L/S Radiculopathy
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OBJECTIVES

- EDX of L/S radiculopathy
- Chronology of EDX abnormalities
- Use of H reflex in DX L/S radiculopathy
- Assessing severity
Frequency of L/S Radiculopathy

- L/5 ::S1   2::1
- L4   - 5%
extremitas (eks-trem’l-tas)
[L. fr. extremus, last, outermost] [NA].
Extremity; one of the ends of an 
elongated or pointed structure.
Incorrectly used to mean Limb.
See membrum.
Check back for symmetry

- Stand quietly
- Both feel weight bearing
- One foot weight bearing
- Forward flexed
Exam prior to EDX

- Straight Limb Raising
- Recumbent
- Recumbent with dorsiflexion after lowering to no sx
- Sitting
- Sitting with neck flexion after SLR lowered
L-5 PX

- Walk on heels (only gross test)
- Check strength of Ext H L
  - NB. Must do with ankle plantar flexed and push on proximal phalanx
- Measure atrophy of leg (greatest circumference)
- MSR – lateral HS
PROXIMAL PHALANX

S-1 Radiculopathy

- Walking on toes is only a gross test
- Must do heel raises unilaterally and compare (10)
- MSR - Ankle jerk
- Numbness lateral foot and sole
EDX of Lumbar radiculopathy

- Prone position is best
- Land marks
  - Mark L-4 spinous process at level of ilium crest
  - Mark L-5 – next caudal spinous process
  - Mark S-1 – next caudal spinous process
  - Draw diagonal line from post. sup. iliac spine to midline
Maximize relaxation

- Pillow under abdomen
- Pillow under ankles

- If still cannot get relaxation – use other hand to poke fingers in abdomen
Lower limb – motor innervation

- Quadriceps and adductors – L 2-4
- L-4 below knee – only anterior tibial
- L-5 below ankle – only ext dig br
- Toes – S1 – S2: medial to lateral ie. Digit 1 to digit 5
Muscles to explore

- Paraspinals
- Same root but 2 different nerves
- One proximal muscle
- One distal muscle
- One muscle ABOVE suspected root
- One muscle below suspected root
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Example – L-5 Radiculopathy

- Explore
  - Antero tib
  - Flex dig long
  - Soleus (distal to suspected root)
  - Vastus medialis (proximal to suspected root)
  - Tensor fascia lata (a proximal muscle)
  - Paraspinals

Chronology of L/S radiculopathy

- When radicular pain begins:
  - Recruitment will be reduced (if significant weakness)
  - H reflex latency will be prolonged
  - Early “polyphasic MUP’s” will appear
Needle EMG Abnormalities - chronology

- 1st week – recruitment frequency will be increased
- By 7-8 days – positive waves in paraspinals (Caution – a train will result if in end plate area!)
- 3rd week – abnormal irritability in paraspinals and proximal limb muscles
- 4th week all findings

Recruitment frequency

- In normal muscles the 2d MU will appear when the 1st MU is firing 10-12 hz
- L-5 radiculopathy – ext dig long 16-18 hz
- Compare with contralateral muscle

- Easiest – a single joint muscle
“Early polyphasic”

- LAMBERT IN 1968 (EEG.CL NEUROPHYSIOL 25:404):
  - A polyphasic MUP can be:
    - A SYCHRONOUS BUT NOT SIMULTANEOUS ACTIVATION OF 2 OR MORE MUP’S

Anterior Tibial M.
early polyphasic

- 2 axons conduct at different rates thus impulses arrive slightly separated
- Looks like a polyphasic MUP
  - Normal amplitude
  - Increased duration
  - Several MUP’s stucked together
KATZ & SCHMITT

Ephaptic activation between two nerve fibers
J. Physiol. 1940. 97: 471
ARVANITAKI, A

Effects evoked in an axon by the activity of a contiguous one.

J. Neurophysiol. 1942.5:89

Seltzer & Devor

Ephaptic transmission in chronically damaged peripheral nerves

Neurol. 1979 29:1061
Ephaptic transmission between single nerve fibers in the spinal nerve roots of dystrophic mice.

J. Physiol. 1980. 305:151

‘H’ REFLEX LATENCY IN LUMBAR RADICULOPATHY

- Will be prolonged in S-1 radiculopathy from the onset of radiculopathic pain
- Difference in latency, side-to-side, =or< 1 millisecond or even .5 millisecond is a red flag.
  - Original study (1974) mean .8 8 +/- S.D. .4 ms
  - More recent series difference side-to-side .3 ms
Formula to calculate H latency

- .46 X distance from stimulation to medial malleolus
- + .1 age in years
- + constant – 9.14

- Difference side to side > 1.0 ms (conservative)
- My opinion is > .5 ms is “red flag”
Use of H reflex latency

- Early in course of L/S radiculopathy
- When abnormal irritability is only in paraspinals
- Underlying peripheral neuropathy (diabetic)
- If muscle exploration is confusing
- Post laminectomy with recurrent symptoms
Use of H reflex latency when positive waves are only in paraspinals

- 90 – 95% of all first appearing radiculopathies are L-5 or S-1
- Ratio of frequency – L-5:S-1 = 2:1
- H latency is prolonged – S-1; if normal – L-5

Needle stimulation of S-1 spinal nerve

- Find posterior inferior iliac spine
- Insert monopolar needle 1 cm cephalad and medial
- Apply 50 – 100 us duration stimulation for direct S-1
- Apply 500-1000 us duration stimulation for H reflex (low intensity)
S-1 DIRECT LATENCY/H REFLEX LATENCY

- Stimulate S-1 spinal nerve (PSIS) 50-100 uS
- Stimulate as above with 1 ms duration

- LATENCIES: S-1/H = 48% normal
- LATENCIES: S-1/H = 45% if S1 radiculopathy

S-1 spinal nerve H reflex

- Stimulate with 1 ms duration and low intensity
- H wave will appear 1st and M wave following by 6-8 ms
- If take-off appears for M wave, there is usually more than 8-9 ms between H & M
M & H are separated
By >8 ms = S-1 radiculopathy
F & H in L/S Radiculopathy

- If can’t get H Reflex
  - Change gain to 200 uV and stimulus duration to .1 ms
- Get 10 F waves
  - Mean of 10 is 1.8 ms longer than ipsilateral H latency
  - Side-to-side difference of mean of 10 F waves - .6 ms
Dural sleeve as entrapment site

- Dural sleeve is inextensible
- Ergo – a “sick” nerve can be compromised

- Diabetic neuropathy – appears as multiple lumbar radiculopathy (formerly called “femoral neuropathy”)

Prognosis

- After 7-10 days an axon undergoing wallerian degeneration will become **inexcitable**
- **Stimulation** of nerve to weak muscle will identify the dead axons (NB. Amplitude, compare with contralateral)
  - L-4 – **ant** tibial or vastus lateralis
  - L-5 – extensor dig long
  - S-1 – medial head gastroc
CLINICAL WEAKNESS BUT... NORMAL AMPLITUDE "M"

[Image of an electrical signal trace]
Muscles to explore

- One proximal muscle (L-5 eg. tensor fascia lata)
- One distal muscle (S-1 eg. Abd hall)
- Muscle from 2 different nerves (L-5 eg. Peron. long; flex dig long) BUT same root
- Paraspinous – level above and below
- Contralateral muscle of most abnormality
EMG of PARASPINALS
S/P surgery

- Not significant if abnormalities are all along scar

- Can be significant if localized and:
  - > 3 cm lateral to scar
  - > 3 cm deep
  - Correlate with sx
Back surgery management

- Stop pain ?ESI
- Exercise program
Williams flexion exercises

- Sit-up in long sitting position
- Pull knees to chest (each and then both)
- Pelvis tilt
- Squat and reach
- Sit-up in short sitting position
- One limb stretch
Case study

- 45 y/o all-purpose worker (heavy) severe back and severe low back and left leg pain after lifting 3 day onset previously
- PX – weakness left great toe extension and +++SLR on left.
- MRI – ‘severe left L4,5 HNP’
- ?Management ??

Patient is scheduled to begin 2 week driving trip with family to Grande Canyon

- 28 tablets 10 mg prednisone
  - Take 7,6,5,4,3,2,1 same time every day and all at once
- Referral to interventional physiatrist
- ? Epidural
  - Consultan“epi could make worse; most severe HNP I have seen before EPI”
  - Patient in 1 week - ‘Sx are better’
  - Ergo defer EPI and take another prescription with you
What Happened??

- 2 days before trip saw consultant
  - Symptoms - a little better
- Left on trip
  - Several calls “no problems”
  - On return re-exam ‘min weakness left toe extensor and mild left SLR
  - Pain occasional only and mild

BOTTOM LINE

Most people recover from LBP even HNP and radiculopathy
ERGO. Tincture of time is best Rx

*Control the pain*

Major reason for operation is PAIN