Radicular and Pseudoradicular Syndromes

Differential Diagnosis and Therapy, Flowcharts

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Case history

• pseudoradicular
  – pain local and proximal
  – symptoms of spondylogetic reflex syndrome (SRS)

• radicular
  – pain distal
  – symptoms of spondylogetic reflex syndrome
  – worse with compression (heel fall, cough, sneeze)
Radicular Syndrome

- Follows segmental criteria on the motor level:
  - all muscles innervated by the root.
  - EMG confirms: Denervation potentials in muscles of ventral and dorsal branch (paraspinal muscles),
  - DD: peripheral impingement
- Follows segmental criteria on sensory level

Functional neurological diagnostics

- Motor
  - manual muscle test
    • upper and lower motor neuron
  - muscle stretch reflex
    • upper and lower motor neuron
  - extensor toe sign (Babinsky), clonus
    • upper motor neuron
- Sensory
  - Pain
    • pinwheel
  - deep sensitivity
    • tuning fork: vibration
    • joint position
  - touch
    • number recognition
    • sharp/numb
Muscle stretch reflex: strength

- 0 = absent
- ± = evokable with facilitation (Jendrassik, bite)
- + = weak
- ++ = normal
- +++ = accentuated
- ++++ = clonus

Muscle stretch reflexes: Interpretation

- Absent:
  - general:
    - peripheral neuropathy
  - single:
    - root lesion peripheral nerve lesion
- Decreased:
  - general:
    - peripheral neuropathy
    - cerebellar hypotonicity
    - DD: other cerebellar signs
    - latent acidosis, hypercalcemia, hypothyroidism
  - distal more than proximal:
    - compression of spinal medulla (laminar distribution of pathways)
  - single:
    - root lesion, peripheral nerve lesion
    - hypotonicity of antagonists with nocireaction
Muscle stretch reflexes: Interpretation

- increased, clonus
  - lesion of upper motor neuron
  - anterior muscles of arm, posterior muscles of leg: pseudo-pyramidal pattern of inhibition
  - alcalosis
  - hypocalcemia
  - hyperthyroidism
  - basal ganglionic windup

- pendular reflex
  - cerebellar lesion

Functional neurological diagnostics

- Sensory and motor (muscle tension)
  - straight leg raise (Lasègue, Bragard)
    - pain proximal (pseudoradicular)
    - pain distal (radicular)
  - upper limb tension test (ULTT)
    - for median, ulnar and radial nerve
    - less reliable
Muscle stretch reflexes

C5: Infraspinatus
C6: Biceps, brachioradialis
C7: Triceps
C8: Trömmner

Cervical plexus: C2 root / IVF 1/2

- No muscle stretch reflex
- M. sternocleidomastoideus
Cervical plexus: C3 root / IVF 2/3

- No muscle stretch reflex
- M. trapezius pars descendens (upper trap.)

Cervical plexus: C4 root / IVF 3/4

- No muscle stretch reflex
- Diaphragma
- Mm. rhomboidei
- M. levator scapulae
Brachial plexus: C5 root, C4/5 IVF

- Scapulohumeral-Reflex
- M. infraspinatus

Brachial plexus: C6 root, C5/6 IVF

- Biceps tendon reflex (more C5, ventral muscle)
- Brachioradialis reflex (more C6, dorsal muscle)
- M. deltoideus
- M. teres minor
- M. serratus anterior
- M. subscapularis
- M. teres major
- M. biceps brachii
- M. brachioradialis
Brachial plexus: C7 root, C6/7 IVF

- Triceps tendon reflex (more C5, ventral muscle)
- Brachioradialis reflex (more C6, dorsal muscle)
- M. triceps
- M. latissimus dorsi
- M. extensor carpi radialis
- M. flexor carpi radialis

Brachial plexus: C8 root, C7/T1 IVF

- Trömmner reflex
- M. flexor carpi ulnaris
- M. flexor digitorum sup. and prof.
- M. interossii
Sensory diagnosis of lumbar syndromes

Lumbar sensory innervation is relatively well indicative of spinal level because of lesser convergence

Radicular Syndroms of Lumbar Spine

• No. of root is by 1 lower than No. of IVF/disc
L3 root, IVF L2/3: Quadriceps Sartorius Adductors

L4 (IVF L4/5): Tibialis ant.
S1 (IVF L5/S1) (N. peroneus)
M. peronaeus longus, brevis, tertius

S1 (IVF L5/S1) (N. tibialis)
M. gastrocnemius
M. flexor digitorum longus
M. flexor hallucis longus
M. tibialis posterior
Muscle stretch reflexes

L2,3: Adductors
L3,4: Rectus femoris
L5: Tibialis posterior
S1,2: Triceps surae

Lesions of spinal medulla: causes

• cervical spondylosis and stenosis
• lumbar stenosis
• functional components thru venous congestion:
  – hypersympathicotonicity
  – viscerale lesions
    • sigmoid fixation
    • hepatic fixation/ptosis

• pathologies
Differential of longitudinal level

1. Impingement/irritation on spinal level
   Radicular/pseudoradicular
disc, spondylosis, ankylosis
2. Impingement of spinal medulla:
cervical and lumbar syndromes
   on cervical level
   Brain stem
   pontomedullary reticular formation (PMRF)
   mesencephalic reticular formation (MRF)
   Cerebral cortex
   lumbar syndromes
   on thoracic and lumbar level (see above)

Pseudo-pyramidal pattern of inhibition

1.) Inhibition of all α- and γ-motorneurons (hypotonicity).
2.) Relatively higher tonus of ventral muscles above Th6
   and dorsal muscles below Th6 (straight leg raise!).
3.) Inhibition of dorsal antagonists above T6 and ventral
   antagonists below T6
4.) Desinhibition of sympathetic NS ipsilateral:
   blood pressure higher, AV-ratio higher
5.) Lack of inhibition of C-fibres
Control of IML (sympathetic motor neurons)
pontomedullary reticular formation (PMRF)
  - ipsilateral cerebrum
  - ipsilateral cerebellum

Claudicatio spinalis

- Narrow spinal canal
- Decreased cortical activity is responsible for reduced inhibition of IML with venous pooling
- Muscle activity induces segmental stimulation of IML and increased venous pooling with entrapment
  > Exertion hypoxia, paresthesia, pain segmentally or regionally
  > balancing of cortical activity is the clue to successful treatment
**Improve activity of PMRF:**

Improve cortical activity:
- kontralat. large diameter fiber afferents
  - muscle spindle (1a),
  - Vibration,
  - TENS

**Increase ipsilateral cerebellar input into PMRF:**

- vestibular stimulation
  - spin, caloric stim.
- eye movements
Treatment of cervical disc and imbrication
1. Possibly traction like in imbrication
2. Segmental corrections
   • strain-counterstrain, respiratory adjustment
3. Craniomandibular dysfunction
4. Liver and other visceral ptoses
5. whole posture
   • pelvic and shoulder girdle alignment

Lumbar lesions: Treatment
• Possibly traction manipulation like in „imbrication“

Respecting antalgic position:
• Lig. sacrotuberale
• sacroccygeal lesions
• sacrum lesions (oblique, nutation)
• Cat. 2
• Cat. 3
• liver-kidney-bladder-uterus-rectum- coccyx
• ICV, sigmoid („Houston“)
Minimal program of neurological exam

<table>
<thead>
<tr>
<th>Technique</th>
<th>Interpretation</th>
</tr>
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<tbody>
<tr>
<td>1. Romberg</td>
<td>propriozeption, large diameter afferents,</td>
</tr>
<tr>
<td></td>
<td>vestibulum, cerebellum, thalamus, cortex</td>
</tr>
<tr>
<td>2. Romberg on soft surface (rubber foam)</td>
<td>vestibulum, cerebellum, less</td>
</tr>
<tr>
<td></td>
<td>propriozeption</td>
</tr>
<tr>
<td>3. On leg stance l/r</td>
<td>propriozeption, vestibulum, cerebellum, cortex</td>
</tr>
<tr>
<td>4. On leg stance l/r on soft surface</td>
<td>vestibulum, cerebellum, cortex, less</td>
</tr>
<tr>
<td></td>
<td>propriozeption</td>
</tr>
<tr>
<td>5. On leg jump l/r</td>
<td>cerebellum, cerebrum</td>
</tr>
<tr>
<td>6. On leg jump l./re. with ball catching</td>
<td>cerebellum, cerebrum</td>
</tr>
<tr>
<td>7. Spin 1 Hz l./r: 3 times</td>
<td>labyrinth, vestibular system</td>
</tr>
<tr>
<td>measure postrotatory nystagmus (Frenzel glasses)</td>
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<tr>
<td>8. Spine-Test</td>
<td>medial cerebellum (spinocerebellum)</td>
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</tbody>
</table>

Minimal program of neurological exam

9. Finger-nose-test                             laterale cerebellum (cerebrocerebellum)  
10. Diadochokinese                              intermediate and lateral cerebellum       
11. Heel-shin-test                               intermediate cerebellum                   
12. Muscle stretch reflexes                     cortex, cerebellum, roots                 
13. Babinsky, abdominal reflex                  upper motoneuron                          
14. Convergence reaction                        mesencephalon, cortex                     
15. Pupillary light reflex                      mesencephalon                             
16. AV-ratio on fundus                          cortex, PMRF, IML                          
17. Blood pressure bilat.                      cortex, PMRF, IML                          
18. Optokinetic test                            frontal, parietal lobe, cerebellum, PPRF  
19. Pursuite                                    parietal lobe, cerebellum                  
20. Sakkades                                    frontal lobe, cerebellum                   
22. Sensory exam, pain                          peripheral and spinal impingements,        
                                              neuropathy, afferent pathways,             
                                              thalamus, cortex                           

Abbildung aus: Carter, Applied Kinesiology, Elsinore, 2004  