

ELECTRODIAGNOSIS

STRENGTH DURATION CURVE



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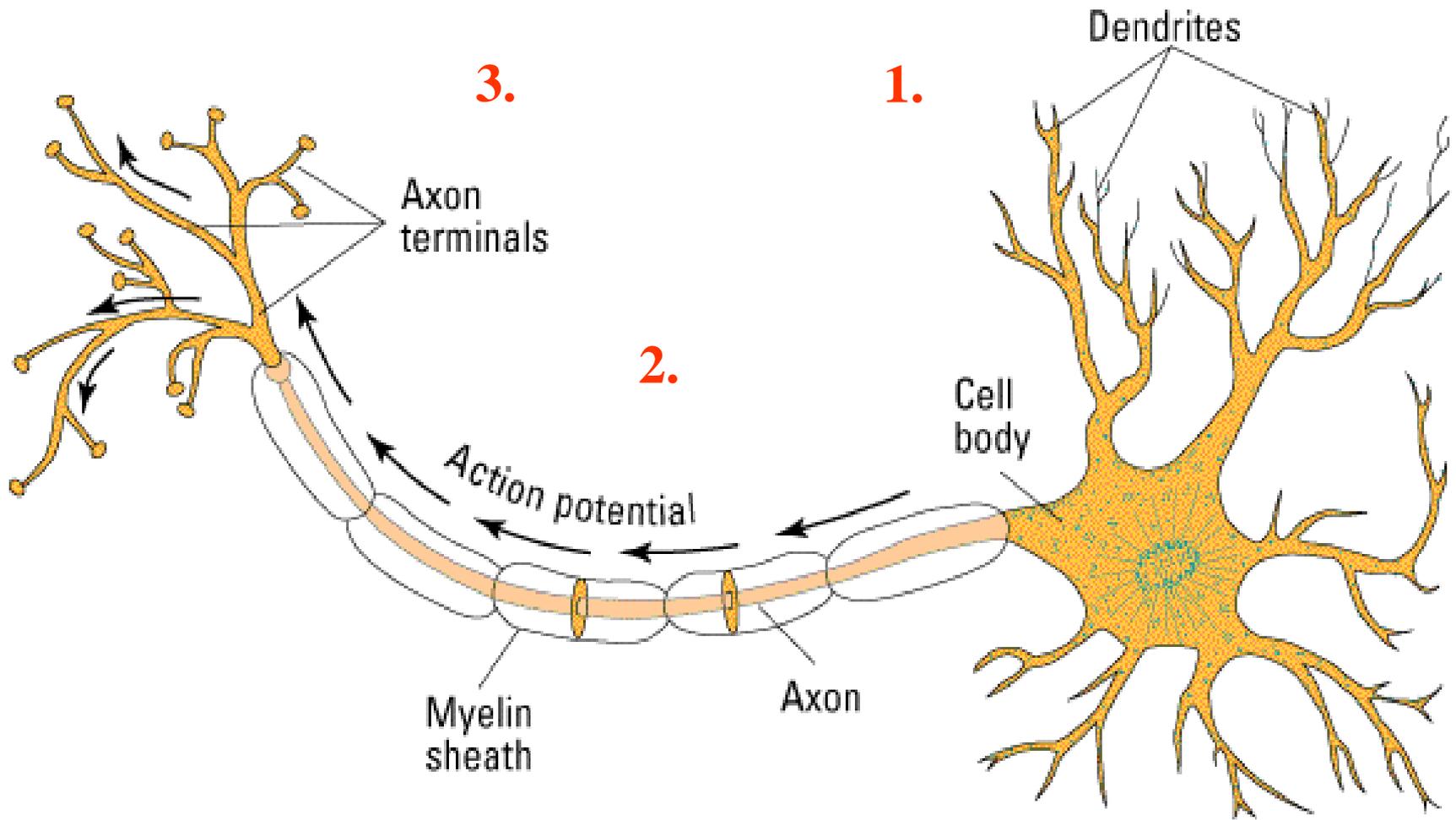
Learning Objectives

- Define Electrodagnosis and its theoretical background.
- Describe the anatomical and functional aspects of the peripheral nerve.
- Differentiate among types of Peripheral Nerve Injuries .
- Describe Strength –Duration Curve and Chronaxie test.
- List different technical points related to Strength-Duration Curve and signs of reinnervation.

Electrodiagnosis

- Determine the location, extent and duration of the lesion.
- provide timely and optimal management.

Structure and Function of a Nerve

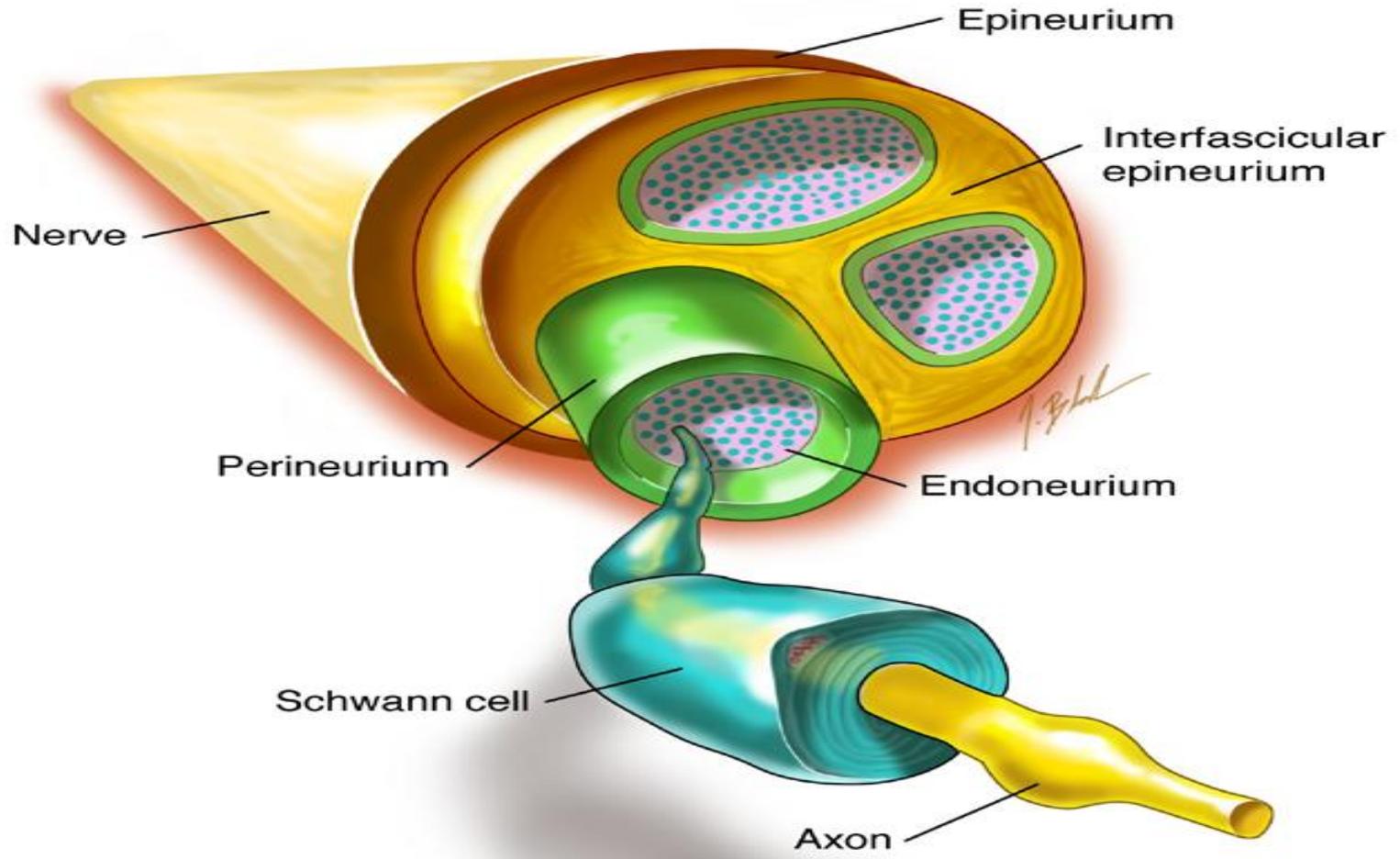


1. Reception

2. Conduction

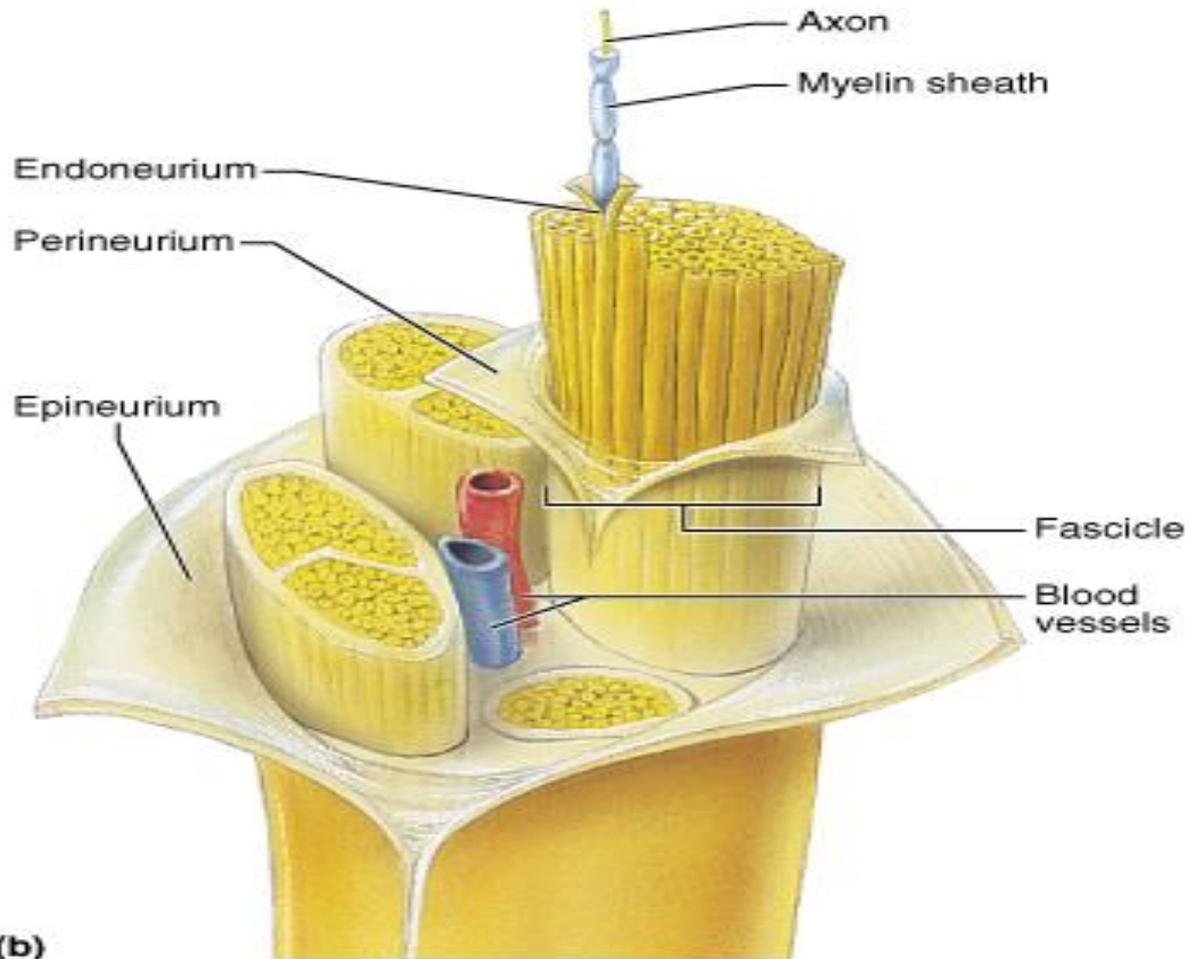
3. Transmission

Structure and Function of Nerve



Connective Tissues Surrounds The Nerve

Structure and Function of Nerve



(b)

Peripheral Nerve Injuries

Nerves can be injured by:

- ✓ Compression
- ✓ Traction
- ✓ Transection

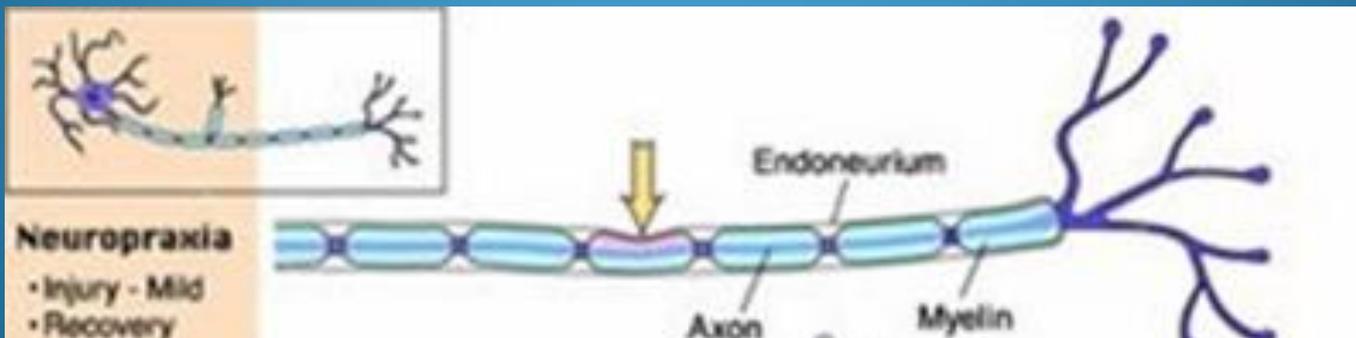
Damage varies in severity:

- Transient and quickly recoverable loss of function.
- Complete interruption and degeneration.

Classifications of Nerve Injury

Neurapraxia

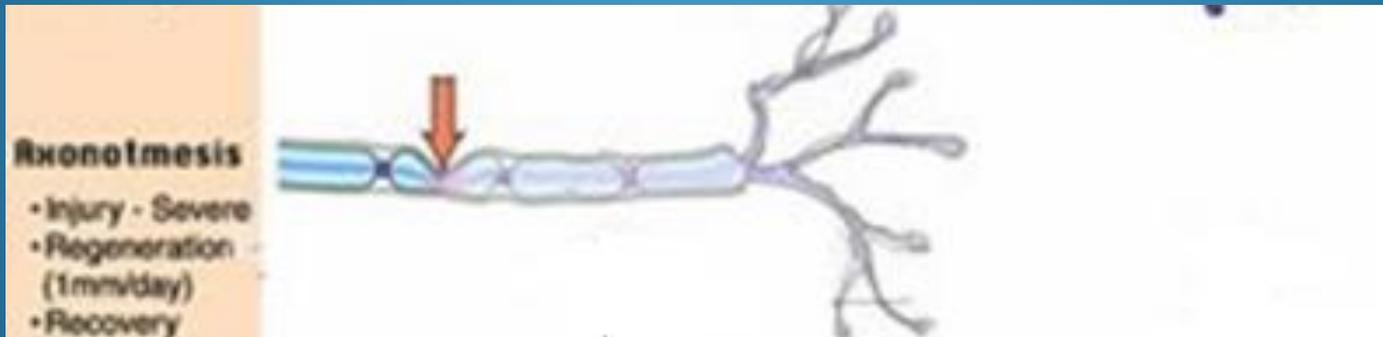
- ✓ Compression but no disruption of nerve tissue (axon) or connective tissue.
- ✓ Best prognosis.



Classifications of Nerve Injury

Axonotmesis

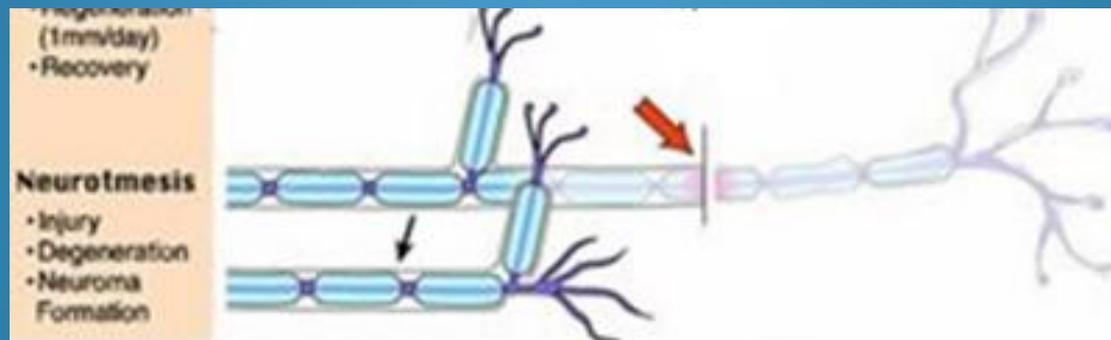
✓ The continuity of the axon and myelin sheath has been disrupted but the endoneurial tubes remain intact.



Classifications of Nerve Injury

Neurotmesis

- ✓ Destruction of axons and connective tissue leading to anatomical discontinuity.
- ✓ Rapid Wallerian Degeneration.
- ✓ Poor prognosis.



DENERVATION

Partial Denervation

- ✓ Some motor units in a muscle lose innervation.
- ✓ Weakness (paresis).

Complete Denervation

- ✓ All motor units in a muscle lose innervation.
- ✓ Paralysis.

REACTION OF DEGENERATION

- ✓ Contraction is no longer instantaneous but has become slow and sluggish.
- ✓ Stimulus duration has become longer.
- ✓ Current intensity has also become greater.
- ✓ The muscle will contract only in response to direct stimulation.

Electrical Stimulation of any Tissue Depends on

- Electrical Excitability
- Refractory Period
- Capacity of the tissue to accommodate to stimulus.

ELECTRODIAGNOSIS OF NERVE AND MUSCLE

Electrophysiological studies provide valuable diagnostic information regarding:

Site of injury

Type of injury

Extent of injury

Documentation of Reinnervation

STRENGTH DURATION CURVE

Excitable tissue respond by discharging an action potential if an applied stimulus meets certain criteria regarding:

Strength

Pulse duration

The intensity of the stimulus must be strong enough to depolarize the membrane and of sufficient duration to overcome its capacitance.

Rheobase:

Minimal stimulus intensity required to elicit a minimal visually perceptible muscle contraction.

Chronaxie:

minimal pulse duration of a stimulus twice Rheobase strength that will cause the excitable cell membrane to discharge.

Chronaxie for nerve is less than 1 msec. while for muscle is much longer, usually longer than 10 msec.

PLOTTING AN S-D CURVE

1- Comfortable starting position and firmly support the part that will be tested.

2- Explain the technique to the patient.

3- Reduce skin resistance by any means (cleaning, warming, and wetting).

- By reducing the resistance the curve is positioned as low on the graph paper as possible.

- The presence of oedema, fibrosis, or ischemia can cause elevation of the Rheobase, and therefore, the whole curve.

- Fatigue may cause the Chronaxie to be doubled.

If any of these factors are present, then it is wise to defer the test, or to take particular care in interpreting the results.

4- A stimulator with a variable current or voltage output and a variable stimulus duration is required.

5- The stimulating cathode is placed over the motor point of the muscle.

6- Start to increase current amplitude till minimal muscle contraction is appear.

7-To insure that you use the minimal current reduce the current until the contraction disappear then increase it slowly until the contraction can be detected

8-Fix the active electrode at this point and record the values of current and pulse duration on the graph as a point.

In the unipolar technique of stimulation, a small active electrode is placed on the muscle to be tested, and a large dispersive electrode is placed as close as possible to the active electrode.

STRENGTH-DURATION / CHRONAXIE TEST

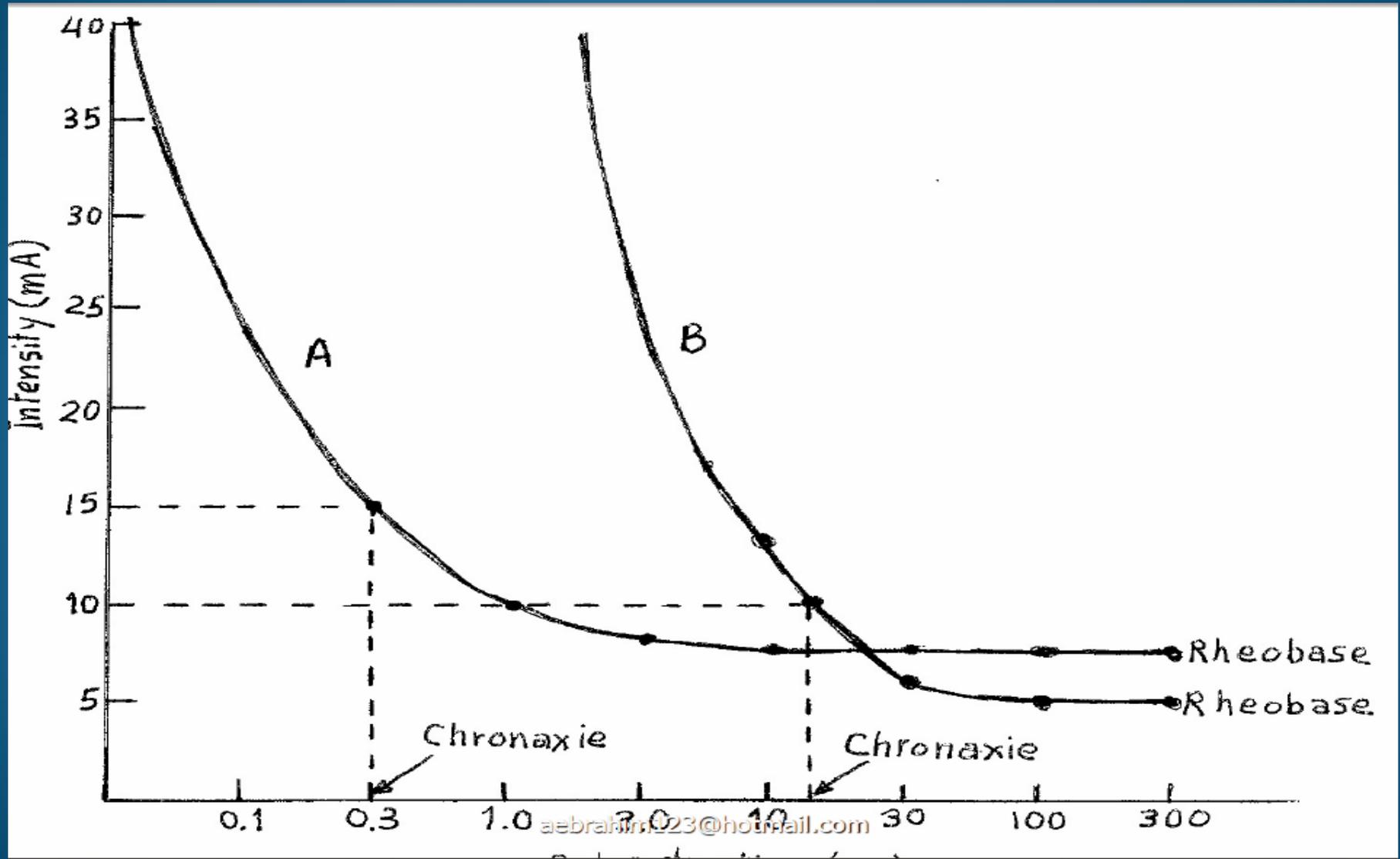
PULSE DURATION (msec.)	Muscle <u>abd. dig. min.</u> L_R Date <u>6/10</u> stim. amp. (mA)	Muscle <u>abd. dig. min.</u> L_R Date <u>6/10</u> stim. amp. (mA)	Muscle <u>abd. dig. min.</u> L_R Date <u>7/16</u> stim. amp. (mA)
100	2	4	3.5
30	2	5	3.5
20*	2	8	6
10**	2	13	7
3	2	20	9
1	2	<i>No response</i>	10
0.5	3		18
0.3	4		<i>No response</i>
0.1	5		
0.05	12		

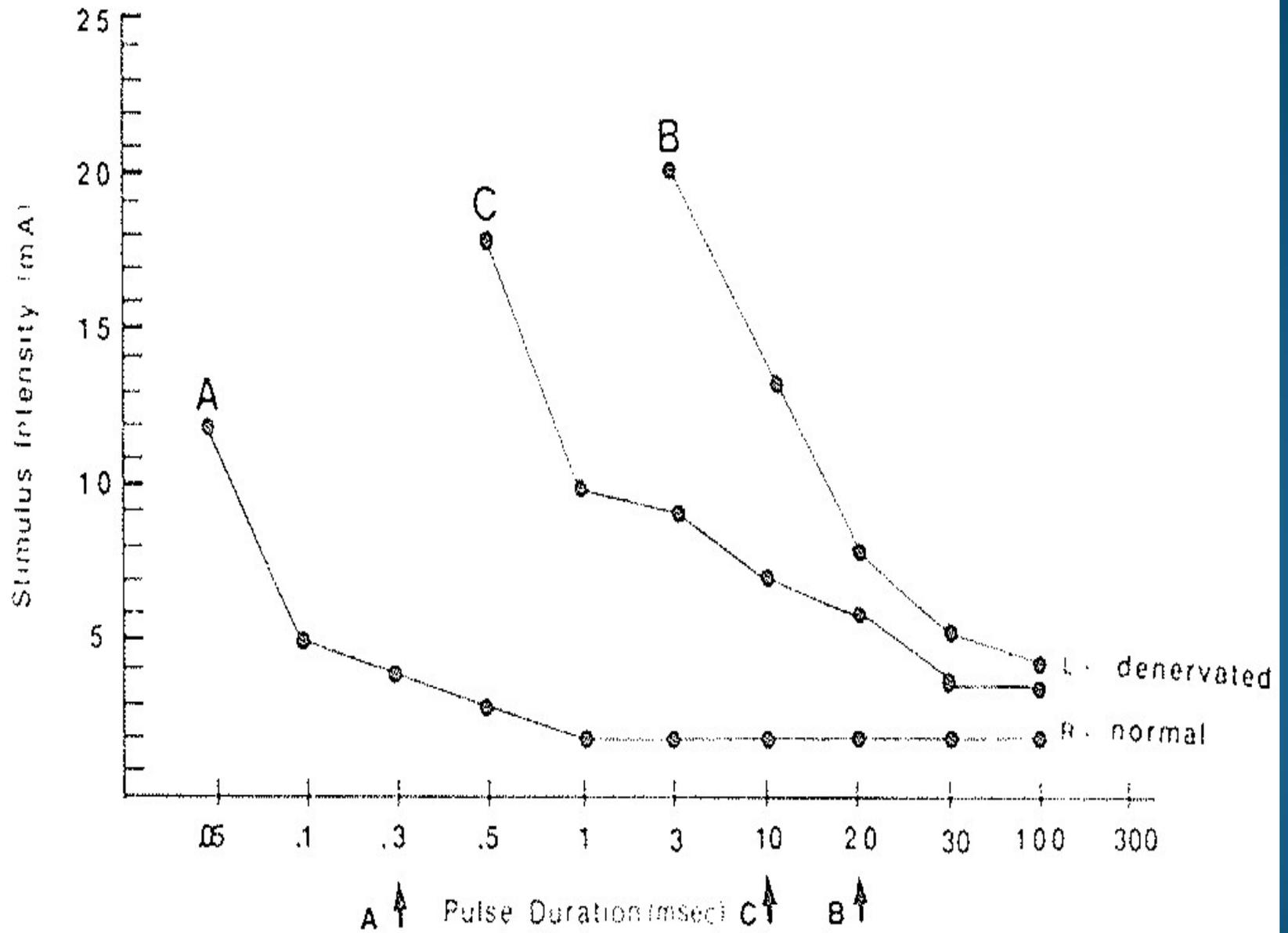
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B

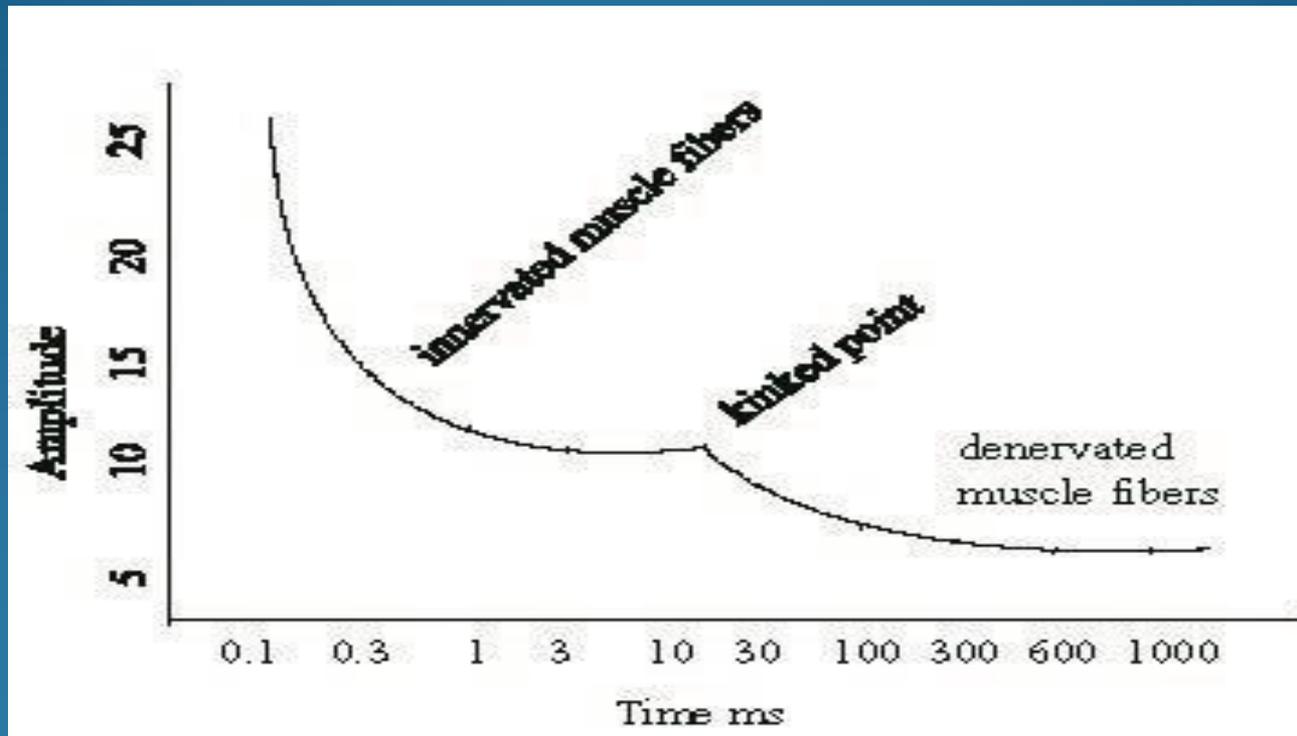
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STRENGTH DURATION CURVE





Sign of Reinnervation in S-D Curve



a discontinuity or kink in a curve demonstrates the existence of partial denervation

Limitations of S-D Curve

- 1- It does not localize the site of neuronal damage.
- 2- In a bulky muscle, such as the quadriceps femoris, only the superficial muscle fibers will be accessible.
- 3- Strength-duration curves assess only the state of motor innervations of muscle, and give no indication of damage to sensory fibers.



THANK YOU