Spine
Maximum Medical Improvement and Impairment Rating

TDI Division of Workers' Compensation

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When there is conflict between...

The Division of Workers' Compensation (DWC) Statutes/Rules/Appeals Panel Decisions (APDs)

and, the AMA *Guides*

Be aware of when DWC **Statutes/Rules/APDs take precedence**

Maximum Medical Improvement (MMI)

§401.11(30)s

- Definition of MMI: **"*The earliest date after which, based on reasonable medical probability, further material recovery from or lasting improvement to an injury can no longer reasonably be anticipated.*"**

Maximum Medical Improvement (MMI)

Rule §130.1(c)(3)

- Assignment of an impairment rating for the current compensable injury shall be based on the injured employee's condition on the MMI date considering the medical records and the certifying examination

Considerations to keep in mind

- **Most Spine Impairments fall in DRE I – II, and some reach the threshold for III**
- Be aware of structural inclusions and the functional criteria necessary to reach the different threshold criteria for each DRE category
- DRE IV-VIII are not common, BUT
  - Make sure you know how to determine the IR for these categories
  - Be aware of differences in how these are assigned for the cervicothoracic / thoracolumbar vs lumbosacral

Spine Impairment Rating

For Your Consideration in the Analysis of Spine Impairment

AMA Guides, Chapter 3 - 3.3a The Spine History
From page 95

"The physician should note any physical findings that are not consistent with the medical history. The physician should identify any information based on the patient's verbal responses or interpretation and not confuse it with objective clinical findings."

Spine Impairment Rating

AMA Guides, Chapter 3 - 3.3a The Spine History
From page 95

" *While the medical history that the physician gathers should consider objective data from others, the physician should be cautious about using* ***only*** *information from others, especially subjective information.*

"It is not appropriate to question the patient's integrity. ***If information from the patient does not make sense, or there are inconsistencies in the history, the physician should note this and describe the discrepancies in the record."***

Spine Impairment Rating

AMA Guides, Chapter 3 - 3.3d Evaluating Impairments:
The injury or Diagnosis-Related Model
From page 100:

"The Injury Model relies especially on evidence of neurologic deficits and uncommon, adverse structural changes, such as fractures, dislocations, and loss of motion segment integrity".

"Under this model, DREs are differentiated according to clinical findings that are verifiable using standard medical procedures".

Impairment Rating
Spine DRE I: Complaints or Symptoms

Structural Inclusions

- **None**

Description and Verification

- No *significant* clinical findings
- No muscle guarding or *"history of"* guarding
- No documented neurologic impairment
- No loss of structural integrity on F/E x-rays
- **No** indication of **impairment** related to injury or illness
- No structural inclusions

Cervicothoracic & Thoracolumbar & Lumbosacral = 0% WP

Impairment Rating
Spine DRE II: Minor Impairment

Structural Inclusions

- Compression fracture **< 25%**
- Non-displaced posterior element fractures
- Transverse or spinous process fracture with displacement in L and C spine; T spine is unclear

Clinical Findings/Differentiators

- Significant intermittent or continuous muscle guarding or spasm or nonuniform loss of range of motion, dysmetria, is present or has been observed and documented by a physician
- Non-verifiable radicular complaints
- No objective signs of radiculopathy
  - loss of relevant reflex(es)
  - 2 cm or greater atrophy with circumferential measurements of relevant extremity
- No loss of structural (motion segment) integrity lateral view flexion/extension x-rays

Cervicothoracic & Thoracolumbar & Lumbosacral = 5% WP

Spine DRE II: Minor Impairment

- It is reasonable to document in your report **what** the DRE II differentiators are
- HOWEVER, DON'T SIMPLY LIST the DIFFERENTIATORS in your report as your rationale.
- EXPLAIN and DOCUMENT in your report
  - ✓**Which** DRE differentiator(s) were used / were present at MMI
  - ✓**Why** that or those differentiators were used
  - ✓**Where** the differentiator(s) are found:
    - in the records OR
    - if in your certifying exam

DRE II

Consider Table 71, on page 109

This table of the DRE Impairment Category Differentiators, includes:

1. **Guarding**

Paravertebral muscle guarding **or** spasm **or** nonuniform loss of range of motion, dysmetria, is present or has been documented by a physician

Muscle Guarding

APD 080966-s states.

…"by placing the word 'or' between guarding, spasm and nonuniform loss of ROM we read those terms in the disjunctive. We read the Guarding portion of Table 71 to say **guarding can be used as a differentiator if guarding *or* spasm *or* nonuniform loss of ROM is present or has been documented by a physician**, not that all three items of guarding, spasm and nonuniform loss of ROM must be present or documented by a physician before it can be used as a differentiator."

Spine – DRE II GUARDING

Clinical Findings/Differentiators

- Significant intermittent or continuous **muscle guarding** or spasm or nonuniform loss of range of motion, dysmetria**, is present or has been observed and documented by a physician**
- Non-verifiable radicular complaints
- No objective signs of radiculopathy
  - loss of relevant reflex(es)
  - 2 cm or greater atrophy with circumferential measurements of relevant extremity
- No loss of structural (motion segment) integrity lateral view flexion/extension x-rays

Muscle Guarding

- **Muscle Guarding** is a **voluntary** contraction of a muscle to minimize motion or agitation of the injured or diseased tissue.

  ✓It is *not* muscle spasm because the contraction of guarding can be relaxed.

  ✓In the spine, it may be associated with reproducible loss of motion, which may then produce non-uniform loss.

  ✓**May be a learned behavior, rather than a permanent impairment**

Spine – DRE II SPASM

Clinical Findings/Differentiators

- Significant intermittent or continuous muscle guarding or **spasm** or nonuniform loss of range of motion, dysmetria, **is present or has been observed and documented by a physician**
- Non-verifiable radicular complaints
- No objective signs of radiculopathy
  - loss of relevant reflex(es)
  - 2 cm or greater atrophy with circumferential measurements of relevant extremity
- No loss of structural (motion segment) integrity lateral view flexion/extension x-rays

Muscle spasm

- **Muscle Spasm** is a sudden **involuntary** contraction of a muscle or a group of muscles, where the muscle contracts but does not produce motion of the body part
  - ✓It is usually associated with recent / acute injury.
  - ✓A physiologic method to splint a moderate to severe injury (such as a fracture)
  - ✓To differentiate true muscle spasm from voluntary muscle contraction, the individual should **not** be able to relax the contractions.
  - ✓ The spasm should be present standing as well as in what should be a relaxed supine position.

Muscle spasm

- **“SPASM"**
  - ✓Laypeople / claimant’s may say they have “spasm”, but must be observed by physician to potentially qualify as a differentiator
  - ✓Normal or increased resting tone or tenderness is often mischaracterized by doctors as spasm
  - ✓Often over-utilized and misused; especially in electronic health records (EHRs); copy / pasted forward well past the acute period

Muscle spasm – What does the EBM say about it?

- ✓The absence of “spasm” in common low-back pain and/or injury cases was established in the 1950 to 1980 era, and no subsequent scientific publication documents true muscle spasm in common back pain scenarios.

Talmage JB: The Lost Art of Spinal Physical Examination AMA Guides® Newsletter : 27: 6 (1–15) Nov 2022.

Muscle spasm –
What does the EBM say about it?

- A study with patients with acute low back pain and a list found electrical silence (no muscle contraction) in the muscles on the convex side; the side with reported spasm [Harrell et al.]
- Validated by a follow up study by E Johnson

Harrell A, Mead S, Muellar E. The problem of spasm in skeletal muscle. JAMA. 1950.; 143(7);640-664.

Johnson E. The MYTH of skeletal muscle spasm. Am J Phys Med Rehabil. 1989;68(1);1

Muscle spasm –
What does the EBM say about it?

- **SPASM has POOR Validity**
  - ✓Low inter-rater reliability,
  - ✓Sensitivity,
  - ✓Specificity

- **It is not typically seen**
  - ✓In those with chronic pain (***despite*** subjective reports)
  - ✓At MMI

Muscle spasm

- Isolated muscle spasm due to acute neck or back pain is NOT the same as SPASTICITY
- **Spasticity** is caused by disinhibition of the lower motor neuron (LMN) due to injury / insult to the upper motor neuron (UMN) - brain or spinal cord
- IF there was a LMN injury (nerve root such as due to radiculopathy), the result is
  - Flaccid weakness in relevant muscles
  - Atrophy of affected muscles
  - Decreased or absent relevant reflexes

Spine – DRE II Non-Uniform ROM / Dysmetria

Clinical Findings/Differentiators

- Significant intermittent or continuous muscle guarding or spasm or **nonuniform loss of range of motion**, **dysmetria**, is **present or has been observed and documented by a physician**
- Non-verifiable radicular complaints
- No objective signs of radiculopathy
  - loss of relevant reflex(es)
  - 2 cm or greater atrophy with circumferential measurements of relevant extremity
- No loss of structural (motion segment) integrity lateral view flexion/extension x-rays

Non-uniform loss of ROM, dysmetria

- **Non-uniform loss of ROM**
  - Does this mean asymmetry?
  - One plane of motion? More than one plane?

- **Dysmetria**
  - Lack of coordinated movement
  - How does this apply to the spine?

❖**Non-uniform loss of motion and Dysmetria is not specifically defined in the Guides.**

DRE I vs. DRE II

- These are just some of the DRE differentiators to consider
- Keep them in context with Rule 130.1(c)(3)

  "Assignment of an impairment rating for the current compensable injury shall be based on the injured employee's condition on the MMI date...."

- Since there is no APD that addresses the issue of the Guides DRE II including a "*history of*" differentiators as criteria for impairment, **and** the Rule in Chapter 130.1 that states IR shall be based on the injured employee's condition on the MMI date, as the DD **you must explain your rationale for the DRE category you select.**

DRE I vs. DRE II

- This is an area where there is variability in interpretation
- There may be a difference of medical opinion
- Very often, there is a **difference of sufficient documentation**
  - ✓Don't let this be a reason for your report to be overturned
  - ✓Document clearly as per prior recommendations (slides 13 and 27)

DRE I vs. DRE II

CONCLUSION:

- **The key is to sufficiently explain your rationale for your choice of DRE I or DRE II** so that others reading your report, including an administrative law judge, may clearly understand your IR and your rationale.
- Failure to sufficiently explain your rationale can lead to receipt of an LOC, or your report being overturned.

DRE I vs. DRE II

- Most non-specific "STRAINS and SPRAINS" of the spine will be a DRE category I or II.
- They should NOT rise to the threshold of a DRE III as there would NOT be the structural or clinical findings necessary to reach a DRE III.
- Even if there was aggravation of Degenerative Disc Disease as a compensable condition, this would not be medically probable to have the appropriate clinical differentiators to reach a DRE III

LET'S DISCUSS DRE III

Impairment Rating
Spine DRE III: Radiculopathy

Structural Inclusions

- Compression Fracture of **25% to 50%**
- Displaced posterior element fractures that disrupts the spinal canal
- Not a spinous or transverse process fracture

Clinical Findings

- Loss of (relatively decreased or absent) relevant reflex(es),
- 2 cm or greater atrophy with circumferential measurements of relevant extremity

Lumbosacral = 10% WP
Cervicothoracic & Thoracolumbar = 15% WP

Impairment Rating
Spine DRE III: Radiculopathy

- Radiculopathy may be an accepted or determined to be a compensable condition, with corresponding clinical findings, but the IE must reach the **THRESHOLD** of *"significant signs"* to be **ratable** as DRE III
- ***"Significant signs"*** of radiculopathy – one or both
  - Loss of relevant reflex(es)
    - includes decreased and absent relevant reflex(es)
  - 2 cm or greater atrophy (at same location)with circumferential measurements of relevant extremity

Impairment Rating
Spine DRE III: Radiculopathy

- APDs 040924, 091039, 111710 - **Loss of relevant reflex(es) includes *decreased* and *absent* reflexes.**
- APD 030091-s Radiculopathy requires > 2 cm of atrophy **and/or loss** of relevant reflex(es).
- APD 072220-s clarified that DRE III radiculopathy was for atrophy of **2 cm or more.**

Case 1

History of Injury

- 28-year-old warehouse worker lifted 50 pound box at work 4 months ago
- Experienced lower back pain and right lower extremity pain

Case 1

Treatment History - Date of Injury

- Occupational medicine physician diagnosed lumbar sprain
- Initial treatment naproxen, cyclobenzaprine and tramadol
- Released to return to work with restrictions not to lift more than 20 pounds
  - employer able to accommodate restrictions

Case 1

Treatment History - 3 Weeks Post Injury

- 6 PT visits in occupational medicine clinic consisting of hot packs, electrical stimulation, and some exercises involving lumbar and hip flexion stretching
- Follow up at three weeks post injury the IE reported worsening symptoms over the past two weeks with **progression of pain** extending into right buttock with “numbness and tingling” sensation in right lateral thigh and leg to the front of the shin.

Case 1

Treatment History - 3 Weeks Post Injury

- NSAID switched to meloxicam and told to discontinue physical therapy
- Continued to work with restrictions

Case 1

Treatment History - 4 Weeks Post Injury

- Lumbar spine plain film x-rays obtained
- Show moderate spondylosis at L4/L5

Case 1

Treatment History - 6 Weeks Post Injury

- Occupational medicine physician referral to PMR physician
- Low back and right lower extremity symptoms increased with sitting, bending forward, coughing, lifting and in morning; better with standing and walking
- Left lumbar list present

Case 1

Treatment History - 6 Weeks Post Injury

- PMR records reported
  - VAS 8/10 and Oswestry score 54%
  - Symptom diagram demonstrated right > left lumbosacral pain extending into right buttock, right lateral thigh, leg and dorsum of foot

Case 1

Treatment History - 6 Weeks Post Injury

- Lumbar flexion of fingertips to knees with increased low back, right buttock and posterior thigh pain, extension slightly decreased in range with increased right axial low back pain without radiation
- Patellar and Achilles DTRs 2+ bilaterally
- Medial hamstring DTR not tested

Case 1

Treatment History - 6 Weeks Post Injury

- Decreased sensation right lateral thigh, leg and dorsum of foot
- Right ankle dorsiflexion, EHL and hip abduction 4+/5
- **Diagnosis**
  - Right L5 radiculopathy secondary to suspected L4/L5 disc protrusion

Case 1

Treatment History - 6 Weeks Post Injury

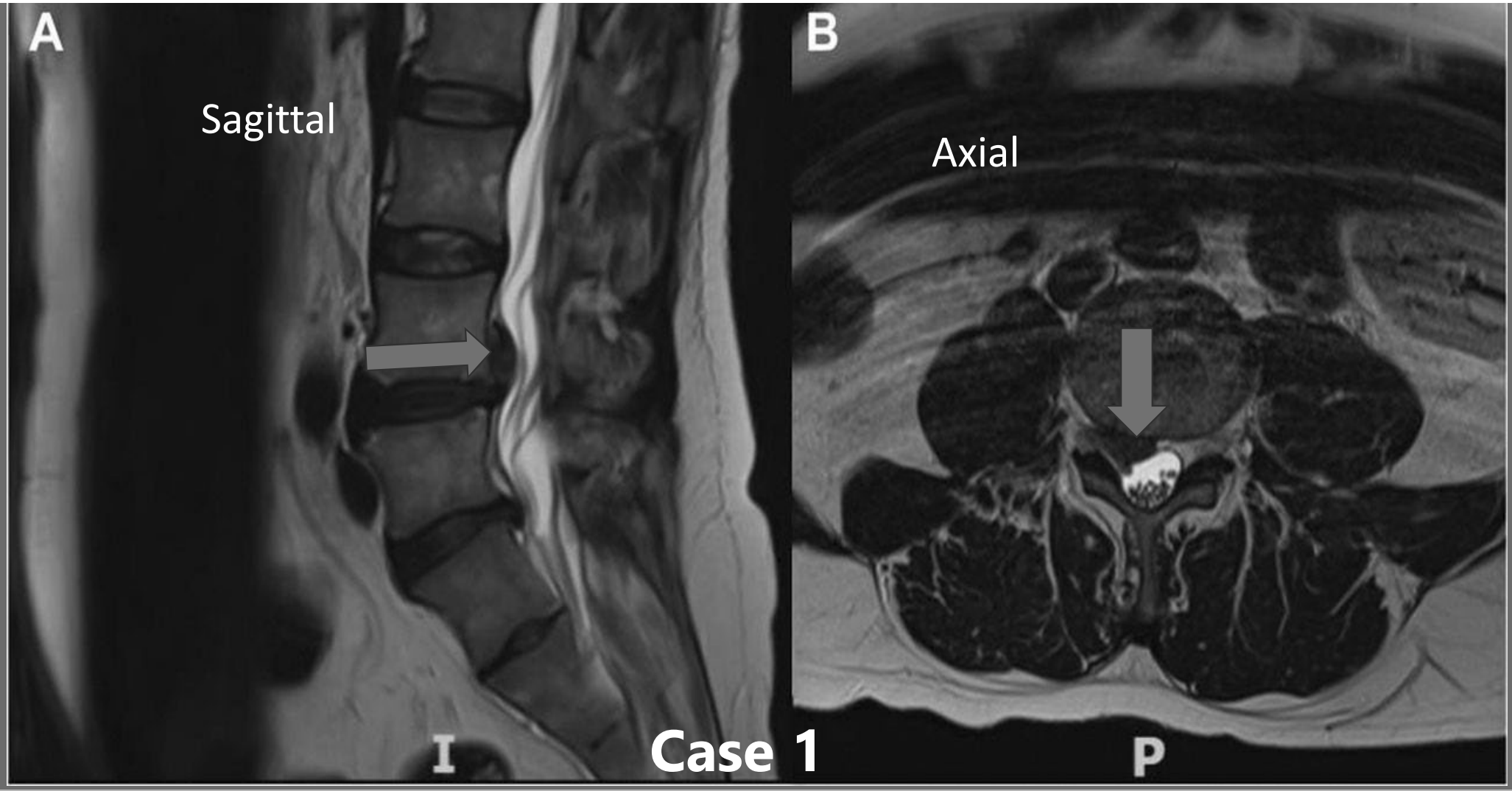
- PMR ordered a non-contrast lumbar MRI scan

Case 1

Treatment History - 8 Weeks Post Injury

Lumbar MRI scan report

- Large right paramedian disc extrusion at L4-5
- Cranial migration of disc content, with impression on the ventral surface of the dural sac and obliteration of the right lateral recess of the vertebral canal, with compression of the descending right L5 nerve root
- Disc bulge at L5-S1
- Disc desiccation at L4/L5 and L5/S1
- No other findings noted at other disc levels



de Carvalho Neto EG, et al. Pract Neurol 2020;20:472–473. doi:10.1136/practneurol-2020-002595

Case 1

Treatment History - 10 Weeks Post Injury

- Transforaminal Epidural Steroid Injection (ESI) at 10 weeks post injury
- Significant relief right lower extremity symptoms for 3 weeks
- Right lower extremity symptoms recurred with sitting and bending forward
- Working restricted duty
- Preauthorization denial for repeat ESI

Case 1

Designated Doctor (DD) Evaluation - 16 Weeks Post Injury

- You are asked to evaluate the injured employee for MMI / IR. You evaluate him at ~ 4 months after the DOI. You document:
  - The mechanism of injury (MOI)
  - Timeline of subjective symptoms and objective findings
  - Imaging findings
  - Response to treatment

Case 1

DD Evaluation - 16 Weeks Post Injury

- Warehouse worker for 5 years, present employer for past 2 years
- Currently working with restrictions
- No co-morbid medical conditions or relevant past medical history
- Sleep disturbed due to back and leg pain

Case 1

DD Evaluation - 16 Weeks Post Injury

- No history of psychological distress or treatment
- Oswestry score 52%
- Pain scale 7/10
- Symptom diagram shows right low back, buttock, posterior thigh and lateral leg pain extending to dorsum of right foot
- Preauthorization denial appealed


AND ELBOW
HAND AND WRIST
FOOT AND ANKLE

Medial Hamstring
DTR
Prone

de Carvalho Neto EG, Gomes MF, Damiani Monteiro M*, et al* The medial hamstring (L5) reflex *Practical Neurology* 2020;**20:**472-473

Medial Hamstring Reflex

Summary

- Approximately 90 to 95 percent of compressive radiculopathies occur at L4-L5 and L5-S1.
- L5 radiculopathy is the single most common lumbar radiculopathy.
- The MHR is very important in rating L5 radiculopathy
- Increase your proficiency by routinely evaluating the MHR prone and supine
- List your findings for the MHR in your report

Case 1

DD Physical Exam – 16 Weeks Post Injury

- Vitals
  - height 70 inches
  - weight 175 lbs.
  - BP 130/82
  - pulse 65
  - respiration 16
- Able to rise from sitting to standing with difficulty assuming lumbar lordosis
- Ambulates with normal gait

Case 1

DD Physical Exam (cont'd) – 16 Weeks Post Injury

- No scars on back or trunk
- Obvious left trunk list
- Able to walk on heels and toes, and perform 10 calf raises on each leg without obvious weakness / asymmetry
- Compensation due to weakness vs pain with squat
- 4/5 strength right EHL, right tibialis anterior, and right hip abductors; otherwise manual muscle testing shows 5/5 strength

Case 1

DD Physical Exam (cont'd) – 16 Weeks Post Injury

- Patellar and Achilles DTRs 2+ bilaterally
- Medial hamstring DTRs tested supine absent bilaterally;
- Examiner did not stop there! Retested: **Prone absent on right, 1+ on left**
- Sensation slightly decreased over fight posterior thigh and anterolateral leg and dorsum of foot
- Symmetric thigh and calf circumference

Case 1

DD Physical Exam (cont'd) – 16 Weeks Post Injury

- Right supine SLR to 45° with increased sharp lower back pain extending into right buttock and posterior thigh
- Worsened with ankle dorsiflexion and hip adduction/internal rotation
- Left supine SLR 70° with only hamstring tightness/discomfort

Case 1

DD Physical Exam (cont'd) – 16 Weeks Post Injury

- Negative femoral nerve root tension signs
- Tenderness with palpation and hypertonicity of right lower lumbar paraspinal muscles at L4/L5/S1

Case 1

Based on medical records and physical exam, what is compensable injury for certifying MMI and IR?

130.1(c)(3)

Case 1

What is compensable injury for certifying MMI and IR?

A. Lumbar sprain

B. Right L5 radiculopathy

C. Lumbar sprain and right L5 radiculopathy secondary to L4/L5 disc extrusion

D. Lumbar sprain, right L5 radiculopathy secondary to L4/L5 disc extrusion and L4/L5 disc desiccation

Case 1

Has MMI been reached?
If so, on what date?

(May not be greater than statutory MMI date shown on DWC Form-032)

Case 1

Has MMI been reached?
If so, on what date?

A. Yes, date of initial PMR visit, 6 weeks post injury

B. Yes, date of TF ESI, 10 weeks post injury

C. Yes, date of DD exam, 16 weeks post injury

D. No, not at MMI

Case 1

What does the ODG say about these treatments?

- ✓ Repeat Transforaminal ESI?
- ✓ Different approach to PT?
  - Directional based exercises?
  - McKenzie? Other?
- ✓ Discectomy?

Is other treatment or time anticipated to result in further material recovery?

Case 1

Any Questions about Case 1?

Case 1- The Sequel

DD Evaluation – 52 Weeks Post Injury

- Underwent L4-5 discectomy **18 weeks after injury**
- Discharged from PT with independent home and gym exercise program **32 weeks post injury**
- Illegible handwritten PT discharge notes at 32 weeks

Case 1- The Sequel

DD Evaluation – 52 Weeks Post Injury

- Medical records document **PMR follow-up 40 weeks post injury**
  - Reports significant improvement AFTER discectomy and PT, but persistent low back and right lower extremity pain with sitting, bending and lifting, “2 - 3/10”
  - Working full duty, but no lifting >50 lbs

Case 1- The Sequel

DD Evaluation (con't) - 52 Weeks Post Injury

- **PMR follow-up 40 weeks post injury** (cont'd)
  - No lumbar list in relaxed stance
  - Decreased lumbar flexion with deviation to left and increased low back and right buttock pain, and slightly decreased extension
  - Right SLR at 60° produces right low back and buttock pain but NOT into the leg, pain increased with ankle DF

Case 1- The Sequel

- **DD Evaluation (con't) - 52 Weeks Post Injury**
  - Medical records document **PMR follow-up 40 weeks post injury** (cont'd)
    - LE strength 5/5 bilaterally
    - LE DTRs bilaterally symmetric
    - Will continue home exercise program
    - Released to full duty, no restrictions
    - Follow-up as needed

Case 1- The Sequel

DD Evaluation - 52 Weeks Post Injury

DD's list of IE's Current Complaints

- Oswestry score 16%
- Pain scale 2-3/10; pain drawing shows right low back, right buttock and posterior thigh pain
- Indicates recurrent axial / low back pain with repeated bending forward, sitting/driving greater than 45-minute intervals, lifting > 50 lbs.
- Reports some relief of low back and RLE symptoms with HEP and ibuprofen prn

Case 1- The Sequel

DD Evaluation - 52 Weeks Post Injury

DD Clinical Exam

- Vitals
  - height 70 inches
  - weight 175 lbs
  - BP 120/78
  - pulse 65
  - respiration 16
- Able to slowly assume lumbar lordosis from sitting to standing
- No list or deformity
- Ambulates with normal gait

Case 1- The Sequel

DD Evaluation - 52 Weeks Post Injury

DD Exam

- Lumbar flexion fingertips to proximal shin, with increased right low back and buttock pain, full extension with moderate low back pain
- Able to walk on heels and toes, squat and perform 10 calf raises on each leg without obvious weakness
- 5/5 strength right EHL; 5/5 right tibialis anterior; and 5/5 right hip abductors. *Normal strength*.

Case 1- The Sequel

DD Evaluation - 52 Weeks Post Injury

- DD Exam
  - Left lower extremity strength 5/5 all levels
  - Patellar and Achilles DTRs 2+ bilaterally
  - Medial hamstring DTRs 1+ bilaterally supine and prone
  - Sensation is intact and bilaterally symmetrical

Case 1- The Sequel

DD Evaluation - 52 Weeks Post Injury

- DD Exam
  - Symmetric thigh and calf circumference
  - Right supine SLR to 62º with increased lower back pain extending into right buttock and posterior thigh
  - Worsened with ankle dorsiflexion and hip adduction/internal rotation

Case 1- The Sequel

DD Evaluation - 52 Weeks Post Injury

- DD Exam
  - Left supine SLR 75º with hamstring tightness/discomfort only
  - No spasm or guarding present.
  - Tenderness with palpation of right lower lumbar paraspinal muscles at L4/L5/S1
    - ✓ Tender muscles or withdrawal to touch is NOT spasm and guarding.

Case 1 – The Sequel

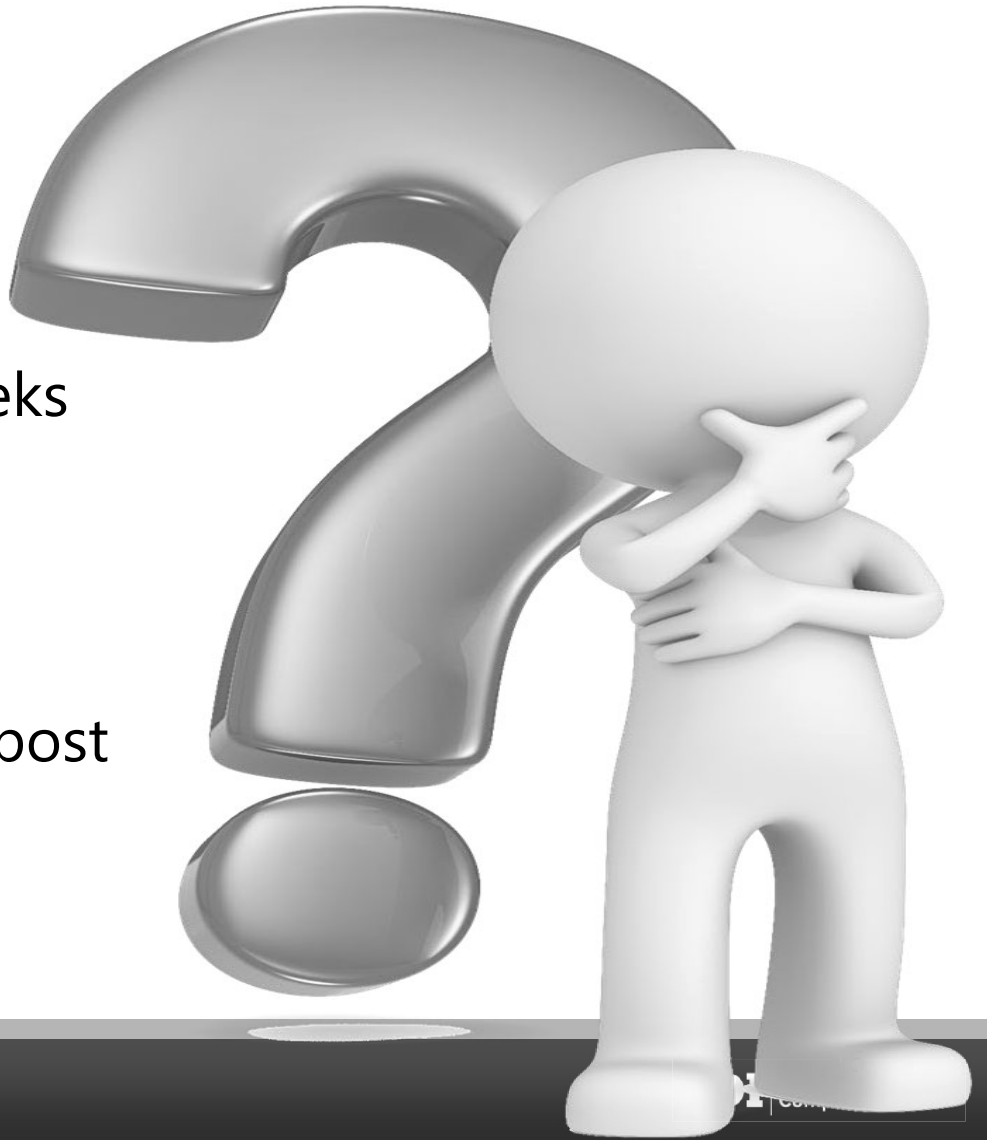
Has MMI been reached?
If so, on what date?

(May not be greater than statutory MMI date shown on DWC Form-032)

Case 1 – Spine MMI/IR

Has MMI been reached?
If so, on what date?

A. Yes, date of PT discharge, 32 weeks post injury
B. Yes, date of PMR follow-up, 40 weeks post injury
C. Yes, date of DD exam, 52 weeks post injury
D. No, not at MMI



Case 1 – The Sequel

On the MMI date, what is the whole person IR?

Case 1 – The Sequel

On MMI date, what is whole person IR?

A. DRE I = 0%

B. DRE II = 5% for non-verifiable right L5 radiculopathy

C. DRE III = 10% for right L5 radiculopathy

Case 1 - the Sequel
CLINICAL radiculopathy vs. RATABLE radiculopathy
KNOW THE DIFFERENCE

AMA Guides vs. DWC Rules/Appeals Panel Decisions

See AMA Guides:

- Dermatomal sensory loss, Myotomal motor loss, Electro-diagnostics, Loss of reflex(es), Atrophy

See APDs:

- Loss of relevant reflex(es)
  2+ cm atrophy
  030091-s, 142524, 040924, 091039, 111710, 072220-s, 051456, 080375

Case 1- The Sequel

- **What about L5 Reflex?**
  - IF the question is whether there is persistent ratable L5 radiculopathy AND seated L5 reflex exam is not productive, check prone and supine where you can observe the medial hamstring
  - Current EBM supports validity of the L5 reflex
- **S1 reflex?**
  - Absent bilaterally in a significant proportion of older population
- **C8? T1?**
  - These roots do not have corresponding reflexes, but fortunately are UNCOMMON cervical radiculopathies

Case 1- The Sequel

ROM MODEL

Can you use the ROM Model for an L5 or S1 radiculopathy if you can't obtain reflexes bilaterally or for a C8 or T1 radiculopathy ?

- Rarely used and requires significant explanation why DRE is not applicable or why more data is needed to place IE in the correct DRE
- Also, if used, use it as a "differentiator", to assist you in sorting to the appropriate DRE category
- Do NOT use the absolute number from the ROM model

Case 1- The Sequel
ROM Model as a Differentiator

- Table 75, pg. 113 for the structural condition.
- Combine with the ROMS.
  - 3 consecutive measures of flexion alternating with extension AND right LF alternating with left LF. (in up to 6 repetitions) that meet CONSISTENCY criteria
  - Must use tightest of the SLR to look at SLR validity criteria - Table 81, pg. 126-128
- Combine with the sensory motor deficits as per Table 83 on page 130 and Table 11 and 12
- **You DO NOT use the absolute #, you use that # to justify using the higher category of DRE III. Be sure to explain.**
- **Best Practice:** recommend ROM model when there are other radicular findings such as weakness in a myotome or loss of sensation in a dermatomal pattern but does not meet the DRE III criteria of reflexes

Case 1 The Sequel

Any Questions?

Case 2

History of Injury

- 42 year-old male restrained taxi driver involved in low speed rear-end motor vehicle accident 10 months ago
- Evaluated by EMS at scene of accident
  - ✓ Neck pain and occipital headache
  - ✓ No loss of consciousness, normal neurologic exam
  - ✓ Recommended for transport, patient denied

Case 2

Treatment History

- Saw chiropractor 1 week post injury
  - Neck pain, occipital headache with non-specific "hotness" into to right forearm and hand
  - Decreased cervical extension, right rotation and right lateral flexion with right neck pain
  - Deviation of head/neck to left during decreased extension
  - Palpation reveals hypertonicity and joint hypomobility C2/3-C6/7, R>L

Case 2

Treatment History

- Chiropractor 1 week post injury
  - Cervical x-rays show no evidence of fracture or dislocation
  - C5/C6 disc space narrowing, with marginal osteophyte anterior aspect of superior endplate at C6

Case 2

Chiropractor's Records

- Diagnosis of acute cervical sprain/strain with "radiculitis"
- Manipulation and soft tissue techniques
- Progression of exercise program – self mobilization, stretching, scapular strengthening with therabands
- 14 visits over 12 weeks

Case 2

Chiropractor's Records (cont'd)

12 Week Follow-Up

- Continued 8/10 pain scale
  - ✓"*Reduced cervical ROM with pain*"
  - ✓Tenderness to palpation of C-spine and superior traps
  - ✓Bilateral +2 upper extremity DTRs
  - ✓Sensation decreased globally across C5-C7
  - ✓Motor strength noted as 4-/5 deltoids, biceps, triceps, brachioradialis, pronator and supinator
- Additional PT request denied – IE mentions he's "*getting a lawyer*"

Case 2

DD Medical History - 24 Weeks Post Injury

- Chief complaint persistent 8/10 neck pain
- Working full duty without restrictions for last 14 weeks
  - ✓He feels this is making him get worse, especially since additional PT has been denied
  - ✓He feels he needs more PT to get better
- Neck Disability Index (NDI) score 52%
- Additional PT has been denied
- Referred to pain management for C-ESIs

Case 2

DD Physical Exam - 24 Weeks Post Injury

- Vitals
  - height 72 inches
  - weight 175 lbs
  - BP 118/78
  - pulse 64
  - respiration 14
- He is cooperative with history and exam but repeatedly discusses delays in care and *"unreasonable"* treatment by his employer and adjuster
- He is dissatisfied with his job

Case 2

DD Physical Exam (cont'd) - 24 Weeks Post Injury

- No scars on the neck or visible deformity, scoliosis, or kyphosis
- No scapular asymmetry or winging.
- Cervical range of motion full and without dysmetria, mechanical block or end range pain.
- No palpable muscle spasm of cervical paraspinal muscles

Case 2

DD Physical Exam (cont'd) - 24 Weeks Post Injury

- Upper extremity DTRs +2 bilaterally
- Muscle strength is 5/5 all levels
- Sensation "decreased" C5-7 bilaterally
- No measurable comparative atrophy of the upper arms and forearm, measured at the same anatomic points.

Case 2

DD Physical Exam (cont'd) - 24 Weeks Post Injury

- Minor axial pain with bilateral Spurling's test, but no reproduction of C5 / C6 / C7 radicular pattern on the right when performing a right Spurling's.
- Lhermitte's sign was negative for reproduction of dermatomal paresthesia to the right upper limb
- Shoulder abduction (relief) sign was negative (did not relive right arm symptoms)

Case 2

Based on medical records and physical exam, what is compensable injury for certifying MMI and IR?

130.1(c)(3)

Case 2

What is compensable injury for certifying MMI and IR?

A. Cervical sprain/strain status post rear-end MVA

B. Suspected cervical disc protrusion

C. A & B

D. Other?

Case 2

Has MMI be reached?

If so, on what date?

(May not be greater than statutory MMI date shown on DWC Form-032)

Case 2

Has MMI be reached?

If so, on what date?

A. Yes, 12 weeks post injury after 14 visits with DC

B. Yes, 24 weeks post injury on date of DD exam

C. Other date?

D. No, not at MMI

Case 2

On the MMI date, what is the whole person IR?

Case 2

On the MMI date, what is the whole person IR?

A. DRE I = 0%

B. DRE II = 5%

C. DRE III = 15%

D. DRE IV = 25%

Case 2

Any Questions?

Case 3

History of Injury
28-year-old male landscape worker
began having acute low back and
right buttock pain
after lifting a 100 pound tree
from an awkward position

Case 3

Treatment History

- Initially seen day of injury at occupational medicine clinic
- Diagnosed with lumbar sprain/strain
- Treated with cyclobenzaprine and Ibuprofen
- 6 visits PT over 3 weeks at occupational medicine clinic
  - ✓hip/lumbar flexion and rotation stretching
  - ✓some "stabilization" exercises
  - ✓complained the exercises were making his pain worse

Case 3

Treatment History

- Released to return to work with restrictions
- Employer did not accommodate restricted duty and reportedly said *"come back when you are 100%"*
- **10 days** post injury reported pain and numbness in right posterior thigh and lateral calf

Case 3

Treatment History

- 14 days post injury, exam demonstrates weakness in the right hamstring (L5/S1), right calf (S1/L5) and toe flexors (S1/L5)
- Numbness of the right lateral foot
- The left straight leg raise and the right “crossed straight leg raise” were “positive”.
- Both reproduced pain in the right buttock and posterior thigh and right lateral calf.

Case 3

Treatment History - Imaging

- **4 weeks** post injury
- **x-rays** showed moderate spondylosis at L5/S1 with bilateral pars defects with a Grade I isthmic spondylolisthesis also at L5/S1
  - No evidence of segmental instability or alteration of motion segment stability on standing flexion and extension views

Case 3

Treatment History - Imaging

- **8 weeks** post injury
- Lumbar MRI scan obtained demonstrated
  - ✓Disc desiccation at L5/S1
  - ✓7 mm right posterolateral L5/S1 disc protrusion displacing right S1 nerve root
  - ✓Chronic bilateral pars defects without increased T2 or inversion recovery signal changes consistent with acute injury

Case 3

Treatment History

- **14 weeks (3.5 months)** post injury, had translaminar lumbar epidural steroid injection at L5/S1 without significant or lasting improvement
- **20 weeks (5 months)** post injury, underwent right L5/S1 hemi-laminotomy/discectomy resulting in some relief of lower extremity symptoms

Case 3

Treatment History

- **24 weeks through 32 weeks** post injury – 14 visits of active PT.
  - ✓Initiated lumbar extension range of motion exercises
  - ✓Progressed into strengthening exercises and work simulation
- **30 weeks** post injury – Repeat lumbar MRI scan with contrast showed:
  - ✓ post-operative changes
  - ✓ chronic bilateral pars defects without evidence of recurrent or residual disc protrusion

Case 3

Treatment History

- **32 weeks** post injury – found another job supervising landscape crew; released to return to work full duty
- **36 weeks** post injury - treating doctor exam
  - Intermittent back and right lower extremity pain
  - Right SLR "positive" at 45 degrees
  - Moderately reduced lumbar flexion
  - Right Achilles DTR decreased

Case 3

Treatment History

- **36 weeks** post injury - treating doctor exam (cont'd)
  - Numbness to pinprick over the right lateral foot
  - Right ankle plantar flexion 4+/5
  - Did not want to pursue additional interventional pain management procedures
  - Continue with gabapentin, follow-up as needed

Case 3

DD Medical History - 52 Weeks Post Injury

- Chief complaint episodes of low back, right buttock and right posterior thigh pain after prolonged sitting, repeated bending forward or lifting
- Lower back, buttock and right lower extremity symptoms had improved significantly
- Continues to work as landscape crew supervisor
- Takes gabapentin, continues home exercise program

Case 3

DD Physical Exam - 52 Weeks Post Injury

- Vitals
  - height 70 inches
  - weight 175 lbs.
  - BP 124/78
  - pulse 62
  - respiration 13
- Pleasant affect, cooperative with history and exam, oriented to time, person, and place with normal attention span and concentration

Case 3

DD Physical Exam - 52 Weeks Post Injury (cont'd)

- Able to rise from sitting to standing with no abnormal motion
- Ambulates with normal gait
- Well-healed approximate 3 cm surgical scar at midline lumbosacral junction
- No visible deformity, scoliosis or kyphosis

Case 3

DD Physical Exam - 52 Weeks Post Injury (cont'd)

- Able to walk on heels, weakness on right toe walk
- 4/5 strength of right toe flexion; ankle inversion and eversion; and knee flexion
- Lumbar flexion and right lateral flexion moderately decreased; extension and left lateral flexion essentially full

Case 3

DD Exam - 52 Weeks Post Injury

- Left SLR 65º limited by hamstring tightness
- Right straight leg raise limited to 45º where it produces right low back and right buttock pain, further increased with ankle dorsiflexion. No pain below the buttocks
- Patellar DTRs 2+ bilaterally; right Achilles DTR decreased relative to the left

Case 3

DD Exam - 52 Weeks Post Injury (cont'd)

- Repetitive calf raises on right reveals subtle weakness
- 2 cm of right calf atrophy
- Some palpatory tenderness and hypertonicity of lumbar paraspinal muscles at right lumbosacral junction

Case 3

Based on medical records and physical exam, what is compensable injury for certifying MMI and IR?

130.1(c)(3)

Case 3

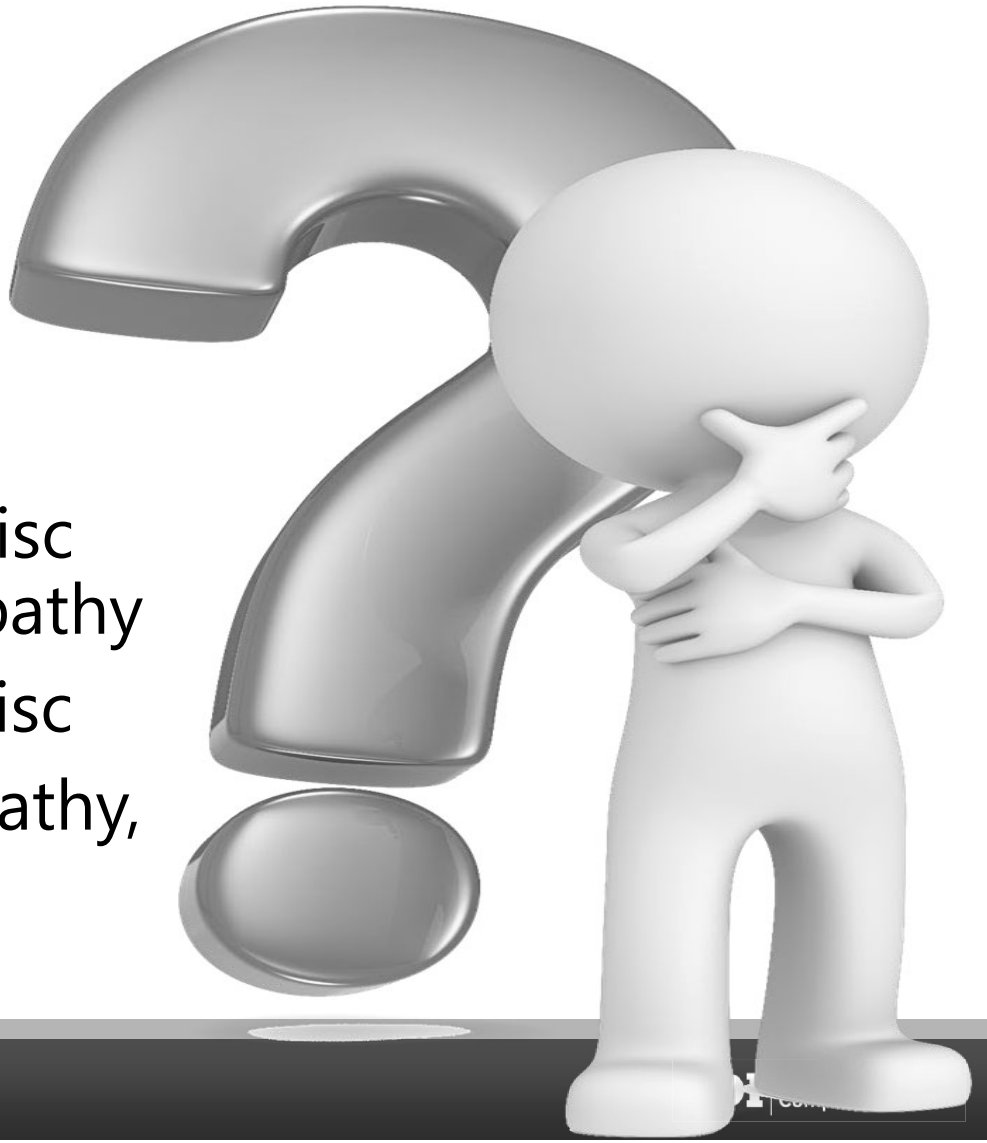
What is compensable injury for certifying MMI and IR?

A. Lumbar sprain/strain

B. Bilateral Pars defects at L5-S1

C. Lumbar sprain/strain, L5-S1 disc protrusion, Right S1 radiculopathy

D. Lumbar sprain/strain, L5-S1 disc protrusion, Right S1 radiculopathy, Bilateral Pars defects at L5-S1



Case 3

Has MMI be reached?

If so, on what date?

(May not be greater than statutory MMI date shown on DWC Form-032)

Case 3

Has MMI be reached?

If so, on what date?

A. Yes, 32 weeks post injury, date completed post-op PT and released to full duty work at new job
B. Yes, 36 weeks post injury, date of treating doctor follow-up visit
C. Yes, 52 weeks post injury, date of DD exam
D. No, not at MMI

Case 3

On the MMI date, what is the whole person IR?

Case 3

On the MMI date, what is the whole person IR?

A. DRE I = 0%

B. DRE II = 5%

C. DRE III = 10%

D. DRE IV = 20%

Impairment Rating
Spine DRE III: Radiculopathy

Structural Inclusions

- Compression Fracture of 25% to 50%
- Displaced posterior element fractures that disrupt the spinal canal
- Not a spinous or transverse process fracture

Clinical Findings

- Loss of (relatively decreased or absent) relevant reflex(es),
- 2 cm or greater atrophy with circumferential measurements of relevant extremity

Lumbosacral = 10% WP
Cervicothoracic & Thoracolumbar = 15% WP

Impairment Rating
Spine DRE III - Radiculopathy

Electrodiagnostic studies?

- APD 051456
  - ✓ EDX studies may be used to verify a clinical radiculopathy as stated page 102, DRE III and in Table 71, page 109, but are **insufficient alone** to rate as DRE III

SUMMARY RADICULOPATHY

Know the difference between a CLINICAL radiculopathy vs "RATABLE" radiculopathy

- Clinical Radiculopathy
  - ✓ Dermatomal alteration of sensation
  - ✓ With or without changes in reflex, motor function or atrophy in the same nerve root distribution
  - ✓ Structural changes on imaging that have the probability for resulting in nerve root compromise
    - ➢ ***ARE ALL OF THESE CONSISTENT in the record?***

SUMMARY RADICULOPATHY

Know the difference between a CLINICAL radiculopathy vs "RATABLE" radiculopathy

- "Ratable" Radiculopathy as per DRE III
  - ✓Loss of (decreased or absent) relevant reflex(es),
  - ✓2 cm or greater atrophy with circumferential measurements of relevant extremity

SUMMARY RADICULOPATHY

Know the difference between a CLINICAL radiculopathy vs "RATABLE" radiculopathy

- Even IF the IE had a clinical radiculopathy that rose to the level of "ratable" early in the treatment course... **REMEMBER you MUST rate the status of radiculopathy at MMI.**
- At MMI, even a previously florid radiculopathy could be a:
  - DRE III
  - DRE II
  - DRE I

DEPENDENT on the findings at MMI

Case 3

Any Questions?

Case 4

History of Injury

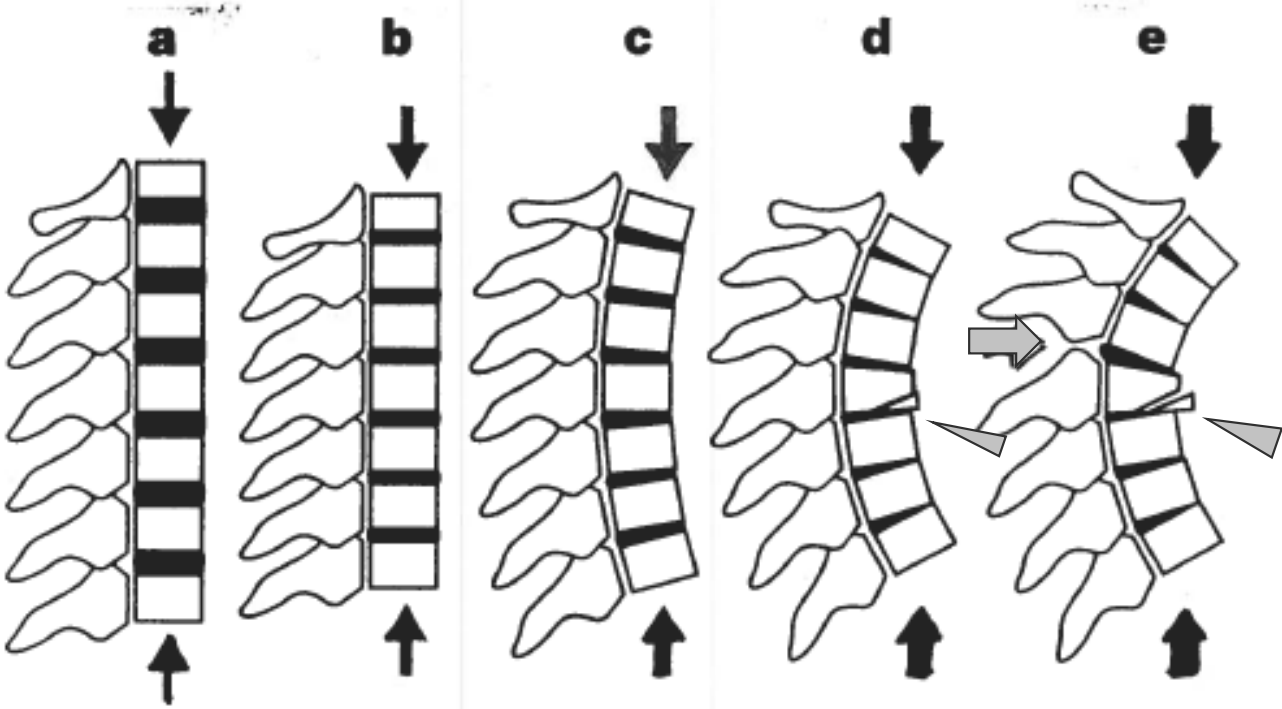
35-year-old male fell from a height of 10 feet. He landed on his feet sustaining a T11 compression fracture, an injury to the lumbar spine and a left calcaneal fracture at work 12 months ago.

[We will consider only the spine injury for this case.]

Case 4

Schematic of axial load to the spine.

- The anterior aspect of the vertebral body is preferentially loaded
- Compression to anterior aspect
- Distraction to posterior aspect



Axial force increases in magnitude from a. to e.

Case 4

Treatment History

- Initially seen at ER
- c/o LBP with left lower leg pain / numbness to the lateral calf
- No objective neurologic deficits
- X-rays demonstrated:
  - ✓Stable anterior compression fracture at T11
  - ✓Minor spondylosis at L4-5 and L5-S1

Case 4

Treatment History

- Orthopedic surgeon initiated conservative treatment with
  - ✓bracing,
  - ✓pain medication
  - ✓ADL/work modifications
- An MRI was ordered at follow up at 12 weeks, due to persistent tingling in the left lateral calf and dorsum of the foot

Case 4

Treatment History

- **Lumbar MRI completed at 14 weeks demonstrated:**
  - ✓ Disc desiccation at L2-3 to L5-S1
  - ✓ Disc bulges at L4-5 and L5-S1
  - ✓ No contact, deflection compression of any lumbar roots
  - ✓ Far field findings on T2 and STIR images demonstrated edema in the T11 vertebral body and the T10 inferior and 12 superior endplates, but not elsewhere in the lumbar spine

Case 4

MRI lumbar spine.

- Note the intra-body disc protrusion at superior endplate on both images
- Edema notable on STIR images
- No acute injury to posterior structures
- (to the left of the

T2 Sagittal

STIR

Case 4

Treatment History

- At 14 week follow up, 2 weeks after the MRI
  - ✓ IE reassured that there was no compression of nerve roots
  - ✓ Prescribed Physical therapy to remobilize after bracing
  - ✓ 10 visits completed by 16 weeks and established on a HEP of stretching
- At 6 month follow up, **x-rays demonstrated:**
  - ✓Well healed T11 compression fracture
  - ✓20% loss of anterior vertebral body height

Case 4

Treatment History

- **Ortho follow up at 6 months**
  - ✓ Essentially full ROM
  - ✓ Subjective decreased sensation on the lateral calf and foot
  - ✓ No atrophy and MMT was 5/5 bilateral lower limbs
  - ✓ *"Much better after PT"*
  - ✓ Doing well, had RTW at **usual PDL**
  - ✓ **S**hould *"return as needed"*

Case 4

DD Medical History - 9 months post injury

- Past Medical and Surgical history:
  - ✓ Non-contributory.
  - ✓ No chronic diseases / Conditions
- Chief complaint:
  - ✓ Low back pain
  - ✓ Intermittent tingling on the top of the left foot
  - ✓ Oswestry score 30%
  - ✓ Pain scale 3/10

Case 4

DD Medical History - 9 months post injury

- Social Occupational History:
  - ✓ Returned to regular job duties, although midback stiffness at the end of the day
  - ✓ Non-smoker / No ETOH
  - ✓ Has returned to walking for exercise
  - ✓ Able to demonstrate his stretching exercises for spine and pelvic mobility

Case 4

- **DD Exam – 9 Months Post Injury**
  - Vitals
    - height 70 inches
    - weight 175 lbs
    - BP 128/78
    - pulse 68
    - respiration 14
  - Pleasant but somewhat flat affect, cooperative with history and exam,
  - Oriented to time, person, and place with normal attention span and concentration

Case 4

DD Exam – 9 Months Post Injury (cont'd)

- Able to rise from sitting to standing with no abnormal motion
- Ambulates with normal gait
- No visible deformity, scoliosis or kyphosis
- Able to walk on heels, toes and squat without weakness
- Lumbar flexion and extension and right/left lateral flexion ALL slightly decreased

Case 4

DD Exam – 9 Months Post Injury (cont'd)

- Diffuse thoracolumbar paraspinal muscle tenderness, but no spasm
- No specific segmental areas of pain other than T10, T11 and T12
- SLR bilaterally at 45º limited by hamstring tightness; produced low back pain on right and back pain into the upper posterior thigh on the left
- Ankle dorsiflexion and hip ADDuction / IR, did not worsen the symptoms

Case 4

DD Exam – 9 Months Post Injury (cont'd)

- Palpation of a trigger point in the left posterior gluteus medius muscle, resulted in radiating pain in the left lateral pelvis and leg, to just past the knee
- Subjective decreased sensation lateral calf and dorsum of the left foot
- 5/5 strength of bilateral lower extremities
- Patellar and Achilles DTRs 2+ bilaterally.
- No measurable atrophy of the left calf / thigh compared to the right

Case 4
DD Exam – 9 Months Post Injury (cont'd)

- DD ordered follow up lateral flexion / extension x-rays to confirm no change in degree of fracture height and to evaluate for instability.
- X-rays demonstrated:
  - ✓ The anterior fracture height loss was < 25 degrees
  - ✓ No abnormal motion on flexion / extension views

Case 4

Based on medical records and physical exam, what is compensable injury for certifying MMI and IR?

130.1(c)(3)

Case 4

What is compensable injury for certifying MMI and IR?

A. T11 compression fracture
B. Lumbar sprain / strain
C. Disc desiccation L2-3 to L5-S1
D. Disc bulges at L4-5 and L5-S1
E. A and B
F. All the above

Case 4

Compensable injury:

A. T11 compression fracture. Why?

AND

B. Lumbar sprain / strain are correct. Why?

C. **No**, to Disc desiccation L2-3 to L5-S1. **Why not?**

D. **No**, to Disc bulges at L4-5 and L5-S1. **Why not?**

Case 4

Has MMI been reached?

If so, on what date?

(May not be greater than statutory MMI date shown on DWC Form-032)

Case 4

Has MMI been reached?

A. Yes, 6 months post injury, date of the ortho follow-up and x-rays showing healed fracture

B. Yes, date of designated doctor exam

C. No, not at MMI, needs an ESI and Work Hardening

Case 4

On MMI date, what is whole person IR?

A. TL DRE II 5% c/w
LS DRE I 0% = **5%**

B. TL DRE II 5% c/w
LS DRE II 5% =**10%**

C. TL DRE II 5% c/w
LS DRE III 10% =**15%**

Impairment Rating
Spine DRE II: Minor Impairment

Structural Inclusions

- **Compression fracture < 25%**
- Non-displaced posterior element fractures
- Transverse or spinous process fracture with displacement

Clinical Findings

- Muscle guarding
- Non-uniform loss of motion
- Dysmetria
- Non-verifiable radicular complaints
- No objective signs of radiculopathy
  - loss of relevant reflex(es)
  - 2 cm or greater atrophy with circumferential measurements of relevant extremity
- No loss of structural (motion segment) integrity lateral view flexion/extension x-rays

Cervicothoracic & Thoracolumbar & Lumbosacral = 5% WP

Case 4

On MMI date, what is whole person IR?

A. TS DRE II 5% c/w
LS DRE I 0%
= 5%

Let's Discuss!

Case 4

WHY is the BEST ANSWER A ?

- Thoracic DRE II = < 25 % Compression fracture of T Spine. **DRE II = 5%**
- Lumbar Spine DRE I. **DRE II = 0%**
  - ✓ Uniform ROM.
  - ✓ No spasm or guarding documented.
  - ✓ What does MRI demonstrate?
  - ✓ What does ODG say related to how to define radiculopathy?
  - ✓ No other OBJECTIVE CLINICAL FINDINGS of radiculopathy or correlation to the MRI .
  - ✓ With no clinical radiculopathy, can't have non-verifiable radiculopathy for "loss of sensation = S1 / L5 on the left".

Case 4

WHY NOT B or C?

Answer B. Was the "abnormal sensation" radicular to qualify for DRE II?

- No dural tension signs.
- Trigger points and muscular tightness are likely explanation referred / sclerotogenous pain in the leg.
- MRI without potential for neural compression

Answer C. Even IF there was clinical radiculopathy,

- Muscle strength and reflexes are +2 bilaterally.
- No finding of atrophy.
- So could not reach DRE III

What About Multilevel Compression Fractures?

WITHIN ONE of the 3 spinal regions

- **One** vertebral body compression fracture may be rated as DRE II, III or IV, depending on the percentage of compression – see pages 102-106
- "If the patient demonstrates the structural inclusions of two categories, the physician should place the patient in the category of the higher impairment percent" page 99

What About Multilevel Compression Fractures?

If there is a compression fracture in one spinal region, and a 2nd in another region…

…rate each region and then COMBINE.

- Example:
  - 20 % **L1** Comp Fracture = DRE II = 5 % WP
  - 30 % **T12** Comp Fracture = DRE III = 15 % WP
  - No neurologic injury
  - Not able to be treated surgically
  - **15 % c/w 5 % = 19 % WP**

What About Multilevel Compression Fractures?

DRE IV

- Multilevel spine (motion) segment structural compromise, such as fractures or dislocations may be rated as DRE IV (i.e., if there are several contiguous levels with compression fractures, there is often associated posterior ligament injury, which will result in segmental instability)
- ROM Model as a differentiator?

What About Multilevel Compression Fractures?

CONCLUSION:

- Provide rationale explaining why selected and how used methodology to assign IR
- ***Show your work – Explain your answer***
- ***"…plausible and relate to the impairment being evaluated…."***

Case 4

Any Questions?

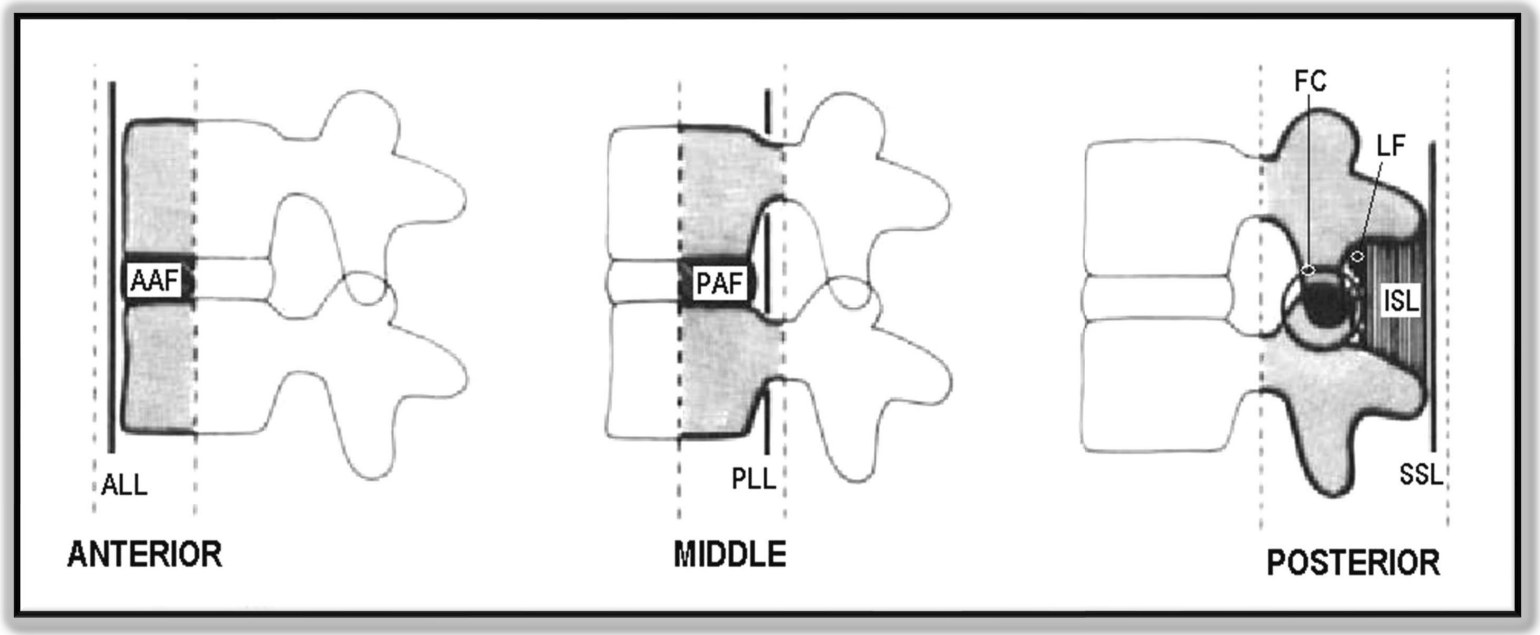
SPINE –
More on Higher
SPINE DRE Categories

Impairment Rating
Spine DRE Categories IV - VIII

Conclusion

- Uncommon circumstances
- Refer to AMA Guides, pages 102-111
- Be aware of the important tables to help in your decision -making process

Spine DRE Categories IV – VIII
Schematic Spinal Anatomy
3 Column Theory (Denis)



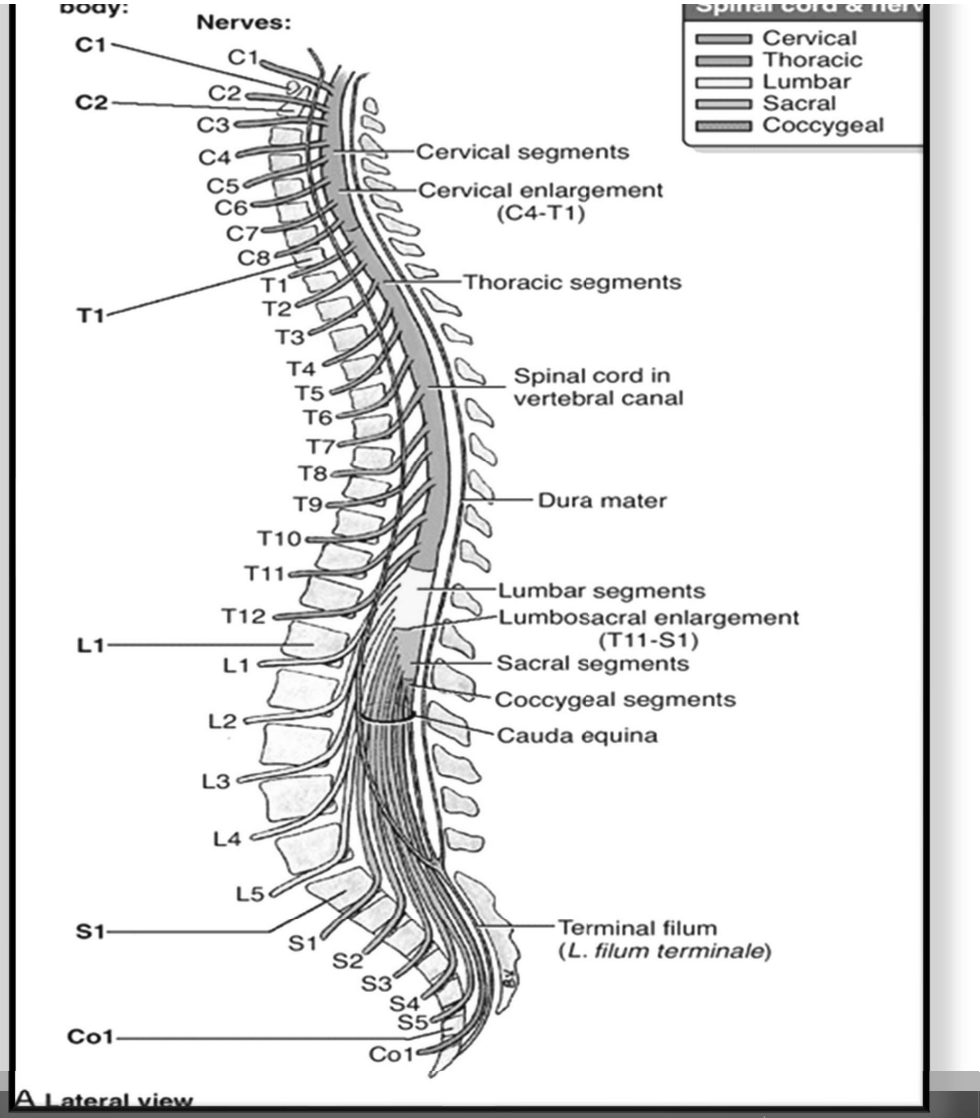
(ALL: Anterior longitudinal ligament, AAF: Anterior annulus fibrosus, PLL: Posterior longitudinal ligament, PAF: Posterior annulus fibrosus, SSL: Supraspinous ligament, ISL: Interspinous ligament, LF: Ligamentum flavum, FC: Facet capsule)

Spine DRE Categories IV – VIII

SPINAL CORD / CAUDA EQUINA / NERVE ROOT SCHEMATIC

Be aware of the spinal segmental levels where the different nerve roots emerge from the cord

- C8 between C7 and T1
- T12 above the conus medullaris (CM) starts to emerge at ~ T9
- L5 root start to emerge from the lumbosacral enlargement of the CM at ~ T11 and exits the spine between L5 and S1
- Sacral roots start to emerge from the lumbosacral enlargement of the CM at ~ T12 and L1



Spine DRE IV
Loss of Motion Segment Integrity (LOMSI) OR Multilevel Neurologic Compromise

Lumbar

≥ 5 mm translation of one vertebra on another (Guides state both ≥ 5mm and > 5mm)

> 15º more angular motion at L5-S1 than L4-L5

>11º more angular motion than adjacent levels

Lumbar and Cervical

Structural inclusions

- Compression Fracture >50%
- Multilevel spine segment structural compromise (fractures and dislocations)

Cervical

> 3.5 mm translation of one vertebra on another

> 11º more angular motion than adjacent levels

Impairment Ratings

Lumbosacral = 20%

Thoracolumbar = 20%

Cervicothoracic = 25%

Impairment Rating
Spine Loss of Motion Segment Integrity

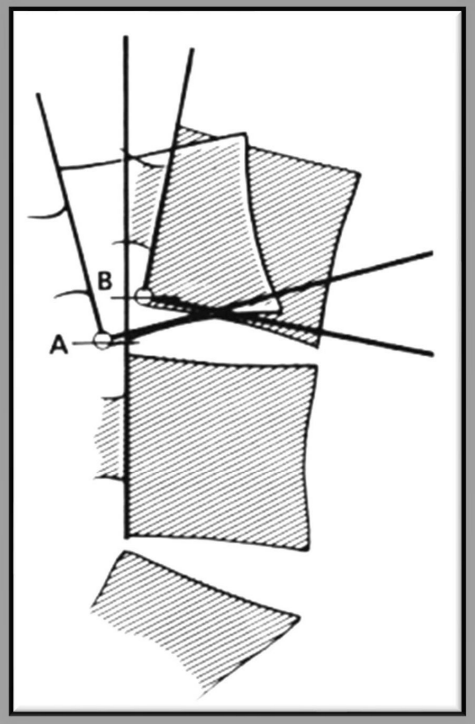


Figure 62
Loss of Motion Segment Integrity: Translation

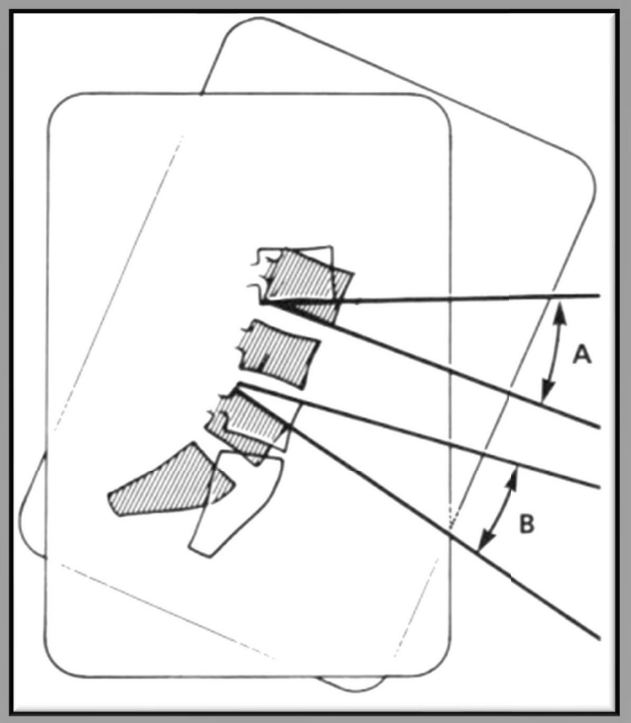


Figure 63
Loss of Motion Segment Integrity: Angular Motion

Lumbosacral - DRE Category V

Radiculopathy AND Loss of Motion Segment Integrity (LOMSI)

- Must meet the threshold for **both**
  - DRE Category III
    - structural OR radiculopathy criteria
  - DRE Category IV
    - documented loss of structural integrity
- **25% WP impairment**

Lumbosacral - DRE Category VI

"Cauda Equina Like" Syndrome <u>Without</u> Bowel or Bladder Signs

- **Permanent** partial loss of bilateral lower extremity function
- **No** bowel or bladder symptoms
- Structural inclusions
  - None
- **40% impairment**

Lumbosacral - DRE Category VII

"Cauda Equina Like" Syndrome With Bowel or Bladder Signs

- Bowel or bladder symptoms requiring use of assistive devices
- Evidence from EMG (sphincter) or cystometrogram may be present
- Structural Inclusions
  - None
- **60% impairment**

Lumbosacral - DRE Category VIII
Paraplegia

- Total or near total loss of lower extremity function
- Not just preference for use of wheelchair; must be structural damage to spine that causes anatomic damage to cauda equina
- Structural Inclusions
  - None
- **75% impairment**

Lumbosacral DRE II - VIII

- Refer to summary Tables:
- 75– page 111 Lumbosacral
- **LS spine DRE II – VIII are stand alone IR.**
- DO NOT COMBINE WITH OTHER DRE like is done for the CT and TL spine.

Loss of Motion Segment Integrity (LOMSI) - Post operative Example

IE sustained a compensable low back injury

- Initial radiographs show 6mm translation between L4-5 on flexion/extension x-rays and MRI c/w injury at the L4-5 level
- Underwent L4-5 fusion for bilateral L4 radic
- Completed appropriate postop PT

At MMI, flexion extension radiographs show solid fusion with no translation between L4-5

  - Reflexes intact, no atrophy in thigh or calf
  - Decreased sensation in the L4 dermatome on the right
- **Appropriate DRE Category? DRE II = 5 % WHY?**

Loss of Motion Segment Integrity (LOMSI) -
Post operative Example

ALTERNATE SCENARIOS

Appropriate DRE for Post-Op Fusion case? WHAT IF….

- **There were no sensation loss, no other findings (i.e., spasm, non-uniform ROM, no LOMSI, etc.)?**
  - ✓ DRE I = 0 %
- **There was 2cm atrophy on the right calf due to radiculopathy?**
  - ✓ DRE III = 10 %
- **The fusion failed and there was 6mm translation residual?**
  - ✓ DRE IV = 20 %
- **There was atrophy from radiculopathy AND 6mm translation?**
  - ✓ DRE V = 25 %

Cervicothoracic – DRE IV: May be reached by Loss of Motion Segment Integrity OR Multilevel Neurologic Compromise

- Differentiators
  - Loss of motion segment integrity
  - Bilateral or multi-level radiculopathy (one root each side or two or more roots the same side)
- Structural Inclusions
  - Compression fracture > 50%
  - Multilevel motion segment structural compromise (multilevel fractures/dislocations)
- **25% impairment**

Cervicothoracic – DRE V
Severe Upper Extremity Neurological Compromise

- Differentiators
  - Total single level loss or severe multilevel loss
  - Requires use of external functional or adaptive device
- Structural Inclusions
  - Structural compromise with severe upper extremity motor compromise
- **35% impairment**

Cervicothoracic – DRE VI, VII and VIII

- **REMEMBER:**
  - **You must COMBINE impairment from Category VI, VII and VIII, with appropriate impairment from Category II thru V**
- These higher DRE categories of injury usually must have significant structural damage of the spine to cause the higher degrees of neurologic injury
- The neurologic injury is at the SPINAL CORD level
- Cervical injury ***and*** long tract signs
  - **Long tract signs** = hyperreflexia, clonus, Babinski + sensory / motor changes, Hoffman's if the cervical spine is involved

Cervicothoracic - DRE Category VI
"Cauda Equina Like" Syndrome Without Bowel or Bladder

- Differentiators
  - Bilateral lower extremity neurological impairment
  - No bowel or bladder
- Structural Inclusions
  - None
  - If patient does not require ambulatory assistive device, the IE is placed in DRE V (page 105)
  - Must combine with most appropriate II thru V
- **40% impairment**

Cervicothoracic - DRE Category VII
"Cauda Equina Like" Syndrome With Bowel or Bladder

- Differentiators
  - Permanent, severe, partial loss of function of one or both lower extremities that requires use of an external ambulation device
  - Bowel or bladder involvement requiring assistive devices
- Structural Inclusions
  - None
  - Must combine with appropriate II thru V
- **60% impairment**

Cervicothoracic – DRE VIII
Quadriplegia / Tetraplegia

- Differentiators
  - Complete loss of or near complete loss of lower extremity function
  - With or without loss of bowel or bladder function
- Structural Inclusions
  - None
  - Must combine with appropriate II thru V
- **75% impairment**

Thoracolumbar

- Rate by the **same methodology** as the cervicothoracic spine
- Spinal Cord Involvement = ***Paraplegia*** because sparing of UE function
- IF there is spinal cord involvement, categories VI, VII, VIII combine with structural injury defined by Categories II – V

Cervicothoracic / Thoracolumbar

- **Refer to summary Tables:**
  - ✓73 – page 110 Cervicothoracic
  - ✓74 – page 111 Thoracolumbar

- These show how the DRE VI to VIII COMBINE with the DRE II to V
  - ✓**Combined Value 43 % to 84 % for Cervicothoracic**
  - ✓**Combined Value 38 % to 76 % Thoracolumbar**

- ***LS spine DRE II – VIII are stand alone IR.***

  DO NOT COMBINE WITH OTHER DRE.

DRE Categories IV - VIII

Any Questions?

Other "Spine" Considerations.
Section 3.4

Other nerves in and around the spine and pelvis

Intercostal Nerves / Table 23 / Table 24

Nerve Injury, POTENTIALLY Associated with Spine / Pelvis Injury

Chapter 4 (pages 150-152) address some areas of nerve injury potentially associated with Spine

- Intercostal nerves – Sensory or motor value is MAX value 2 % per nerve
- Spinal Nerves in the Head and Neck Region - Table 23
- Inguinal and Perineal - Table 24

The 2 % for intercostal nerves and the Table 23 and 24 values are the Maximum value.

Nerve Injury, potentially associated with Spine Injury

Intercostal / Table 23 / Table 24

- **Take the MAX value and MULTIPLY by**

  Tables in Chapter 4 on page 151 to obtain the final IR:
  - ✓ Table 20 – Sensory
  - ✓ Table 21 – Motor

- These tables mirror Tables 11 and 12 in Chapter 3 for the upper extremity

Pelvis

Section 3.4 – page 131

- This table is based on **healed** fractures.
- IR accrues only with **residual displacement** of the healed fracture and with or without residuals, dependent on the location.
- Some pelvic fractures are also addressed in lower extremity DREs (Table 64)
- SI joint issues?

SPINE – CHAPTER 3.3

ANY Questions about

Cases 1 – 4

or

Chapter 3.3 (and 3.4)?

Spinal Cord Injury: Section 4.3

Related to Chapter 3.3

Can occur **without** injury to the structure of the boney spinal column. In this case, – Use Chapter 4 (4.3) – pages 147-149.

- Examples: Epidural Hematoma, Transverse Myelitis, Infections
- Six areas of function (7 tables)
- If multiple areas are involved, ***COMBINE*** the values.

Spinal Cord Injury

- 4.3a – Station and Gait (Table 13) #
- 4.3b – Use of Upper Extremity (Tables 14 and 15)
- 4.3c – Respiration (Table 16)
- 4.3d – Urinary Bladder Dysfunction (Table 17)
- 4.3e – Anorectal Dysfunction (Table 18)
- 4.3f – Sexual Functioning (Table 19)

 # Do NOT use 4.3 b for a Lower Extremity MSK injury

MORE…

- What if there was a lower thoracic or lumbar spinal column injury (i.e. Burst Fracture with retropulsed fragments affecting the sacral roots)
  - With Bowel and bladder changes
  - No lower extremity weakness?
- It WOULD NOT meet DRE VI
  - However, you may ***consider*** picking the highest DRE structural category for the FRACTURE, and then combine with the bowel / bladder / erectile function as per Spinal Cord in section 4.3
- ***Do NOT use the higher DRE (VI VII VIII) from Chapter 3 and any applicable 4.3 Spinal cord injury impairments***

MDs / DOs - Don't Forget!

Please submit your evaluation for the Spine MMI/IR presentation.

Also submit your Overall Course evaluations

DD and MMI/IR Certification Evaluation form

(includes all webinars on one form)

Overall DD and MMI/IR Certification evaluation form

Please submit your attestation form for the pre-recorded presentations

Online DD Attestation for prerecorded presentation videos

Cases 5, 6 and Alternate Scenario 6

Case 5 is provided for further study by DCs and MDs for an upper-level lumbar case.

Case 6 and Alternate Scenario 6 are provided for further SELF study by MDs for upper-level cervical cases.

SCI case – Impairment Rating

SELF STUDY - When you open the presentation from the DWC Training page to view this alternate case…

1. look for a yellow speaker box icon in the upper left corner of the pdf slides that indicates there is a speaker note.

2. click on the icon and leave the cursor there, to view the speaker note.

Case 5

32 year-old male fell backward off the 2nd rung from the top of a ladder, landing on his buttocks

Complained of severe lower back pain, pain in the legs and difficulty moving them

Case 5

- **EMS arrived:**

  ✓Vitals stable and GCS 15/15
  ✓Painful paresthesias in the anterior thighs and lower legs
  ✓Difficulty lifting or squeezing his legs together
  ✓Intact sacral sensation

- Due to neurologic symptoms / findings, additional treatment provided on scene

  ✓ Back boarded and transported to Level I trauma

Case 5

- **At ED,** vitals remained stable other than slightly hypotensive
  - ✓ **Subjective:** Severe mid to low back pain with pain / paresthesias in the anterior leg
  - ✓ **Objective:**
    - ➢ Lack of patellar reflex with intact Achilles, abnormal sensation in the L3 and L4 dermatomes and weakness of the hip quads (L2/L3/L4) > hip abductors (L4/L5/S1) and tibialis anterior (L4/L5)
    - ➢ Sacral sparing with normal sensation

Case 5

- **Trauma CT of the pelvis demonstrated:**
  1. No acute fractures
  2. No intraabdominal / retroperitoneal hematoma
  3. Normal viscera

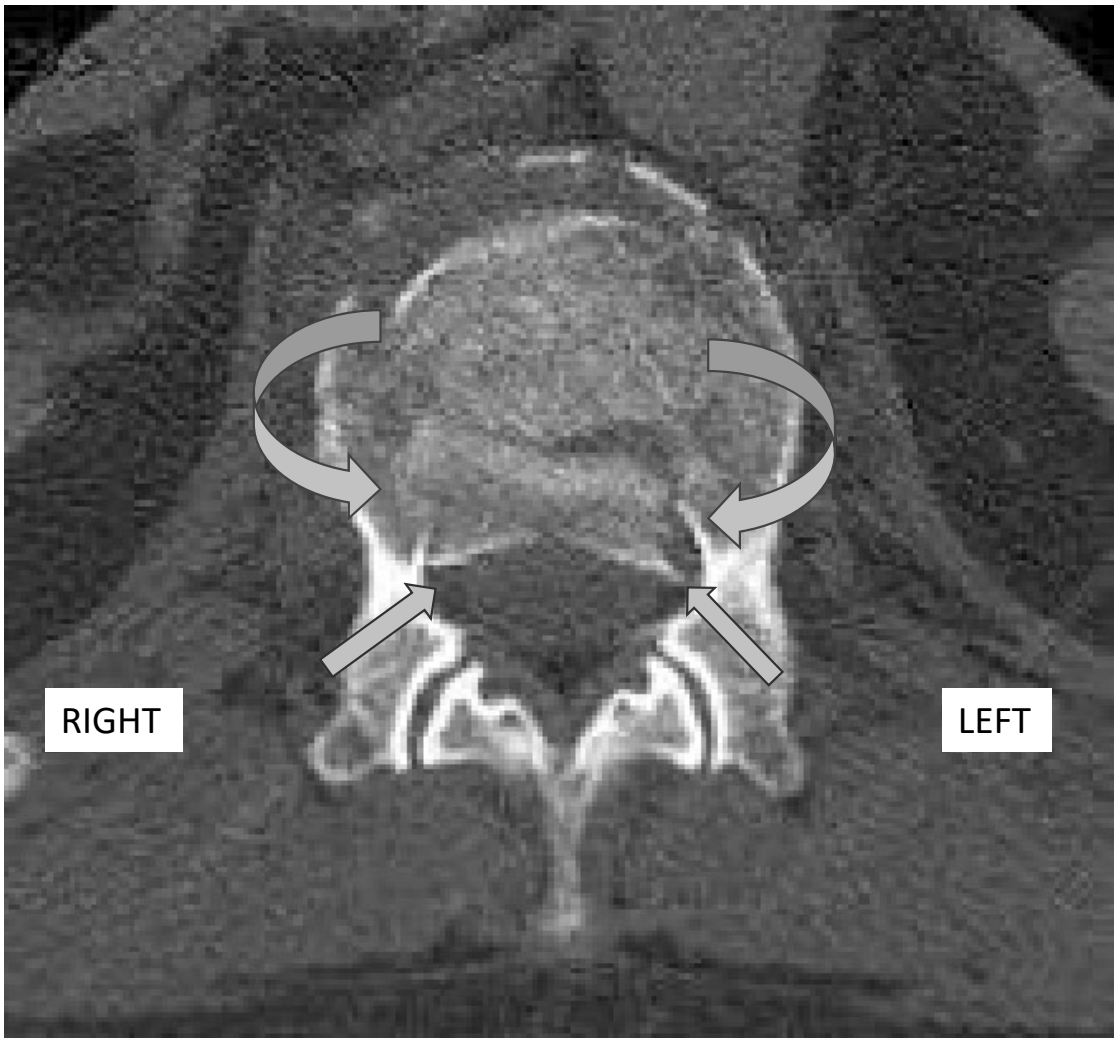
- **Trauma CT of the lumbar spine demonstrated:**
  1. **Burst fracture** of L3 vertebra
  2. Retropulsion of L3 vertebral body fragments, mostly affecting the exiting L3 roots and traversing L4 roots.
  3. There were no posterior element fractures and there was no malalignment of the vertebral bodies
  4. No other significant acute findings

Case 5

Axial CT image of L3 vertebral body

Note:

- ✓ Disruption of posterior cortex of vertebral body
- ✓ Fracture fragments into spinal canal with impression on thecal sac
- ✓ No fractures of the pedicle or other posterior elements



Case 5

- While the CT findings demonstrated likely stability of the fracture, due to the neurologic compromise, additional imaging with an MRI lumbar was completed

- **MRI findings:**
  1. Burst fracture of L3
  2. No fractures of the posterior elements or ligamentous injury
  3. Contact with ***some*** roots of the cauda equina, most notable traversing L3 and L4 roots bilaterally (on axial images)

Case 5

Sagittal STIR MRI IMAGE at Approximate midline:

- Bracket on the left of spine spanning the burst fracture of the L3 vertebrae
- Left facing broad arrow points to the cauda equina at the L3 level
- Skinny arrow points to deformation of posterior cortex
- The deformed L3 vertebrae demonstrates contact with the cauda equina Good hydration / lack of significant disc bulging of the other lumbar disc levels, including those adjacent to the burst fracture.

Case 5

- Due to the neurologic compromise, surgery was planned.
- The orthopedic surgeon took the IE to the OR for evaluation of the spinal canal and fusion from L2 – L4.
- Post-op recovery was uneventful.
- Was able to void after removal of the Foley.
- After acute care, inpatient rehab for 10 days and then out-patient PT for 3 months.

Case 5 – Designated Doctor Exam – 16 months post injury

DD History:

- In the early recovery phase, the IE required Knee-Ankle-Foot Orthoses (KAFOs bilaterally)
- Progressed over the course of a year from ambulation in the parallel bars WITH assistance, to a rolling walker with supervision, to bilateral Lofstrand crutches independently with braces.
- PM&R documented that neurologic recovery stalled out at ~ 14 months post-injury

Case 5 – Designated Doctor Exam – 16 months post injury

- Chief complaint:
  - ✓Low back pain, Pain scale 3/10
  - ✓Persistent numbness distal L4 > L3 distribution
  - ✓Weakness and inability to walk without braces
- Past Medical and Surgical history:
  - ✓ Non-contributory
- Social and Occupational History:
  - ✓ Unable to return to regular job duties, although able to function in a Sedentary to Light PDL
  - ✓ Midback stiffness at the end of the day
  - ✓ Non-smoker / No ETOH

Case 5 – Designated Doctor Exam – 16 months post injury DD Exam

- Vitals. ^ height 72 inches. ^ weight 195 lbs
  ^ BP 132/82. ^ pulse 68
- Somewhat anxious appearing
- Ambulates independently into the exam room with compensated gait with AFO on the right and KAFO on the left, with bilateral Lofstrand crutches independently with braces.
- **Sensation** return in proximal L3 and L4 dermatomes but impaired distally
- **Strength** 4 +/5 right quads and adductors and left gluteus medius, 3+/5 quads and adductors, 3/5 right TA and 2+/5 in the left TA. No evidence cogwheel / giveway and strength c/w recent records

Case 5– Designated Doctor Exam – 16 months post injury

DD Exam (continued)

- Atrophy of bilateral anterior compartment of the lower legs > anterior thigh (left > right), although measurements not > 2 cm in comparison *
- Preservation of strength and sensation in the L5 and S1 root distributions
- Bilateral patellar reflexes absent, preserved Achilles
- Sacral sparing and normal rectal tone *

Case 5– Designated Doctor Exam – 16 months post injury

DD Exam (continued)

If prior records had documented sacral sparing and normal B/B function, but there were late complaints of these changes, as the DD, you SHOULD likely:

- ✓ Perform a rectal exam and advanced sacral reflex exam
- ✓ Order advanced imaging to determine if there was a late complication of the injury / surgery

Case 5 – Compensable Injury

The designated doctor determined the compensable injury:

- **L3 Burst fracture**
- **Partial Cauda Equina Injury involving bilateral L3 and L4 roots**
- The DD did not diagnose bowel or bladder dysfunction or ED

The designated doctor determined that IE reached MMI as of 14 months after the DOI, when neurologic recovery stalled out and all appropriate treatment had been provided for the compensable diagnoses.

Case 5

On MMI date, what is whole person IR?

How would you approach the IR in this case?

Find the highest DRE level that the IE most appropriately meets the threshold requirements.

Case 5 – Impairment Rating

DRE Lumbosacral Category VI: Cauda Equina-like Syndrome Without Bowel or Bladder Signs Description and Verification:

- ✓ Patients in this category have a cauda equina-like syndrome with objectively demonstrated, **permanent, partial** loss of lower extremity function bilaterally.
- ✓ They may or may not have loss of motion segment integrity.
- ✓ They **do not** have objectively demonstrated bowel or bladder impairment.

Structural Inclusion: No additional for lumbosacral

40% whole-person impairment.

Case 5 – Impairment Rating

- **What about DRE Lumbosacral Category III: Radiculopathy?**

  - ✓**At a minimum, the IE would have reached this threshold.**
  - ✓**Factors to consider**...
    - ➢This was a bilateral radiculopathy with atrophy but may not have met the qualifier for atrophy as this must be *"compared to measurements on the contralateral side at the same location".*
    - ➢There was a loss of relevant reflexes. What if the initial loss of reflexes had recovered?
    - ➢Burst fractures do not always result in loss of height. Obtain lateral x-ray at MMI to evaluate for structural inclusion thresholds.

Case 5 – Impairment Rating

- **What about DRE Lumbosacral Category III: Radiculopathy?**

  ✓**DRE level III, would be appropriate IF AT MMI**
  - The IE had recovered enough that he did not require:
    - Lofstrand crutches OR
    - Bilateral bracing

Case 5 – Impairment Rating

What about DRE Lumbosacral Category IV: Loss of Motion Segment Integrity (LOMSI)?

- ✓ DRE IV would not be appropriate as there was not documented segmental instability - the exploration / fusion was done due to the neurologic compromise from fracture fragments, NOT performed for instability
- ✓ Fusion was done and treated any potential instability

Case 5 – Impairment Rating

- **What about DRE Lumbosacral Category V:**
  Radiculopathy AND Loss of Motion Segment Integrity?
  ✓ Radiculopathy present, BUT NOT LOMSI

Case 5 – Impairment Rating

- **Is the ANALYSIS of this case LOGICAL?**
- **Did the MOI and the degree of structural injury justify this level of IR?**
- **USE CRITICAL THINKING AND DETAIL YOUR RATIONALE AS TO WHY YOU DID or DID NOT CHOOSE THE VARIOUS HIGHER DRE CATEGORIES**

SPINAL CORD INJURY Case 6

55-year-old male fell 10 feet, headfirst off a roof

Broke his fall with his upper extremities (without fractures) and struck the vertex of his head.

Case 6

- No LOC, but complained of
  - ✓ Paresthesias / numbness in his arms > trunk > legs
  - ✓ Could not move the arms or legs
- EMS arrived:
  - ✓Vitals stable and GCS 15/15
  - ✓Numbness UE / LE to pinprick
  - ✓Unable to contract muscles / move UE / v LE
- C-collar / blackboarded and transported to Level I trauma

Case 6

- **In emergency room - MD exam**
  - ✓ GCS 15/15
  - ✓ Numbness from C6 to distally, including sacral region
  - ✓ Inability to move limbs
  - ✓ Hyperreflexic and positive Hoffman's
- **Initial trauma imaging:**
  - ✓ CT head

    1. No acute intracranial process

Case 6

- **Initial trauma imaging (continued):**
  - ✓**CT** Cervical / Thoracic spine demonstrated
    1. Mild cervical spondylosis
    2. Fracture dislocation of C5-6
    3. Anterolisthesis of 50 % of C5 on C6
    4. N**o** other acute injuries of the cervical or thoracic spine
  - ✓**MRI** of the cervical and thoracic spine demonstrated similar findings

Case 6

MRI of the Cervical spine T2 sagittal imaging highlights

- The fracture – dislocation at C5-6.
- Spinal cord compression at C5-6
- Acute edema in the cord from ~ C4-5 to C6-7

Case 6

- Neurosurgery evaluation and taken emergently to the OR for cervical decompression and fusion
- After acute care for 10 days, had In-patient rehab for 4 weeks
- After spinal shock resolved, and additional time, the ASIA level was C6 A (complete)
- Urodynamic evaluation demonstrated no spontaneous void, early detrusor contractions and sphincter-detrusor dyssynergia
- Bladder management discussed and the IE opted for a suprapubic catheter for ease of management (decreased hand dexterity)
- Established on a bowel program, and medications for spasticity
- Out-patient rehab x 3 months

Case 6

- FU MRI images 4 months after decompression surgery demonstrated myelomalacia in the spinal cord from C5-6 to C6-7
- FU by PM&R monthly for the first 6 months and then every 3 months for management of medications, equipment and surveillance.
- Neurosurgery and Urology follow up yearly.
- No complications arose such as decubitus ulcers, heterotopic ossification
- Can experience limited psychogenic erections, with limited improvement with oral meds
- Appointed for DD evaluation ~ 12 months after DOI

Case 6

DD evaluation ~ 12 months after DOI

- Review of the medical records revealed
  - Medications: Zanaflex 6 mg TID, Gabapentin 800 mg TID, Surfak, Glycerin and Enemeez suppositories and oxybutynin for detrusor dyssynergia.
  - Equipment: Lightweight wheelchair, sliding board, padded 3 in one rolling shower chair, multipodus boots and resting wrist hand orthosis for nighttime, dynamic wrist orthosis and adaptive equipment to assist in modified ADLs
  - Home modifications were completed to include wheelchair ramp and roll in shower.
  - 4 hours of HHA 2 x daily

Case 6

DD evaluation ~ 12 months after DOI

- Exam revealed
  - Complete sensory loss at and below C6 dermatome, including the sacral region
  - Able to shrug shoulders, abduct and flex the shoulders, good elbow flexion, supinate and pronate the forearm, and weak elbow extension and extension of the wrist.
  - Some ability for tenodesis (passively flex fingers with wrist extension) and has a dynamic wrist hand orthosis
  - No independent hand function
  - Increased tone to passive extension of the lower extremities, hyperreflexia of the patellar reflexes and unsustained clonus

Case 6 – Compensable Diagnoses

The designated doctor determined the compensable injury:

- C6 tetraplegia, complete
- Neurogenic bladder
- Neurogenic bladder
- Erectile dysfunction
- Spasticity

The designated doctor determined that IE reached MMI as of the date of their exam.

Case 6

On MMI date, what is whole person IR?

How would you approach the IR in this case?

Find the highest DRE level that the IE most appropriately meets the threshold requirements.

Case 6 – Impairment Rating

1st step for a CERVICOTHORACIC neurologic injury >>>

- DETERMINE IF THERE IS *"documentable long-tract nervous system signs of bowel and bladder **or** lower-extremity impairment"* (page 100).
- IN THIS CASE, the IE is bumped up to a DRE VIII (75 % WP) due to OBJECTIVE
  - complete loss of lower extremity function
  - long-tract nervous system signs of bowel and bladder

Case 6 – Impairment Rating

2nd Step for a Cervicothoracic category VIII impairment estimate

- **Combine** with an appropriate impairment estimate from cervicothoracic category II, III, IV, or V using the Combined Values Chart
  - ➢ Cervicothoracic Category V: Severe Upper Extremity Neurologic Compromise (35 % WP)
    - ✓ *"The patient has **objectively demonstrated** a significant upper-extremity impairment requiring the use of upper-extremity external functional or adaptive device(s). There may be total neurologic loss at a single level or severe, multilevel neurologic loss".*
    - ✓ Structural compromise is present with severe upper extremity motor compromise but without severe lower extremity involvement

SCI case – Impairment Rating

DRE VIII (75 % WP)

COMBINED WITH

DRE V (35 % WP)

= 84 % WP

- ***SEE the EXAMPLE at the bottom of page 105 in the Guides***

Case 6

ANY FINAL QUESTIONS

RE: Cases 5 or 6?

If you mastered these, try Case #6 Alternate Scenario

Case 6

ADDITIONAL REFERENCES

Not provided in the primary presentation

Will be at the end of Alternate Case #6

SCI case – Impairment Rating

- The following is a similar but alternate case to case #6.
- This has MANY advanced concepts for self-review
- Compare and contrast what is objective (able to be validated) in Case #6 vs Alternate Scenario #6.
- **Try to assess what YOU WOULD DO about this case without looking at the case notes and the final answer suggestion, but review those later for additional learning opportunity.**

SPINAL CORD INJURY Case 6 – ALTERNATE SCENARIO

55-year-old male fell 10 feet, headfirst off a roof

Broke his fall with his upper extremities (without fractures) and struck the vertex of his head.

SCI case 6 – Alternate Scenario

- He did not have LOC, but complained that he had paresthesias /numbness in his arms > trunk > upper legs and had difficulty

  moving them

- EMS arrived: Vitals stable; GCS 15/15

- Numbness / paresthesia / weakness upper > lower extremity

- C-collar / blackboarded and transported to Level I trauma

Case 6 – Alternate Scenario

- ED MD exam:
  - ✓ Vitals with sl. tachycardia. **BMI 38.** Confirmed GCS 15/15
  - ✓ Numbness and paresthesias greatest at C4, C5, C6 > trunk > proximal LEs.
  - ✓ Sacral sparing
  - ✓ Hyperreflexic and positive Hoffman's
- Initial trauma imaging:

  CT head: No acute intracranial process

Case 6 – Alternate Scenario

- Initial trauma imaging:

  ✓**CT Cervical / Thoracic spine demonstrated**

  1. Moderate spinal canal stenosis present at C4-5, and C5-6 levels due to disc / osteophyte protrusion (degenerative / developmental stenosis)
  2. Congenital cervical spinal canal stenosis due to short pedicles.
  3. **No acute compression fracture or other fracture of the cervical or thoracic spine.**

Case 6 – Alternate Scenario

- Neurosurgeon evaluated the IE and ordered additional imaging.
- **MRI Spine Cervical and Thoracic spine demonstrated**
  1. Moderate to severe spinal canal stenosis present at C4-5 and C5-6 and due to disc osteophyte protrusion.
  2. Congenital cervical spinal canal stenosis due to short pedicles.
  3. **Central cord T2-STIR hyperintensity from C4/5 to C6 without cord expansion**
  4. No thoracic cord contusion or hemorrhage
  5. There were no fractures and no evidence of a more subtle bone or ligamentous injury.

Case 6 - Alternate

Midline Sagittal MRI Image

STIR sequence (suppresses fluid signal of fat so only edema / inflammation show up.

- Pertinent Positive: Central cord T2-STIR hyperintensity from C4/5 to C6 without cord expansion
- Pertinent Negative:

  No evidence of significant structural injury of spine

Case 6 – Alternate Scenario

- Due to spinal cord edema, significant stenosis and persistent neurologic deficits, neurosurgeon took IE to the OR for anterior cervical discectomy and fusion at C4-5 and C5-6 for ***"incomplete spinal cord injury with central cord syndrome".***
- Successfully transferred to the floor 2 days post-op.
- Strength improved significantly, legs > arms, but paresthesias persisted mostly in the UEs and trunk.
- Catheter pulled and voided spontaneously with low Post-Void Residuals (PVRs).
- Was able to pass stool with Surfak and regular toileting
- No cognitive or emotional symptoms reported.

Case 6 – Alternate Scenario

- **After acute care for 7 days, then was discharged to home.**
  - ✓**ASIA level was C6 Grade D**
  - ✓OT: Modified Independent (Mod I) in ADLS with some difficulty only with fine motor activities, improving.
  - ✓PT: Contact guard with rolling walker x 500 feet, Min Assist with gait belt without assistive device. Improving daily. No spastic scissoring / ataxia. Improving.
  - ✓Recommended out-patient OT and PT for improving gait and ADLs.

Case 6 – Alternate Scenario

- **Discharged to home with ASIA level was C6 Grade D (cont)**

  - ✓DC Meds: Surfak, Cyclobenzaprine, Tylenol #3 Gabapentin 600 mg TID
  - ✓DC Equipment: Rolling Walker, discontinue as tolerated.
  - ✓No indwelling catheter, catheter supplies or other bowel supplies were recommended and no urologic follow up planned

Case 6 – Alternate Scenario

- 4 weeks after return to home in major metro area, the IE chose DC as treating doctor
- Complaints of persistent paresthesias in upper >lower limbs, as well as neck, thoracic and low back pain.
- Initiated in modalities, ***chiro adjustments*** to entire spine and eventually strengthening exercises for upper and lower extremities.
- The exercises documented he was performing would require at least 4 to 4 + strength in the LEs and 4 /5 in the proximal arms.

Case 6 – Alternate Scenario

- Changed to a different DC group 10 weeks after the DOI.
- Complained to the DC of difficulty urinating, defecating, significant erectile dysfunction and that *"he could not walk"*
- No hospital or other records provided to the DC
- DC concerned about an *"occult TBI, persistent spinal stenosis or cauda equina syndrome"*.
- MRIs of the brain, cervical thoracic and lumbar spine were ordered.
- No referral to neurosurgery, neurology, PM&R

Case 6 – Alternate Scenario

10 weeks after the DOI, findings were as follows:

- Brain: No acute / subacute findings
- Thoracic spine:
    1. Multi-level degenerative spondylosis, non-contiguous levels
    2. No acute findings of bone injury, soft tissue injury (edema, or hemorrhage at any level

Case 6 – Alternate Scenario

10 weeks after the DOI, findings were as follows (cont):

❖Lumbar spine:

1. Degenerative spondylosis with degenerative spondylolisthesis at L4-5.
2. No posterior element fracture or pars edema to indicate acute cause of slippage
3. Mild spinal stenosis at L4-5 with no evidence of contact, compression, deflection of any of the lumbar or sacral roots.

Case 6 – Alternate Scenario

Imaging 10 weeks after the DOI, findings (continued)

❖Cervical spine:

1. Adequate decompression with solid fusion at C4-5 and C5-6
2. No significant disc protrusion / extrusion above or below the fusion
3. No evidence of syrinx, cord expansion, no edema in the cord or myelomalacia.

[Resolution of the cord edema that was present at two days post op.]

Case 6 – Alternate Scenario

- **Referred to Pain Management (PM) at 3 months after DOI**

✓Complained of neck and back pain, pain / paresthesias and weakness in the arms and legs.

✓Neuro exam on multiple occasions with PM documented **normal** strength in the arms and legs with subjective paresthesias in C5 and C6 dermatomes.

✓No hyperreflexia or spasticity documented

✓No wheelchair or walker documented

✓He was trialed on Baclofen and Tizanidine without improvement in “tremors” or muscle tightness.

Case 6 – Alternate Scenario

- **Referred to Pain Management (PM)**
  - ✓Preferred and was prescribed cyclobenzaprine at 10 mg TID.
  - ✓Over 3 months, the PM MD increased the dose (strength) and frequency (number of times per day) of opioids, from 90 mg codeine (13.5 morphine equivalents) to 60 mg oxycodone (90 morphine equivalents)!
  - ✓**The pain management doctor recommended several procedures:**
    - ➢C4 / C5 / C6 and L4 / L5 / S1 medial branch blocks for axial neck and back pain #. Alternating with
    - ➢Series of 3 Cervical and Lumbar ESIs for radiating pain and paresthesias in the arms and legs #

Case 6 – Alternate Scenario

- **Referred to Neurosurgery (NSG) by Pain Management at 4 months after DOI**
  - ✓Complaint were neck pain and back pain radiating to the arms and legs respectively
  - ✓MD reviewed the MRIs obtained by PM
  - ✓His exam was documented as :
    - ➢Decreased Achilles reflex bilaterally and symmetric loss of sensation and strength in bilateral "L5" distribution

Case 6 – Alternate Scenario

- **Referred to Neurosurgery (NSG) by Pain Management (cont.)**
  - ✓No rectal exam and no sacral sensory loss documented
  - ✓BUT also, no B / B / ED symptoms documented by NSG
  - ✓Diagnosis given of ***"spondylolisthesis at L4-5, with bilateral L5 radiculopathy".***
  - ✓Laminectomy and fusion at L4-5 recommended

Case 6 – Alternate Scenario

- **Referred to Psychiatry by PM at 4 months after DOI**
  - ✓Complaints were of depression, anxiety, "PTSD"
  - ✓The IE reported LOC and "brain injury"
  - ✓The psychiatrist had no outside records
  - ✓Claimed PTSD due to *"witnessing his near death"*.
    - ❖No dissociative symptoms, but non-specific nightmares (no symbolic content)
    - ❖No report of irritability or aggression, risky or destructive behavior,
    - ❖No report of hypervigilance or heightened startle reaction

Case 6– Alternate Scenario

- **Referred to Psychiatry by PM at 4 months after DOI**
  - ✓Diagnosed with PTSD, Anxiety and Traumatic Brain Injury
    - ❖No discussion of DSM-5 criteria for PTSD and "anxiety"
  - ✓Over several months the psychiatrist prescribed and titrated meds to include Cymbalta 60 mg a day for depression and pain, plus Lorazapam TID for anxiety and nightmares of PTSD
  - ✓Psychiatrist was not aware of the medications prescribed by the PM MD (and therefore could not be aware of potential interactions between PM meds and Psych Meds)

Case 6– Alternate Scenario

- **Referred to Urologist by PM at 5 months after DOI**
  - ✓Complaints were loss of erectile function; but at that time reported he had nocturnal erections and mail order Cialis "helped a little"
  - ✓Reported that he wore diapers because of accidents of urine and stool
  - ✓On exam, there was a normal circumcised penis and descended testicles, with subjective reports of decreased sensation over the entire penis but not in the peri-rectal sacral dermatomes.
  - ✓Rectal tone normal and normal bulbocavernosus reflex (BCR)

Case 6 – Alternate Scenario

Urodynamic studies (UDS) performed

- Starting Post Void volume was 100 ml ^
- EMG of the detrusor muscle was quiet during filling.
- *"Unable to record the first desire and strong desire to void". #*
- Guarding reflex was intact, and the sphincter muscle was synergistic during filling.
- Capacity was 395 ml (normal capacity in a male is 300 to 600 ml). There was a detrusor contraction at 157 ml of filling. **At volume 395 cc, he had a detrusor contraction and was able to void (empty his bladder).**

Case 6 – Alternate Scenario

Urodynamic studies (UDS) (continued)

- Voided volume was 350 and his PVR on that occasion was 45 ml (normal).
- Maximum flow of 22 ml/s @

The urologist diagnosed "neurogenic bladder".

✓14 French catheters were prescribed for a every 4- hour intermittent catheterization program (ICP).

✓Cialis was prescribed for complaints of erectile dysfunction.

While prescribed, there were no records these went through pre-authorization or were dispensed by the WC pharmacy / provider.

Case 6 – Alternate Scenario

- **Referred to PM&R by Pain Management at 6 months after DOI**
  - ✓Complaints were TBI, PTSD, neck pain / back pain, difficulty walking, using his UEs, paresthesia entire body, inability to pass urine / stool without assistance and complete ED.
  - ✓PM&R did not have any records from prior providers, but had reports of latest MRIs provided by IE
  - ✓Presented in a wheelchair and was examined from the wheelchair in street clothing
  - ✓Exam was limited without assessing basic mental status, gait, strength (other than below the knees or hands) , sensation of the LEs, and no GU exam.

Case 6 – Alternate Scenario

- **Referred to PM&R by Pain Management at 6 months after DOI**
  - ✓What was performed documented no hyperreflexia, clonus, but left "foot drop"
  - ✓Diagnoses given were "***TBI, PTSD, central cord syndrome, neurogenic bowel, neurogenic bladder, erectile dysfunction***"
  - ✓Recommended:
    1. Left AFO,
    2. Out-Patient SCI rehab – PT / OT and COGNITIVE rehab,
    3. FU with PM, Urology and Psychiatry,
    4. Neuropsychology testing

Case 6 – Alternate Scenario

Designated Doctor Examination at 15 months post injury - Additional history and records were obtained:

- Attended the PT / OT inconsistently – about 1/3 of the appointments, often missing without explanation or due to appointments with his attorney
- WC did not pre-authorize the PM injections, but several were performed under PI letter of protection (LOP)
- Cialis and other urologic medications were reported as being used but on this date reported "NO EFFECT". Reported that not even noting nocturnal erections.
- He was taking all meds by his psychiatrist and undergoing counseling, but his ***"anxiety, depression, insomnia, fatigue, nightmares and cognitive complaints were getting worse".***

SCI case – Alternate Scenario

Designated Doctor Examination at 15 months post injury - History

- He had NO strength in his left leg and limited strength in the right leg @
- He reported that he must use his walker and AFO on the left leg at ALL times.
- He reported that he was unable to drive.
- Claimed he was unable to hold a fork well and had to have his food cut up, but reported he was catheterizing every 4 hours *
- The IE was unable to tell the DD
  - ✓ Where / who was supplying the adult diapers or catheters ^
  - ✓ His bowel program or what volumes were produced on catheterization ^

SCI case – Alternate Scenario

Designated Doctor Examination at 15 months post injury – Exam

- Had Uber driver drop him off at the facility and remove walker from trunk.
- Ambulated with left AFO and rolling walker without evidence of spasticity, but he tended to drag the left leg, scuffing the anterior shoe #
- Able to step up curb with EACH leg and balance transiently on each leg ^
- Could balance briefly each leg with light pressure on the walker, without compensation, such as due to weakness. ^
- After removal of shoes and AFO, the 9 month-old left AFO had minimal wear and there were no significant wear on the toes of the left shoe #

SCI case – Alternate Scenario

Designated Doctor Examination at 15 months post injury – Exam

- Vitals with elevated BP. BMI ~ 38.
- Mental status was normal with excellent recall of conversations with some of the prior doctors and at other times vague or obtuse in answers.
- No overt demonstration of anxiety, startle response, agitation
- Stood and disrobed to gown without walker and standby assistance; wore a diaper.
- Functional strength of uppers was good including pinch / grasp / dexterity of digits during changing out / in street clothing, manipulating belt and phone use. ^
- Manual muscle testing inconsistent and much worse muscle grade than demonstrated during functional activities

SCI case – Alternate Scenario

Designated Doctor Examination at 15 months post injury – Exam

- Well preserved muscle bulk without focal / observable or measurable atrophy of the upper and lower extremities;
- Reported left leg completely insensate below L1 and only partial sensation in the entire right leg which was worse than partial sensation in bilateral UE, in non-dermatomal, "stocking glove" fashion.
- Patchy areas of decreased sensation in the trunk, anterior worse than posterior.
- Complained of complete loss of sensation of penis, scrotum, and perianal region.
- Rectal tone normal and normal bulbocavernosus test.

Case 6 – Alternate Scenario

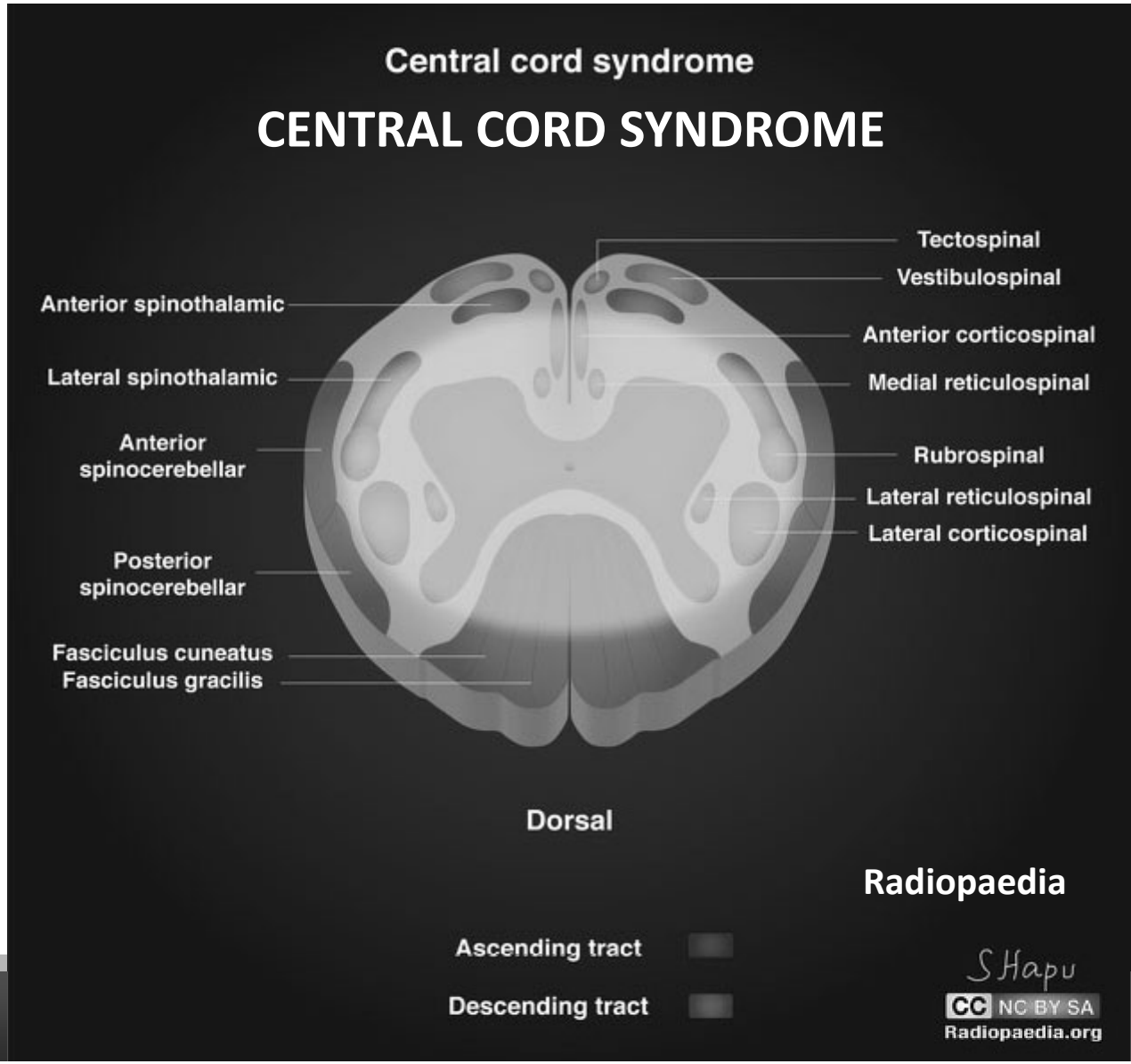
What does the EBM say about distribution of spinal cord tracts involved in a Central Cord Syndrome (CCS)?

What type of deficits would you expect to see?

Do the initial or subsequent subjective and objective makes sense for an IE with CCS?

SCI case – Alternate Scenario

- CCS usually affects the descending (motor) anterior and lateral corticospinal tract and the ascending (sensory) anterior and lateral spinothalamic tract.
- Affects cervical > thoracic > lumbar > sacral.
- Called the "walking SCI"
- Deficits usually most pronounced in the hands



SCI case – Alternate Scenario

- **Medical records included:**
  - ✓ Video surveillance: The IE was observed to ambulate without a walker, drive his vehicle and demonstrate digital dexterity. Inconsistent with complaints in later records and to DD
  - ✓ Neuropsychological testing:
    - ➢ Neuropsychologist reported that the IE's *"reported course of worsening and cognitive concerns is also inconsistent with a trajectory of recovery from a traumatic brain injury".*
    - ➢ The IE *"performed below recommended limits on two standalone and one embedded measure of performance validity. In one instance, his score on a forced choice performance validity measure was below chance".*

SCI case – Alternate Scenario

- **INCONSISTENCIES noted by the DD:**
  - ✓Timing of later complaints, especially B / B / ED and TBI
  - ✓Inconsistency of complaints of deficits to what should be seen with a CCS
  - ✓Inconsistency of extent and distribution of persistent or worsening complaints with complete resolution of edema in the cord and NO other changes to spinal MRIs that could explain them
  - ✓Inconsistencies of neurologic exams that were initially normalizing over time from the DOI

Case 6 – Alternate Scenario

- **Don't blindly accept presumptive diagnosis / diagnoses by treating or consulting doctors**
  - ✓**They are not applying a causation analysis**
  - ✓**Often base their diagnosis on subjective complaints without adequate examination**

- **YOU ARE the FORENSIC EXPERT addressing causation.**

- **Are there reasonably probable alternate explanations?**

SCI case – Alternate Scenario

- **Erectile dysfunction UNLIKELY to be due to "SCI", WITHOUT:**

  ✓OBJECTIVE bowel and bladder dysfunction

  - Assess if the records support appropriate supplies or medications for management of B/B and ED

  ✓OBJECTIVE structural imaging initially and subsequent consistent with a reason for persistent spinal cord findings

SCI case – Alternate Scenario

- **Be aware of EBM regarding non-SCI causes of Erectile dysfunction:**
  - ✓Low testosterone
  - ✓SSRI
  - ✓Opioids / benzos
  - ✓ETOH
  - ✓Various street drugs
  - ✓Smoking (vascular)
  - ✓Elevated BMI / Obesity (adipose cells have estrogen effect)

SCI case – Alternate Scenario

URODYNAMIC TESTING and NEUROPSYCHOLOGICAL TESTING

TEST RESULTS - KNOW the basics of how to:

- ✓ Do a basic interpretation of the results
- ✓ Evaluate the validity of the results
  - ➢ Are there factors of testing that can SKEW test results?
  - ➢ Are any of the results effort driven or under the conscious control of the IE?
- ✓ Clinically corelate the results

SCI case – Alternate Scenario

Must temper ALL the information from the records, including these samples on the prior slide, with the evidence in the records and what the EBM reports on CCS

HOW WOULD YOU ASSIGN IR IN THIS CASE?

In THIS CASE, there WAS an injury and there were likely some residual deficits, BUT with so many invalid results and inconsistencies,

WHAT WOULD YOU DO? **Chapter 3 DRE ?** **vs**

Chapter 4 SCI?

SCI case – Alternate Scenario

Chapter 3 Method:

- **NO structural inclusions – no fracture / dislocation of the cervical spine**

- Difficult to assign a DRE III for functional inclusions

- The best category with all the inconsistencies present would be a DRE II, for Non-verifiable radicular complaints

5 % WP

SCI case – Alternate Scenario

Chapter 4 Method:

- **4.3a – Station and Gait (Table 13)**
  - Patient can rise to a standing position and can walk but has difficulty with elevations, grades, stairs, deep chairs, and walking long distances

    IR range 1 - 9 % WP
- **4.3b – Use of Upper Extremity (Tables 14 and 15).**
  - The criteria for spinal cord disorders affecting both upper extremities are given in **Table 15. Criteria for Two Impaired Upper Extremities: Impairment description**
  - Patient can use both upper extremities for self-care, grasping, and holding, but has difficulty with digital dexterity (1 – 19 % WP).

    IR range 2 % WP to 26 % WP

SCI case – Alternate Scenario

Chapter 4 Method:

- **Explain and defend what percent you chose within the class chosen (just like in other NON-MSK chapters).**
- **USE what you can objectify.**

- **WHY NOT?**
  - ✓4.3d Urinary Bladder Dysfunction?
  - ✓4.3e Anorectal Dysfunction?
  - ✓4.3£ Sexual Functioning?

SCI case – Alternate Scenario

Chapter 4 Method:

- **There were too many inconsistencies**
  - ✓Late presenting complaints
  - ✓Complaints that did not comport with CCS or any other SCI pattern
- Inconsistencies of OBJECTIVE clinical or other diagnostic findings with the subjective
- **Potential for Secondary Gain, Conscious Deception and Tertiary gain from Dual Compensation (WC and personal litigation)**

Explain and defend your rationale for your decision

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ADDITIONAL STUDY

INFORMATION RELATED

TO THE MEDIAL HAMSTRING REFLEX

Medial Hamstring Reflex

DTR tested supine in 100 post discectomy patients

- Frequency of disc level - L4/5 most common

Disc level	Frequency (%)
L12	1
L12+L45	2
L34	4
L34+L45	4
L45	49
L45+L5S1	11
L5S I	29

Over 93% Intra-rater reliability for the MHR between 2 evaluators)

Esene IN, Meher A, Elzoghby MA, El-Bahy K, Kotb A, El-Hakim A. Diagnostic performance of the medial hamstring reflex in L5 radiculopathy. Surg Neurol Int. 2012;3:104. doi: 10.4103/2152-7806.100862. Epub 2012 Sep 13.

Medial Hamstring Reflex

Medial Hamstring DTR tested supine in 100 post discectomy patients

Reflex	Sensitivity	Specificity	Youden index
Knee Reflex	87.5	85.9	73
MHR	75.8	85.3	60
Ankle Reflex	82.5	56.7	40

Esene IN, Meher A, Elzoghby MA, El-Bahy K, Kotb A, El-Hakim A. Diagnostic performance of the medial hamstring reflex in L5 radiculopathy. Surg Neurol Int. 2012;3:104. doi: 10.4103/2152-7806.100862. Epub 2012 Sep 13.

Medial Hamstring Reflex

Medial Hamstring DTR tested supine in 100 post discectomy patients

Reflex	Youden index (%)	Likelihood ratio	Percentage correctly classified
Knee Reflex	73	42.5	86
MHR	60	18	79
Ankle Reflex	40	6	67

Interrater reliability over 93% between 2 evaluators

Esene IN, Meher A, Elzoghby MA, El-Bahy K, Kotb A, El-Hakim A. Diagnostic performance of the medial hamstring reflex in L5 radiculopathy. Surg Neurol Int. 2012;3:104. doi: 10.4103/2152-7806.100862. Epub 2012 Sep 13.

Medial Hamstring Reflex

- The semitendinosis DTR (prone) was detected in 100% of 40 healthy young volunteers (median age 30), confirmed with EMG

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