PTA 213
Therapy Clinic

Muscle Tone

Muscle Tone Lecture Outline

- Muscle Tone
  - Normal
  - Influences
  - Hypertonia
  - Hypotonia
  - Fluctuating tone
    - ataxia
    - athetosis
- Treatment Based on Muscle Tone
  - Spasticity
  - Hypotonia
  - Ataxia
  - Athetosis

Normal Tone

- Supports activity
- You have a range available
- Low enough to allow movement, but high enough to support activity
What influences Muscle Tone?

- Stress (emotional state)
- Level of physical fitness
- Genetics
- Race (Asians meet developmental milestones later, and African Americans reach developmental milestones earlier)

Hypertonia vs Spasticity

- Hypertonia and spasticity **ARE NOT** the same thing
- **Hypertonia**: is a general term which describes a state with excessive resistance to movement. Hypertonia stems from neural and non-neural components
- **Spasticity**: is a much more specific term which describes a *velocity dependent* increase in resistance to *passive* movement. Spasticity only results from neural components.

Hypertonia

- Muscle tone is too high
- The patient presents with increased stiffness in muscles, making passive and active movements difficult
Hypertonia

- Rigid, limited ROM
- Difficulty isolating one part of extremity from another
- Usually move in midranges
- Difficulty initiating and terminating movement

Testing Spasticity

- Ashworth Scale
- Deep Tendon Reflexes
- Clonus

Ashworth Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No increase in tone</td>
</tr>
<tr>
<td>1</td>
<td>Slight increase in muscle tone, manifested by a catch and release or minimal resistance at the end of the ROM when the affected part(s) is moved in flexion or extension</td>
</tr>
<tr>
<td>1+</td>
<td>Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM</td>
</tr>
<tr>
<td>2</td>
<td>More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved</td>
</tr>
<tr>
<td>3</td>
<td>Considerable increase in muscle tone, passive movement difficult</td>
</tr>
<tr>
<td>4</td>
<td>Affected part(s) rigid in flexion or extension</td>
</tr>
</tbody>
</table>
Deep Tendon Reflexes

- May be hyperreflexive with an UMNL and hyporeflexive with a LMNL

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Innervation Level</th>
<th>DTR</th>
<th>Grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps</td>
<td>C5</td>
<td>0</td>
<td>Absent</td>
</tr>
<tr>
<td>Brachioradialis</td>
<td>C6</td>
<td>1</td>
<td>Diminished</td>
</tr>
<tr>
<td>Triceps</td>
<td>C7</td>
<td>2</td>
<td>Average (Normal)</td>
</tr>
<tr>
<td>Patella</td>
<td>L4</td>
<td>3</td>
<td>Exaggerated</td>
</tr>
<tr>
<td>Achilles</td>
<td>S1</td>
<td>4</td>
<td>Clonus</td>
</tr>
</tbody>
</table>

Testing Deep Tendon Reflexes

- The patient must be relaxed and the muscle/tendon you are testing must be relaxed
- Put the tendon on a slight stretch
- Apply adequate stimulus via reflex hammer to the tendon

Testing DTR

- LE
  - [http://www.youtube.com/watch?v=vUzdKGH2dk](http://www.youtube.com/watch?v=vUzdKGH2dk)

- UE
  - [http://www.youtube.com/watch?v=xAx1N6Fj-lU&NR=1](http://www.youtube.com/watch?v=xAx1N6Fj-lU&NR=1)
Clonus

Clonus is a clinical sign of an UMNL. It is a repetitive stretch reflex that is elicited by passive dorsiflexion of the ankle or passive wrist extension.

Hypotonia

- Low muscle tone
- Decreased resting muscle tension
- Decreased ability to generate force
- Have excessive joint flexibility
- Lack postural stability
- “floppy”
- is a transient state very often seen before a different type of muscle tone emerges
- no universally accepted scale for measuring

Fluctuating tone - Ataxia

- Underlying muscle tone is low
- Poor balance and poor coordination
- Tremor
- Impaired timing
- The only consistency is that these patients are inconsistent in their responses and movement
- Patients fall into one of two groups
  - patients who are afraid to move
  - patients who blunder through the world
- Uncommon in pediatrics, far more common in adults
- Will see in TBI and head tumor
- Less than 10% of kids with CP have ataxia

http://www.youtube.com/watch?v=liE9fVMYZPU
http://www.youtube.com/watch?v=0l9y42ycRKE&feature=fvw

http://www.youtube.com/watch?v=cPe0iL4i23U
Fluctuating Tone - Athetosis

- Underlying tone fluctuates from low to high at any given moment
- Writhing movements that fluctuate between flexion & extension
- Involuntary movement
- No postural control

http://www.youtube.com/watch?v=J_wIDm1_ax4&feature=PlayList&p=527FC5BCC5A93DE7&index=1

We do see all the “tone” issues in combination with each other, even though we discussed them here in isolation

A Guide to Treatment Based on Muscle Tone - Lecture Outline

1. Spasticity
   - Physical problems
   - Focus of treatment
2. Hypotonia
   - Physical problems
   - Focus of treatment
3. Ataxia
   - Physical problems
   - Focus of treatment
4. Athetosis
   - Physical problems
   - Focus of treatment
A Guide to Treatment based on Muscle Tone

Patients with different types of muscle tone often have different needs.
The following list is intended to serve as a guide for treatment, not a "cookbook" that will meet every patient’s needs!

Spasticity – Physical Problems

- Low tone in trunk musculature
- Increased tone in extremity musculature
- Extremities maintained in midrange
- Stereotypical and limited movement patterns
- Slow laborious movement
- At risk for orthopedic deformities
- Fearful of movement

Spasticity – Focus of Treatment

- Increase muscle activity in trunk
- Reduce hypertonicity through movement (large, wide range, rhythmical movements)
- Anticipate sites of muscle shortening and joint immobility
- At least initially, work on increasing proximal stability
- Work on increasing active and passive ROM in the extremities
- Provide varied movement experiences with weight bearing
- Help children learn to initiate movement
Hypotonia – Physical Problems

- Poor head control
- Very poor trunk stability and control
- Shallow breathing
- Absent or slow postural reactions
- Joint hypermobility

Hypotonia – Focus of Treatment

- Increase postural tone through movements of various amplitudes and speeds
- Improve head and trunk control against gravity
- Stabilize joints in neutral alignment through weight bearing with compression
- Use tapping and other facilitory techniques over muscle belly
- Have patient work against graded resistance
- Hold positions in various points in the range

Ataxia – Physical Problems

- Usually hypotonic, occasionally will see increased tone
- Poor co-contraction and holding of postures
Ataxia – Focus of Treatment

1. Treat child slowly and steadily, allowing for a gradual increase in postural tone
2. Develop balanced postural tone
3. Lots of weight bearing with and without pressure and resistance
4. Learn to control weight shifts away from midline (in small ranges)
5. Work on gaining control over trunk rotation

Athetosis – Physical Problems

1. Fluctuating level of muscle tone – ranges from increased tone to low tone
2. Involuntary movement is present
3. Lack of co-contraction of muscles
4. Asymmetry in posture and movement
5. Movement of head affects trunk and limb position due to strong influence of tonic and labyrinthine neck reflexes

Athetosis – Focus of Treatment

1. Balance postural tone – tone will fluctuate over treatment session
2. Develop midline and symmetrical movement
3. Gradually develop control in ranges away from midline
4. Hold positions at various points in the range
5. Work on smooth grading of movement
6. Aim for independent movement of the head on a stable trunk
7. Avoid over stimulation – keep yourself calm and organized
8. Work on firm surfaces
9. Provide lots of proprioceptive and kinesthetic input
10. Work at gaining eccentric control especially in small ranges
11. Work toward proper timing and sequencing in various activities
What happens to tone when there is damage to the brain? ie. Stroke

Will see hypotonicity immediately after a stroke and in 90% of patients spasticity emerges.

Questions?