The Therapists Role in Spasticity Management
Indications and Recommendations for Chemodenervation
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The Therapists Role in Spasticity Management

*Indications and Recommendations for Chemodenervation*

1. Recognize the importance and benefits of assessing spasticity within a functional context over time.

2. Understand the clinical problem solving process therapists use to identify indications and goals for spasticity management.

3. Appreciate the need for and benefits of a multi-disciplinary team in managing post-stroke spasticity for optimal treatment benefit.
Current Research & Clinical Interpretations

Spasticity: Definition

- “...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...” (Lance 1980)

  - Characterization spasticity during passive movement
  - Assumptions:
    - Increased muscle activity during stretch phase due exclusively increase stretch reflex activity.
    - Velocity dependent increase in resistance to passive stretch due exclusively to spasticity.
Current Research & Clinical Interpretations

Spasticity: Definition

- “........ results from abnormal intra-spinal processing of primary afferent input” (Young 1994)
- Afferent input other than passive stretch
  - Cutaneous, Proprioceptive, Supraspinal
- Allows for measurement & description of spasticity under passive and active conditions
Current Research & Clinical Interpretations

Spasticity: Definition

“... disordered sensori-motor control, resulting from an UMN lesion, presenting as intermittent or sustained involuntary activation of muscle.” (Pandyan 2005)

• Not pure motor disorder ---disordered motor control

• Insufficient evidence to support that abnormal muscle activity observed in spasticity due exclusively stretch reflex hyperexcitability. (Payden 2005)
Clinical Implications

• Cannot differentiate stiffness/resistance due tonic stretch reflex activity alone.

• Changes in resistance to passive movement not uniquely related to muscle activity.

• Confounding factors:
  • inertia limb segments; abnormal voluntary ms activity; changes in visco-elastic properties soft tissue & joints; structural changes in intrinsic & external muscle properties (Pandyan 2005)
Post-Stroke Spasticity (PSP)

• Not a single entity (phenomena)
• Demonstrates considerable variability
  • Correlates to intensity sensory stimuli
  • Lesion location (cerebral cortex – primary, secondary, supplementary motor area SMA)
• Does not conform to standard definition
  • Diverse manifestations
  • Uncertain pathophysiology

(Ward 2012)
Observations/Associations
Post-Stroke Spasticity

Internal Factors Affecting Post-Stroke Spasticity
• Noxious Stimuli: pain, cut, sore
• Changes Medical Condition: decubitus ulcer, UTI, infection, fever
• Emotions: anger, anxiety, stress
• Physical Exertion / Effort

External Factors Affecting Post-Stroke Spasticity
• Weather – cold temperatures
• Time of Day

(Cheung 2015, Li 2015)
Clinical Implications
Physical & Occupational Therapists

Given variability of spasticity, number of internal & external factors affecting spasticity & that spasticity has both an passive and active component...

• Challenging with clinical assessment to identify at the impairment level whether and to what extent spasticity impacts a client’s functional abilities.
Evaluation Post-stroke Spasticity

Subjective

1. Functional History
   - Sleep Disturbances
   - Limited Mobility / Ambulation
   - Interference with Self-Positioning, Self-Care, Transfers
   - Decreased Ease Care by Caregiver (Passive Function)
   - Limited Functional Performance d/t Inability Use Affected Extremity
   - Poor Quality of Life
Evaluation Post-stroke Spasticity

Subjective

2. Symptoms Suggestive of Spasticity
   - Muscle Stiffness / Tightness
     • Muscle weakness
   - Muscle Spasms
   - Clonus / Shaking
   - Difficulty Performing Voluntary Movements
   - Limb Deformity (cosmetic / functional concern)
   - Pain
     • Differentiate btw neuropathic / musculoskeletal pain
Evaluation Post-stroke Spasticity

Objective Findings

1. Functional Assessment
   Observe Client Perform Functional Activities in Different Environments, Variable Conditions

Mobility: Gait & Gait Related Activities
- indoor, outdoor, distractible, social, unpredictable environment
- over, around obstacles, thru doorways, up & down stairs
- stooping to floor, sit to stand
- slow, fast speeds
Evaluation Post-stroke Spasticity

Objective Findings

1. Functional Assessment
   Observe Client Perform Functional Activities in Different Environments, Variable Conditions

   Participation Activities, ADL’s:
   - driving
   - work related responsibilities
   - activities related to role spouse, parent, grandparent
   - participation in hobbies / interests
   - dressing, bathing, hygiene
   - cooking, cleaning, mowing the lawn
Evaluation Post-stroke Spasticity Objective Findings

2. Assess Specific Body Systems

*Objective: Identifying system impairments contributing to functional limitations.*

– Differentiate contribution of spasticity from other neuromotor and/or musculoskeletal impairments limiting functional abilities *(Thibaut 2013) (Sunnerhagen 2013)*
Evaluation Post-stroke Spasticity

Objective Findings

• Neuro-motor Control - Spasticity
  – Clonus (passive stretch)
  – Flexor / Extensor Muscle spasms (response to stimuli)
  – Co-contraction agonist + antagonist (during active movement)
  – Associated reactions
  – Dyssynergic stereotypical spastic dystonia (active movement)
  – Synergistic v. Selective voluntary movement (active movement)
Evaluation Post-stroke Spasticity

Objective Findings

• Neuro-motor Control
  - Muscle Weakness
  - Impaired Coordination (Decreased timing, sequencing: reciprocal; speed; ability to perform alternating mvt.)
    – Impaired Motor Control & Planning
    – Muscle Fatigability
Implications of Spasticity
Related to Post-Stroke Motor Recovery

- Spasticity along with Motor Weakness, Impaired Coordination, Motor Control or Planning → Result in Dynamic Clinical Presentation

- Brunnstrom’s description, post-stroke motor recovery parallels emergence, eventual disappearance of spasticity (Brunnstrom 1966, 1970) (Li 2015)

- Motor Recovery may stop along this continuum and spasticity persists.
Evaluation Post-stroke Spasticity

Objective Findings

3. Perform Special Tests

• Velocity Dependent Resistance to Passive Mvt./ Assess severity spastic hypertonia.
  • Ashworth Scale
  • Modified Ashworth (MAS)
  • Tardieu Scale (TS)
Evaluation Post-Stroke Spasticity

Special Tests

Modified Ashworth

- Designed Measure Spasticity (spastic hypertonia) Clients CNS Lesion *(Rehab Measures)*
- Actually Measures level resistance passive movement
- Measures Combination: Spasticity (Stretch Reflex Response) **PLUS** Non-contractile soft tissue properties (intrinsic properties muscle, tendon, connective tissue) + Spastic dystonia (persistent muscle activity) *(Thibaut 2013)*
Evaluation Post-Stroke Spasticity

Special Tests

**Modified Ashworth** (Stroke Specific)

- Reliability differs depending on the motor group assessed.
- General: Mod – Good Intra-rater reliability
  - Poor – Mod Inter-rater reliability *(Thibaut, 2013)*
  - UE: MDC 1 point; *(Shaw 2010)* MCID Not Established
  - LE: MDC, MCID Not Established
    - Intra-rater reliability Adequate; Greatest agreement on Grade 0 = Normal
    - Inter-rater reliability Poor; *(Blackburn 2002)*
Evaluation Post-Stroke Spasticity

Special Tests

**Modified Ashworth**

Limitations:

- Can not control velocity passive movements
- Cannot distinguish among various neuromuscular components of spasticity across range positions + velocities
- Does not measure PSS effects resting posture; observed associated reactions; or active/voluntary component spasticity \(\text{(Sunnerhagen 2013)}\)
Evaluation Post-Stroke Spasticity

Special Tests

Fugl – Meyer Assessment (FMA)

• Quantitative evaluative instrument measuring sensorimotor recovery after stroke (Fugl-Meyer 1975)

• Items Motor Domain incorporate components sequential stages of motor recovery described by Twitchell, Brunnstrom (Brunnstrom 1966, 1970) and include concept posture & selective movement (Bobath 1970) (Gladstone 2002)

• Motor Domain excellent interrater, intrarater reliability, construct validity, as indicator motor impairment severity across different stroke recovery time points (Rehab Measures)
Evaluation Post-stroke Spasticity

Objective Findings

4. Identify Musculoskeletal Impairments

- Differentiate neural component (spasticity) from non-neural component (musculoskeletal) – is this possible?
  - Spasticity & Contractures BOTH characterized by increase resistance to passive joint movement
  - Spasticity: Involuntary muscle contractions OR Musculoskeletal Impairment: structural changes in soft tissue

  Cycle: Spasticity + Weakness → Contracture → Spasticity  (Katalinic 2016)
Evaluation Post-stroke Spasticity

Objective Findings

4. Identify Musculoskeletal Impairments
   • Thorough Musculoskeletal Assessment Assist in Distinguish Clients Symptoms:
     • Stiffness (spasticity v. joint arthritic changes, capsular tightness, muscle shortening, joint malalignment)
     • Pain (spasticity v. capsular tightness, tendonitis/bursitis, joint instability; malalignment; poor biomechanics)
     • Limitations in voluntary control (spasticity v. weakness of antagonist)
Evaluation Post-stroke Spasticity

Clinical Assessment

- Identify Impact Spasticity on Functional Abilities
- Determine if Medical Management of Spasticity is Indicated
  - Minimize Client’s Symptoms
  - Prevent Secondary Impairments Related to Spasticity
  - Enhance Potential for Motor Recovery
  - Optimize Activity / Functions
    - Passive Function (Ease of caregiving)
    - Active Function (Use Affected Extremities)
    - Mobility (Gait, Gait Related Activities)
Evaluation Post-stroke Spasticity Clinical Assessment

• Establish Realistic Goals / Expectations with client
  • Willingness to pursue consult with Provider
• Refer Client to Provider for Consultation re: Spasticity Management.
• Provide recommendations re: potential muscle groups or muscles to target with BoTNX based on client’s subjective history, functional assessment, objective clinical findings
Multidisciplinary Team
Managing Post-Stroke Spasticity

Collaborative Relationship

OhioHealth Stroke Prevention Clinic
&
Neurological Outpatient Rehabilitation
Multidisciplinary Team
Managing Post-Stroke Spasticity

Clinical Assessment

• Identify Impact Spasticity on Functional Abilities
• Determine if Medical Management of Spasticity is Indicated
• Establish Realistic Goals / Expectations with client
  • Willingness to pursue consult with Provider
• Refer Client to Stroke Prevention Clinic for Consultation re: Spasticity Management.
• Provide recommendations re: potential muscle groups or muscles to target with BoNT based on client’s subjective history and objective clinical assessment
Multidisciplinary Team
Managing Post-Stroke Spasticity

Stroke Prevention Clinic
– Provider, Therapist with Client and Family Member
  Establish Goals
– Provider, Therapist
  • Examine client
  • Prioritize muscles for treatment based on exam findings; recommendations of treating therapist
– EMG Guided Injections: Verify Clinical Decision Making
Multidisciplinary Team
Managing Post-Stroke Spasticity

• Therapist continues treatment s/p BoTN determining:
  – goals achieved
  – dosage administered adequate in reducing spasticity (impairment level)
  – change in client’s symptoms, motor recovery, functional abilities, mobility
  – additional muscle groups should be considered for next round of BoTN

• Communication with Provider at 6 wk follow up re: changes in at the functional and impairment level; changes in recommendations for next round of BoTN

• At client’s 6 wk follow up visit with Provider, the Provider determines amount of BoTN needed for next procedure
Recommendations:
Post-Stroke Spasticity Management (Winstein 2016)

• **Target injection BoNT into localized UE limb ms** → reduce spasticity; increase PROM or AROM; improve dressing, hygiene, limb positioning

• **Target injection BoNT into LE ms** → reduce spasticity interfering with gait function

  **Class I : SHOULD** be Performed

  **Level A**: Multiple populations evaluated; Data – multiple randomized clinical trials / meta analysis

  **Class I  Level A**
Recommendations: Spasticity Management (Winstein 2016)

- Physical Modalities: **NMES or vibration** applied to spastic ms. → reduce spasticity temporarily as adjunct to rehab therapy

- Use of **splints, taping NOT recommended for prevention wrist, finger spasticity**

Class IIb: **MAY BE CONSIDERED**

Level A: Rec useful / efficacy well established. Greater conflicting evidence from multiple randomized trials or meta analysis

Class III: **NO BENEFIT**

Level B: Recommendation: procedure/treatment is not useful/effective may be harmful
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