International Standards for Neurological Classification of Spinal Cord Injury
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Current Concepts in Spinal Cord Injury Medicine Conference
April 29, 2017

“ASIA Exam”
• The exam now referred to as the International Standards exam
• Patients are classified according to the ASIA Impairment Scale (AIS)
• Combined efforts from
  – ASIA: American Spinal Injury Association
  – ISCOS: International Spinal Cord Society

International Standards
• Last Revised booklet in 2011, 7th edition
• Worksheet revised 2013

Components of the Test
• Three Main Parts to the Exam:
  – Strength Testing
  – Light Touch Sensation
  – Pinprick Sensation
• Lowest Level of motor control:
  – Voluntary Anal Contraction
• Lowest Level of Sensation:
  – Deep Anal Pressure

Explaining the exam to your Patients
• This is NOT a fun exam- it is uncomfortable, confusing and requires patience
• So explaining to the patient why we do it is important!
What not to say:

- “Let’s do this test- it’s for a research database and makes the world a better place!”
- These patients have just gone through significant traumas- they may not care about helping the greater good.

Explaining the exam to your Patients

- This test will help us determine where your spinal cord was injured
- It might be different than what was seen on the MRI or CT Scan
- This is the main test we use to determine what level your injury was, how severe it was, and a rough idea of what we could expect for recovery

Explaining the exam to your Patients

- Plus, not only can we use past data to predict how you will do, if you would like, we can add your exam to a research database so that future people can benefit like you will

Timing of the Exam

- Initial exam in ER documents traumatic SCI
  - Apply appropriate interventions
  - Attempt to determine motor level, sensory level, completeness of injury and AIS score
- Difficult to obtain a complete and reliable exam in ER
- Comorbidities: TBI, Respiratory failure, pain, illicit drugs, shock, cognitive changes, etc
- 72 hour exam may be better for prediction of recovery

Manual Muscle Testing Grading

<table>
<thead>
<tr>
<th>Strength Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/5</td>
<td>Full Strength, Full ROM</td>
</tr>
<tr>
<td>4/5</td>
<td>Provides some strength against resistance for full ROM</td>
</tr>
<tr>
<td>3/5</td>
<td>Can perform movement against gravity for full ROM</td>
</tr>
<tr>
<td>2/5</td>
<td>Can perform movement with gravity eliminated for full ROM</td>
</tr>
<tr>
<td>1/5</td>
<td>Some muscle activity (Palpable or visible), but unable to move against gravity</td>
</tr>
<tr>
<td>0/5</td>
<td>No muscle activity detected</td>
</tr>
</tbody>
</table>
**Manual Muscle Testing: Other considerations**

- The grade must be achieved with full range of motion at the given resistance level.
  - For moving 25% of ROM against gravity does not earn you a 3/5.
- 5* indicates that you would expect a muscle to be 5/5 strength if there was no SCI-related limiting factor (like a fracture, or pain limiting motion).
- NT for limbs that you are not certain of 5/5 strength, but could not be tested due to pain/casting/fracture etc.
- No pluses or minuses!

**Positioning for Motor Exam**

- Neutral positioning for Grade 3 testing
- Strategically eliminate gravity for Grade 2 testing
  - Maintain that position for Grade 1 or 0 testing
  - When testing for grade 4 or 5, the muscle is positioned in a manner that partially activates the muscle
  - Patient is instructed to maintain that position
  - Examples:
    - C6 – wrist in full extension
    - L2 – Hip flexed to 90 degrees
- Refer to Motor exam guides on ASIA website for detailed positioning for each myotome.

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**C5- Biceps**

- Gravity Eliminated
- Against Gravity
- Against Resistance

**C6- Wrist Extensors**

- Gravity Eliminated
- Against Gravity
- Against Resistance

**C7- Triceps**

- Gravity Eliminated
- Against Gravity
- Against Resistance

**C8- Finger Flexors (FDP-DIP)**

- Gravity Eliminated
- Against Gravity
- Against Resistance
T1- Finger Flexors (FDP-DIP)
Gravity Eliminated
Against Gravity/ Against Resistance

L2- Hip Flexors
Gravity Eliminated
Against Gravity

L3- Quadriceps
Gravity Eliminated
Against Gravity

L4- Dorsiflexors
Gravity Eliminated
Against Gravity/ Against Resistance

L5- Great Toe Extensor
Gravity Eliminated
Against Gravity/ Against Resistance

S1- Plantarflexors
Gravity Eliminated
Against Resistance

Gravity Eliminated
Against Gravity
Motor Exams Pearls and Pitfalls

- Patient must be supine for testing
- Move the joints through ROM prior to MMT to rule out any pain, spasticity, or contracture which might effect motor scores
- Stabilize above and below the joint tested to prevent muscle substitution
  - Supination for Wrist extension
  - Elbow extension by external shoulder rotation

Motor Exams Pearls and Pitfalls

- Beware compensatory muscle relaxation
  - Elbow extension mimicked by biceps relaxation
  - Relaxation of great toe flexors
  - Palpate the muscle to verify contraction
- Consider substituting isometric muscle contractions in persons with unstable spine
  - Avoid hip flexion in persons with lesion T8 and below as this may increase kyphotic stress on L-spine

Non-key Muscle Groups

- Shoulder movement (C5) except shrug
- Elbow Supination (C5)
- Elbow pronation (C6)
- Wrist Flexion (C6)
  - Etc... See ASIA Form
- These become important when assigning AIS Grade

Light-touch Sensation

- Use a cotton swab with the top fluffed out
- Use the face as comparison

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Normal Sensation</td>
</tr>
<tr>
<td>1</td>
<td>Abnormal Sensation (hyper or hypo -esthesia)</td>
</tr>
<tr>
<td>0</td>
<td>Absent Sensation</td>
</tr>
<tr>
<td>NT</td>
<td>Not Testable</td>
</tr>
</tbody>
</table>

Pinprick Sensation
**Pinprick Sensation**

- Use a Safety Pin - cover = dull, pin = sharp
- Use the face as comparison

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<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Normal - can distinguish sharp/dull, and sharp is equivalent to face</td>
</tr>
<tr>
<td>1</td>
<td>Can distinguish sharp/dull, and sharp is less than or sharper than face</td>
</tr>
<tr>
<td>0</td>
<td>Cannot distinguish sharp/dull (&lt;80%)</td>
</tr>
<tr>
<td>NT</td>
<td>Not Testable</td>
</tr>
</tbody>
</table>

**Sensation Pearls and Pitfalls**

- Eyes should be closed for sensory testing
- Tell the patient not to guess
- If a patient cannot accurately distinguish sharp/dull on their face then the sensory exam is Not Testable
- If there is concern for guessing, each point should be tested 10 times. – An accurate response is required 8/10 times

**Sensation Pearls and Pitfalls**

- If a patient has abnormal sensation at C2 but intact sensation on the face, then the person is given a sensory level of C1
- Dermatomes can be graded as Not Testable if factors are present which inhibit normal testing
  - Hairy chest, burn, peripheral neuropathy, wrapping, etc.

**Brief Overview of Dermatomes**

- T3: At the mid-armpit line and the third intercostal space, medial to the axilla
- C1: At the mid-armpit line and the first intercostal space, lateral to the axilla
- C2: At the mid-armpit line and the second intercostal space, lateral to the axilla
- T12: At the level of the 12th rib
- T10: At the level of the 10th rib
- C5: At the mid-cervical spine
- C7: At the level of the mandible
- C8: At the level of the greater occipital nerve

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**Brief Overview of Dermatomes**

- T10: At the level of the 10th rib
- T12: At the level of the 12th rib
- L4: On the midline of the body
- L5: On the midline of the body
- S1: On the midline of the body
- C7: At the level of the mandible
- C5: At the level of the cervical spine
Anal Exam

• Very Important Part to test!
• Voluntary Anal Contraction:
  – Insert finger into rectum, and ask patient to contract anus (like holding in a BM), and release. Repeat several times to confirm voluntary contraction
• Deep Anal Pressure:
  – With finger still in rectum, ask patient which direction you are applying pressure: towards head, towards feet, towards right side or towards left side.
  – Should show consistent differentiation between directions
• Use Gloves and Lube

Scoring the ASIA Exam

1) Each vertical column is added for a column total for motor and sensory

ASIA Impairment Scale Classification

1. Determine sensory levels for right & left sides
   • The lowest level with a 2 (normal) for both pinprick and light touch where every level higher is also 2
   • The sensory levels may be different on the left and right sides

Scoring the ASIA Exam

2) Separate motor scores are calculated for the UE and LE

Scoring the ASIA Exam

3) Separate total scores are calculated for Lt and PPT
AIS Classification

2. Determine motor levels for right and left sides.
   - The lowest level where the muscle grade is at least a three, with all muscles above graded as a 5
   - In regions where there is no myotome to test, the motor level is presumed to be the same as the sensory level

3. Determine the Neurological Level of Injury
   - The highest level of the four individual levels

4. Determine whether the injury is Complete or Incomplete. If complete AIS Grade = A
   - Defined by presence/absence of sacral sparing
   - If NO voluntary anal contraction AND all S4-5 sensory scores are O AND there is NO deep anal pressure then injury is COMPLETE
   - NOOOON Sign

5. Determine ASIA Impairment Scale (AIS) Grade
   A = Complete
   B = Sensory Incomplete (ie Motor Complete)
   C = Motor Incomplete
   D = Motor Incomplete
   E = Normal

6. If A is ruled out, is the injury Motor incomplete? (Do they get out of “B”???)
   - Preservation of motor function is defined by
     • Presence of voluntary anal contraction
     • Motor movement greater than three levels below the motor level on that side of the body
     - (may use non-key muscle groups)
   - If both of these are absent, AIS Grade = B

Non-key muscle groups
AIS Classification

6. If B is ruled out, how incomplete is the motor function?
   - Are at least half of the key muscles below the neurological level of injury graded 3 or better?
   - If no, AIS Grade = C
   - If yes, AIS Grade = D

Zone of Partial Preservation

- Only defined for AIS A COMPLETE lesions
- Lowest dermatome and myotome on either side with any preserved function (even if abnormal)
- [Diagram of Zone of Partial Preservation]

You’re ready to do an ASIA Exam!

References

  - ISNCSCI Exam Sheet
  - Motor Exam Guide
  - Sensory Exam Guide
- Online ASIA Exam calculator: http://isncscialgorithm.azurewebsites.net/

Examples...