**How to Classify a Spinal Cord Injury**

**Nomenclature & Classification**

- **Tetraplegia**: Impairment or loss of motor and/or sensory function in the cervical segments due to damage of neural elements within the spinal canal.
  - Usually means person has impairment of function in arms, legs, trunk, & pelvic organs.
  - Doesn't include brachial plexus injuries or peripheral nerve injuries.
- **Paraplegia**: Impairment or loss of motor and/or sensory function in the thoracic, lumbar, or sacral neurological segments due to damage of the neural elements within the spinal canal.
  - Usually means person has impairment of function in legs, trunk, & pelvic organs.
  - No impairment in upper extremities.
  - Does include injuries to cauda equina and conus medullaris.
  - Doesn't include lumbar-sacral plexus injuries or peripheral nerve injuries.
- **Complete Injury**: Absence of sensory and motor function in the lowest sacral segment (no anal wink/no deep anal sensation).
- **Incomplete Injury**: Partial preservation of sensory and/or motor functions is found below the neurological level and includes the lowest sacral segment.
- **Sacral Sensation**: Sensation at the anal mucocutaneous junction and deep anal sensation.
  - A test of motor function: presence of voluntary contraction of the external anal sphincter upon digital examination.
  - Basically stick your finger in person's a**$$
  
- May be the only evidence of an incomplete SCI.
- **Spinal Shock**: When spinal cord basically shuts down initially after injury.
  - Complete loss of reflex activity occurs below level of injury.
  - Occurs immediately after injury.
  - Duration varies from 1 week to 3 months post injury.
  - Flaccid paralysis below level of lesion.
  - No bowel or bladder tone.
  - Increased spasticity may indicate resolution of spinal shock.
  - Cannot determine if lesion is complete or incomplete during spinal shock.
- **Zone of Partial Preservation**: Dermatomes & myotomes caudal to the neurological level that remain partially innervated.
  - Recorded as the exact segments with impaired sensory and motor function found below the lowest normal segment.
  - Only for complete injuries.
CLASSIFICATION OF SCI

- **ISCSCI (ASIA):** International Standards for Neurological Classification of Spinal Cord Injury
  - published by ASIA (American Spinal Injury Association)
  - purpose:
    - to have a universal definition of level, completeness of injury, & classification
    - describes level of impairment (AIS A.B.C.D)
    - to provide a format of testing to improve reliability and accuracy between users
    - relativity of national database/multi-center research

**SENSORY EXAM:**
- tests deep anal pressure, sharp/dull, & light touch
- determines the most caudal normally innervated dermatome on both sides of the body
- evaluates:
  - spinalthoracic tract (amniotroch) = sharp/dull and pain/temp
  - DALS = light touch, light pressure

<table>
<thead>
<tr>
<th>METHOD</th>
<th>SNAPPY DOBBY</th>
<th>LIGHT TOUCH</th>
<th>DEEP ANAL SENSATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHOD</td>
<td>use a standard safety pin</td>
<td>use a tapered wisp of cotton</td>
<td>use most important part of the whole exam</td>
</tr>
<tr>
<td>METHOD</td>
<td>face is a reference point for normal</td>
<td>face is a reference point for normal</td>
<td>tells us if complete or incomplete SCI</td>
</tr>
<tr>
<td>METHOD</td>
<td>have patient close eyes</td>
<td>have patient close eyes</td>
<td>put on gloves &amp; insert your finger into their rectal area</td>
</tr>
<tr>
<td>METHOD</td>
<td>start at C2 &amp; work down</td>
<td>start at C2 &amp; work down</td>
<td>don't go past DIP</td>
</tr>
<tr>
<td>METHOD</td>
<td>apply light pressure w/o pin movement after making contact</td>
<td>apply light pressure w/o pin movement after making contact</td>
<td>&quot;let me know when you feel my finger</td>
</tr>
<tr>
<td>METHOD</td>
<td>ensure random order of Sharp &amp; dull sides of pin</td>
<td>ensure random order of Sharp &amp; dull sides of pin</td>
<td>ask patient to squeeze</td>
</tr>
<tr>
<td>METHOD</td>
<td>need 0/10 correct answers to document as intact</td>
<td>need 0/10 correct answers to document as intact</td>
<td>patient describes sensory awareness (touch/pressure)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GRADING</th>
<th>SNAPPY DOBBY</th>
<th>LIGHT TOUCH</th>
<th>DEEP ANAL SENSATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>1</td>
<td>impaired</td>
<td>impaired</td>
<td>absent</td>
</tr>
<tr>
<td>2</td>
<td>normal</td>
<td>normal</td>
<td>absent</td>
</tr>
</tbody>
</table>

- if key sensory point is unable to be tested, use another point within dermatomes & document
- if completely unable to test, document as "NT" for not tested
ASIA motor exam determines the most caudal motor segment intact bilaterally.

- Intact innervation = grade of 2/5 and the next rostral key muscle has a grade of 5.
- For myotomes that are not represented by key muscles, the motor level is presumed to be the sensory level.

- Completed by testing 10 key muscles on each side.
  - Method:
    - Perform with patient in supine.
    - Start at C5 on one side and work down.
    - It is NOT NECESSARY to place each muscle in all testing positions.
    - Be aware of substitution patterns.
    - Stabilize proximally on Grade 4 if and palpate the muscle you're testing.

- Grading:
  - 0: No visible or palpable contraction.
  - 1: Any visible or palpable contraction.
  - 2: Muscle is able to move at least once, through full ROM (or max allowable ROM) in gravity-eliminated position.
  - 3: Muscle is able to move, at least once, against gravity.
  - 4: Patient can complete grade 3 with some resistance against examiner.
  - 5: Patient is able to exert normal resistance against examiner.
  - 5+: Examiner feels patient could exert normal resistance in absence of pain, desire, etc.
  - NT: Not testable, muscle is unavailable.

- ASIA Impairment Scale:
  - ASIA A: Complete CCI
    - No sensation or motor function is preserved in the sacral segments.
    - No VAC or DAP.
  - ASIA B: Sensory incompete, motor complete (considered a complete CCI).
    - Sensory function is preserved below the neurological level and includes the sacral segments S4-S5 (light touch, sharp/dull, or DAP) and no motor function is preserved more than 3 levels below the motor level on either side of the body.
    - May present like ASIA A but has sensation below the level of the lesion and no motor function below that level. As a result, need to do zPP for ASIA B patients!
  - ASIA C: Motor incomplete, <½ muscles below NL 3/5
    - Motor function is preserved below the neurological level.
  - ASIA D: Motor incomplete, >½ muscles below NL 3/5
    - Motor function is preserved below the neurological level.
  - ASIA E: Normal motor and sensation function.

*To be motor incomplete, ASIA C or D, motor function must be present in either the lowest sacral segment or more than 3 levels below motor level (>3 key muscles).
1. Neurological levels:
   - For both sensory & motor, look for the most caudal segment with normal sensory & motor functions.
   - **Sensory:** On the L, the most caudal normal (C7) segment is T10 (the R side happens to be the same level).
   - **Motor:** On the L, the most caudal normal segment is T1, but since there are no myotomes represented by key muscles from T2-L1, the motor level is presumed to be the sensory level, which is T10 (the R side also happens to be the same).

2. Neurological level of injury:
   - The most caudal segment with both sensory & motor function bilaterally.
   - T10 is the neurological level in this case (lowest level w/ full function).
   - Ex) If sensory was T10 on R & L and motor was T5 on R & L, the neurological level would be T5.

3. Complete or incomplete SCI:
   - Look at VAC, sensory points, and DAP.
     - If the line spells NOOOON, it is a complete injury AND ASIA A.
     - If the line has a Y in VAC or DAP, it is an incomplete injury with at least ASIA B.
   - VAC, sensory points, and DAP: for this case, it spells "NOOOON" so it is a complete SCI.

4. ASIA Impairment Scale:
   - See notes above on how to decide!
   - ASIA A because it is a complete SCI.

5. Zone of partial preservation:
   - For complete SCI only!
   - Sensory & motor levels caudal to the NCI that remain partially innervated.
   - ZPP T11 for all in this case → T11 is the most caudal segment that's ≥ 70 for sensory, and then use the same concept for motor as determining the motor level (no myotomes T2-L1 → use sensory).