Caitlin Aguirre
Rafid Rahman, MD
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AAP BRS podcast: SCI Part 2-Incomplete Spinal Cord Syndromes and UMN and LMN Bowel and Bladder

How do the terms handicap, disability and impairment differ?

- Impairment: physical abnormality from one's injury (e.g. paraplegia)
- Disability: used when discussing one's ability to perform a certain activity (e.g. disability regarding ambulation)
- Handicap: an exclusion from a specific activity in relation to society due to the impairment. Handicap can be removed if modifications are made to the specific activity (e.g. handicap entering a building if required to traverse stairs due to his paraplegic impairment. Handicap is removed if wheelchair ramp is installed)

Basic Spine Anatomy Review:

- Spinal cord terminates around L1 in adults
- Dorsal Columns and Medial Lemniscus: light touch, proprioception, vibration sensation
- Spinothalamic Tract: pain and temperature sensation
- Corticospinal Tract: motor control

Incomplete Spinal Cord Syndromes:

Syndrome	Pathophysiology	Clinical Features	Risk Factors/Notes
Central Cord (Most Common)	- Compression of the spinothalamic and corticospinal tracts	- Bilateral motor paresis (upper > lower extremities; distally > proximally) - Variable sensory deficits, bladder dysfunction (retention is most common) - Preserved sacral sensation	- Cervical hyperextension injuries - Older individuals with ligamentum flavum hypertrophy, cervical spondylosis, and/or facet hypertrophy
Brown-Sequard	- Hemisection of the cord - Damage to the three major tracts	Ipsilateral: - Loss of all sensory modalities - Flaccid paresis at level of the lesion - Spastic paresis below lesion - Babinski sign Contralateral - Loss of pain, temperature, and non-discriminatory touch 1-2 levels below lesion	- 2-4% of all traumatic SCI
Anterior	- Injury to the anterior spinal artery (ASA), vertebral artery which supplies the ASA, or the Artery of Adamkiewicz which anastomoses with the ASA - Causes damage to the spinothalamic tracts and corticospinal tracts	- Loss of pain and temperature sensation below the lesion - Loss of motor control - Preserved proprioception and light touch	- Abdominal Surgery
Posterior (Very Rare)	- Vitamin B12 deficiency - Syphilis - Vascular or iatrogenic causes are rare due to dual blood supply	- Loss of proprioception - Preservation of motor ability and strength	- Removed from recent *International Standards* because it is extremely rare

**Cauda equina and conus medullaris syndrome are also considered incomplete syndromes

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Bowel and Bladder Anatomy Review:

	Parasympathetic	Sympathetic	Somatic
Bowel	- Vagus n.: proximal bowel to splenic flexure - Pelvic Splanchnic n. (S2-4): distal bowel and internal anal sphincter	- Hypogastric n. (T10-L2): entire length of bowel	- Pudendal n.: voluntary control of the external anal sphincter
Bladder	- Pelvic Splanchnic n: detrusor contraction	- Hypogastric n.: detrusor relaxation and internal urethral sphincter	- Pudendal n.: voluntary control of external urethral sphincter

Upper Motor vs. Lower Motor Neurogenic Bowel and Bladder Function:

	Upper Motor Neuron Injury	Lower Motor Neuron Injury
Bowel	Clinical Features: - Present recto-colic reflex – aids in movement of stool into rectal vault with digital stimulation Treatment: - Daily or every other day bowel program - Digital stimulation of recto-colic reflex followed by suppository placed against the mucosal surface	Clinical Features: - Flaccid sphincter and frequent leakage of stool - Slower rate of stool propulsion (3-6 days for colonic transport) due to preserved enteric nerve function - Absent recto-colic reflex (Pelvic Splanchnic n.) Treatment: - Fiber supplements: psyllium or methylcellulose - Twice daily bowel program - Enema if incontinence persists - Consider ostomy if resistant to medical therapy
Bladder	Clinical Features: - Urge incontinence due to autonomous contraction of the detrusor muscle - Incompetent urethral sphincter (more common in LMN bladder) Treatment: - Oxybutynin or tolterodine to prevent bladder contraction - Mirabegron to increase sympathetic tone causing detrusor relaxation	Clinical Features: - Overflow incontinence caused by flaccid paralysis of detrusor muscle - Incompetent urethral sphincter Treatment: - Intermittent catheterization program 4-6 times daily and refer to urology for urodynamic evaluation - Bethanechol – some inherent contraction still present - Pseudoephedrine – use if bladder and sphincter are flaccid