Infections of the Spine

Johns Hopkins Orthopaedic Surgery Review Course

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A 56 y.o. diabetic develops severe right leg pain and is diagnosed with a herniated L4-5 disc. He undergoes a caudal epidural steroid injection and achieves immediate relief. Administration of a. Over the next week he notes generalized weakness of the lower extremities and has one episode of urinary incontinence. Next most appropriate management?

1-Nonsteroidal anti-inflammatory drugs and reassurance that this is a steroid flare reaction that should subside within 2 to 3 days
2-Emergent L4-5 diskectomy
3-Repeat epidural steroid injection at L4-5 under fluoroscopy
4-MRI of the lumbar spine
5-Myelography and CT

Key Points

1. Presenting sx of osteodiscitis vs epidural abscess
2. Understand the laboratory and imaging studies necessary for spinal infections
3. Difference between pyogenic and granulomatous infections
4. Understand medical Rx for spinal infections
5. Surgical indications for spinal infections
6. Basic considerations for ant. vs post. procedures

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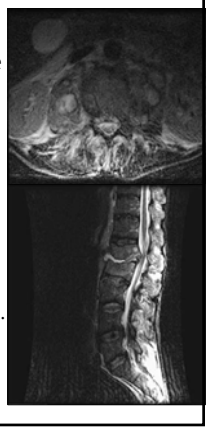
2- Repeat laboratory studies in 1 week to recheck the ESR
3- MRI with gadolinium
4- Biopsy of the surgical disk space
5- Irrigation and debridement of the surgical wound in the operating room

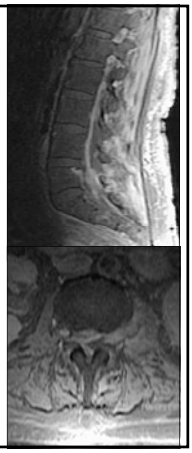
32-yo increasing back pain. Progressive paraparesis x 2wks. Febrile, WBC of 12,500/mm3. Mgt should consist of

1- CT-guided needle aspiration and organism-appropriate antibiotics.
2-Laminectomy and postop bracing.
3-PSF with instrumentation and IV Abx.
4-Anterior debridement/strut graft, with possible posterior instrumentation.
5-Posterior extracavitary decompression alone.



An 81-y.o. man with severe low back pain reports right extensor hallucis longus and anterior tibialis weakness and difficulty urinating x 24 hours. Temperature 38.3° C. Management:

1- hospital admission for IV antibiotics and observation.
2- an epidural steroid.
3- anterior diskectomy and fusion with autologous bone graft.
4- laminectomy for decompression and debridement.
5- laminectomy for decompression with an instrumented posterolateral fusion.



Scope of Spinal Infections

- Vertebral Osteodiscitis
  - Pyogenic infections
  - Granulomatous Infections
    - Tuberculosis

Discitis ⟷ Continuum ⟷ Vertebral Osteomyelitis

- Infections of the spinal canal
  - Epidural Abscess

Presentation

Laboratory Studies

- ESR/CRP
  - Elevated > 90%
- WBC
  - Elevated in only 42% of cases
  - Typically normal in chronic cases

CTQ

- Blood cultures
  - Positive in 24% of patients with pyogenic infections

Heamtogenous Arterial Spread

Osteodiscitis

- Most commonly accepted etiology
  - Osteomyelitis occur at the vertebral end plate
  - Low-flow conduits allow for bacterial seeding
  - Disc space penetration
- Bacteria flourish in the avascular nucleus pulposus

Radiographic Imaging

- Tomograms
  - Show changes earlier than x-ray
  - Local endplate osteopenia (10-14d)
- Plain radiographs
  - Lag behind clinical sx up to 2-8 wks
  - Disc space narrowing
    - Earliest and most consistent finding
  - Soft tissue findings (abscess)
    - C-spine: Wide retropharyngeal
    - T-spine: Wide paravertebral
    - L-spine: Changes in psoas shadow

Presentation: Osteodiscitis

Symptoms

- Based on acuity (acute, subacute, or chronic)
- Pain most common
- Only ~ 50% had fever

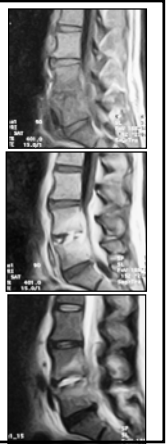
CTQ

- Clinically significant abscess is uncommon
  - C-spine: retropharyngeal → mediastinum
  - T-spine: paraspinous/retromediastinal
  - L-spine: psoas abscess
- Abscess from spine can drain almost anywhere

Pyogenic Infections

MRI

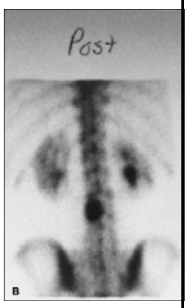
- T1-weighted
  - Decreased signal between vertebra and disc with indistinct margins
- Gadolinium
  - Enhances on T1
  - Vascularized inflammatory tissue
- T2-weighted
  - Hyperintensity at the involved levels



Pyogenic Infections

Radiographic Imaging

- CT
  - Soft tissue mass
  - Gas within soft tissue, bone or disc
  - Cystic changes or bony destruction
- Radionuclide Studies
  - Allows for whole body imaging
  - 3-5% multifocal infections



Surgical Indications

CTQ

1. Obtain bacterial diagnosis
   - Percutaneous biopsy is negative or unsafe
2. Drain clinically significant abscess
3. Refractory to nonoperative treatment
4. Neurologic deficit from spinal cord compression
5. Significant deformity or bony destruction

General Principles

Goals of Treatment

1. Establish tissue and bacteriologic diagnosis
2. Prevent/reverse neurologic deficits
3. Maintain/establish spinal stability and alignment
4. Relieve pain

Surgical Principles: **Osteodiscitis**

Anterior approach

- Most cases since pathology is anterior
  - One exception is perhaps lumbar discitis
- Direct access to infected tissue
  - Perform an adequate debridement
- Allows bone grafting
  - Structural bone graft (autograft) allows stabilization
  - Promotes healing/fusion

Empirical Treatment

- Parenteral Abx
  - Four to six weeks
  - High failure rates with treatment < 4 weeks
- Oral Abx
  - ESR/CRP- reasonable indicators of response CTQ
  - Consider repeat biopsy if ESR/CRP does not decrease
- Consider orthosis for immobilization
  - Pain control
- Address co-morbidities CTQ
  - Nutrition, hypoxia, metabolic deficit, diabetes
  - Treat any underlying infections

Surgical Principles: **Osteodiscitis**

Posterior

- Isolated Laminectomy
  - Contraindicated in most cases
  - Increased instability and neurologic deficits
  - Possibly indicated in lumbar discitis below conus
    - No psoas abscess, minimal vertebral body involvement
    - Preserve the facets
    - Discectomy performed
- Typically combined with anterior procedures

Pyogenic infections

Prognosis

- **Recurrent infection**
  - Up to 25% of cases
  - Lower if treated >28 d with appropriate antibiotics
- **Neurologic deficits** (overall <15%)
  - Worse prognosis:
    - Patients with *increased age*
    - More *cephalad lesion*
    - Diabetes, RA, immune deficiency disorders
  - Root lesions do better (even if treated nonoperatively)

CTQ

Pyogenic infections

Prognosis

- Mortality rate < 5-16%
  - Associated with patient age and co-morbidities
- IV drug abusers
  - Excellent prognosis
  - 92% response with 4 weeks of parental Abx therapy
  - Those that relapsed respond to 2nd course of therapy

Pyogenic infections

Prognosis with Medical Tx

- Arthrodesis
  - If adequated treated spontaneous fusion is the rule!
    - Most in under 1 year
    - Higher the level the more likely spontaneous fusion
- Pseudarthosis
  - Frequently stable, painless fibrous unions

Tuberculosis Spondylitis

- Etiology
  - Tuberculosis (most common world wide)
  - Fungi
  - Certain bacteria
  - Spirochetes
- Hematogenous spread from est foci
  - Pulmonary
  - GU system
- Direct extension from visceral lesion
- Lymphatic or venous routes?

Pyogenic infections

Prognosis

- Deformity
  - *Less common* than in tuberculous infections
  - *More common*
    - thoracic/thoracolumbar areas
    - > 50% vertebral body involvement

Tuberculosis Spondylitis

Differences from Pyogenic Infections

1. Pathologic changes usually take longer to develop
2. Discs relatively resistant and may be preserved despite extensive bone loss
3. Large Paraspinal Abscesses more common
4. Frequently associated with greater deformity

CTQ

Management

- Drug therapy
  - Integral for the tx of spinal tuberculosis
    - Include even if surgery is undertaken
  - Addresses the infection, but *deformity* a problem
    - 75% bony fusion
    - 49% had 0-10 degrees of *kyphosis*
    - 18% had > 30 degrees of *kyphosis*
- Surgery
  - Indication: same as in pyogenic infections

Epidural Abscess

- Abscess location
  - ***Posterior 73%***
  - Anterior 27%
  - Usually covers 3-4 segments
- Stages of untreated disease
  1. Local pain
  2. Radicular pain
  3. Weakness
  4. Paralysis
  (5. Possibly death)

Epidural Abscess

Epidural Abscess

Medical Management

- Antibiotic therapy alone for epidural abscess
  - Rarely indicated CTQ
    - Poor surgical candidate
    - ? No significant neurologic deficit
    - ? Significant multiregional spinal canal involvement
    - ? Complete neurologic deficit for > 3 days

Epidural Abscess

- Incidence increasing
  - 7% spine infxns have epidural abscess
- Hematogenous
- Contiguous spread
  - Discitis
  - Vertebral osteomyelitis
- Direct inoculation
  - Intraoperative
  - ESI
  - Lumbar puncture

CTQ

- Patients are more systemically ill than vertebral osteomyelitis patients

Epidural Abscess

Surgical Management

- Surgical approach depends on location
  - Posterior Laminectomy
    - Lumbar spine in particular
    - If no associated vertebral body abscess
    - Preserve facet joints
  - Anterior (+/- Posterior)
    - Anterior epidural abscess in thoracic spine
    - If abscess is due to vertebral osteomyelitis or discitis
- If stability compromised then fusion is required
  - +/- Internal instrumentation vs external immobilization

Summary

- Establish the diagnosis!
  - MRI with gadolinium
  - Percutaneous biopsy (off antibiotics)
- Identify medical vs surgical management
  - Discitis / Osteomyelitis
    - Typically MEDICAL
      - Not septicemic
      - No abscess
      - No deformity
  - Epidural abscess
    - Typically SURGICAL CTQ

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Factomas/Factosarcomas

- Exceptions to medical managment : CTQ
  - Unable to make a diagnosis with biopsy
  - Neurologic changes
  - Clinically significant abscess
  - Refractory to nonoperative therapy
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MR Imaging

	Pyogenic Infection	Tb	Tumor
T1 weighted	Low	Low	Low
T2 weighted	High	High	High
Vertebral pattern	Contiguous	Either	Skipped
Disc space	Usually involved	Usually Spared	Usually Spared
Endplate	Usually involved	Can be involved	Usually not involved
Surrounding tissue/planes	Edematous / Diffusely obscured	Commonly Involvement	Typically intact / Focally obscured

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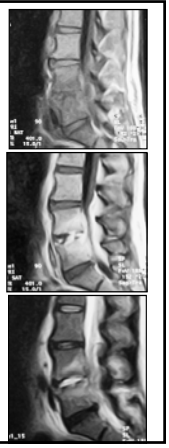

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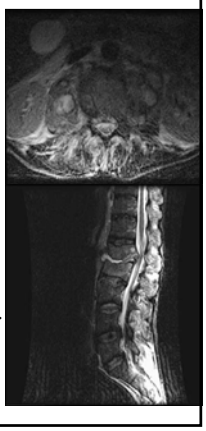

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Preferred answer: 4

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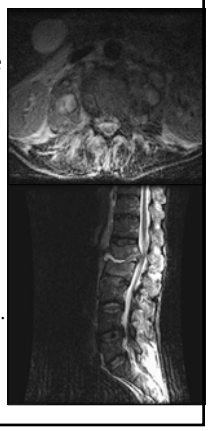

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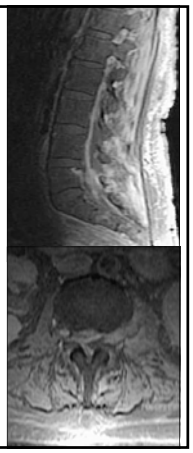

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