An Interactive Case Based Presentation

Making the Diagnosis

Spine Imaging and Interventions

Wade Wong DO FACR
Professor of Radiology
University of California, San Diego

76 y/o M c/o LBP  ?Dx

- Findings:
  * Marrow Replacement
  * ?Mass
- Dx: Prostate Ca

Vertebral Neoplasms

- Common Neoplasms
  * Mets
  * Lymphoma, Myeloma
  * Hemangioma
- Less Common Neoplasms
  * Osteoid Osteoma, Osteoblastoma
  * Giant Cell Tumor, ABC
  * Osteosarcoma, Chondrosarcoma

Vertebral Mets

- Common: Breast, Lung, Prostate, Lymphoma, Renal, Thyroid, Colon
- Hypervascular: Renal, Thyroid, Melanoma
- 5% encroach on thecal sac
- Tendencies: Colon: lumbar
  Lung: Thoracic

72 y/o F c/o LBP; PMH Cervical Ca

- Pos. DWI

- Path Fxs: extracellular fluid vol replaced by tumor
  - If neg or iso=B9
  - If Hyperintense=+
  - (Bauer: 6/106 FP)

Pos. DWI

- Bx: Benign VCF
80 y/o M c/o LBP

Dx?
- Prostate Ca. Metastatic to spine & R L3-4 lat recess & NF

80 y/o c/o LBP
Dx?

- Pagets Ds

Spine Biopsies: Lumbar

Preop Bx Considerations

- H & P
- Imaging
- Labs: Coags
- Informed Consent
- Anesthetic requirements, NPO

Informed Consent

- Procedure Explanation
- Anesthesia: usually conscious sedation & local anesthetic
- Risks: *Bleeding, Vascular Injury, Stroke, Death
  *Infection
  *Nerve Injury (Paralysis)
  *Pneumothorax

Complication Rate: < 2%

Spine Biopsy Approaches

- Lumbar
  - Posterior Lateral
  - Transpedicular
  - Fluoroscopy
  - C.T.

43 y/o M IVDA c/o BP, Fever
**Patient Positioning**

- **Path:** Strep Viridans

**Lumbar Disc: Needle Entry**

- 45° LPO or RPO
- SAP midway betw ant & post disc margins
- Slight caudal or cephalad angle to superimpose sup. end plates
L5S1 Disc Entry

- Problem: iliac crest
- Pearl: add Ceph angulation
- See the Triangle
- Skin entry higher

Straight Prone: No Sidebend

Prone: Sidebend
Even with Sidebending

Other Alternatives
- Curved Needle
- Transpedicular

L5 S1 Disk Biopsy

58 y/o M Urosepsis, BP
- L6, L5-6, & L6S1
- Challenges:
  * High iliac crest
  * Low lumbar
- Approach:
  * Transpedicular

Transpedicular Biopsy

Path: E. Coli
INSIDE THE SPINAL CANAL

- Spinal cord
- Cauda equina
Single Posterior Lateral Approach

Hazards!
- Segmental Arteries
- Exiting nerve root

66 y/o M c/o BP, No Known Primary

CT or Fluoro?
- Comfort Zone
- Availability
- CT:
  - Soft Tissue Bx
  - Poor Boney Landmarks
  - Avoid Deep Structures (Lung, Aorta)
- Speed
- Boney Landmarks

Fluoro Guidance
- Spinal Laminar Line
Fluoro Guidance

Spine Biopsies: Thoracic

Fluoro Guidance
Path: Adenoca (Colon)

Spine Biopsies
Thoracic Challenges

- Lung
- Aorta
- Spinal Cord
- Kyphosis
- Shoulders
- Smaller Pedicles

Pedicle Entry Points

- Depending on the level of the thoracic vertebra:
  - Entry point is at lateral junction of transverse process and superior articular process
  - Between rib and transverse process at superior, lateral pedicle wall
CT Guidance

Path Dx: Intraosseous Disk

CT Guidance

Fluoro: Thoracic Disc Bx

Path: Fibrosis c/w Neuropathic Jt

C.R.

• 60 y/o F
• Mid BP

A.A. 53 y/o M: c/o backpain; decreased sensation both L.E.

Dx?

• Fibrous Dysplasia
Spinal Angiogram

New Plan: Embo then Bx

Caution: Artery of Adamkiewicz
- T9-L2 85%
- T5-T8 15%
- L 75% R 15%
Coils to protect (isolate) distal Intercostal Arteries; Then 200 uPVA

Angioseal & Turn Pt. Prone for Bx

Path Dx
• DDX Vascular Mets
  Melanoma
  Renal
  Thyroid
  Chorioca (Lung)

• Final Dx: Thyroid Ca met

Hypervascular Vertebral Lesions
• Mets
  *Renal
  *Thyroid
  *Melanoma
• Hemangioma
• Other: Chordoma, Hemangiopericytoma,
67 y/o M c/o butt pain

Presumed Dx: Renal Cell Ca

Pre Bx Embolization: R. Int. Iliac Feeders… 200 u PVA

L Int. Iliac Feeder: 200 U PVA

Bleeding P Bx: Gelfoam
Post Gelfoam: No Bleeding
Path Dx: Chordoma (Sacrum)
Renal Cell Ca (Kidney)

Chordoma
- M/C primary sacral neoplasm
- Notochord remnants
- 50% sacrococcygeal, 35% skull base, 15% vertebral
- Malignancy: sacral>vertebral>clival
- Lytic, highly destructive
- 40-70 y/o

R.C.
- 55 y/o M
- c/o increasing midback pain & weakness bilat LE
- Numbness feet
Gelfoam Pledgets

Path: Aggressive Hemangioema

Outcome: Tumor shrunk p emb; Surg not necessary

38 y/o F c/o mid thoracic BP

Direct Injection: ETOH

Pre vs 3mo post
Pain finally gone

ETOH: Disadvantages

• Painful: GA
• Can’t See it
• 3 mo to work

Painful Hemangioma: Vertebroplasty
PMMA Injection
Outcome: Painfree in 1 hr

Hemangioma
- Common B9 vascular neoplasm
- High sig: T1, T2, T1pgd
- Most: Asx, incidental
- Less common: painful, epidural, neurological

Pitfalls
- 44 y/o F
- s/p antibiotic Rx for osteomyelitis
- Dx: Hemangioma

44 y/o M c/o Neck Pain: Dx? How?
- Challenges:
  * Vertebral A.
  * Spinal Cord
  * Nerve Roots
  * Pharynx
  * Carotid Sheath

Spine Biopsies: Cervical

Spine Biopsies
Cervical Challenges
- Carotid & Vertebral Arteries
- Jugular Vein
- Spinal Cord
- Esophagus
- Trachea
77 y/o F c/o Neck Pain

- Breast Ca 15 yrs ago
- “Cured” of Breast Ca 10 yrs ago
- M.A.I. 5 yrs ago

Challenges

- Vertebral Artery
- Spinal Cord
- Pharynx
- Carotid Sheath

Transpedicular

- CT guidance
- Short EZ em 17 ga
PathDx: Breast Ca

Challenges
- Vert. A.
- Carotid Sheath
- Nerve Roots
- Spinal Cord
- Facial N.

PathDx: Prostate Ca

67 y/o M c/o Neck Pain
DDx: Fibrous Dysplasia, Prostate Ca.

77 y/o F c/o Neck Pain
PMH:
*Diabetes M.
*Breast Ca

Challenges
- Carotid Sheath
- Pharynx
- Vertebral A.
Push & Shove Technique

- Large bore needle
- Smaller Coax needle
- CT or Fluoro

Path Dx: E. Coli

54 y/o M c/o neck pain

- HIV+
- h/o lymphoma
- Feverish

- H&N surg, NS unwilling

Transoral Bx

Path Dx: ABC

Path: Enterobacter

Aneurysmal Bone Cyst

- Solitary, expansile benign cystic lesion
- ?vascular malformation instead of neoplasm
- Blood-fluid level
- Association w/ Giant Cell Tumor, Fibrous Dysplasia, Chondroblastoma
- May cross disc space

Giant Cell Tumor

- Expansile locally aggressive neoplasm
- Benign or malignant
- Sacrum>vertebra
- Posterior Elements
- Possible Neuro compromise
60 y/o F: B.P & R.L.E. Pain

Dx?

• Synovial Cyst

62 y/o M: Neck Pain

DDx?

• Rheumatoid Arthritis; Rh-like arthritis
• Pseudogout
Path Dx?

- Pseudogout with odontoid fx

Vertebral Inflammatory Ds

- Pyogenic: discitis, Osteomyelitis, Paravertebral/epidural abscess
- Granulomatous
  TB: Subligamentous, VCF, paravertebral abscess, meningitis, discitis late
  Cocci: osteomyelitis, paravertebral abscess, pachymeningitis

Epidemiology

- 1: 10,000 Admits
- Serious
  * Neurological
  * Death
- Staph Aureus 60%
- Other: Enterobacter E Coli, TB,
**Routes of Spread**
- Hematogenous
  * Cardiac
  * Pulmonary
  * Renal
- IVDA
- Direct Inoculation (Surg, GSW)
- Contiguous Spread

**Types of Spinal Infections**
- Discitis/Osteomyelitis
- Spinal Epidural Abscess
- Meningitis
- Myelitis/Cord Abscess
- Polyradiculitis

**Discitis/Osteomyelitis: Pyogenic**
- Peds: Disc then vertebra
- Adults: Subchondral EP then Disc
- Later: Sp. Epidural Ab, Paravertebral Ab

**Spinal Epidural Abscess**
- Phlegmon
- Abscess
29 y/o F: postop fever, LBP
- Staph

42 y/o M c/o back pain, temp 103

MRSA: Fever broke 4 hrs after placing percutaneous drains

39 y/o M: bilat UE&LE weakness (IVDA)

Problem:
Myelography

Pitfalls
39 y/o (IVDA) F: Brown Sequard
Disc Herniation

82 y/o F sudden onset BLE weakness
Epidural Hematoma

36 y/o M c/o Mid BP
Costovertebral Jct Approach
(Extrapedicular)
Path Dx: Sq. Cell Ca (H&M)

Less Typical Spinal Infections
Path Dx: Staph Aureus

54 y/o F
• c/o LBP, fever 103
• ER demands emergency MRI to r/o epidural Abscess 2AM

MM
What should ER have ordered?

66 y/o La Jolla Socialite
c/o BP: Hx Breast Ca

Pyelonephritis

Spinal Tuberculosis

- T & L spine m/c involved
- Initially: ant VB near endplate
- Later: Post elements, disc
- VB Collapse: Gibbus
Spinal T.B.
- Skip areas or contiguous
- Paraspinal Abscesses
- Meningitis

T.B. Destructive Ant & Post

T.B. Gibbus

4 y/o Mexican Boy
c/o BP & HA; pos PPD

Lymphoma
- NHL: 85% of spinal Lymphoma
- Hodgkins: blastic (NHL: destructive)
- 40-60 y/o
- Tend to infiltrate epidural space, meninges
- The Mimicker!
7 y/o Immigrant c/o BP, Pos PPD, Incontinence

27 y/o Immigrant M worsening paraplegia

Path Dx Delayed (7 wks): T.B.

Associated Findings:
- Spinal T.B.
- Pos PPD
- Pos CXR
- Subcutaneous Abscesses
- Ca++ LN

44 y/o M, HIV+, PPD+ c/o mid BP

Presumed DX: TB

Path Dx: Candida

Granulomatous Spondylitis
- Tuberculosis
- Coccidiodomycosis
- Brucellosis
- Other
Brucellar Spondylitis

- Lower Lumbar
- Focal or diffuse
- Less destructive than TB
- Ant. Endplate
- Post element sparing
- Rare Paraspinous component

48 y/o M c/o neck pain x 4 mo
FP refers for CESI

27 y/o Jailee c/o severe H.A.

Bx: Cocci

Path Dx: Cocci
Spinal Coccidiomycosis

- Spine: m/c site of osseous involvement
- Pulm. Origin
- Philipinos, blacks, HIV, immunocomp
- Highly destructive
- Thick meningitis, epidural abscess
- Paravert abscess

R.W.

- 44 y/o B M
- c/o LBP
- Occasional IV drugs

Dx?
What Next?
22 ga chiba, 018 wire, Micropuncture set, 035 amplatz, 8F APD

Post Jackson Pratt Bulb
80 cc pus: Cocci

2 days later...
Post 80 cc pus

DDx?

- Abscess
- Seroma
- Pseudo-meningocele

How to Dx/Rx?
Paravertebral Infections

- Ext Discitis/Osteo
- Direct extension from adj. organ infection
- Hematogenous

Path Dx: Staph Aureus

Renal Abscess

Path Dx: E.Coli

73 y/o F: Central Line Complication

Psoas Abscess: Staph

56 y/o F c/o BP

- Temp: 99.9
- WBC 10.1 K
- Dx: Infection, best guess Staph

Path Dx: Adeno Ca (Gastric)
67 y/o M: LBP & Fever

BB: 54 y/o F c/o mid thoracic pain

DDx

• Met: Lung, Breast, kidney, colon, etc
• Schwannoma
• Paraganglioma
• Other

• How would You Dx?

Path Dx: Marrow... Extramedulary Hematopoeisis
Summary

• Utilize the appropriate imaging tools
• Make the Findings
• Describe the anatomical extent
• Formulate a reasonable DDx
• But remember: No matter how good your imaging is, you still can’t see the histology….Don’t hesitate to BIOPSY