Physical Exam of the Spine

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Goals

- Systematic approach to performing a spine physical exam
- Improve understanding of physical exam findings
- Synthesize information from exam to help achieve diagnosis

Overview

- General Principles
  - Patient care setting
    - Priorities, setting up for success
  - Look, listen, feel….
- Motor
- Sensory
- Special tests
- Examining more than the spine…
  - Hip-Spine Syndrome

General Principles

- Physical exam is exceptionally critical in identifying surgical vs. nonsurgical pathology in spine
  - Neurologic status often determines intervention
- Systematic approach to avoid mistakes
- When does your evaluation start?
  - Before you walk in the room!
- When does the physical exam start?
  - When you first “see” the patient!

General Principles

- Setting of evaluation
  - Special considerations depending on situation
    - Trauma bay
    - ER consult
    - Inpatient consult
    - Outpatient setting
  - Paying careful attention to physical exam decreases risk of missed injuries, delay to diagnosis, timely imaging, and improved accuracy of diagnosis

ER Patient Setting

- Trauma bay?
  - Greatest likelihood of missed injuries or delay in diagnosis
  - Heightened awareness when evaluating obtunded or intubated patients
  - Be aware of associated injuries
    - Do they have S1 weakness from a burst fracture or is there a missed talus/ calcaneus fracture?
  - Be aware of distracting injuries!
    - Inability to detect sensory changes due to LE burns… etc.

ER Patient Setting

- Awake/alert patient in ER?
  - They are in the ER and not in your office for a reason!
  - Avoid the ER traps
    - ”Frequent flyer...” “just here for pain medicine…”
    - Are these patients misdiagnosed? Other missed pathology?
    - Victim of domestic abuse?

Other Patient Settings

- Inpatient consults
  - Why were they admitted?
  - History of infection? New onset back pain? → Osteodiscitis? Epidural abscess?
  - Recently extubated with weakness? Cervical Spondylosis on CT? → Central cord?
  - Always read the chart!
- Outpatient/ clinic setting
  - Patients may present in a much different fashion and certain tests may be able to be excluded (ex. rectal exam)

Spine Trauma Evaluation and Exam

Spine Trauma Evaluation and Exam

- Considerations before you step in the trauma bay
  - High energy?
    - MVC, fall of a ladder, etc..
  - Low energy?
    - Ground level fall? Step off a curb?
  - Age
    - Osteoporosis fracture risk?
    - Pathologic fracture risk?
  - Awake and Alert?
  - Intubated or obtunded?

Spine Trauma Evaluation and Exam

- Things to remember!
  - Always start with ABC's
  - Be present for logroll (if possible)
    - If not, then repeat
  - "ER intern said the rectal was fine…"
    - Repeat when necessary

- Primary Survey
  - Airway
  - Breathing
  - Circulation
  - Disability
  - Exposure
- Secondary Survey
  - Typically, when you come in…
  - Not to interfere with ABC's

Spine Trauma Evaluation and Exam

- Phases of spine trauma physical exam
  - 1) Inspection and palpation
    - Identify other injuries
    - Anterior
    - Posterior- log roll (can be part of primary or secondary survey)
  - 2) Neurologic
    - Motor
    - Sensory
    - Reflexes

Inspection- Anterior

- Start with head-to-toe visual inspection
- Remove all clothes
  - Head- Racoon Eyes, bleeding from auditory meatus, etc
    - Basal Skull fracture
  - Neck- Cock-robin posture
    - Atlantoaxial rotatory subluxation, facet dislocation
  - Chest
    - Chest contusions
    - Flail Chest

Inspection- Anterior

- Chest/ Abdomen
  - Seat belt sign
- Perineum/ Pelvis
  - Scrotal swelling
  - Vaginal bruising
- Extremities
  - Limb Deformities/ injury
    - ER position of hip, etc
  - Bruising/ Swelling
    - Palpate all large joints
    - If intubated, patient may withdraw from pain
  - Gross movement/ muscle tone
  - Every bruised, swollen or tender extremity gets an Xray!

Inspection- Posterior

- Log Roll
  - Inspect
    - Bruising
    - Open wounds
    - Probe if necessary
  - Palpate
    - Spinous processes from skull to sacrum
    - Ribs, SI joints
  - Be sure to have help to turn
  - Maintain spine precautions

Neurologic Exam

- Motor
- Sensory
- Reflexes

INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY (ISNCSCI)

ASIA ISCOS

Patient Name _____ Date/Time of Exam _____

Examiner Name _____ Signature _____

RIGHT

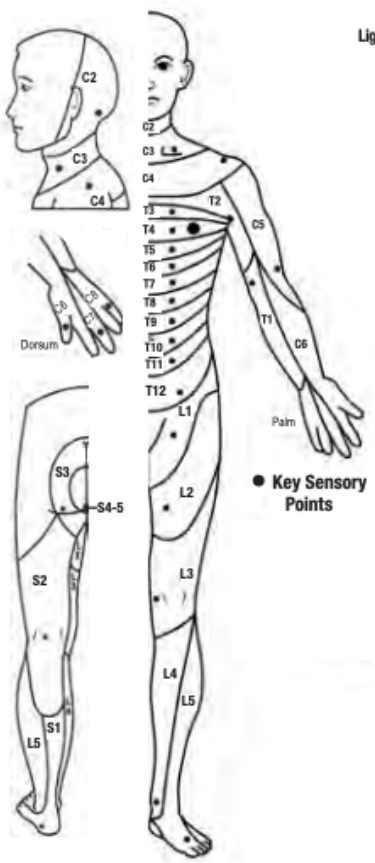
MOTOR KEY MUSCLES		SENSORY KEY SENSORY POINTS Light Touch (LTR)	Pin Prick (PPR)
	C2		
	C3		
	C4		
Elbow flexors	C5		
Wrist extensors	C6		
Elbow extensors	C7		
Finger flexors	C8		
Finger abductors (little finger)	T1		
	T2		
	T3		
	T4		
	T5		
	T6		
	T7		
	T8		
	T9		
	T10		
	T11		
	T12		
	L1		
Hip flexors	L2		
Knee extensors	L3		
Ankle dorsiflexors	L4		
Long toe extensors	L5		
Ankle plantar flexors	S1		
	S2		
	S3		
	S4-5		
RIGHT TOTALS (MAXIMUM)		(50)	(56) (56)

UER (Upper Extremity Right)

LER (Lower Extremity Right)

Comments (Non-key Muscle? Reason for NT? Pain?):

(VAC) Voluntary Anal Contraction (Yes/No) ☐



● Key Sensory Points

SENSORY KEY SENSORY POINTS Light Touch (LTL)	Pin Prick (PPL)	MOTOR KEY MUSCLES		
		C2		
		C3		
		C4		
		C5	Elbow flexors	
		C6	Wrist extensors	
		C7	Elbow extensors	
		C8	Finger flexors	
		T1	Finger abductors (little finger)	
		T2		
		T3		
		T4		
		T5		
		T6		
		T7		
		T8		
		T9		
		T10		
		T11		
		T12		
		L1		
		L2	Hip flexors	
		L3	Knee extensors	
		L4	Ankle dorsiflexors	
		L5	Long toe extensors	
		S1	Ankle plantar flexors	
		S2		
		S3		
		S4-5		
(56)	(56)	(50)	LEFT TOTALS (MAXIMUM)	

LEFT

UEL (Upper Extremity Left)

LEL (Lower Extremity Left)

MOTOR (SCORING ON REVERSE SIDE)

0 = total paralysis
1 = palpable or visible contraction
2 = active movement, gravity eliminated
3 = active movement, against gravity
4 = active movement, against some resistance
5 = active movement, against full resistance
5* = normal corrected for pain/disuse
NT = not testable

SENSORY (SCORING ON REVERSE SIDE)

0 = absent 2 = normal
1= altered NT = not testable

(DAP) Deep Anal Pressure (Yes/No) ☐

MOTOR SUBSCORES

UER ☐ + UEL ☐ = UEMS TOTAL ☐ (MAX (25) (25) (50))

LER ☐ + LEL ☐ = LEMS TOTAL ☐ (MAX (25) (25) (50))

SENSORY SUBSCORES

LTR ☐ + LTL ☐ = LT TOTAL ☐ (MAX (56) (56) (112))

PPR ☐ + PPL ☐ = PP TOTAL ☐ (MAX (56) (56) (112))

NEUROLOGICAL LEVELS
Steps 1-5 for classification as on reverse

	R	L
1. SENSORY	☐	☐
2. MOTOR	☐	☐

3. NEUROLOGICAL LEVEL OF INJURY (NLI) ☐

4. COMPLETE OR INCOMPLETE? ☐
Incomplete = Any sensory or motor function in S4-5

5. ASIA IMPAIRMENT SCALE (AIS) ☐

(In complete injuries only) **ZONE OF PARTIAL PRESERVATION**
Most caudal level with any innervation

	R	L
SENSORY	☐	☐
MOTOR	☐	☐

REV 11/15

Motor Exam- Cervical Spine

- Stick to ASIA classification for testing
- Isolate muscle group for exam

- C5-
  - Elbow Flexors
- C6-
  - Wrist extensors
- C7-
  - Elbow Extensor
- C8-
  - Finger flexor
- T1-
  - Finger abductors

Motor Exam- Lumbar Spine

- Stick to ASIA classification for testing
- Isolate muscle group for exam

- L2-
  - Hip Flexor
- L3-
  - Knee Extension
- L4-
  - Ankle Dorsiflexion
- L5-
  - Long toe extensor (EHL)
- S1-
  - Ankle Plantarflexion

Motor Exam- Pearls & Pitfalls

- Test muscle in contracted position
- Compare strength between sides
- Test one extremity at a time, write down the results

Motor Exam- Pearls & Pitfalls

- For L2-
  - isolate hip flexors by flexing knee and testing in 90 degrees of hip flexion
  - Weakness with straight leg raise may not necessarily indicate weak hip flexion

Motor Exam- Pearls & Pitfalls

- For C5-
  - May also isolate and test deltoid function
  - Innervated by axillary nerve which is almost purely C5
  - Elbow flexion (biceps) has some contribution from C6

Brown et al. 2011

Motor Exam- Pearls & Pitfalls

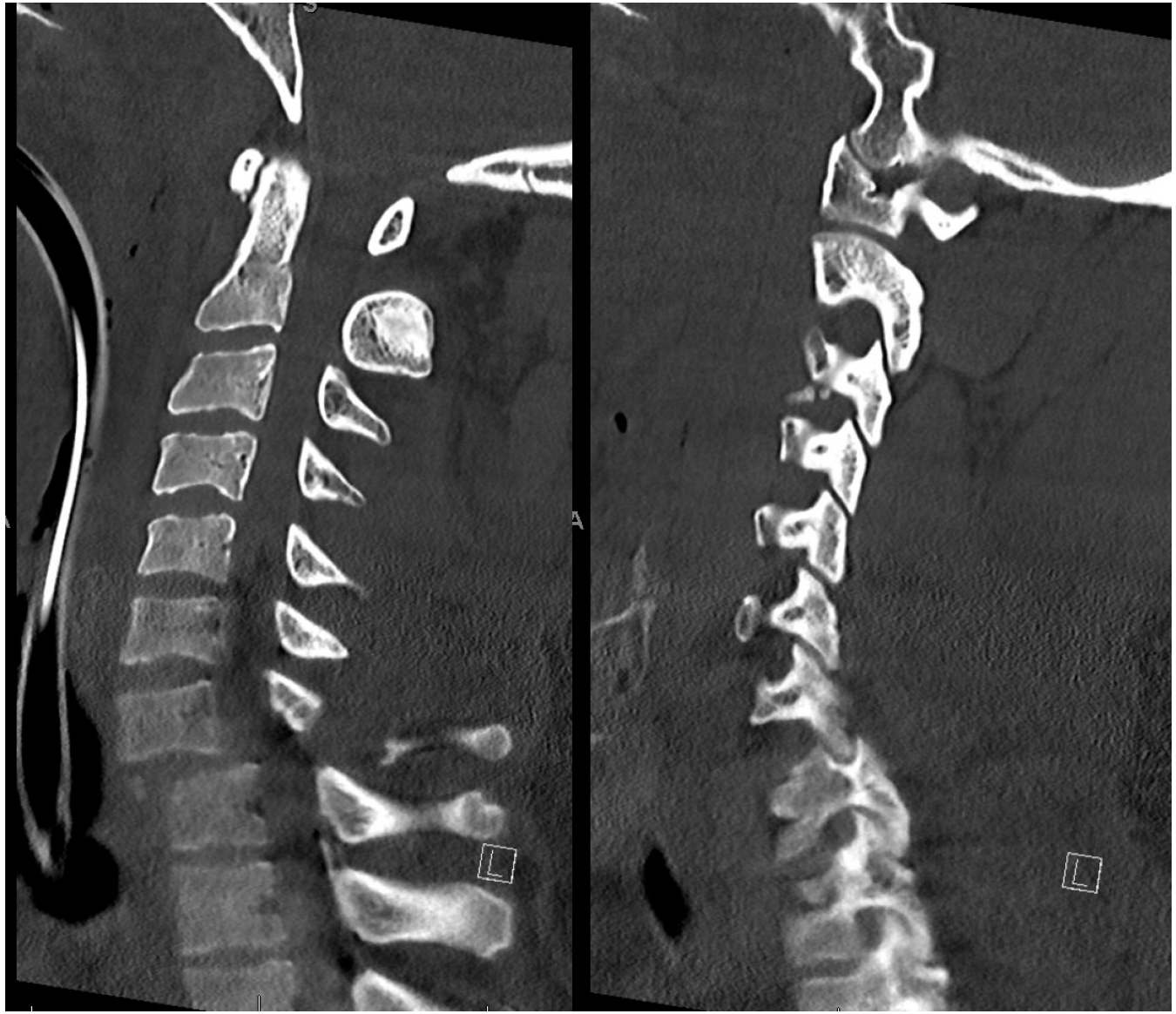
- For S1-
  - Frequently taught to evaluate by plantarflexing ankle
  - However, given the high cross-sectional area of the GS complex, it can be difficult to detect subtle weakness
- Solution:
  - Isolate Peroneus Longus (S1) by placing your thumb on the plantar surface of the first metatarsal
  - Then, patient plantarflexes

Motor Exam- Motor Grade (ASIA)

- 5/5
  - Active movement, full ROM against gravity, sufficient resistance
- 4/5
  - Active movement, full ROM against gravity, moderate resistance
- 3/5
  - Active movement, full ROM against gravity
- 2/5
  - Active movement, full ROM with gravity eliminated
- 1/5
  - Palpable or visible contraction
- 0
  - Total paralysis

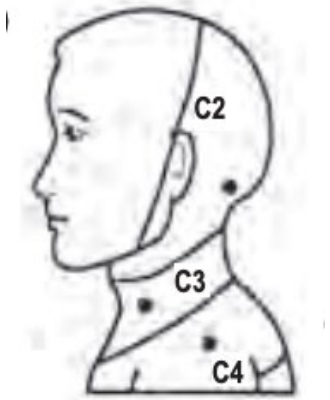
Neurologic Exam

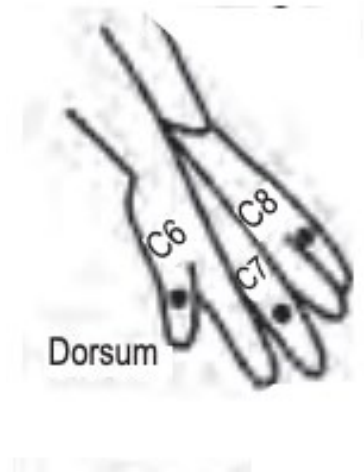
- Motor
- Sensory
- Reflexes

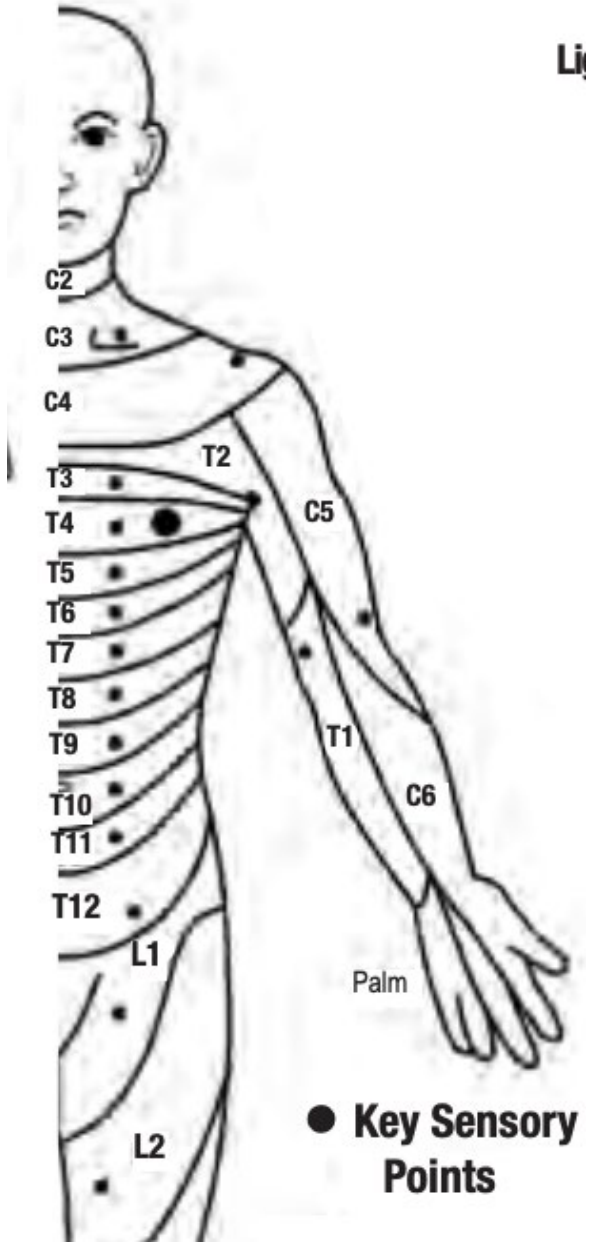


Sensory Exam- Cervical Spine

- C5-
  - Anterior lateral shoulder
- C6-
  - Dorsal Thumb
- C7-
  - Dorsal MF
- C8-
  - Dorsal 4/5th digit
- T1-
  - Medial Forearm

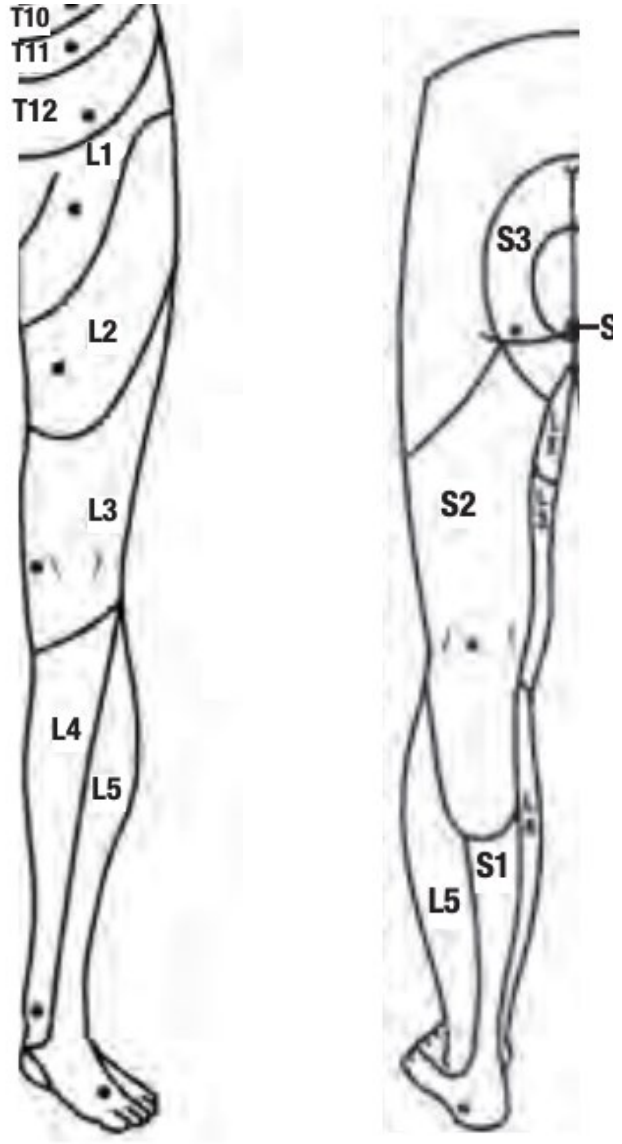






Sensory Exam- Lumbar Spine

- L2-
  - Proximal medial thigh
- L3-
  - Distal medial thigh
- L4-
  - Medial ankle
- L5-
  - 1st web space
- S1-
  - Lateral ankle/ heel



Sensory Exam- Sensory Grading (ASIA)

- 0
  - Absent
- 1
  - Altered (decreased, impaired, or hypersensitivity)
- 2
  - Normal

Rectal Exam (ASIA)

- Extremely important
- Helps determine cord injury grade
- Dermatome is S4-5

Rectal Exam (ASIA)

- Exam consists of:
  - Sensation
    - Light touch (LT)/ pin prick (PP)
    - Deep anal pressure (DAP)
  - Voluntary Anal Contraction (VAC)

- Grading/ Scoring
  - If sensation (LT/ PP) ***or*** DAP ***or*** VAC are present= **Sacral sparing= incomplete cord injury**

Neurologic Exam

- Motor
- Sensory
- Reflexes

Reflexes

- Cervical
  - C5- Bicep
  - C6- Brachioradialis
  - C7- Tricep
- Lumbar
  - L4- Patella
  - S1- Achilles

Reflexes- Grading

- 0
  - Absent
- 1+
  - Hyporeflexic
- 2+
  - Normal
- 3+
  - Hyperreflexic
- 4+/ CL
  - Associated with Clonus

UMN Pathologic Reflexes

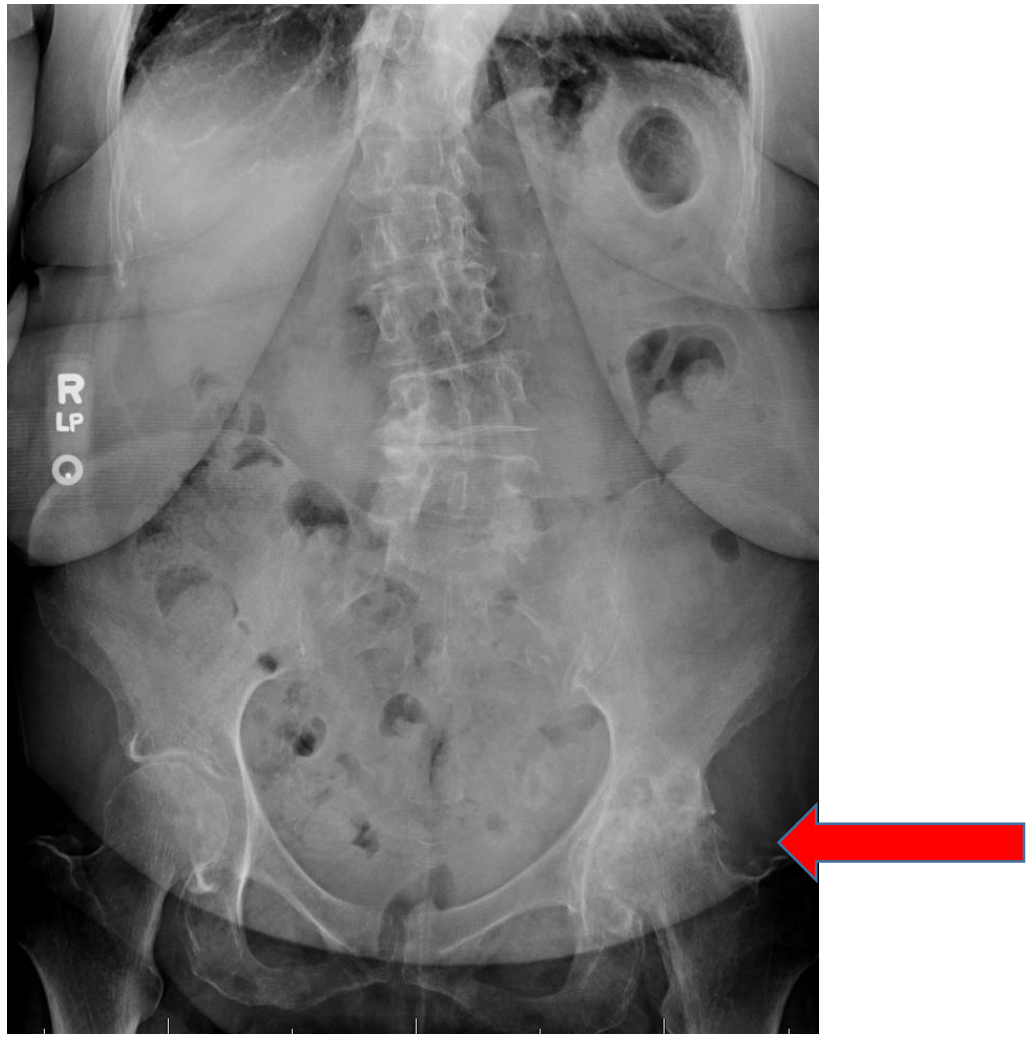
- Hoffman
- Clonus
  - >3 beats
- Babinski
- Inverted radial reflex
  - Finger flexion when test BR reflex
- Hyperreflexia

Other Patient Settings- Considerations

- Non-trauma evaluation
  - ER consult
  - Inpatient consults
  - Outpatient visits
- Gait analysis
  - Walking aids (walker, cane, walking stick, etc)
  - Trendelenburg gait- L5 palsy?
  - Wide based- myelopathy?
  - Flat back posture- claudication?
  - Pitch-forward posture- Sagittal imbalance? Adult spinal deformity?

Considerations: Hip-Spine Syndrome

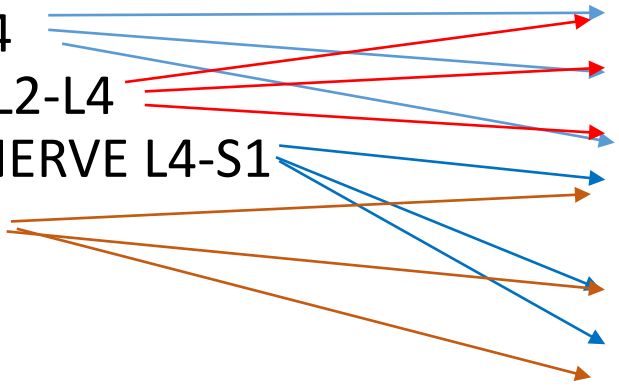
- Anterior Hip Capsule
  - Branches of obturator and femoral nerve
- Posterior Hip Capsule
  - Branches from nerve to quadratus, superior gluteal, and sciatic nerve



Hip-Spine Syndrome- Referred Pain

HIP CAPSULE Innervation

- FEMORAL NERVE L2-4
- OBTURATOR NERVE- L2-L4
- SUPERIOR GLUTEAL NERVE L4-S1
- SCIATIC NERVE L4-S3



Extremity Cutaneous Nerve Innervation

- Genitofemoral L1-L2
- LFCN L2-3
- Anterior FCN L2-L3
- Saphenous/ Medial Crural Nerve L3-4
- Superficial Peroneal Nerve L4-S1
- Common Peroneal/ Lateral Sural Nerve L4-S2

Hip- Spine Syndrome: Exam

- Every spine exam needs a hip exam!
  - ROM
    - Contractures?
  - Pain with internal or external rotation?
  - Stinchfield positive?
    - Resisted active hip flexion at 30-45 deg
    - Painful response may indicate intraarticular hip pathology
- Positive findings? → GET HIP XRAYS!
  - Consider diagnostic and therapeutic intraarticular hip injection

Conclusion

- Physical exam is exceptionally critical in identifying surgical vs. nonsurgical pathology in spine
  - Neurologic status often determines intervention
- Systematic approach to avoid mistakes
- When does your evaluation start?
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