

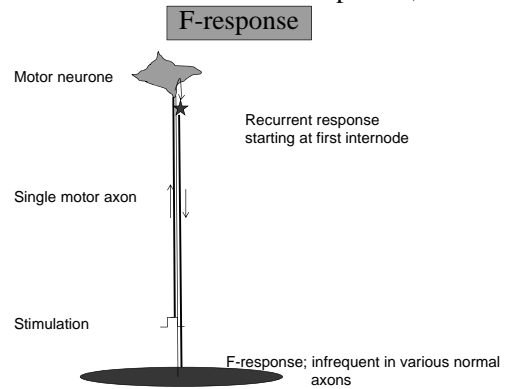
What can You see after the CMAP?

Late responses with variable latency

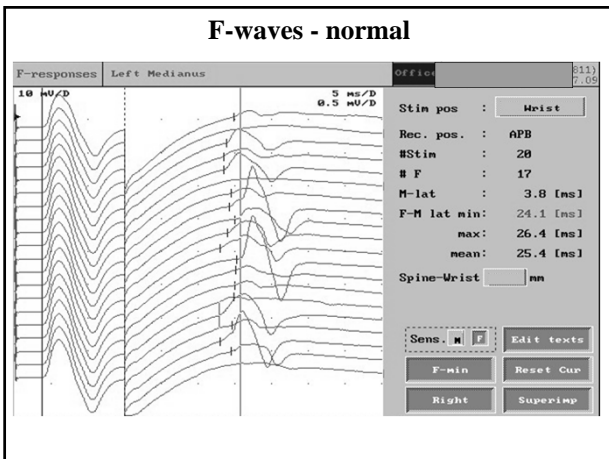
- F-waves
- Extra-discharges in the end-plate
- (Reflexes)

F-waves

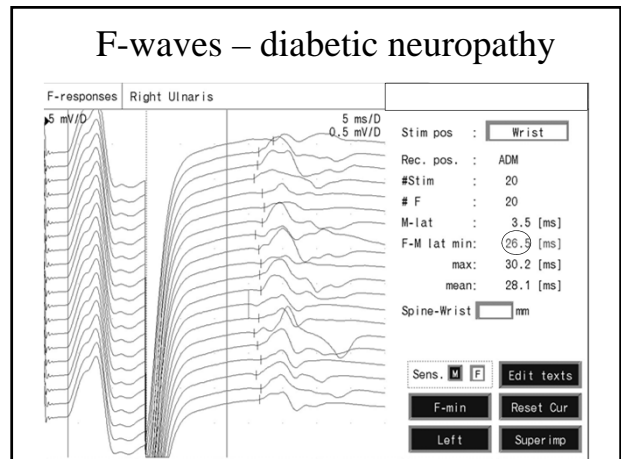
Generator site for late responses;



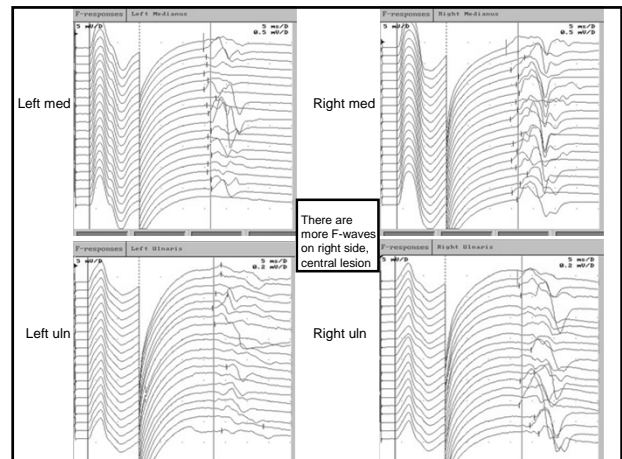
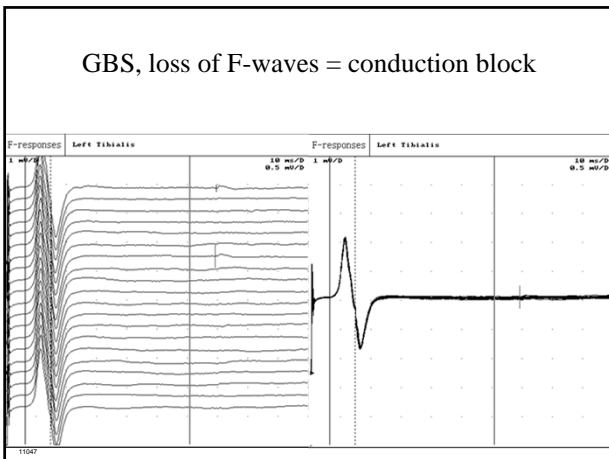
F-waves - normal



F-waves – diabetic neuropathy

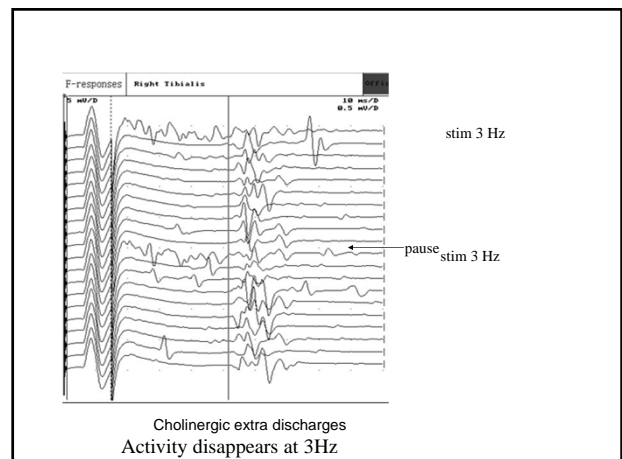
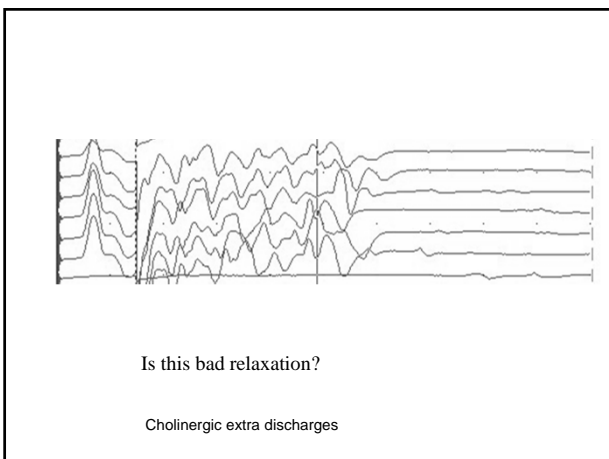
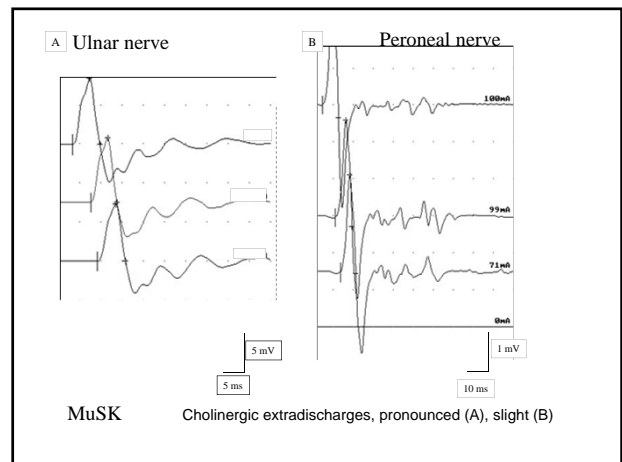


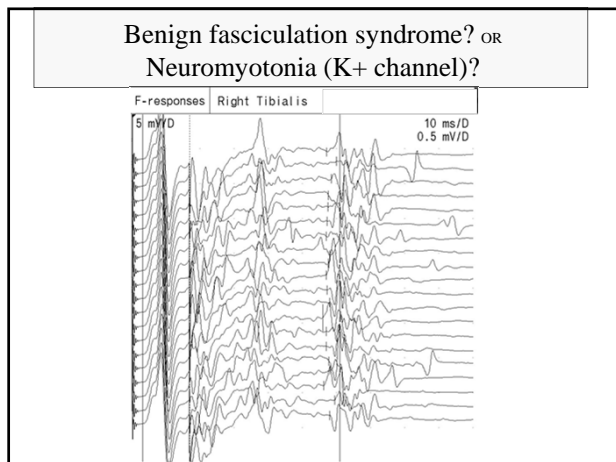
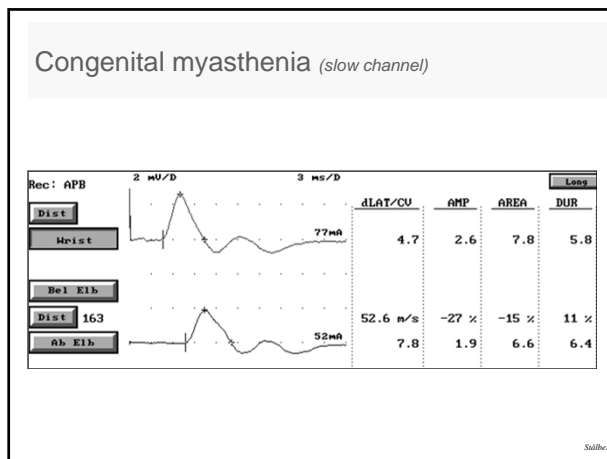
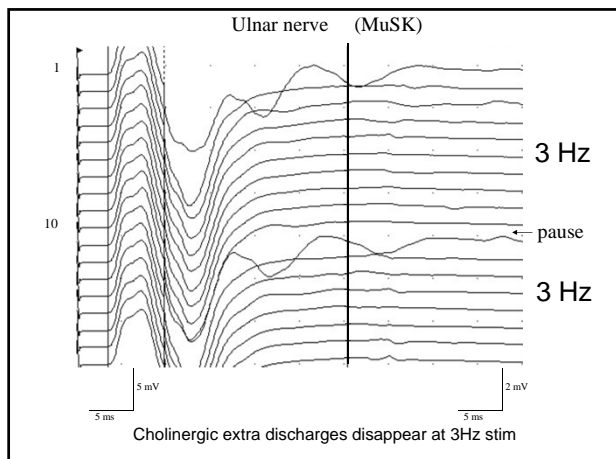
GBS, loss of F-waves = conduction block



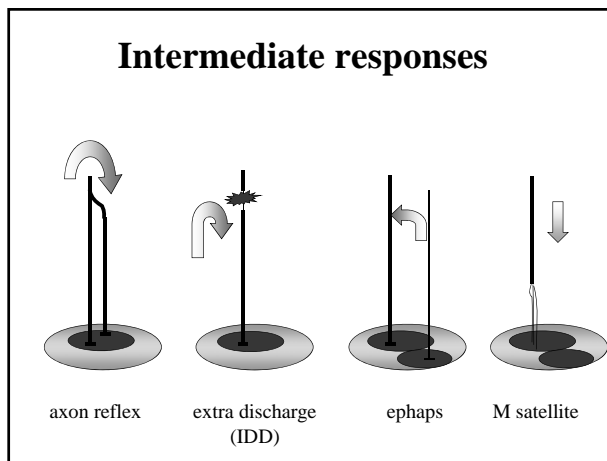
### Extra-discharges in the nm-j or muscle

- Acetylcholine induced (overtreatment, organophosphates)
- Channelopathies
  - Slow channel syndrome
  - Myotonia (PEMD)
- Motor neuron pathology
  - Fasciculations
  - Other spont activity

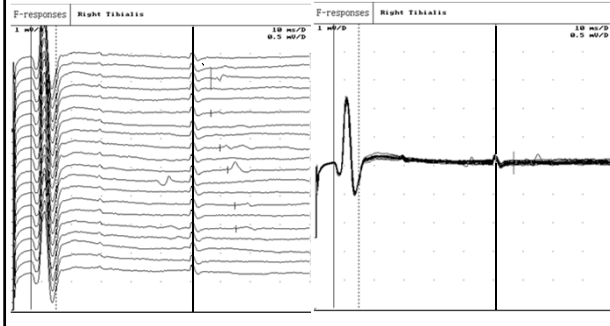




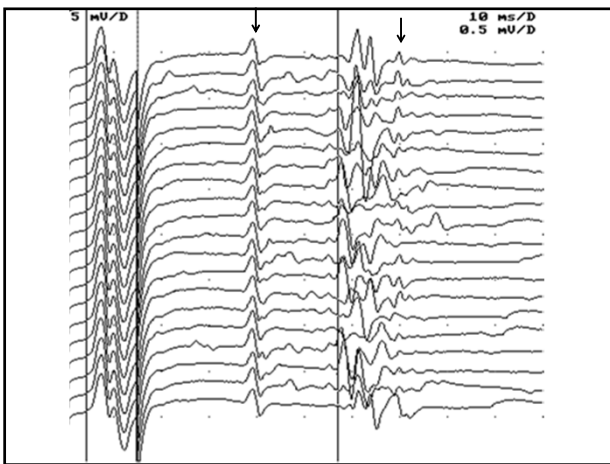
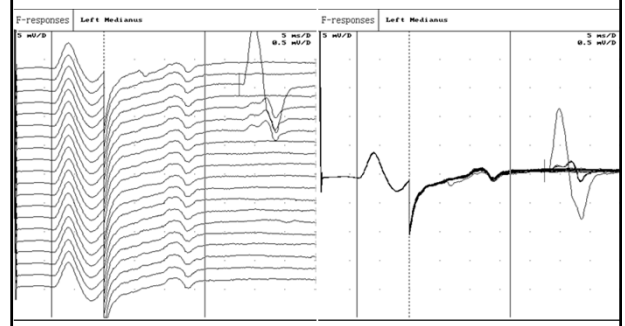
- Late responses with constant latency**
- A-waves
    - IDD
    - M-satellites
    - Ephaptic transmission
    - Axon reflex
  - Repeater F-waves
  - H-reflex



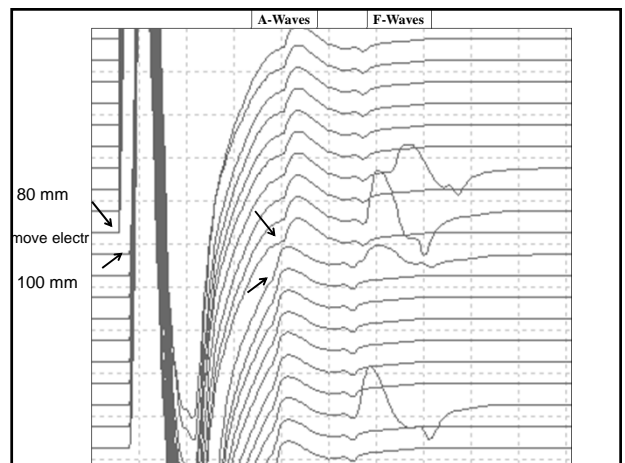
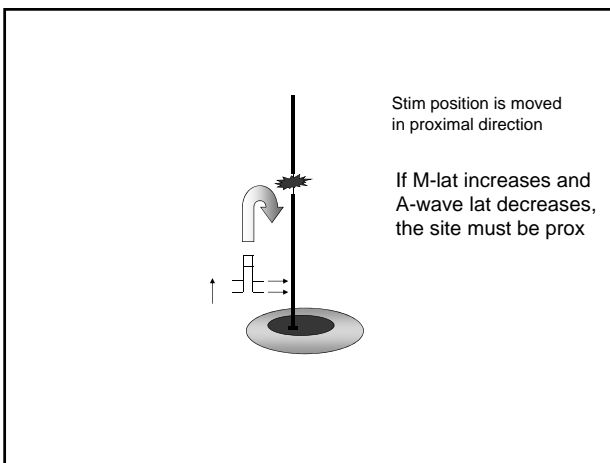
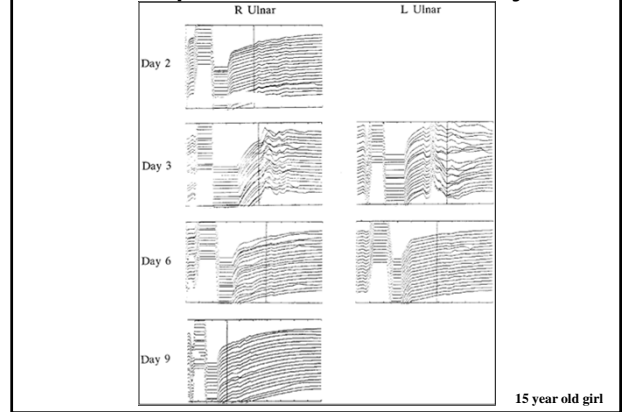
GBS A-waves and few F-responses

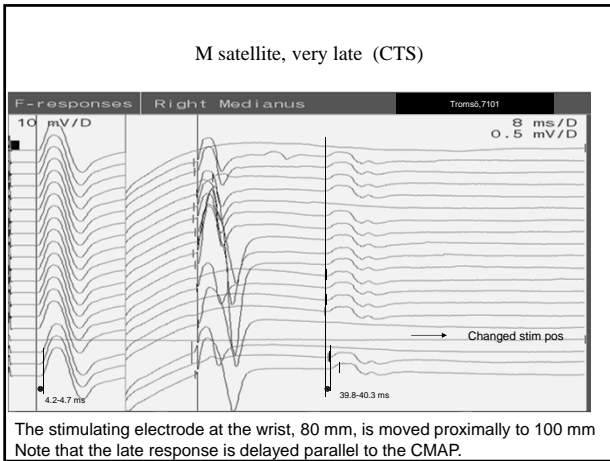


A-waves (and repeaters) in GBS



A-waves in a patient with Guillain Barré syndrome

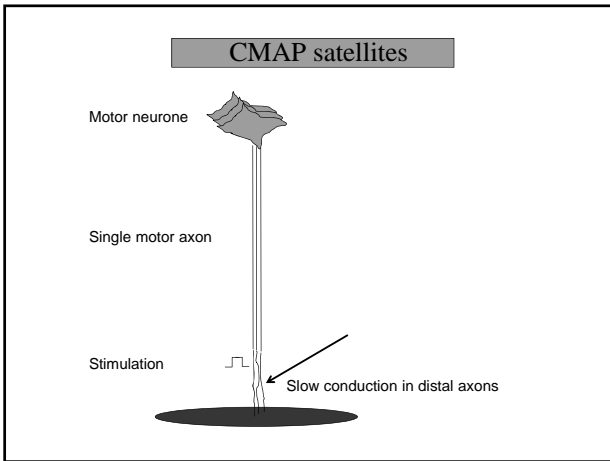




### Frequency of A-wave findings

Diagnosis	% of patients with A-waves in the group	% of A-waves found in:
Polyneuropathy	64.7	53.2
Nerve root lesion	47.8	17.7
Entrapment syndroms	5.4	5.6
Motor neuron diseases	60.0	4.8
Guillain-Barré- Syndrome	71.4	4.0
Plexopathy	27.3	2.4
Postpolio- Syndrome		1.6
Myopathy	0	0
Other diagnosis	10.0	1.8
Without other clinical or neurophysiological pathology	5.1	8.9

Bischoff, Stålberg, Falck



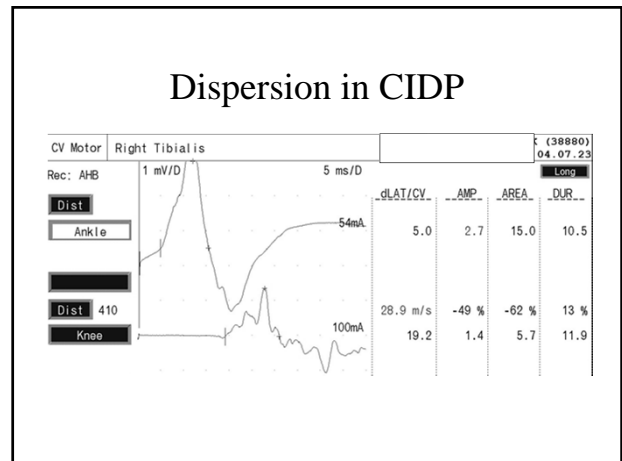
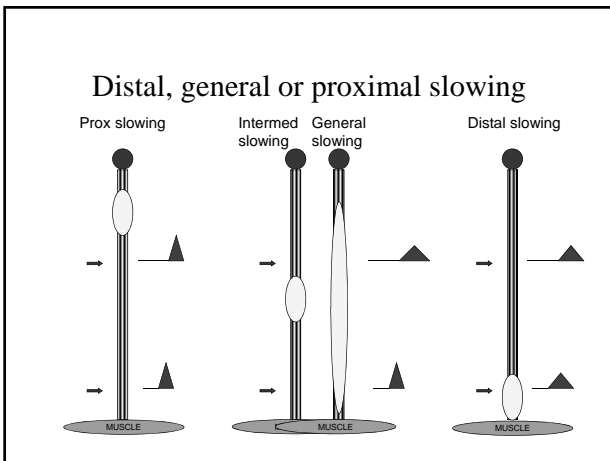
### IDD and M-satellites - different pathophysiology

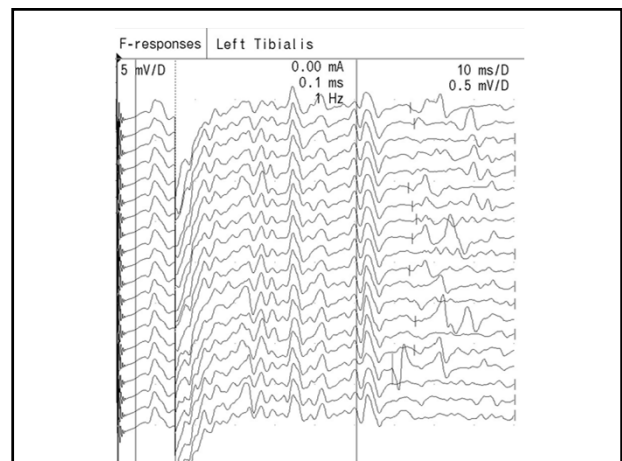
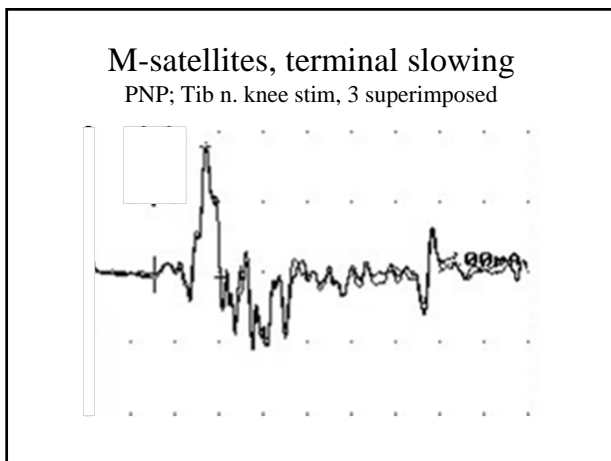
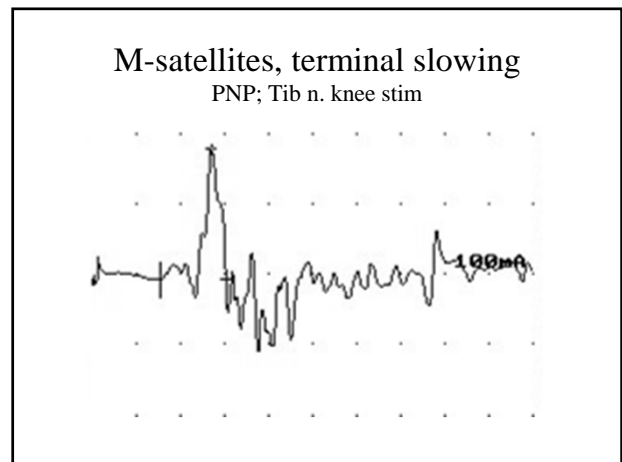
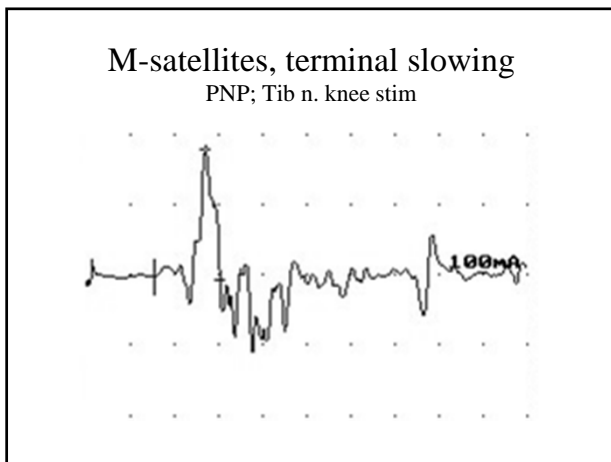
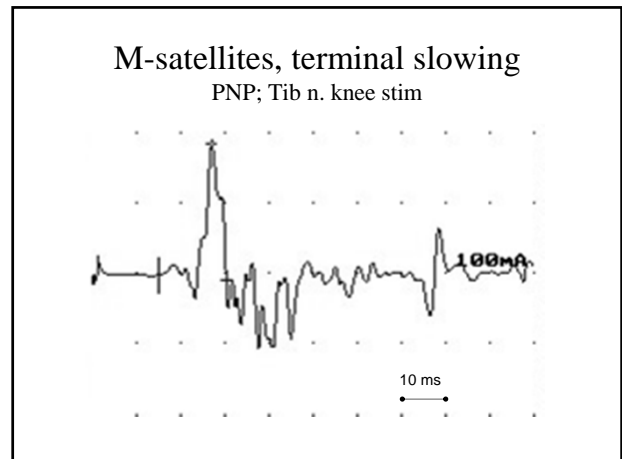
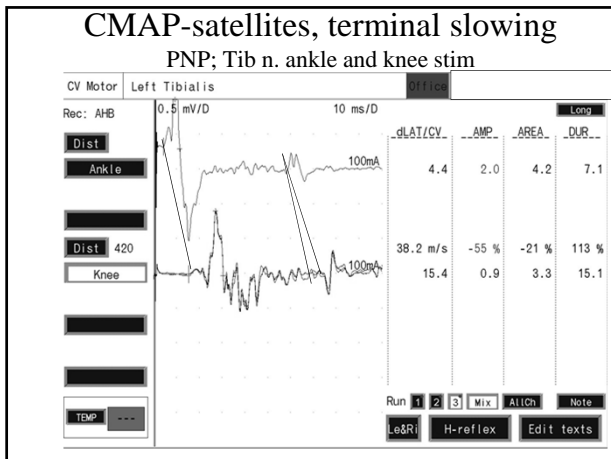
- IDD myelin defect, channel (K<sup>+</sup> defect)
- M-satellites, axonopathy

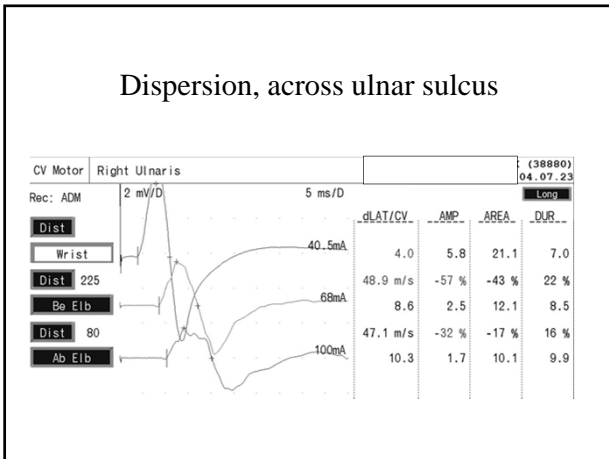
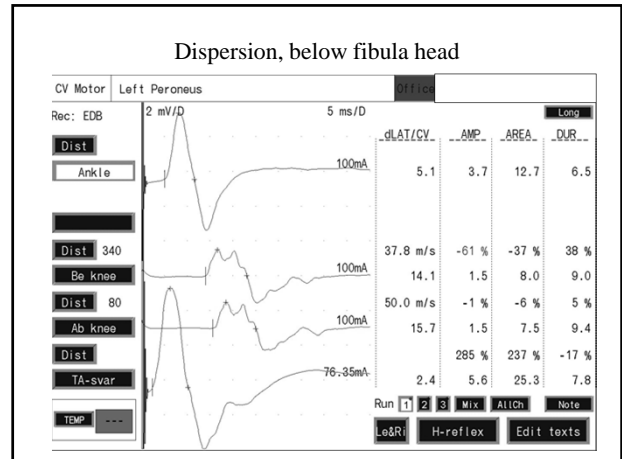
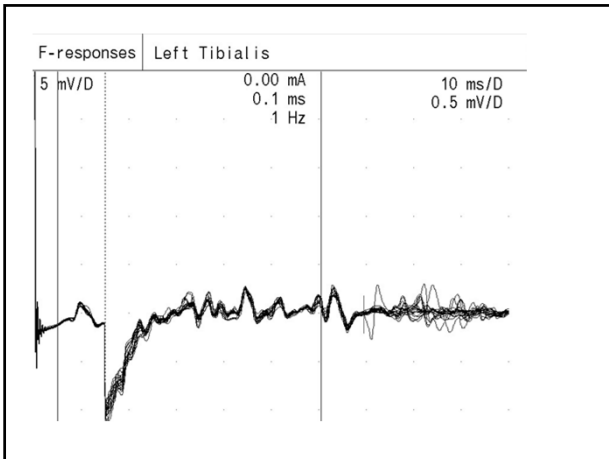
  

### IDD and M-satellites can be differentiated

Moving stimulating electrode  
Double stimulation







**Late components after the CMAP**  
Erik Stålberg, Uppsala Sweden

type	latency after CMAP		
	immediate	intermed	late
not relaxed, submax stim	X		
extra discharges	X		
myotonic discharges (PEMD)	X		
A-waves	X	X	(X)
CMAP-satellites	X	X	(X)
F-waves		X	
H-reflex		X	
flexion reflexes			X
ILR			X
C-waves			X

## Summary

Some late components after the CMAP are seen in healthy

Others indicate pathology; look for them  
-you can do that in every EMG lab-  
and try to interpret them, they tell a lot