MYELOPATHIES

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• Mr HM presents with a 2 year history of progressive weakness of both lower limbs. He now walks with the aid of a stick.
• The legs feel stiff and have episodes of kicking out on their own while he is sitting or lying down.
• He has numbness in both lower limbs up to around the umbilicus.
• He also experiences lower back ache.
• He also reports that he wets his pants before he reaches the toilet. He can however feel that his bladder is full.
DEFINITION

• Disturbance or disease of the spinal cord

• Onset is acute or insidious
BASIC ANATOMY

• The cord begins at cranio-cervical junction
• The cord ends at L1/L2 level.
• 8 cervical nerves (only 7 vertebra)
• 12 thoracic nerves
• 5 lumbar nerves
• 5 sacral nerves
Basic anatomy....

• Cervical nerve roots emerge above the corresponding vertebra.

• Thoracic, lumbar and sacral nerve roots emerge below the corresponding vertebra.

• Because the cord ends at L1/L2, the cauda equina is formed to allow nerve roots to exit at correct level.
Bone notch at the base of the neck is C7.

The spinal cord ends approximately between L1 & L2.

Sacral cord segments (S1-S5 “Cauda Equina”) are level with T12-L1 Vertebrae.

The sacral vertebrae are fused to make up the sacrum.

The coccygeal vertebrae are fused to make the coccyx or “tail bone”.

Cervical spinal nerve roots C1 - C7 correspond with upper aspects of vertebral bodies.

Sensation of C7 nerve is for the middle finger.

C8 and lower spinal nerve roots leave below the corresponding vertebral body.

Sensation of T4 spinal nerve is approximately level with the nipple line.

Sensation of T6 spinal nerve root is approximately level with the bottom of the sternum.

Sensation of T10 spinal nerve root is approximately level with the abdomen.

Sensation of T12 spinal nerve root is approximately level with the pubic bone.

The sensations of lumbar nerves are over the legs.

Sensation of S3, S4 & S5 nerves is the Perineal (genital) area.
Basic anatomy....

• Blood supply:
  • 1 anterior spinal artery
  • 2 posterior spinal arteries
BLOOD SUPPLY OF SPINAL CORD

The central area supplied only by the anterior spinal artery is predominantly a motor area.
Dermatomes
Dermatomes.....
MYOTOMES
SYMPTOMS

• Paresthesias, numbness or cold sensation
• Heaviness, weakness or stiffness of the limbs
• +/- Pain localized over the spine or nerve root (often worsened by coughing, sneezing)
• Urgency or hesitancy of micturition
• Sexual dysfunction
SIGNS

- Paraparesis/paraplegia motor
- Quadriparesis/Quadriplegia level
- Sensory level
- Bladder dysfunction
- +/- Tenderness over the spine
- +/- A Gibbus
SCENARIO

• The patient was found to have:
  – Motor level at T8
  – Sensory level T10
  – Urgency of micturition
  – Tenderness over the lower back area

• Location of the lesion
  – Paraparesis T8 cord level
  – Lesion at T7/T8
  – Interruption of continence fibers
  – Mechanical
### Scenario: Weakness

<table>
<thead>
<tr>
<th>Paraparesis</th>
<th>Weakness of lower limbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadriparesis</td>
<td>Weakness of all 4 limbs</td>
</tr>
<tr>
<td>Plegia</td>
<td>Power 0/5</td>
</tr>
<tr>
<td>Myotome</td>
<td>Group of muscles served by a single nerve</td>
</tr>
</tbody>
</table>
Scenario..... Weakness

• NB
  – THE HIGHEST LEVEL OF WEAKNESS CORRESPONDS TO THE LEVEL OF THE LESION IN THE SPINAL CORD.
    • e.g. weakness up to (and including) hip flexion => L1
    • Weakness up to (and including) abdominal wall => T8 lesion
  – LEARN MYOTOMES
Scenario.... Loss of sensation

• Sensory level => spinal cord lesion
• Spinothalamic level
  – Pain
  – Temperature
  – Crude touch
• Posterior column level
  – Vibration
  – Proprioception
  – Fine touch
Scenario.... Loss of sensation

- NB:
  - THE 2 MODALITIES ARE NOT ALWAYS INVOLVED TO THE SAME EXTENT.
  - THE SPINOTHALAMIC LEVEL IS 2-3 LEVELS BELOW THE SPINAL CORD LEVEL.
  - LEARN ALL DERMATOMES
Scenario.... Problems of continence

- Frequency + Urgency – Due to spastic bladder
- Overflow incontinence – Bladder voids automatically
- Bladder distention + inability to void – Common in acute spinal cord lesions
Scenario.... Backache

• Can localize to vertebrae
  – e.g. # due to trauma
  – e.g. Collapse of vertebrae

• Radicular pain -> Pain starts at back and radiates along nerve pathway.
  – Due to involvement of nerve root.
  – e.g. collapse of vertebrae

• Lower back pain (Not corresponding to lesion level) – probably due to muscle spasm
APPROACH TO THE PATIENT

• Rule out compressing lesion.
  – This can be operated on as an emergency
  – How? ........ MRI

• If no compressing lesion on MRI -> look for medical cause
CAUSES OF A MYELOPATHY

COMPRESSIVE
- Tumors
- Disc prolapse
- Vertebral collapse
- Hemorrhage
- Abscess

NON-COMPRESSIVE
- Infections
- Demyelinating diseases
- Metabolic conditions
- Vascular problems
- Neoplasm
- Hereditary
NON-COMPRESSIVE MYELOPATHIES

- Infections:
  - TB
  - Syphilis
  - Herpes
  - Bilharzia
  - HIV
  - Toxoplasma
  - Varicella
  - CMV

Usually associated with HIV.
NON-COMPRESSIVE MYELOPATHIES

Demyelinating:
- MS
- Neuromyelitis optica (De Vic’s)
- Acute demyelinating encephalomyelitis (ADEM)
Non-compressive myelopathies....

- **Metabolic conditions**: Vit B12 deficiency

- **Vascular**: Anterior spinal artery occlusion

- **Neoplasms**: Primary
  - Astrocytoma
  - Ependymoma
  - Lymphoma

  Secondary
  - Metastasis e.g. prostate
CORD SYNDROMES

- Transection of the cord
- Anterior spinal artery syndrome
- Postero-lateral cord syndrome
- Hemisection of the cord
- Central cord syndrome
1. TRANSECTION OF THE CORD
Transection of the Cord....
Transection of the cord....

- Weakness below the lesion
- Spinothalamic sensory fallout below the lesion
- Loss of posterior column sensation below the lesion

- Causes – trauma, viral, post viral
2. ANTERIOR SPINAL ARTERY SYNDROME
Anterior spinal artery syndrome...
Anterior Spinal Artery Syndrome....

- Weakness below the lesion
- Spinothalamic sensory fallout below the lesion
- Posterior columns intact
Anterior spinal artery syndrome....
3. CENTRAL CORD SYNDROME
Central Cord Syndrome - Syrinx
Central Cord Syndrome....

- Suspended sensory level
- Sacral sparring
- Weakness with UMN signs below the lesion
- LMN signs at level of the lesion

• Causes – Syrinx, Tumors, demyelination, granulomas
<table>
<thead>
<tr>
<th>Key to Pathways</th>
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</thead>
<tbody>
<tr>
<td>spinothalamic</td>
</tr>
<tr>
<td>dorsal spinocerebellar (hindlimb, ipsilateral)</td>
</tr>
<tr>
<td>ventral spinocerebellar (hindlimb, contralateral)</td>
</tr>
<tr>
<td>spinocuneocerebellar (forelimb, ipsilateral)</td>
</tr>
<tr>
<td>cranial spinocerebellar (forelimb ipsilateral)</td>
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<tr>
<td>spinoreticular (ARF)</td>
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4. POSTERO-LATERAL CORD SYNDROME

• Spasticity below the lesion
• Posterior column fallout below the lesion
• No spinothalamic sensory fallout

• Causes – HIV, Vit B12 deficiency, trauma, hereditary
Brown-Sequard Syndrome
of Spinal Cord
Hemisection

Same side as lesion:
- UMN weakness
- Loss of position & vibration

Side opposite lesion:
- Loss of pain & temp.

Posterior (dorsal) columns
Lateral corticospinal tract
Spinothalamic tract
5. HEMISECTION OF THE CORD

• Brown Sequard syndrome
  – Ipsilaterial posterior column fallout
  – Ipsilaterial corticospinal tract fallout
  – Contralateral spinothalmic fallout

• Causes – Trauma, tumors, demyelination
Cauda equina and Conus medullaris

- C1: Cervical spinal nerve roots C1 - C7 correspond with upper aspects of vertebral bodies.
- C8: Sensation of C7 nerve is for the middle finger.
- T1: C8 and lower spinal nerve roots have below the corresponding vertebral body.
- T4: Sensation of T4 spinal nerve is approximately level with the ripple line.
- T6: Sensation of T6 spinal nerve root is approximately level with the bottom of the sternum.
- T10: Sensation of T10 spinal nerve root is approximately level with the abdomen.
- T12: Sensation of T12 spinal nerve root is approximately level with the pubic bone.
- L1: The sensations of lumbar nerves are over the legs.
- L5: S1: S2, S3, S4 & S5 nerves is the Perineal (genital) area.

Bone notch at the base of the neck is C7.

- The spinal cord ends approximately between L1 & L2.

- Sacral cord segments (S1-S5 "Cauda Equina") are level with T12-L1 Vertebrae.

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- Sensory loss
- Weakness/motor loss
- Sensory and motor loss
THANK YOU