

Spasticity

Is it Good or Bad?

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Disclosures

- Speakers Bureau for Allergan/AbbVie

Objectives

- Describe spasticity and other movement disorders as they relate to traumatic brain injury
- Identify potential benefits of spasticity or emerging tone
- Delineate negative effects of spasticity and treatments aimed at tone

What is spasticity?

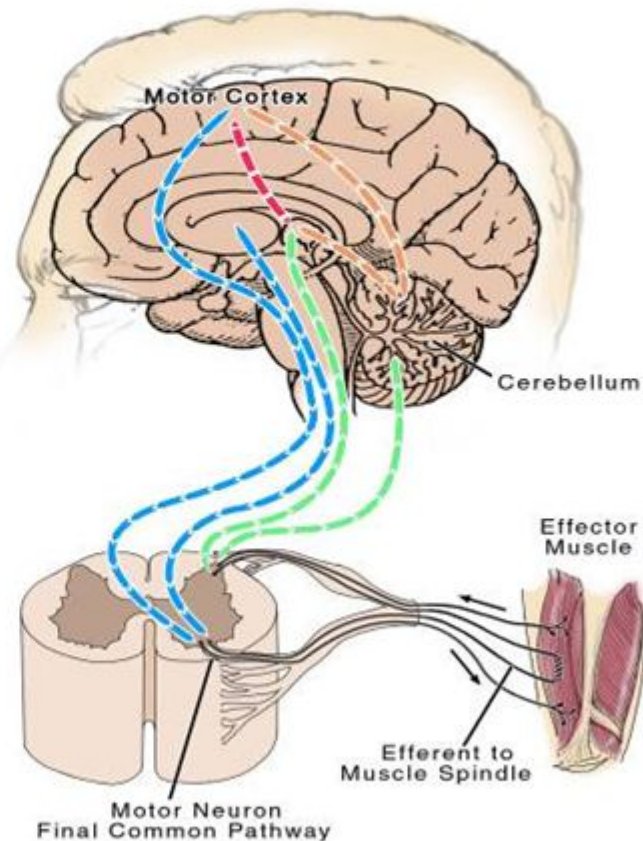
- A velocity dependent increase in muscle tone associated with an exaggerated stretch reflex
- One component of the upper motor neuron syndrome
- Other components
 - Hyperreflexia
 - Weakness
 - Clonus

What Causes Spasticity?

Theory

- Imbalance between descending excitatory and inhibitory impulse to the alpha motor neuron:
 - Spasticity of cerebral origin results from lack of descending inhibitory input from subcortical nuclei in the brain
 - Spasticity of spinal origin results from interruption of descending tracts that inhibit or modulate alpha and gamma motor neurons

Sensory and Stretch Receptors



What is not spasticity?

- Rigidity- a condition in which antagonist muscles both have increased tone causing difficulty with movement in all directions
- Dystonia- involuntary muscle contractions causing patterns of unwanted movements
- Other hyperkinetic movement patterns-
 - Ballismus
 - Choreaform movements
 - Athetosis

How to measure hypertonicity

- Used to supplement for measurement of spasticity
- Moderate interrater reliability
- Reliability depends on joints measured
- Within rater reliability is good
- Positioning is important
- Used as the measurement for most spasticity intervention studies

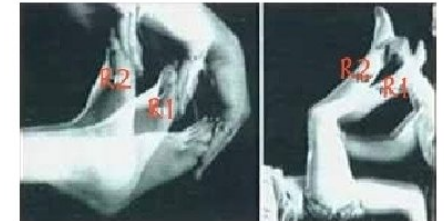
Modified Ashworth Scale	
0	• No increase in tone
1	• Slight increase in tone • Catch/release at end ROM
1+	• Slight increase in tone • Catch/release and resistance through rest ROM (1/2 ROM)
2	• More marked increase in tone through ROM, but affected part moved easily
3	• Considerable increase in tone, passive movement difficult
4	• Affected part in rigid flexion and extension

Other measurement options

- Modified Tardieu Scale
- Spasm frequency scale

Modified Tardieu Scale

- Measurements;
 - R2 = passive ROM
 - R1 = angle of muscle reaction
 - R2 - R1 = dynamic tone



Pro's	Con's
<ul style="list-style-type: none"> • Differentiates between the neural and biomechanical components (<i>Alhusaini et al 2010</i>) • Test conditions are standardised • 'catch point' = 	<ul style="list-style-type: none"> • Insufficient research has been completed to confirm if this scale is a valid measure of spasticity (<i>Haugh et al 2006</i>) • Often requires two clinicians to



Key information in the history

- Language of spasticity
 - Tone, tightness, spasms, jumpy legs
- Sleep
- Pain
- Fatigue
- Functional status
- Caregiver information

Important Functional Information

- How do you transfer?
- How do you get dressed? Upper extremities? Lower extremities? In bed or in chair?
- Do you wear splints? Really wear them?
- How do you use your impaired arm (for hemiplegics)?
- Do you have caregivers? What are their hours?

Positive effects of spasticity

- Provides a solid grasp to put things in
- Provides tone in transfers
- Decreases muscle atrophy
- Potentially improves orthostasis
- May provide more UE movement than a flaccid toneless arm

Negative effects of Spasticity

- Pain
- Can't control limb when want to
- Skin issues
- Cannot tolerate bracing or positioning
- May impact sleep
- Makes it harder for caregiver to do tasks

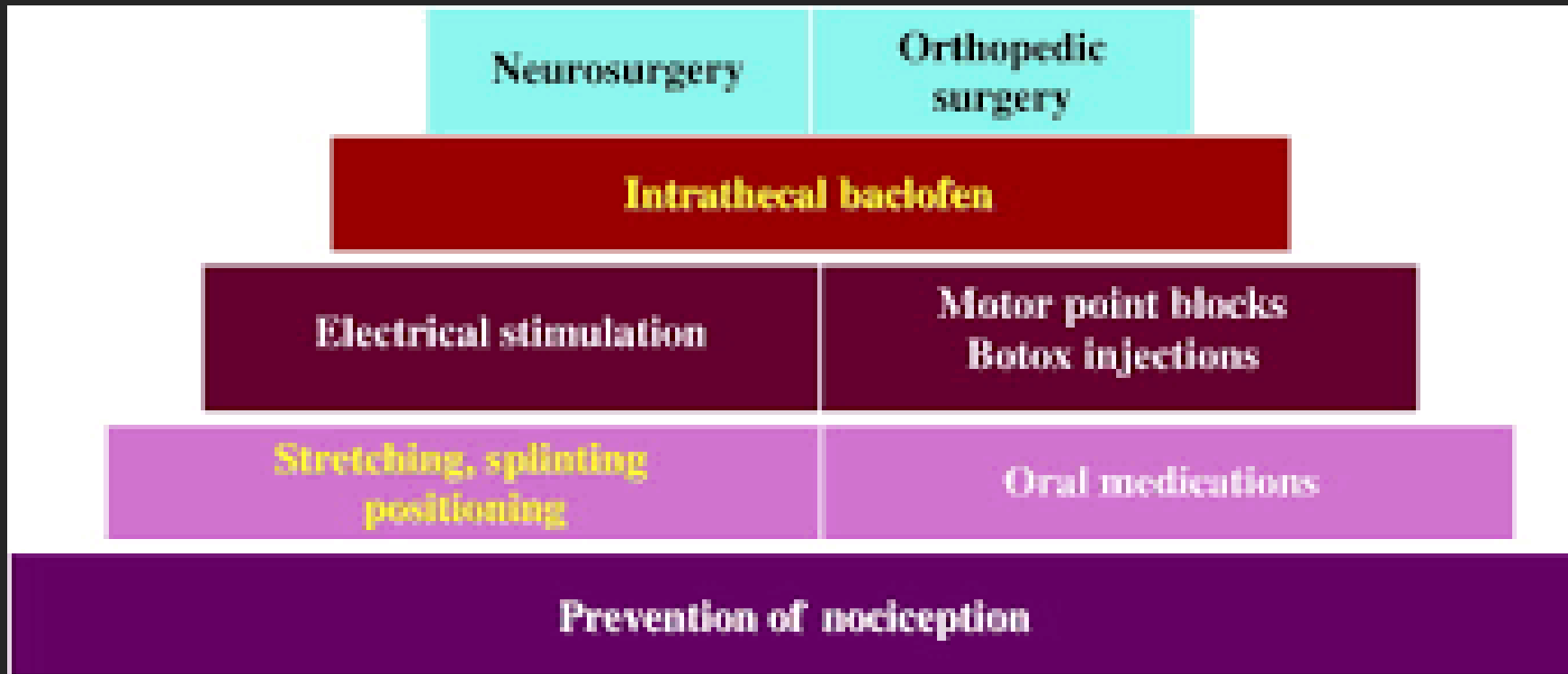
Treatment plan decisions

- What are the patient's goals?
- What are the family's goals?
- What can you achieve therapeutically?
- Need input from other sources
 - PT
 - OT
 - Paid caregivers

Timing of management

- Acute
 - Patients change quickly
 - Goals need to be focused
- Subacute
 - Usually still involved with therapies
 - Patient/family still adjusting to illness
- Chronic
 - Role of contractures

Theories of Spasticity Management



How We View It Now

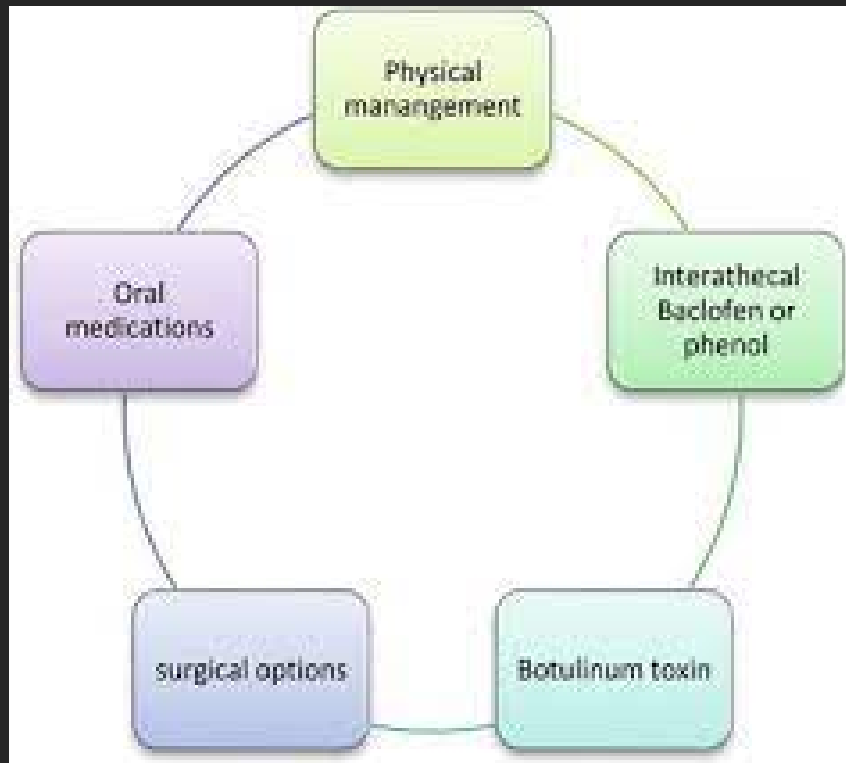


Fig. 2. Spasticity management diagram.

Take Home Points

- It is not a mutually exclusive treatment plan
- What you do at one time may change as a patient changes
- You need to evaluate each intervention independently
- Reevaluate goals with patient and family periodically
- Need to take in to account psychosocial factors that may impact compliance- especially with ITB

Oral Medications

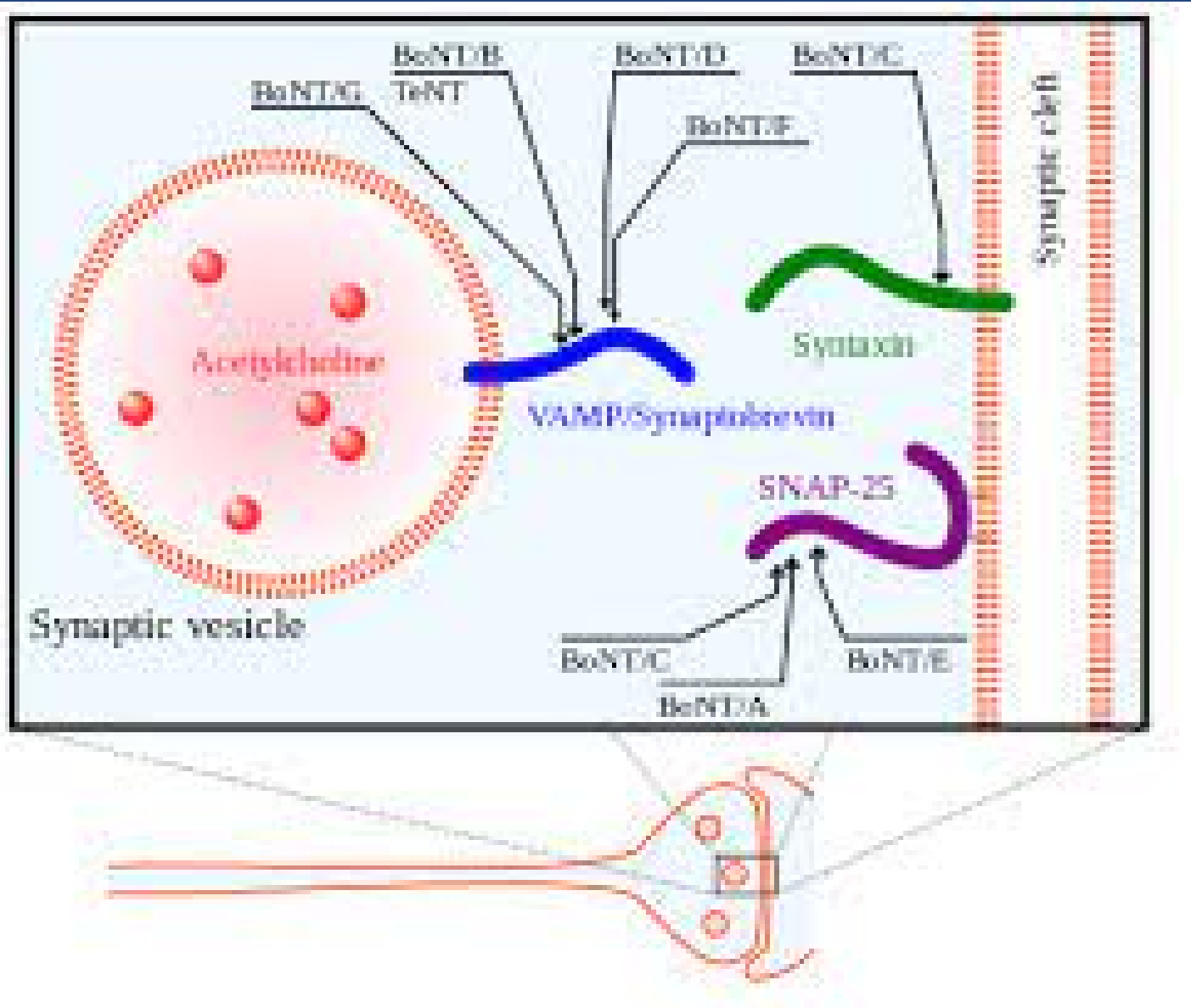
- Baclofen- GABA-B agonist used to manage spasticity of spinal and cerebral origin
 - Depresses reflex transmission
 - Metabolized by liver/excreted by kidneys
 - Doesn't easily cross blood/brain barrier
- Dantrolene-direct acting skeletal muscle relaxant- interferes with calcium release from the sarcoplasmic reticulum
 - Metabolized by liver

Oral Medications (cont)

- Tizanidine- Alpha-2 adrenergic receptor agonist causes presynaptic inhibition of excitatory neurotransmitters
 - Decreases heart rate and blood pressure
 - Metabolized by the liver, excreted by kidneys

Neurotoxin injection

- Botulinum toxin A and B used to block acetylcholine release at the neuromuscular junction
- Commercially available as Botox, Dysport, Jeuveau, Xeomin, Myobloc, Neurobloc
- FDA indications for upper and lower limb spasticity in spastic hemiparesis



Advantage/Disadvantages of Neurotoxins

- Advantages
 - Work focally
 - Work quickly
 - Temporary
- Disadvantages
 - Cause weakness
 - Temporary
 - Difficult to treat large muscles
 - Cost

Surgical Treatment of Spasticity

- Tendon releases/lengthening/muscle procedures
- Intrathecal baclofen pump
 - Powerful way to get baclofen past the blood brain barrier
 - Highest potential of weakness
 - Needs maintenance
 - Usually best for global tone management

Intrathecal Baclofen Pump



Placed in the RLQ

Accessed with a spinal needle using a guidance template

Refilled every 2-6 months

Adjustable in the office

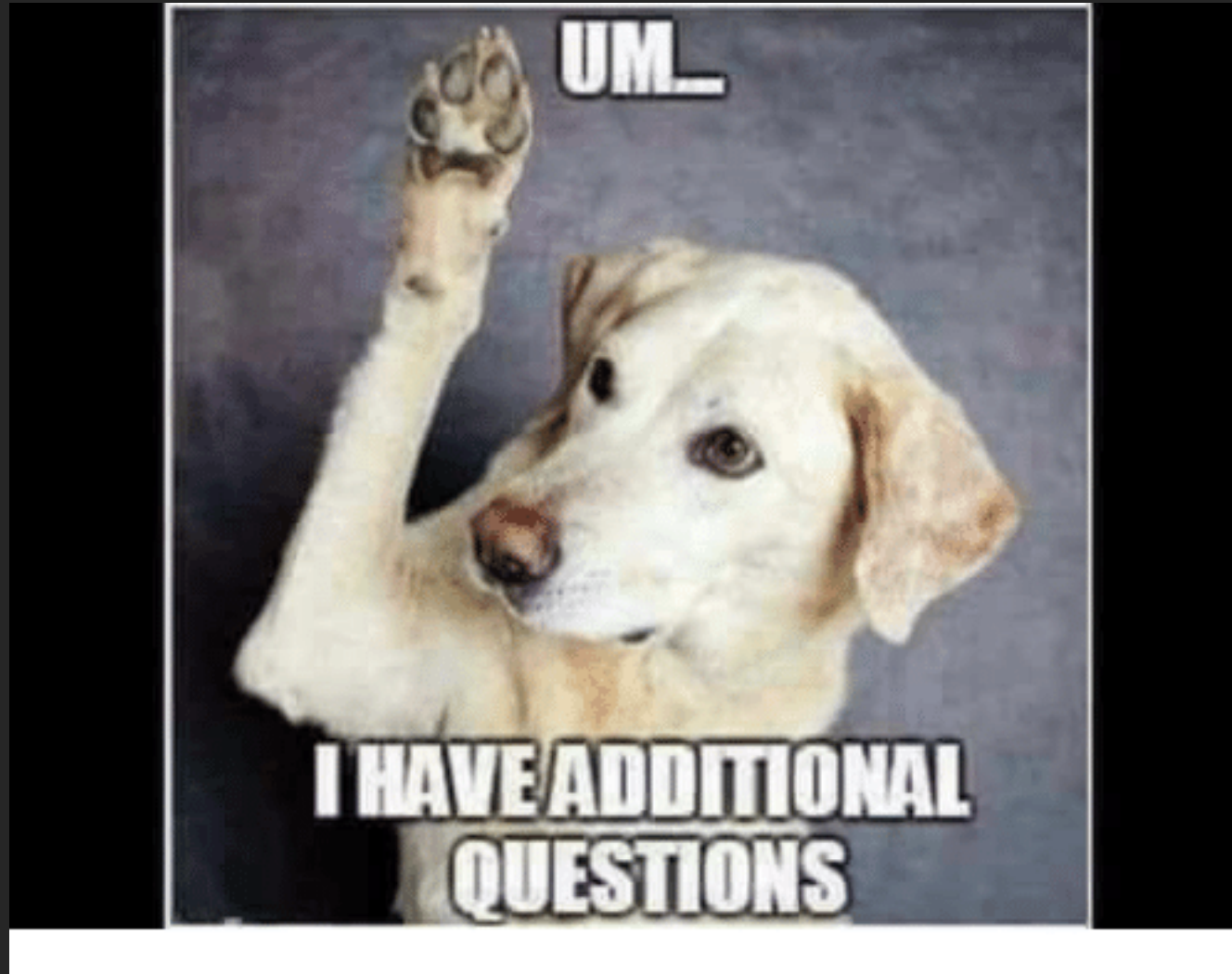
Questions to Ask

- Temporary vs. Permanent tone reduction
- Interaction with other medical care
 - Always look at medical comorbidities before treating tone
- What else has changed
 - Seating and positioning
 - Splinting
 - Weight gain or loss
 - Sleep patterns

Conclusions

- Use your resources- patients, families, therapists
- Develop a treatment plan
- Not all tone is bad

Questions???





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