Der spinale neurologische Notfall

Spinal cord emergency

Prof. Dr. A. Curt, FRCPC
Spinal cord emergencies

• traumatic

• non-traumatic
  – primary (myelitis, syringomyelia, intramedullary tumors..)
  – secondary (spinal metastases, intraspinal hemorrhage and abscess, spinal canal stenosis..)

• congenital
  – (meningo-myelocele, diastematomyelia, tethered cord..)
Spinal cord disorders: „the neurological examination is key!“
Spinal cord emergencies

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Sport injuries
Traffic accidents
Diagnostische Abklärung einer akuten traumatischen Querschnittslähmung, Leitlinien DGN 2010
- Time is spine (early treatment)
- Decompression surgery
- Stabilization
- Cardiovascular management (ICU guidelines)
- Controlled mobilization
  - Methylprednisolone
  - No evidence!
Spinal cord emergencies

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Better a murder than a misdiagnosis.

House MD
Red flags
Diagnostische Abklärung nicht-traumatischen Querschnittlähmung
DGN Guidelines 2010
Degenerative spinal canal stenosis

Spinal canal encroachments and instability

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Red flags

First Red Flag: Pain

- Usually first symptom
  - 80-90% of the time
- Usually precedes other neurologic symptoms by 7 weeks
  - Increases in intensity
- Severe local back pain
- Aggravated by lying down
  - Distension of venous plexus

Distribution of pain:
- bilateral pain
- clumsy hands/feet
- altered temp sen.
- girdle/belt like

Segmental Sensory Assessment

Somato-sensory Evoked Potentials

SSEPS

Contact Heat Evoked Potentials

CHEPS

Large Diameter (tactile)

Small Diameter (temperature, pain)
Segmental Sensory Assessment

Somato-sensory Evoked Potentials

**SSEPS**

- Large Diameter (tactile)
- Small Diameter (temperature, pain)

Contact Heat Evoked Potentials

**CHEPS**
Segmental Sensory Assessment

Kramer J, et al.. D-SSEP and EPT for the assessment of posterior cord function in SCI. J Neurotrauma 2008
Snake – eye myelopathy
Snake–eye myelopathy
police officer, ♂ 51 yrs
thermal hypaesthesia

Ulnar SSEP

Tibial SSEP

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Red flags

Second Red Flag: Motor

- **Weakness:** 60-85%
  - Tends to be symmetrical
  - Severity greatest with thoracic mets
- **At or above conus medularis**
  - Extensors of the upper extremities
- **Above the thoracic spine**
  - Weakness from corticospinal dysfunction
  - Affects flexors in the lower extremities
- **Patients may be hyper reflexic below the lesion and have extensor plantars**

Walking signs:
- unsteadiness
- fatigue
- weakness
  (limb or bilateral)

Calcified disc herniation T7/8
Lower back pain
Dysesthesia left leg
Lower limb reflexes increased
Female 36 years

Calcified disc herniation T10/11
Back pain, left leg pain
Bladder - bowel normal
Unlimited walking
Male 53 years
Spinalis Anterior Syndrome

Patient with complete paralysis due to spinalis anterior syndrome with loss of thermal and pain sensation below T7 but preserved light touch where accordingly dSSEP remained normal but dCHEP were abolished below the level of lesion.
Intraspinal – epidural haemorrhage

Acute, non traumatic epidural haemorrhage

male, 31 years, physiotherapist, paraplegia T3 AIS B, became paralyzed within 60 min
Intraspinal – epidural haemorrhage

Although patient received decompression surgery within 6 hours after onset of symptoms he suffers from established (chronic) paraplegia (AIS-B)

Spinal cord damage as a sequel of spinal cord compression due to epidural haemorrhage
Intraspinal – epidural haemorrhage

Sub-acute onset
Male 63 yrs, marcumar therapy
AIS-C, able to stand and walk indoors

Pre OR

Post OR
Red flags

Bladder signs:
- frequency
- voiding
- incontinence
Arterio-venous malformation of spinal cord

Lower limb fatigue and bladder urgency!
Meningeoma of thoracic cord

Lower limb pain and bladder urgency!
Spinal metastases

What types of cancer cause it?

Most commonly seen in

- Breast
- Lung
- Prostate
- Lymphoma
- Myeloma

- 3-5% of patients with cancer overall

constant & increasing

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Take home message: Red flags

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Lecture can be found on: www.balgrist/Zentrum für Paraplegie
...the spinal cord works not wireless yet, but we have ways to assess it....
Supplement
The examination of motor function is key!!
Schematic demarcation of dermatomes shown as distinct segments. There is actually considerable overlap between any two adjacent dermatomes.

Cervical segments
C5—Anterolateral shoulder
C6—Thumb
C7—Middle finger
C8—Little finger

Thoracic segments
T1—Medial arm
T3—3rd, 4th interspace
T4—Nipple line,
   4th, 5th interspace
T6—Xiphoid process
T10—Navel
T12—Pubis

Lumbar segments
L2—Medial thigh
L3—Medial knee
L4—Medial ankle
   Great toe
L5—Dorsum of foot

Sacral segments
S1—Lateral foot
S2—Posteromedial thigh
S3, 4, 5—Perianal area
MUSCLE GRADING
0 total paralysis
1 palpable or visible contraction
2 active movement, full range of motion, gravity eliminated
3 active movement, full range of motion, against gravity
4 active movement, full range of motion, against gravity and provides some resistance
5 active movement, full range of motion, against gravity and provides normal resistance
5¢ muscle able to exert, in examiner’s judgement, sufficient resistance to be considered normal if identifiable inhibiting factors were not present
NT not testable. Patient unable to reliably exert effort or muscle unavailable for testing due to factors such as immobilization, pain on effort or contracture.

ASIA IMPAIRMENT SCALE

☐ A = Complete: No motor or sensory function is preserved in the sacral segments S4-S5.

☐ B = Incomplete: Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.

☐ C = Incomplete: Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.

☐ D = Incomplete: Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.

☐ E = Normal: Motor and sensory function are normal.

CLINICAL SYNDROMES (OPTIONAL)

- Central Cord
- Brown-Séquard
- Anterior Cord
- Conus Medullaris
- Cauda Equina

STEPS IN CLASSIFICATION
The following order is recommended in determining the classification of individuals with SCI.

1. Determine sensory levels for right and left sides.
2. Determine motor levels for right and left sides.
   Note: 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 single neurological level.
   This is the lowest segment where motor and sensory function is normal on both sides, and is the most cephalad of the sensory and motor levels determined in steps 1 and 2.
4. Determine whether the injury is Complete or Incomplete (sacral sparing).  
   If voluntary anal contraction = No AND all S4-5 sensory scores = 0 AND any anal sensation = No, then injury is COMPLETE. Otherwise injury is incomplete.
5. Determine ASIA Impairment Scale (AIS) Grade:

   Is injury Complete? If YES, AIS=A Record ZPP
   (For ZPP record lowest dermatome or myotome on each side with some (non-zero score) preservation)
   If NO, AIS=B
   (Yes voluntary anal contraction OR motor function more than three levels below the motor level on a given side.)

   Are at least half of the key muscles below the (single) neurological level graded 3 or better?

   NO  NO
   AIS=C

   YES  YES
   AIS=D

If sensation and motor function is normal in all segments, AIS=E
Note: AIS E is used in follow up testing when an individual with a documented SCI has recovered normal function. If at initial testing no deficits are found, the individual is neurologically intact; the ASIA Impairment Scale does not apply.
Thank you for your attention!