

### What can we assess with EMG?

- Muscle membrane function - spontaneous
- Muscle fibre characteristics; diameter
- MU organization
  - number of fibers
  - grouping
- N-M transmission
- Motor units
  - total number
  - activation; pattern, fullness

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### Parameters to quantify in Conc/Monopolar EMG

- **spontaneous activity**
- **shape of individual MUPs**
- **jiggle**
- **recruitment (early, reduced)**
- **fullness at strong activation**
- **dynamic changes with time (fatigue)**

### Spontaneous activity

### Visual scoring Spontaneous activity from the *muscle*

**FINDING**

- fibrillation potentials, psw
- myotonic discharges
- CRD
- myokymic discharges
- myogenic extra discharges

**MEASURE AS**

- **#/ 10 recording sites**
- **or +, ++, +++, +++++**
  - few
  - moderate
  - abundant
- **or**
  - spontaneous or
  - after provocation

### Visual scoring Spontaneous activity from the *nerve*

**FINDING**

- neuromyotonic discharges
- myokymic discharges
- muscle cramps
- fasciculations
- neurogenic extra discharges

**MEASURE AS**

- **#/ 10 recording sites**
- **or +, ++, +++, +++++**
  - few (per time unit)
  - moderate
  - abundant
- **indicate**
  - spontaneous or
  - after provocation

### Spontaneous activity in myopathy

Fib, PSW ?	Yes		Muscular dystrophies
		→	Myositis, IBM
			Debrancher Glycogenosis
			Acid Maltase Deficiency
			Hyperkalemic per paralysis
			Myotonic conditions
			LGMD 1A
			Nemaline myopathy
			Myotubular myopathy
			Mitochondrial myopathy
			Carnitine Deficiency
			Hypothyroid myopathy
			Rhabdomyolysis
			Toxic - Chloroquine
			- Alcoholic
			- Statins
			- Colchicine
Myotonic Disch. ?	No		
CRD ?	No		

Courtesy R.Liguori, modified

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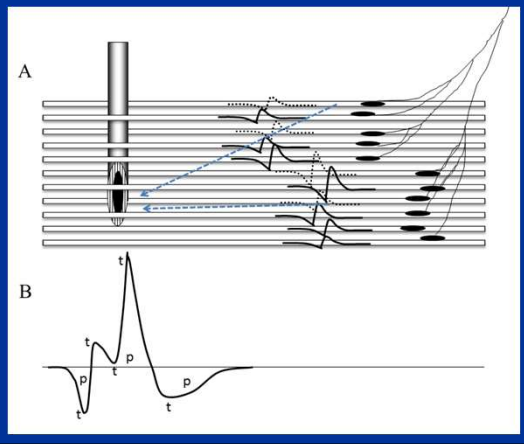
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Fib, PSW ?	No	→
Myotonic Disch. ?	Yes	→
CRD ?	No	→

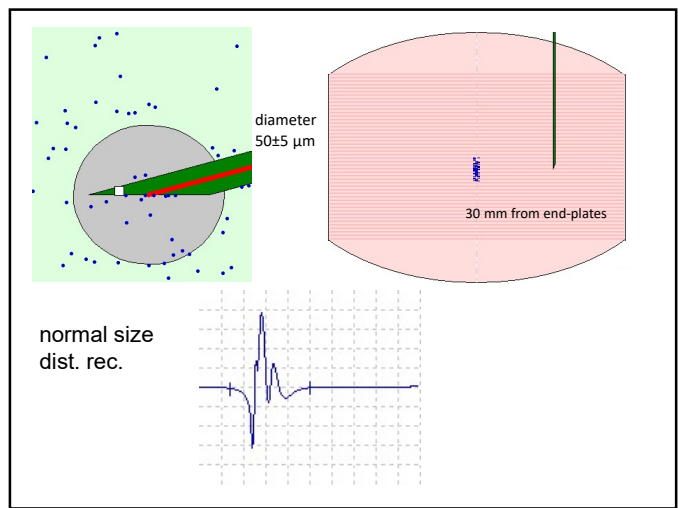
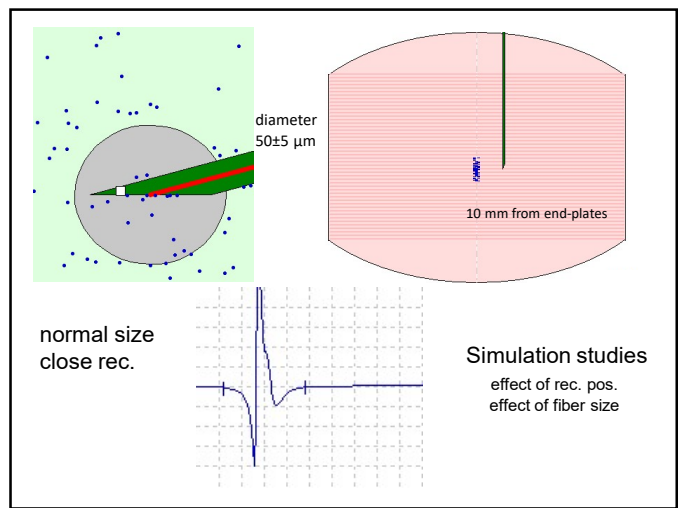
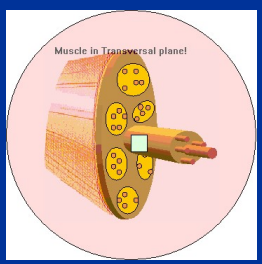
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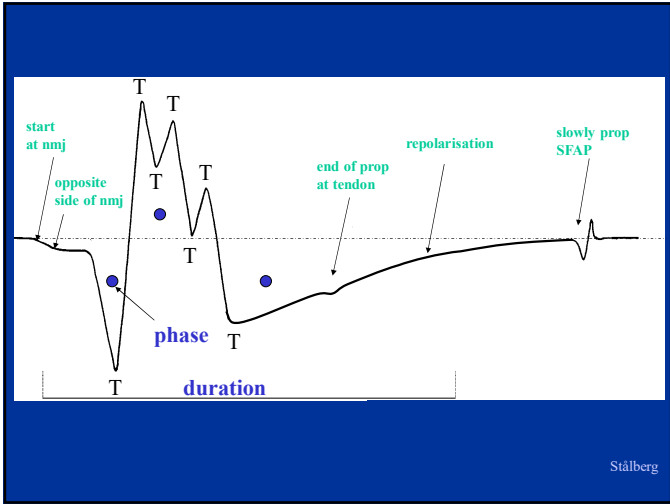
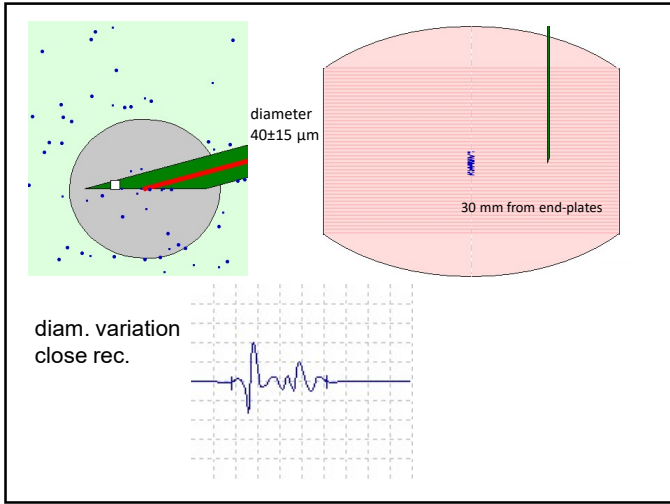
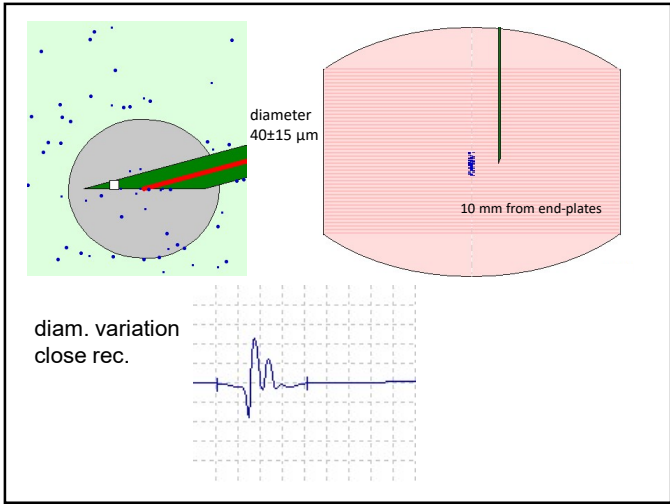
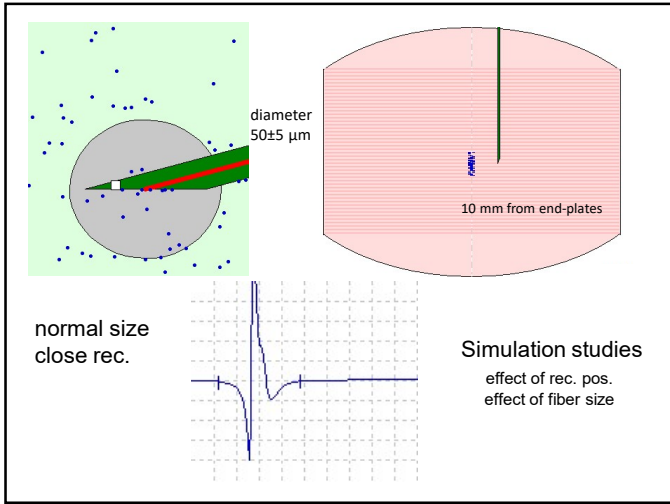
## Voluntary EMG

### Generation of a MUP



### The EMG Simulator





### Parameters used in MUP analysis

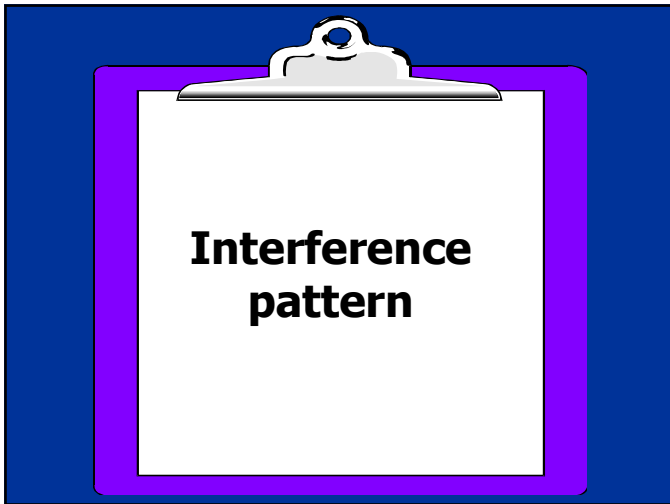
parameter	significance	measurement
• Amplitude	# fibers/0.5mm	peak-peak
• Area	# fibers/2 mm	within dur
• Duration	# fibers in 2.5 mm	slope criteria
• Thickness	# close fibre	area/ampl
• Size index	MU size	normalized thickness
• Phases	temp dispersion	0-cross + 1
• Turns	“	change in dir
• Irregularity	“	length/ampl
• Rise time	closeness to fibre	neg-pos peak
• Satellites	extreme delay	late spike
• Jiggle	n-m transm	shape stability

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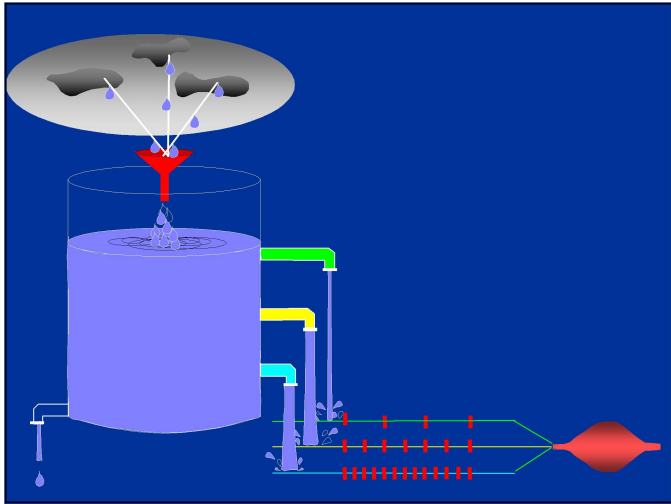
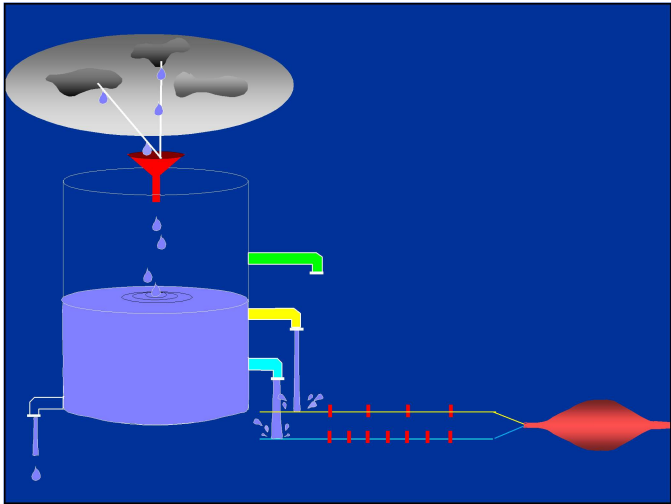
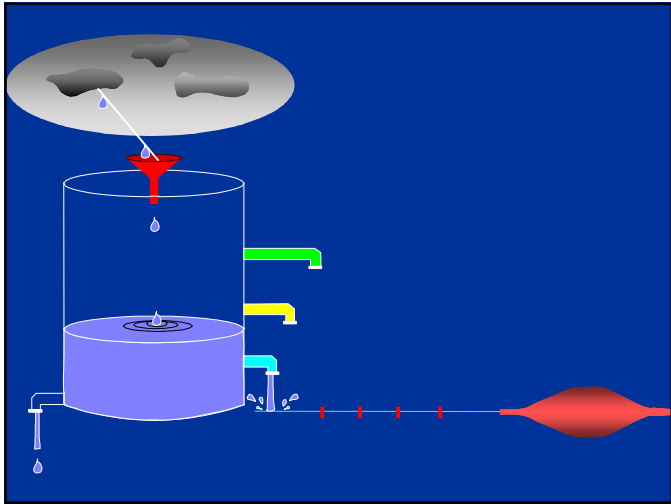
### Parameters that can be assessed visually/manually

parameter	significance	measurement
• <b>Amplitude</b>	# <b>fibers/0.5mm</b>	<b>peak-peak</b>
• area	# fibers/2 mm	within dur
• <b>Duration</b>	# <b>fibers in 2.5 mm</b>	<b>slope criteria</b>
• Thickness	# close fibre	area/ampl
• Size index	MU size	normalized thickness
• <b>Phases</b>	<b>temp dispersion</b>	<b>0-cross + 1</b>
• <b>Turns</b>	“	<b>change in dir</b>
• Irregularity	“	length/ampl
• Rise time	closeness to fibre	neg-pos peak
• <b>Satellites</b>	<b>extreme delay</b>	<b>late spike</b>
• <b>Jiggle</b>	<b>n-m transm</b>	<b>shape stability</b>

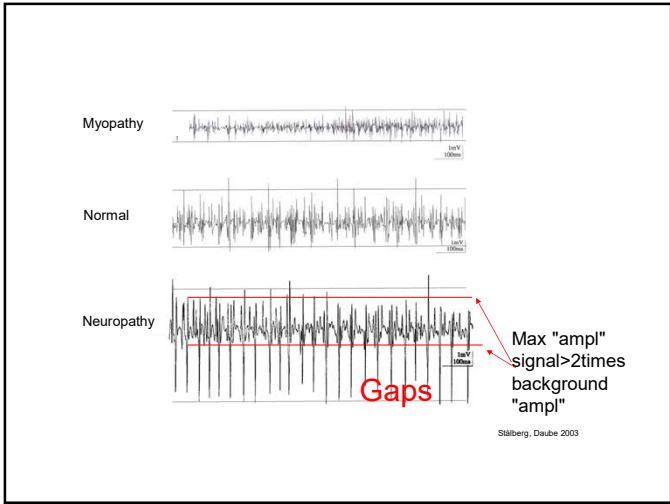
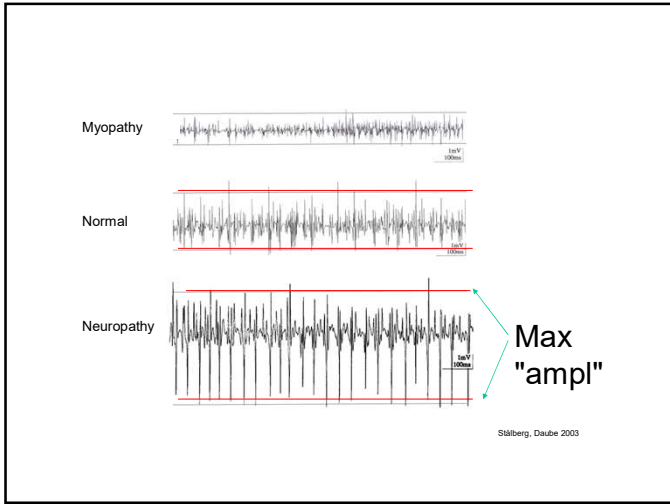
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- ### Methods
- recruitment analysis
  - visual inspection (ampl, fullness)
  - spectral analysis
  - broad band filter analysis
  - turns/amplitude analysis
  - "ampl", "turns", activity



**Visual analysis of  
EMG at full effort**



Comparison of electrophysiological parameters

Parameters	nm-j	myopathy	den/reinn	axon loss	CB	central
SFEMG	↑	↑	↑	n	n	n
Conv MUP	abn	↓	↑	n	n	n
Conv IP	n	myo	neur	↓	↓	↓
Macro	n	↓	↑	↓	n	n
MUNE	n	n	n	↓	n	n
TMS	n	n	n	↓	↓	abn

About Denervation/Reinnervation

Prof. Weber