Spasticity

Diagnosis and Management

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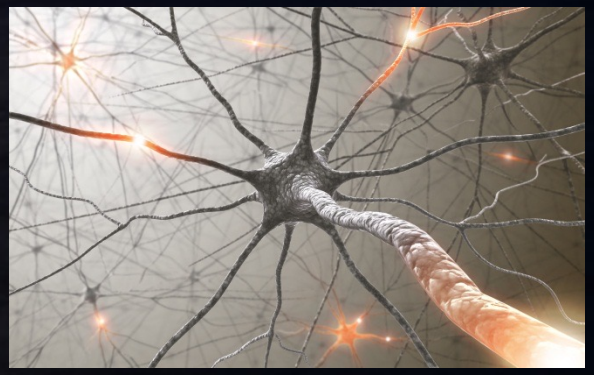
What is Spasticity?

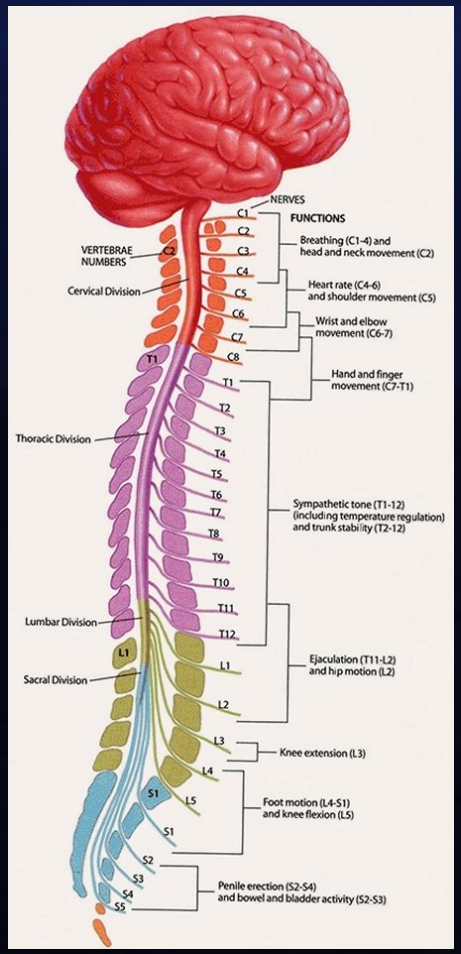
- a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes (muscle tone) with exaggerated tendon jerks, resulting from hyperexcitability of the stretch reflex…

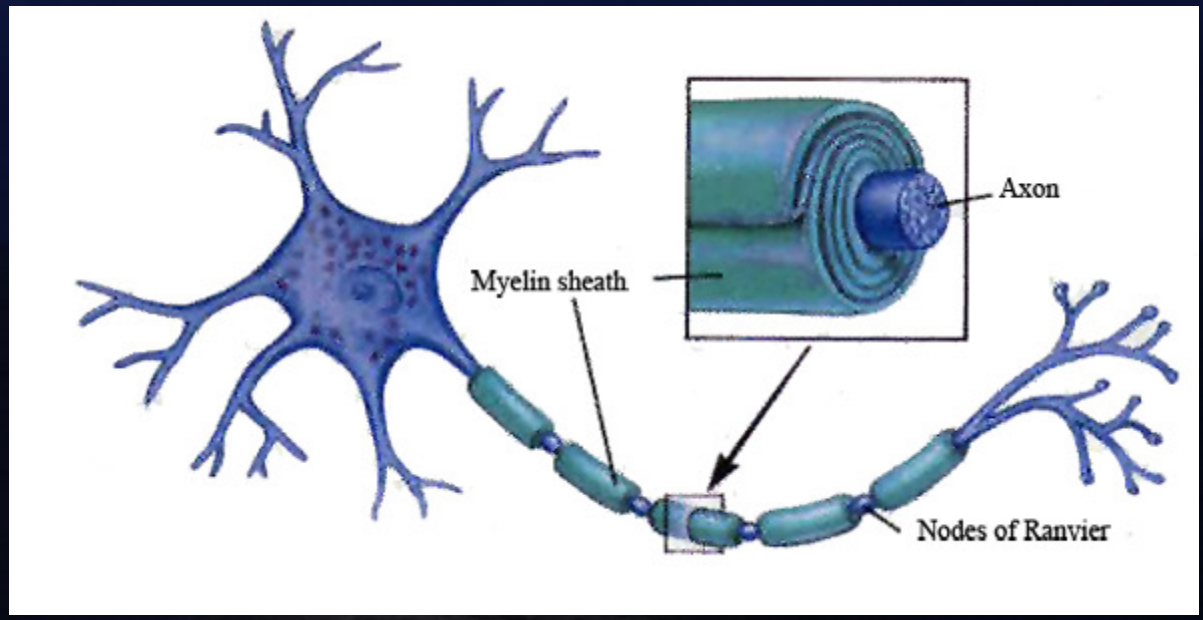


What is Spasticity?

- Tight, stiff muscles or spasms that may make movement, posture, and balance difficult.
- It may affect the ability to move one or more of the limbs, or to move one side of the body.
- If severe, it can get in the way of daily activities, sleep patterns, and caregiving.

CNS Anatomy


NERVES
FUNCTIONS
VERTEBRAE NUMBERS
Cervical Division
Thoracic Division
Lumbar Division
Sacral Division
C1
C2
C3
C4
C5
C6
C7
C8
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5
Breathing (C1-4) and head and neck movement (C2)
Heart rate (C4-6) and shoulder movement (C5)
Wrist and elbow movement (C6-7)
Hand and finger movement (C7-T1)
Sympathetic tone (T1-12) (including temperature regulation) and trunk stability (T2-12)
Ejaculation (T11-L2) and hip motion (L2)
Knee extension (L3)
Foot motion (L4-S1) and knee flexion (L5)
Penile erection (S2-S4) and bowel and bladder activity (S2-S3)


Axon
Myelin sheath
Nodes of Ranvier

What causes Spasticity?

Causes of Spasticity

- Caused by damage or injury to the part of the central nervous system that controls voluntary movement.
- This damage disrupts important signals between the nervous system and muscles, creating an imbalance that increases muscle activity or spasms.

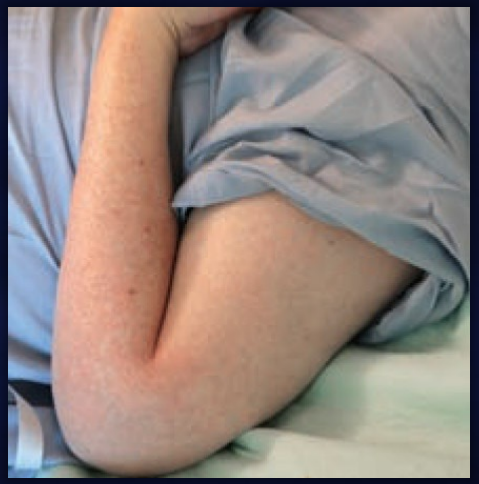
What are the Symptoms?

Symptoms

- Increased muscle tone
- Overactive reflexes
- Involuntary movements, which may include spasms (brisk and/or sustained involuntary muscle contraction) and clonus (series of fast involuntary contractions)
- Pain

Symptoms

- Decreased functional abilities and delayed motor development
- Difficulty with care and hygiene
- Abnormal posture
- Contractures (permanent contraction of the muscle and tendon due to severe persistent stiffness and spasms)
- Bone and joint deformities



What conditions cause Spasticity?

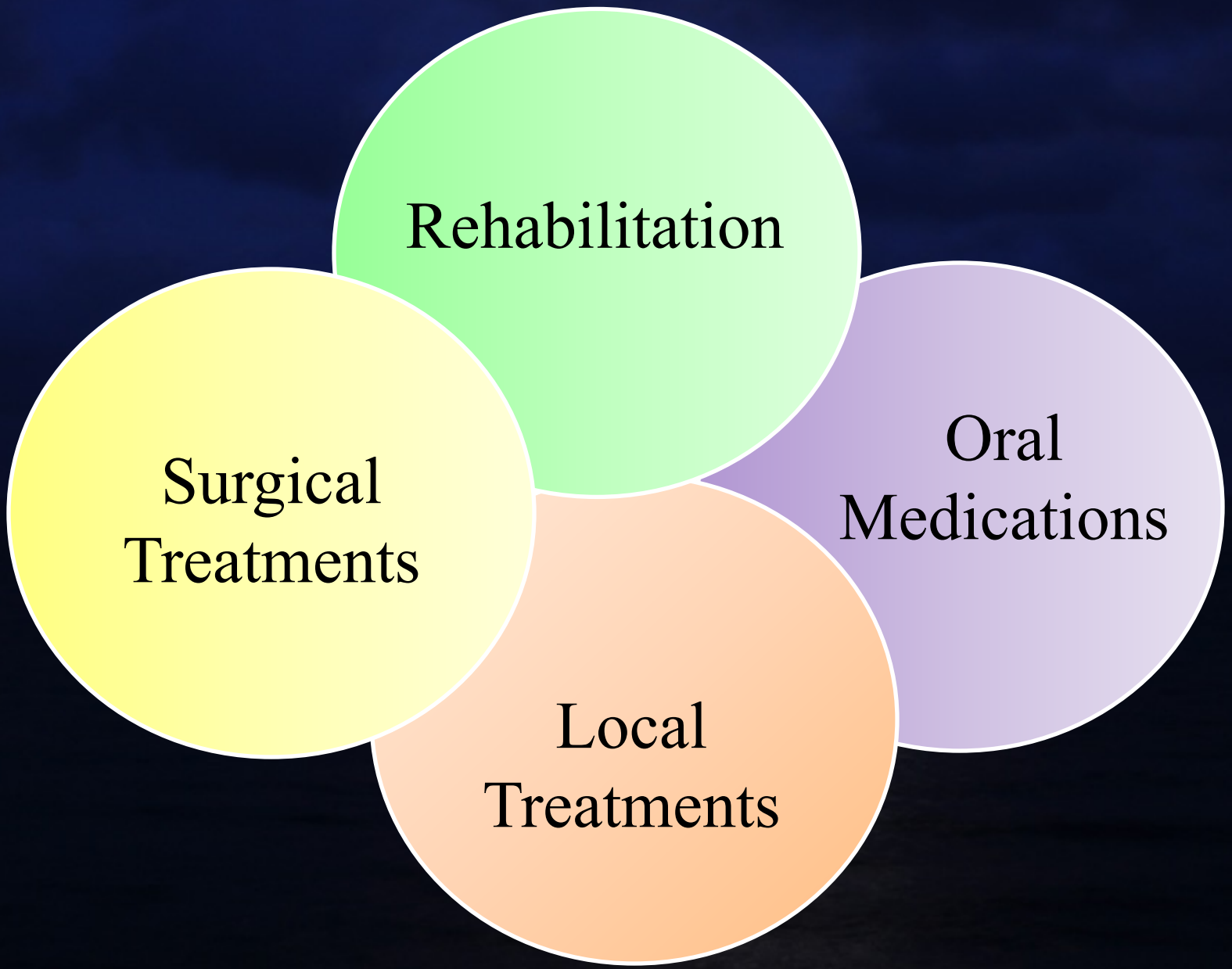
- Stroke
- Spinal Cord Injury
- Multiple Sclerosis
- Cerebral Palsy
- Traumatic Brain Injury
- Transverse Myelitis
- NMOSD

Treatment Goals

- Improvements in
  - Position
  - Mobility
  - Pain
- Contracture prevention
- Ease of care

Day to Day Approach

- Stretching and range of motion
- Myofascial and joint mobilization
- Active assistive, active and resistive exercise
- Endurance training


Rehabilitation
Surgical Treatments
Oral Medications
Local Treatments

Oral Medications

- **Baclofen**
  - Adverse reactions: weakness, **sedation**, hypotonia, ataxia, confusion, fatigue, nausea, dizziness, lower seizure threshold
  - Sudden withdrawal may cause seizures, hallucinations, rebound spasticity
- **Tizanidine**
  - Adverse reactions: **drowsiness**, dizziness, dry mouth, orthostatic hypotension
- **Dantrolene**
  - Adverse reactions: weakness (including ventilatory muscles), **drowsiness**, lethargy, nausea, diarrhea, Liver toxicity

Rehabilitation

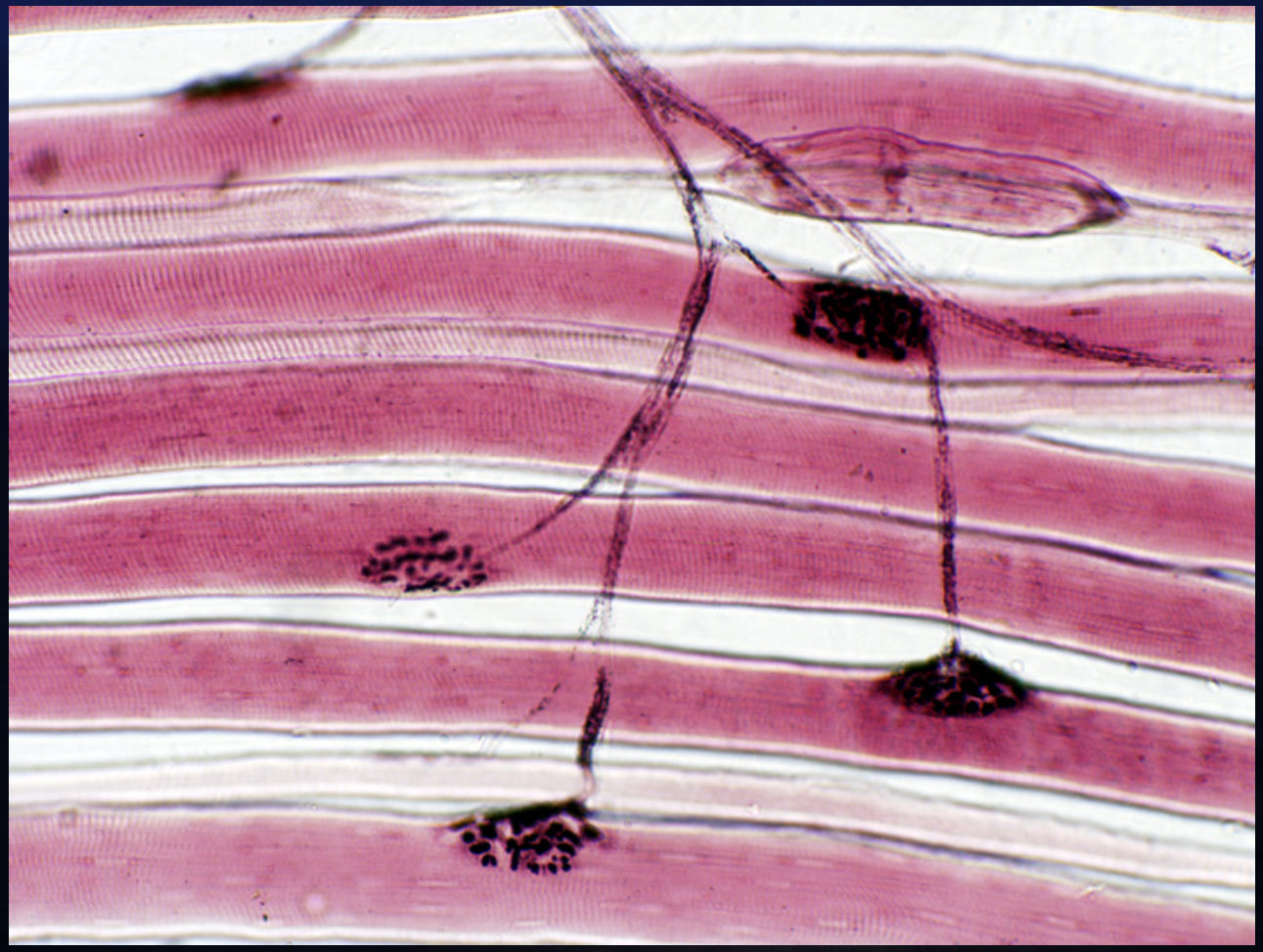
- Physical Therapy
- Occupational Therapy
- Speech therapy
- Activity Based Rehabilitation (FES)

Local Treatments

Botulinum toxin (Botox)

- Approved 1989
- Injected directly into overactive muscles
- Reduces contractions, relaxes muscles
- Advantages of local injection
  - Targeted to specific muscles that are causing the symptoms
  - When used at recommended doses, avoids systemic, overt distant clinical effects

How does Botox work?



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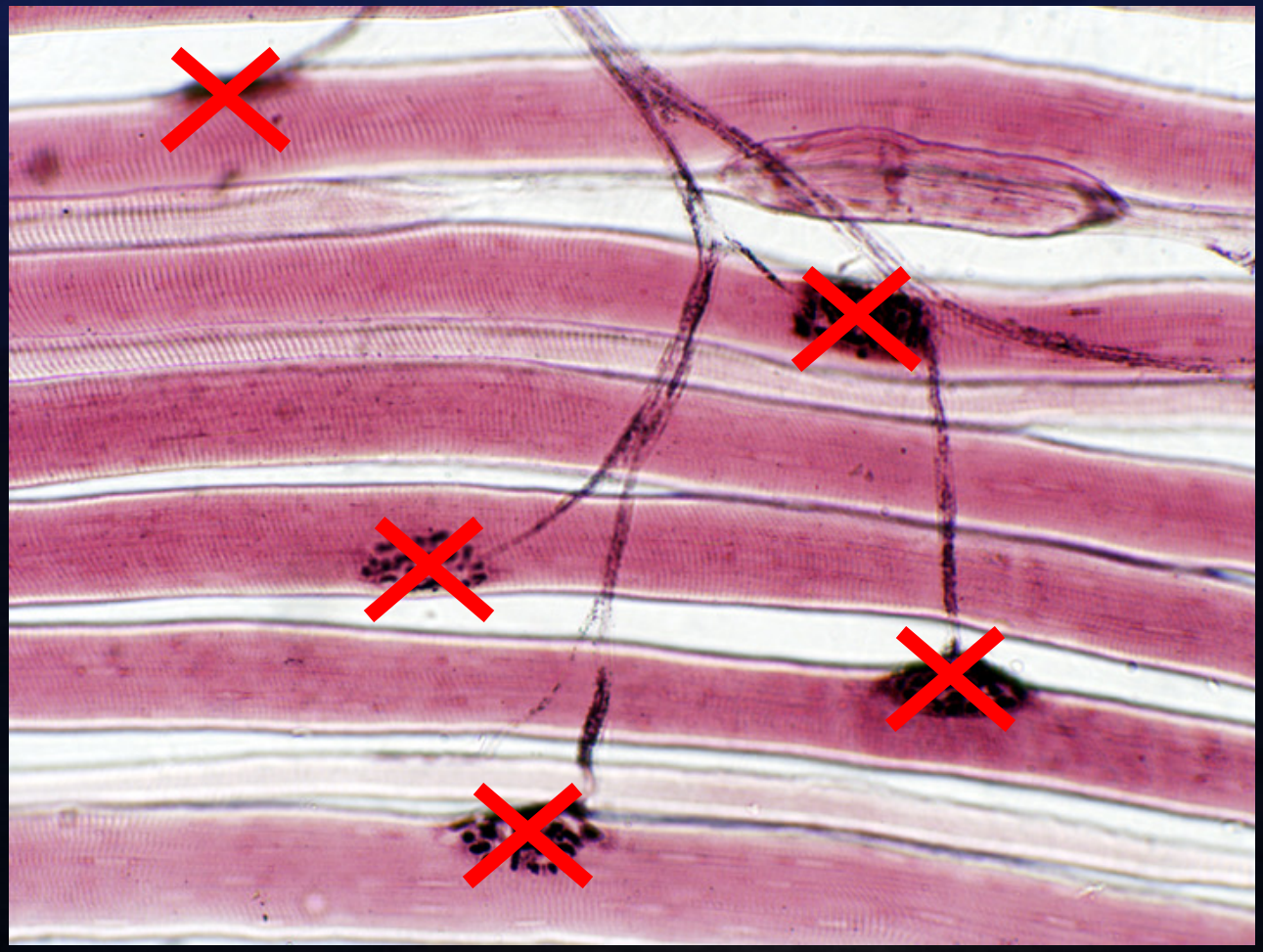


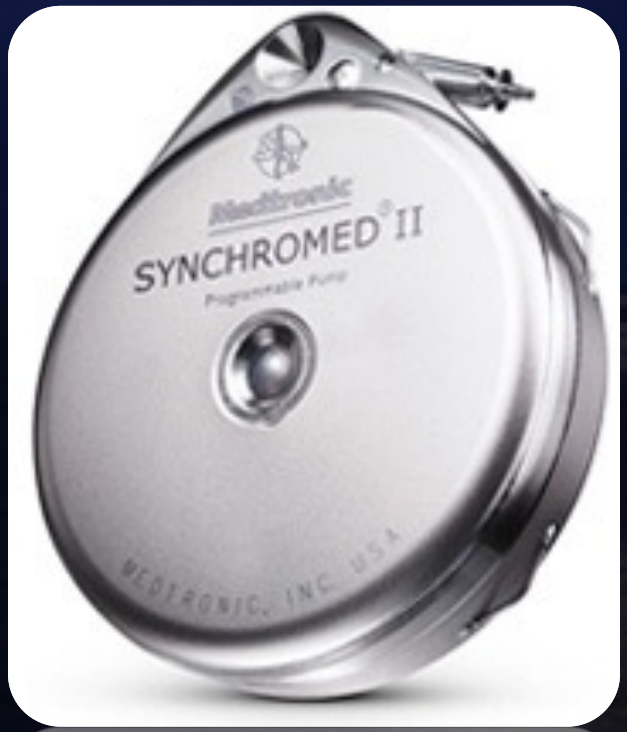
Botox

- Very good safety profile
- Can be used in any muscle (including the bladder)
- Effect lasts 3-6 months

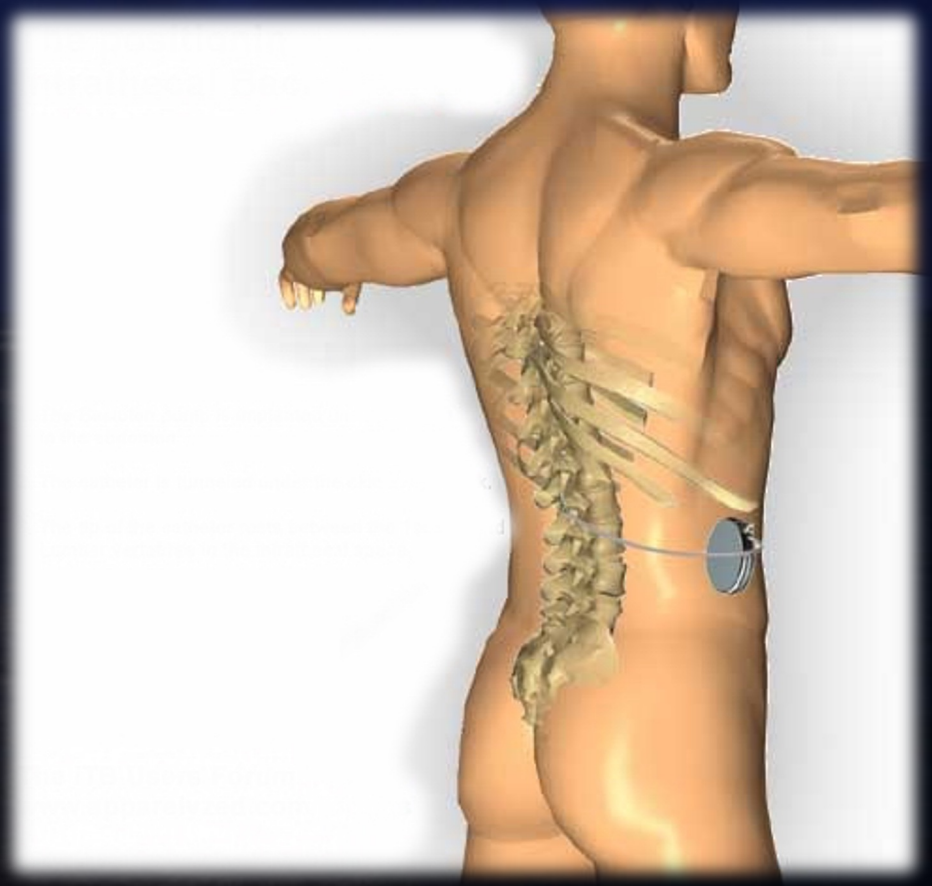
For more severe cases…

- or if too many muscles involved
- or if oral medications are not effective or cannot be tolerated…

ITB Therapy (Baclofen Pump)



Intrathecal Baclofen



Intrathecal Baclofen

- Small doses of baclofen delivered directly to the spinal canal (1000 times less medication than by mouth).
- Fewer side effects, better relief of spasticity
- Usually more effective for spasticity in the lower extremities
- Requires committed patient and family, pump must be refilled every 6 months.

Other Surgical Treatments

- Usually last resort as these are permanent options”
  - Dorsal rhizotomy, in which the dorsal (sensory) nerve roots are severed.
  - Tendon transfers.
  - Osteotomies (cutting a bone to change its alignment).

Most effective therapy?

Combination of the above guided by an experienced physician.

Summary

- Spasticity is common after CNS injury, and is manifested as muscle tightness in the muscles.
- Several different treatment options are available, including physical therapy, oral medications and injections.
- If you suffer from spasticity you should be seen by a physician who specializes in spasticity management.

Thank you