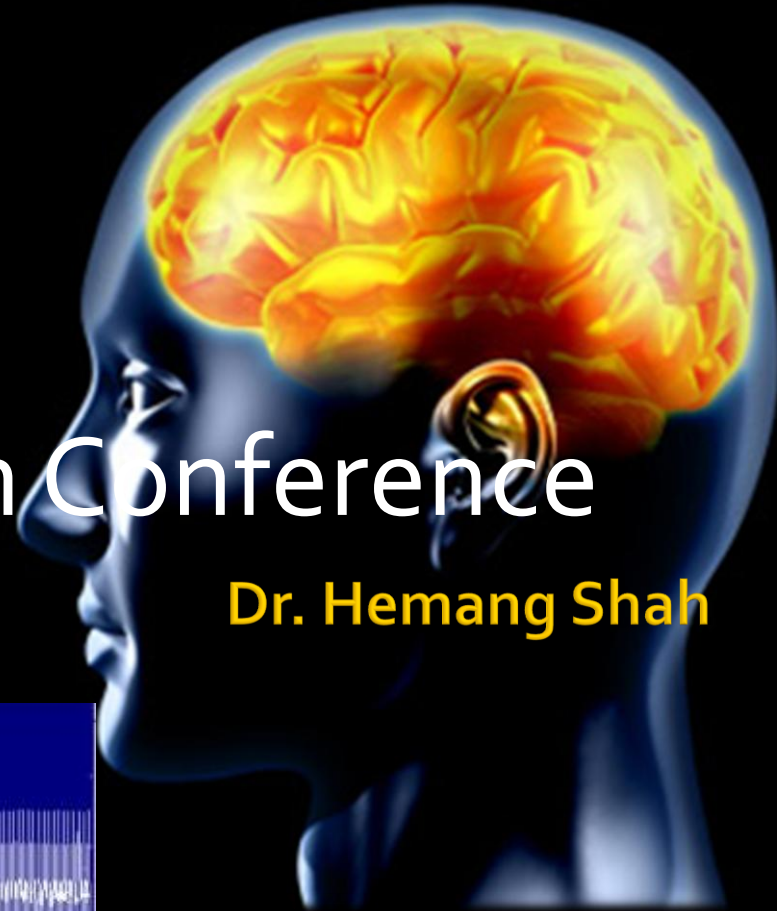


Needle Exam

Neuromuscular Noon Conference

Dr. Hemang Shah



Basic Stuff



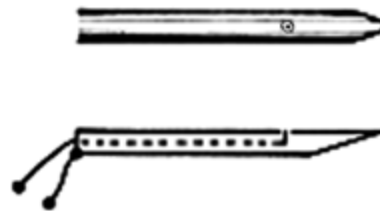
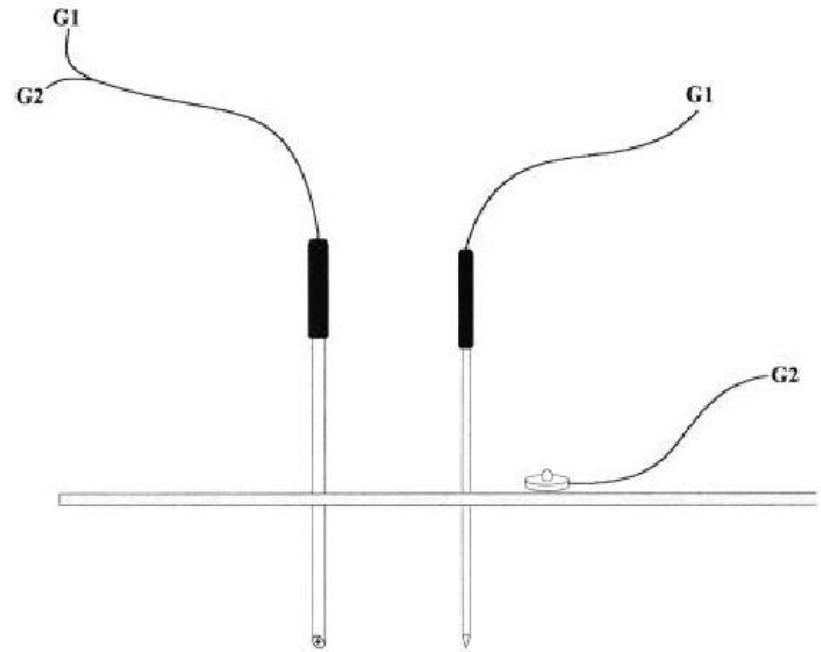
- Extension of basic neurology exam
- Need to know anatomy
- Don't need be an engineer but need to know some electronics
- Know your machine well (know how to turn on/off, how to get to EMG screen, put the ground, gather everything you need before you stick)
- Tell patients everything you do.

The Needle

- Concentric needle – tear drop field, less noise



- Monopolar needle – sphere field, may be more noise, cumbersome



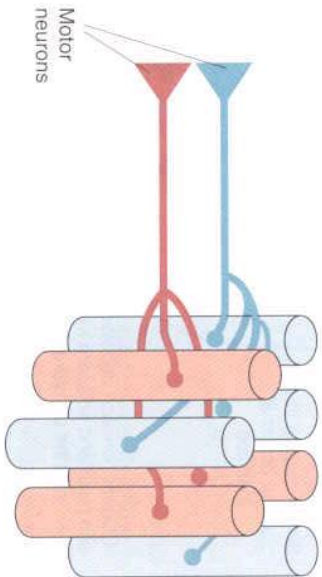
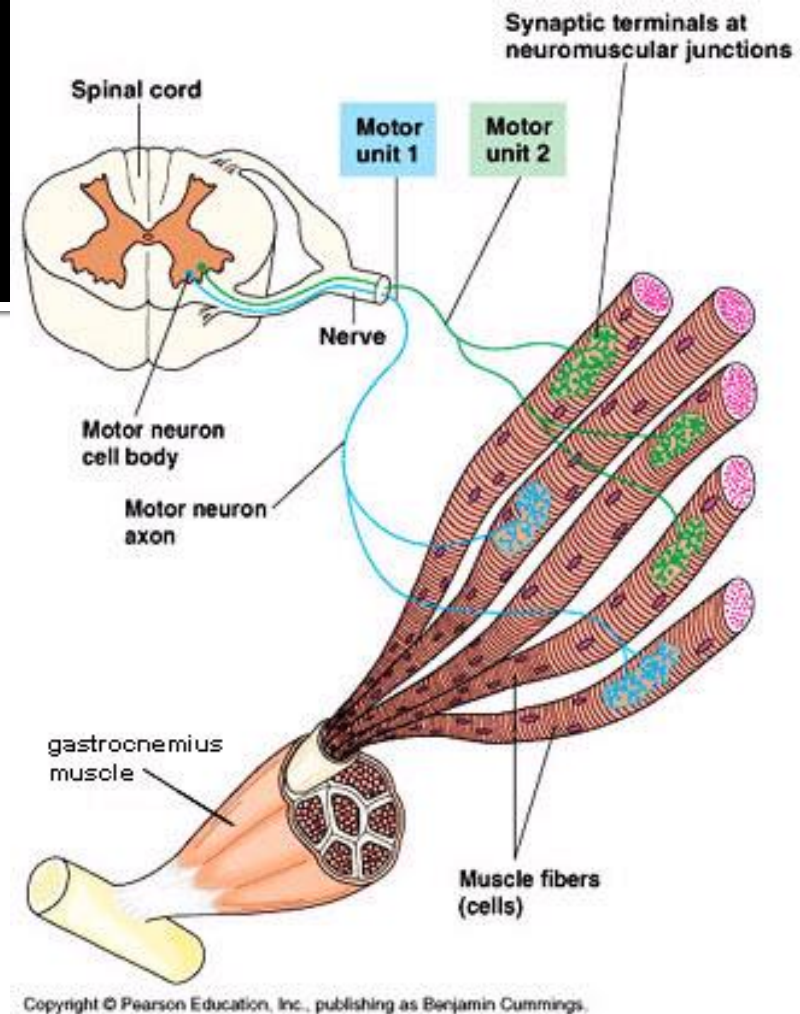
Single Fiber
EMG needle

Analysis of MUAP

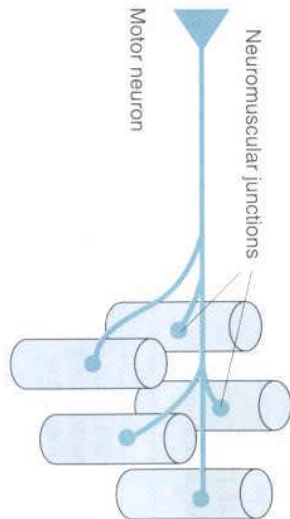
- Morphology (duration, amplitude, phases)
- Stability, firing characteristics
- It will tell you neuropathic Vs myopathic, acute Vs chronic, degree of severity.
- Varies based on age of patient and muscle (deltoid < 25% polyphasia is normal)

Physiology

- Motor Unit – defi.
- Dimensions – 5 to 10 mm (location, age)
- Fiber arrangement



(B) TWO MOTOR UNITS



(A) SINGLE MOTOR UNIT

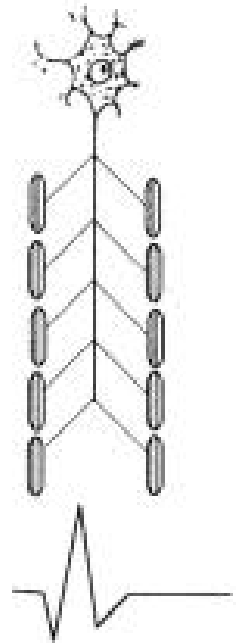
Physiology

Size Principle

Types of muscle fiber – I, II

Distance of needle from generator

Action Potential



Morphology



Duration, amplitude and number of phases

Variability based on muscle

Quantitative Vs Qualitative analysis

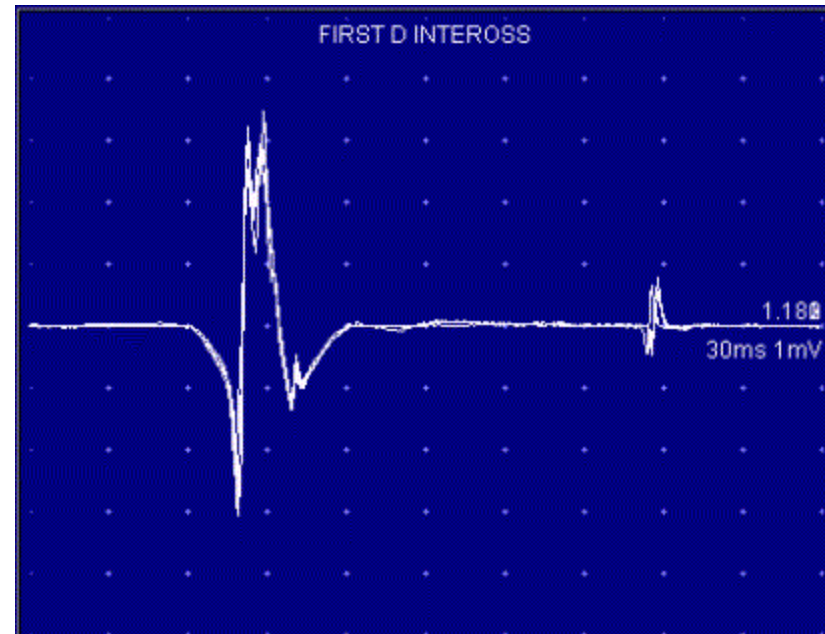
Duration shorter in proximal muscles

Amplitude increase with age (why?)

Duration



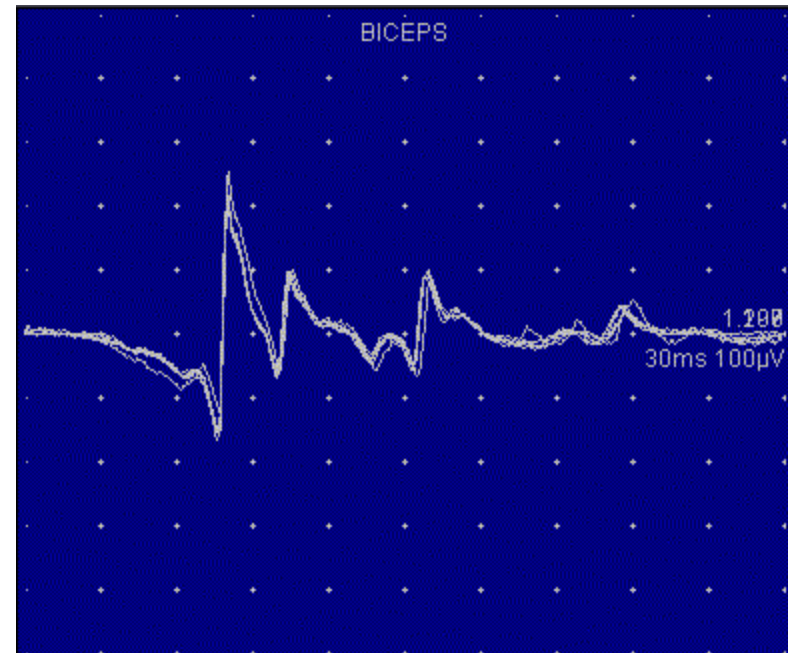
- Reflects number of muscle fiber within a motor unit
- 5-15 ms
- Age, temperature, proximal Vs distal
- Listen (high pitch Vs low pitch)



Phases



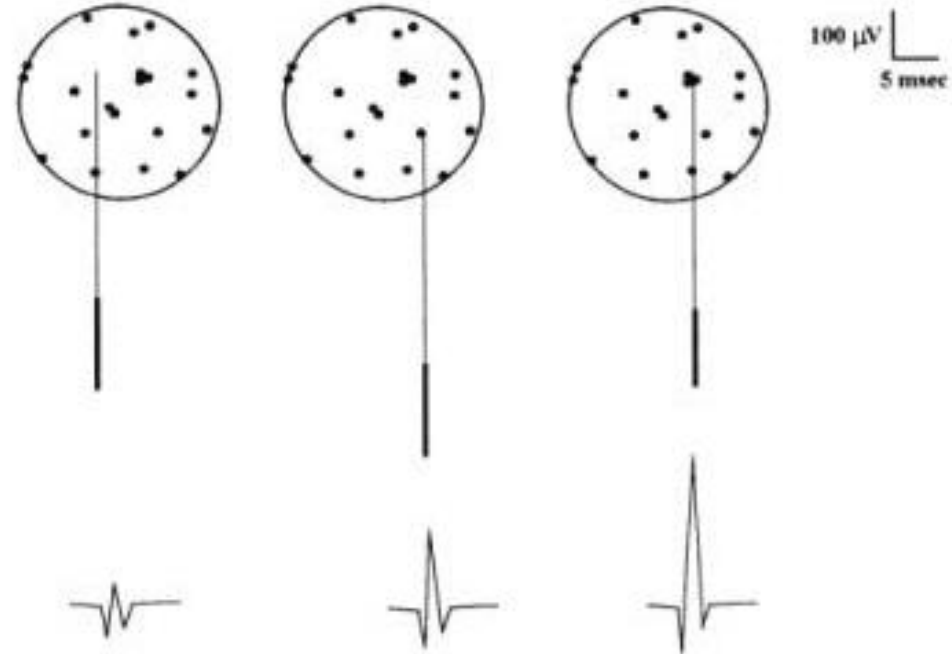
- Polyphasia is a measure of synchrony
- $N + 1$ (2 to 4 is normal)
- 10% polyphasia acceptable (Deltoid)
- High frequency “clicking” sound
- Serrations
- Satellite potential



Amplitude



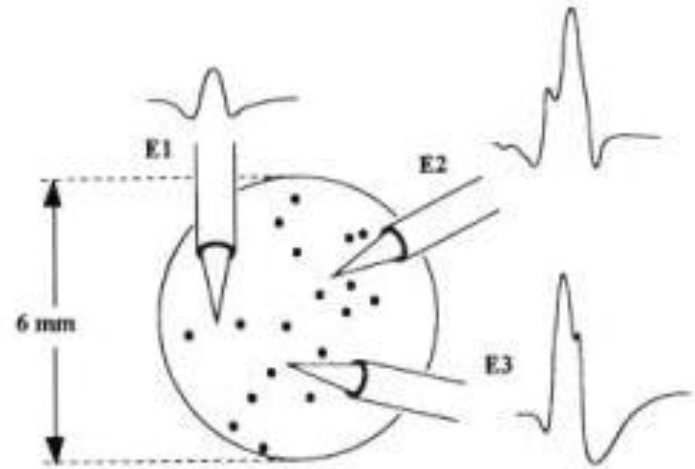
- Amplitude reflects only few fibers nearest to the needle (2-12)
- 100 μV to 2 mV
- Variable – needle proximity; number, diameter and synchronization of muscle fiber
- Listen: amplitude = volume



Major Spike



- Largest positive to negative component
- Usually after first positive spike
- Depends on proximity of needle
- Rise time $< 500 \mu\text{s}$ indicates optimal needle placement

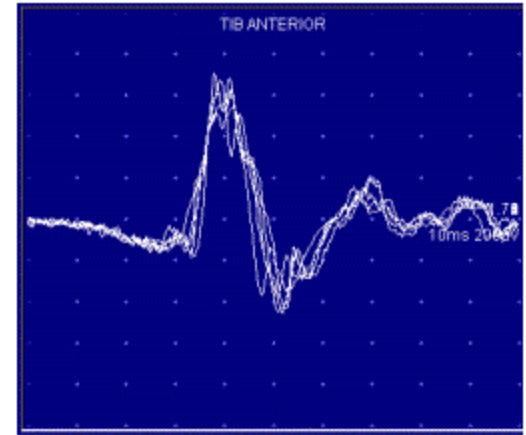
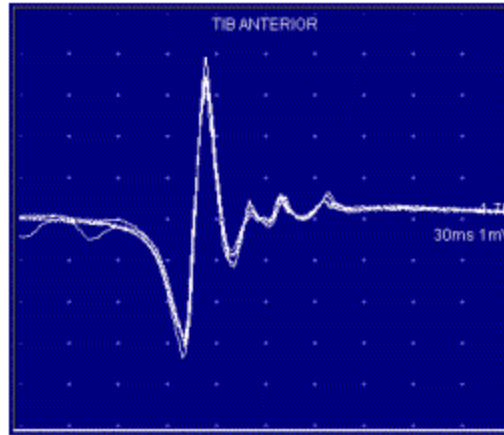


Stability



- Mechanism of instability.
- Not only NMJ disorders but also reinnervation (immature NMJ)

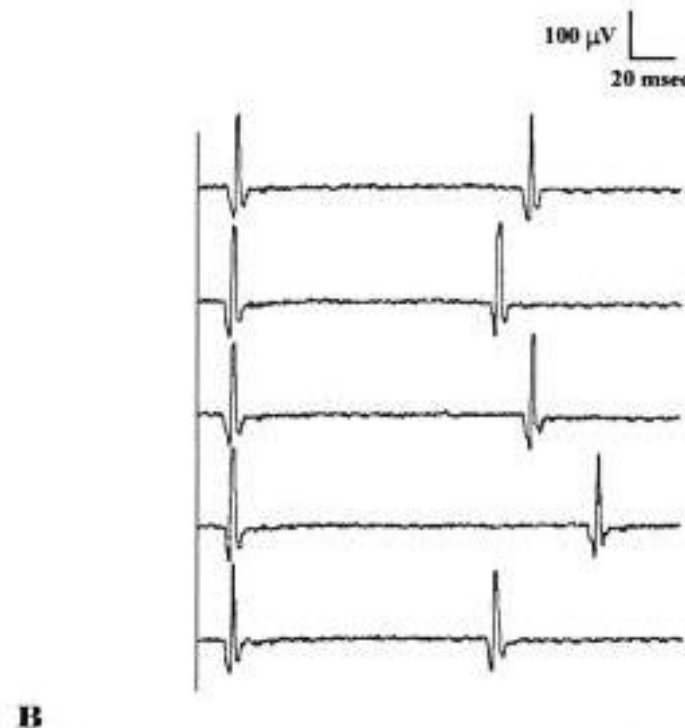
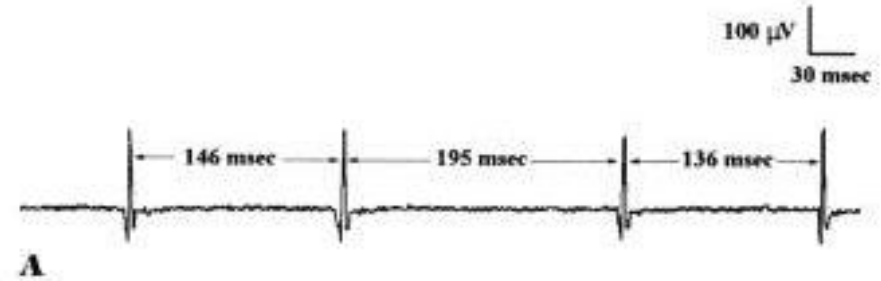
Poor Person's SFEMG



Firing Pattern



- Most important and difficult
- MUAP fire in a semi-rhythmic fashion
- Two ways to increase force during contraction (activation and recruitment)
- 5:1 ratio





Activation & recruitment

- Variable with muscle 30-50 Hz. (soleus 15 Hz, ballistic movement 100 Hz)
- Poor Voluntary Efforts (pain, poor cooperation, CNS lesion – stroke, MS)
- Decreased recruitment (neuropathic)
- Early recruitment (myopathic)
- Maximal contraction (complete interference pattern) Vs moderate contraction.