Spasticity Management in the Prevention and Treatment of Pressure Wounds

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Disclosures

• Nothing to disclose
Objectives

• Identify risk factors spasticity presents in the development of pressure wounds

• Describe conservative treatment options for spasticity management

• Learn about advanced treatment options for spasticity management
Risk Factors

• Immobility
• Lack of sensory perception
• Poor nutrition and hydration
• Medical conditions affecting blood flow
• Moisture or other factors causing skin fragility
Causes of Pressure Wounds

• Pressure
• Friction
• Shear
High Risk Areas

• Posterior head
• Scapular area
• Lumbar region
• Sacral region
• Ischial prominences
• Trochanteric prominences
• Heels
A Discussion of Risk Factors – Immobility

• Immobility - Neurological and Medical Causes
  • Prolonged bedrest
  • Prolonged sitting
  • Immobile joints
    • Casts
    • Splints
    • Contractures
A Discussion of Risk Factors – Sensory Perception

• Neuropathy
  • Spinal cord injury
  • Peripheral neuropathy
  • Stroke
  • Multiple Sclerosis

• Loss of sensorium
  • Coma
  • TBI
  • Dementia
A Discussion of Risk Factors – Medical Conditions

• Poor nutrition and hydration
  • Acute and Chronically Ill
  • Elderly

• Medical conditions affecting blood flow
  • Vascular diseases
  • Diabetes
  • Sepsis or other causes of hypotension

• Moisture or other factors causing skin fragility
  • Incontinence
  • Wound drainage
  • Sweat
Causes - Review

• Pressure
  • Immobility – Multiple causes

• Shear
  • Bedsheets one way, the skin the other...sliding down in bed
  • Usually with higher pressure, lower rate/frequency

• Friction
  • Skin rubbing against clothing or bedding
  • Usually with lower pressure, but higher rate/frequency
Contractures

• A condition of shortening and hardening of muscles, tendons, or other tissue, often leading to deformity and rigidity of joints

• Caused by prolonged immobility
Contracture Types

• Muscle
  • Amenable to treatment

• Joint - capsule
  • Amenable to treatment, but only typically early in course of process

• Joint - bone
  • Ankylosis
  • Not amenable to conservative treatment
Rigidity and Spasticity

- **Rigidity**
  - Inability to be bent or be forced out of shape
  - An abnormal increased involuntary muscle tone...stiffness.
  - Parkinson’s disease
  - Extrapyramidal side effects of medications
    - Reglan/Metoclopramide, Haldol/Haloperidol, Thorazine...Anti-psychotics

- **Rigidity on exam**
  - “lead pipe” on range of motion (ROM)
  - Not velocity dependent
  - The resistance is the same if slow or rapid ROM is attempted

- **Rigidity may lead to contracture**
Rigidity and Spasticity

• Spasticity
  • An Upper Motor Neuron phenomenon (Brain and Spinal Cord)
  • Abnormal involuntary increase in muscle tone
• Spasticity on exam
• “Catches” on range of motion (ROM)
• Velocity dependent
• The resistance is the different if slow or rapid ROM is attempted
  • Tighter with faster ROM
  • Looser with slower ROM
• Spasticity may lead to contracture
Spasticity May Lead to all Risk Factors

• Spasticity leads to immobility
  • Pressure
  • Shear

• Spasticity leads to friction
  • Muscle spasms
  • Clonus
Prevention

• Pressure wounds are COMPLETELY preventable with…
  • Proper turning schedule
  • Proper ROM schedule
  • Proper pressure releases – when sitting
  • Proper cushioning
  • Proper hygiene
  • Proper nutrition
  • Proper analgesics

• But, with spasticity, prevention can be more difficult…
Treatment of Muscle Contractures – Regardless of Cause

• Range of Motion – multiple times daily
  • Who is responsible?
• Splinting
• Serial Casting
• Modalities - Heat, Ice, Vibration
• Analgesics prior to ROM activities
• Botulinum toxins
• Surgical intervention
• Medications? Typically best for spasticity induced contractures
Spasticity –
An Upper Motor Neuron Phenomenon

• TBI
• CVA
• Other brain insults (infection, hydrocephalus, tumors etc.)
• Multiple Sclerosis
• Cerebral Palsy
• Spinal Cord Injury above the Conus Medullaris
Spasticity

- Uncontrolled muscle stretch reflexes
- Usually not painful
- Expected onset
- Little prognostic significance
- Minimal to powerful
- Does not always require treatment
- May preserve muscle mass
- May lessen the incidence of venous thrombosis
Causes of Worsened Spasticity

• Spinal instability
• Syringomyelia
• Pressure ulcer
• Infection
• Nephro or Urolithiasis
• Constipation or Urine retention
• Paronychia, Tight Clothing, etc.
Treat Spasticity to Improve:

- Self care
- Gait
- Wheelchair positioning
- Transfer activities
- Sleep
- Excessive pain
- Joint deformity
- Risk of pressure ulcerations
Spasticity Treatment Foundations

- Daily routine of prolonged stretching (ROM)
  - With modalities (Heat, Ice, Vibration)
  - Pre-medicate with analgesics
- Orthotics / Serial splinting/casting
- Medications
- Muscle Block
- Nerve Block
- Orthopedic Surgery
- Neurosurgical Techniques
Orthotic Devices

• Orthotic devices
  • Splints
  • Casts
  • Tone-reducing AFO’s (TRAFO’s)

• Decision to use an orthotic device depends on:
  • Age of the patient
  • Functional level
  • Motor control
  • Type of deformity
  • Commitment to use
Medications for Spasticity

- Baclofen
- Diazepam
- Dantrolene
- Clonidine
- Tizanidine
- Others
  - Gabapentin
  - Other Benzodiazepines
Baclofen

- Site of action: GABA “B” receptor
- Decreases release of excitatory neurotransmitters from afferent terminals
- Max dose is 20mg qid
- SE = Weakness, fatigue, confusion, depression, GI upset
- May lower seizure threshold
- Abrupt withdrawal may precipitate seizures or hallucinations
- Used with MS and SCI, but also TBI, etc.
Diazepam

- Site of action: Brainstem reticular formation and spinal cord
- Increases GABA binding, potentiating presynaptic inhibition by GABA
- Max Dose = 40mg/day. Start with 2 mg bid.
- SE = Drowsiness, fatigue, urinary retention, constipation, impaired memory
- May develop tolerance and dependence.
- Cognitive effects worse in MS and TBI
Dantrolene

• Site of action: Intrafusal and extrafusal muscle fibers
• Decreases release of calcium from the sarcoplasmic reticulum
• Max dose: 12 mg/kg/day up to 400mg/day
• SE = Weakness, fatigue, drowsiness, diarrhea
• May depress pulmonary function
• Reversible and irreversible hepatotoxicity (1.8%)
Clonidine and Tizanidine

• Central Alpha-2 Adrenergic agonist

• Clonidine (po, transdermal)
  • More potent in lowering blood pressure

• Tizanidine (po)
  • Less potent in lowering blood pressure
  • May facilitate action of glycine – an inhibitory neurotransmitter, preventing release of excitatory amino acids (glutamate/aspartate) from the presynaptic terminal of spinal interneurons.
Clonidine

• Central Alpha-2 Adrenergic agonist
• Clonidine (po, transdermal)
  • More potent in lowering blood pressure
Clonidine Side Effects

• Syncope
• Hypotension
• Nausea
• Vomiting
Clonidine

• Most patients note benefit with 0.1mg bid or less.
• Transdermal patch may be used as well.
Clonidine and Tizanidine

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  • May facilitate action of glycine – an inhibitory neurotransmitter, preventing release of excitatory amino acids (glutamate/aspartate) from the presynaptic terminal of spinal interneurons.
Tizanidine Side Effects

- Dry Mouth
- Somnolence
- Asthenia
- Dizziness
- Headache
- Insomnia
Tizanidine

• Starting dose is 4mg in the PM
• Avg. daily dose is 24 mg/day
• Maximum daily dose is 36 mg/day
• Generally provided on a TID schedule
Gabapentin

• A cyclohexane acetic acid derivative
• Synthesized as an analog of GABA but it does not act on any known GABA receptor
• SE – Dizziness, ataxia, fatigue, nystagmus
• Maximum dosage is 2400 mg/day
Other Procedures

• Phenol Motor Point block
• Botulinum toxin
• Selective posterior rhizotomy
• Intrathecal Baclofen pump
Motor Point Block

• Alcohol
• Phenol
• Botulinum toxin
Injection Technique

- Typical EMG location of “Motor Point”
- EMG guidance if desired
- Electrical Stimulation useful
- Ultrasound guidance
- Often quite painful
Chemical Neurolysis

- Aqueous phenol >5% concentration leads to protein coagulation and necrosis of axons of all sizes.
- Effect lasts months to years
- Inexpensive compared to Botox
- Residual fibrous tissue at injection site.
- Nerves gradually regenerate
Common Sites

• Musculocutaneous nerve for Elbow flexion contractures
• Median nerve block for severely flexed wrist and fingers
• Obturator block decreases hip adduction
• Paravertebral block for hip flexor spasticity
• Tibial nerve block can reduce equinovarus or clawing toes
• Perineal nerve block can reduce PVR’s when severely spastic sphincter present
Risks of Phenol

• Dysesthesias in 10% of patients when sensory or mixed nerves are injected
• Pain may last 1-3 weeks
• Unwanted weakness
• Overdosage of phenol
  • Convulsions
  • CNS depression
  • Cardiovascular collapse
Botulinum Toxin

• Seven serologically distinct toxins
  • A, B, C, D, E, F and G
• Works at the neuromuscular junction by inhibiting release of acetylcholine
• Clinical effect is 2-6 months
• Up to 3% of patients may develop neutralizing antibodies with chronic treatment
Botox Side Effects

• Unwanted weakness
• Transient Fatigue
• Nausea
• Headache
• Dysphagia
• Side Effects are often dependent on the injection site
Botox Considerations

• Cost
• Temporary Change
• Limited effect as effect is only local
• Dose limitations
Intrathecal Baclofen Therapy – A Process

• **Patient Identification**
  • Oral Baclofen not tolerated
  • Spasticity refractory to all oral medications
  • Patient location near to a spasticity center
  • Compliant patient
  • Insurance coverage
  • Goals attainable with ITB

• **Trial Protocol**

• **Pump Implantation**

• **Pump Management**
ITB Pump Considerations

• Trial or no trial?
• Initial trial amount?
• Level of catheter placement?
• Size of Pump
• Concentration of Baclofen
• Initial rate on implant?
• Post-implant rehabilitation and titration plan?
Orthopedic Surgery

• Tendon Releases
• Muscle Lengthening
• Hip stabilization
• Spine stabilization
Thank You!
Any Questions?