Nerve conduction studies and EMG.

A video will help you get the main idea
http://www.youtube.com/watch?v=Ul9akZciU7s

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- Important
- Further Explanation

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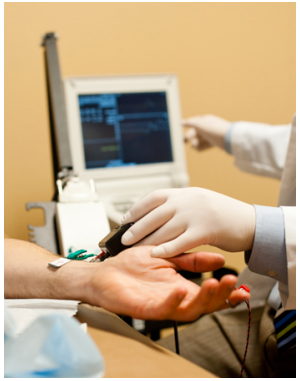
Objectives

- Define what is nerve conduction study (NCS) and electromyography (emg) .
- Explain the procedure of NCS using Abductor Pollicis Brevis muscle .
- Define the normal conduction velocity in upper limb and lower limb nerves .
- Define the motor unit potentials (MUPs) and how they are changed in muscle and nerve diseases .

Nerve Conduction Study (NCS)



A nerve conduction study (NCS): is an electrophysiology test commonly used to evaluate the function of peripheral nerves* of the human body.

(NCS) could be :

- motor nerve conduction study (motor NCS)
- sensory nerve conduction study
- mixed nerve conduction study

+ The only thing we are going to study in this lecture

* In the motor test the recorded response is the muscle CMAP (compound muscle action potential).

* The peripheral nervous system (PNS) is the part of the nervous system that consists of the nerves and ganglia outside of the brain and spinal cord.

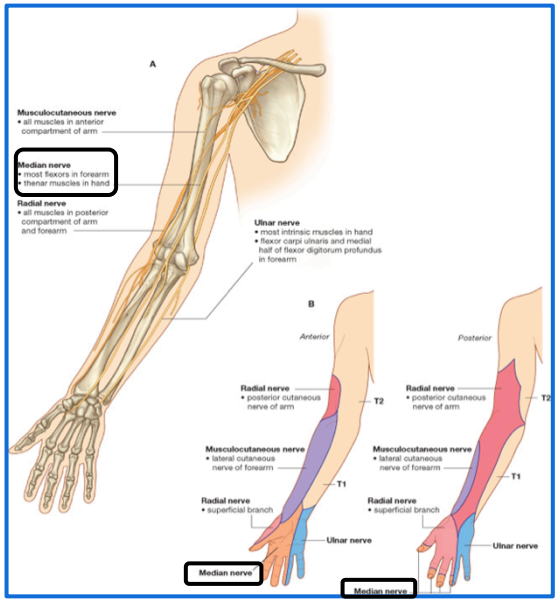
Procedure:

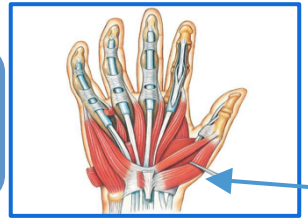
- An electrical stimulus is applied over a nerve (e.g., median nerve) and a recording electrode is placed over the muscle supplied by that motor nerve .

- The stimulus is applied at two sites : a distal site (wrist) and a proximal one (antecubital fossa[1] , elbow)

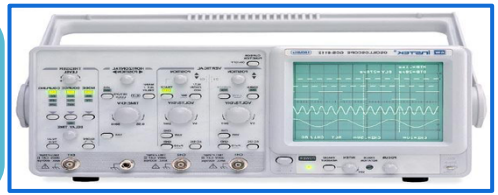
- The muscle usually chosen in this routine test is the Abductor Pollicis Brevis.

- The oscilloscope (CRO) sweep speed is adjusted to 2 ms/cm.
- The stimulus duration used is 0.2 ms and stimulus frequency to 1 / sec.





Abductor Pollicis Brevis



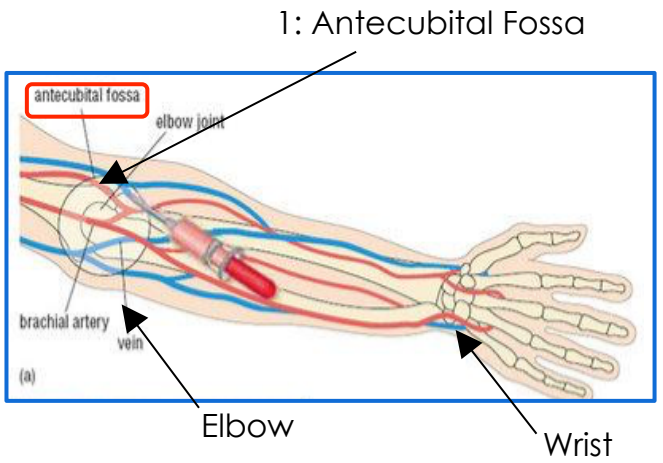
Procedure: cont..

- And the reference recording electrode (G2) about 3 cm away.

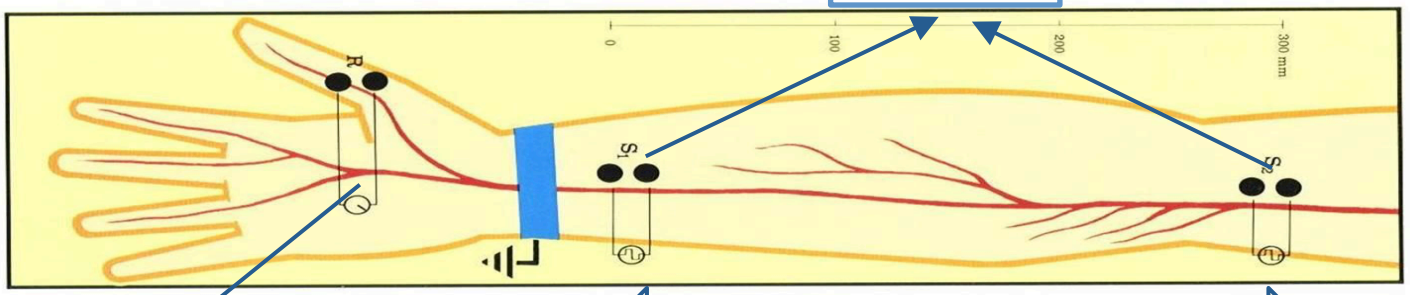
- The active recording electrode (G1) is placed over the thenar eminence which overlies the muscle .

- Apply the stimulus and record the response from stimulation at the wrist
- Store the CMAP (compound muscle action potential) in the first channel of the oscilloscope .

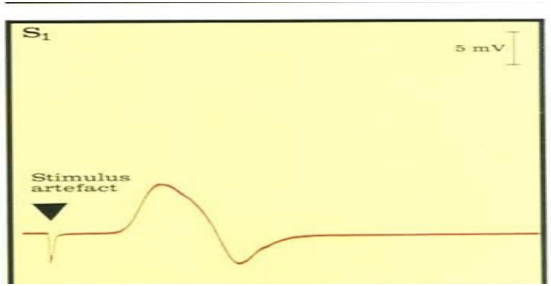
- Change the stimulating site from wrist to antecubital fossa (elbow) .
- Stimulate the nerve & record the CMAP for median nerve* stimulation at the elbow .



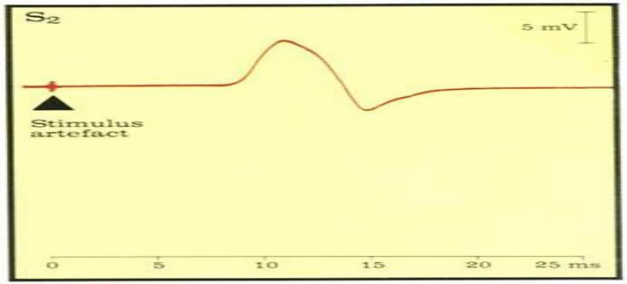
- Measure the distance from elbow to wrist with a measuring tape.
- Measure the latency in first CMAP & in the next CMAP.
- Enter the distance between the elbow and wrist .



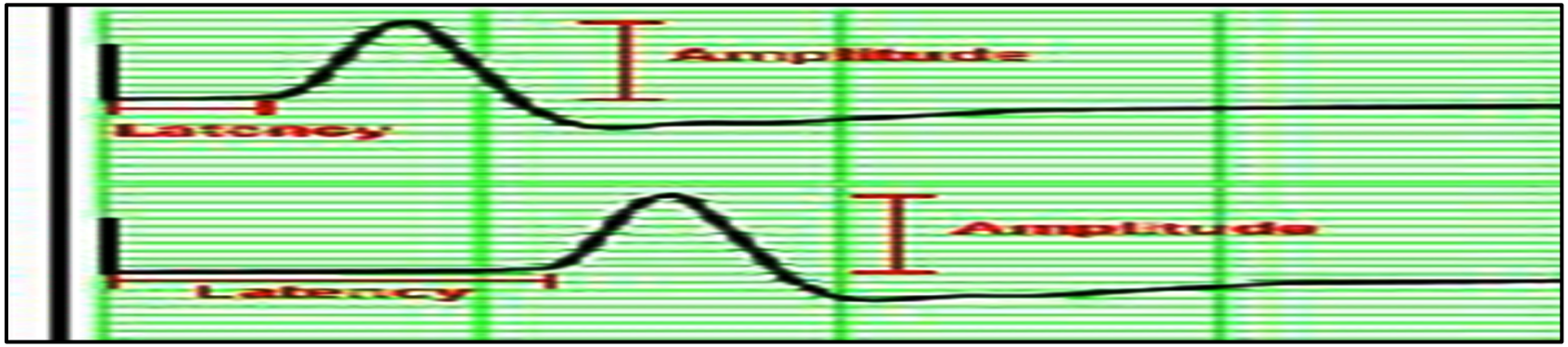
Latency: is the time between the stimulus artefact and the action potential



L1 Latency At wrist= 3.5 ms



L2 Latency At elbow = 8.5 ms



MNCV

MNCV will appear

- It can also be calculated by formula

- MNCV (m/sec)= $\frac{\text{Distance (mm)}}{\text{L2-L1 (ms)}}$

L1 = latency at wrist
L2 = latency at elbow

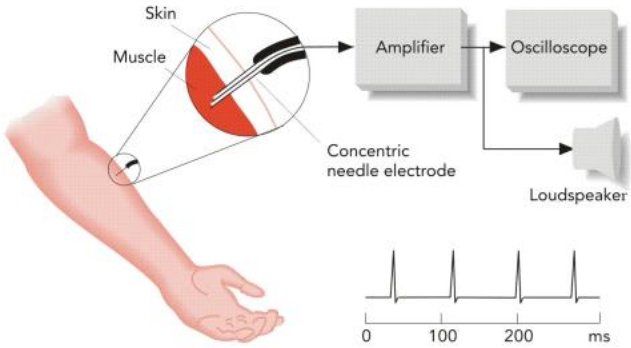
Normal values for conduction velocity

In arm
- 50 – 70 m / sec.

In leg
- 40 – 60 m / sec

Conduction of velocity could be more than the normal which is very good and the patient is not complaining from any thing BUT the abnormal when its become lower than the normal**(slower conduction velocity).**

Electromyography (EMG)



- Electromyography (EMG) is a technique for evaluating and recording physiologic properties of muscles at rest and while contracting.

or

- The potentials recorded in needle emg are derived from motor units of the muscle, hence known as motor unit potentials (MUPs).

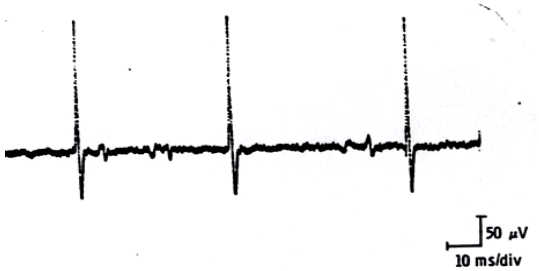
It's a recording of electrical activity of the muscle by:

inserting needle electrode in the belly of the muscles (needle emg)

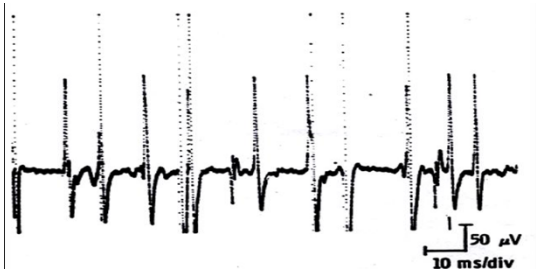
applying the surface electrodes (surface emg)

- **Define what is a " motor unit "?**

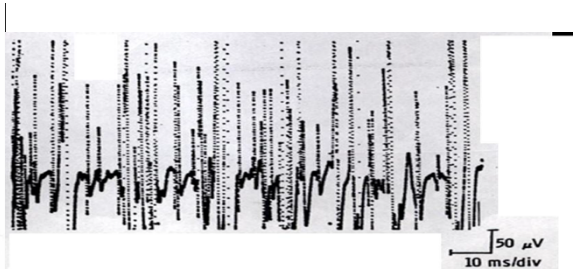
A motor unit is defined as one motor neuron and all of the muscle fibers it innervates.



During Mild Effort



During Moderate Effort note recruitment of additional motoneurons



During Full Voluntary Effort . There is full recruitment (you can not see the baseline)

Normal MUPs

- Amplitude: 300 μV (microvolt) – 5 mV (millivolts)
- Duration : 3 – 15 ms(milliseconds)

Examples of Abnormalities of MUPs

- In nerve diseases :
Giant MUPs due to reinnervation > 5 mV
- In muscle disease :
Small MUPs < 300 μV

Most common disease is Diabetic neuropathy they has numbness , pain in the limbs , loss of sensation and can't sleep because of the pain

MCQs

1. The muscle usually chosen in Nerve Conduction Study is?

A) Elbow
B) Wrist
C) Abductor Pollicis Brevis
D) Adductor Pollicis Brevis

2. During the procedure of NCS, an electrical stimulus is applied over ____, and a recording electrode is placed over ____?

A) Muscle, Nerve
B) Nerve, Muscle
C) Oscilloscope, Motor Unit
D) Motor Unit, Oscilloscope

3. Normal values for conduction velocity in leg?

A) 40 – 80 m / sec
B) 50 – 70 m / sec
C) 40 – 60 m / sec
D) 60 – 80 m / sec

4. When is the baseline not seen?

A) During full voluntary effort
B) During moderate effort
C) During mild effort
D) All of the above

Answers:

1 C
2 B
3 C
4 A

Matching

1- Motor Unit

2- NCS

3- Latency

4- EMG

A- The time between the stimulus artefact and the action potential.

B- Electrophysiology test commonly used to evaluate the function of peripheral nerves.

C- Technique for evaluating and recording physiologic properties of muscles at rest and while contracting.

D- One motor neuron and all of the muscle fibers it innervates.

Answers:
1 D
2 B
3 A
4 C

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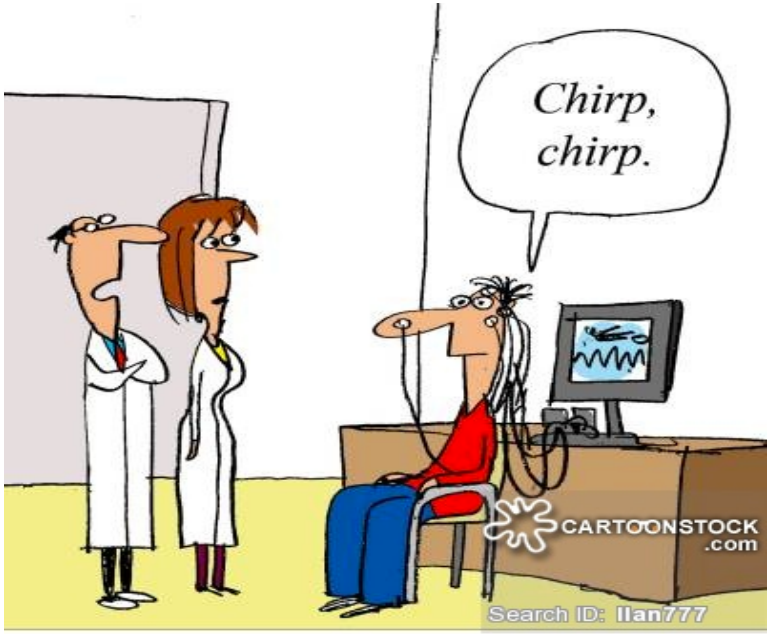

"This new device converts brain waves to sound."