Surgical Strategies for the Revision Spine Patient

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Overview

• The Differential Diagnosis

• A Systematic Approach
  • History
  • Physical Examination
  • Historical Documentation
  • Imaging Studies
  • Other investigations

• Strategies for Surgical Management
  • Revision Decompression
  • Adjacent Level Fusion
  • Revision Fusion
  • Deformity Correction

The Differential Diagnosis

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Disclosures

Royalties – SpineArt
Consulting – Mazor Robotics, SpineArt, Vertebral Technologies
Institutional Research Support – Baxano, NuVasive
### The Differential Diagnosis

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**History Taking – Symptoms**

- Back pain
- Leg pain
- Neuro deficit
- Functional limitations
- Unable to stand straight
- Others
  - Infection
  - Spinal headache
  - Prominent hardware

**History Taking – Account of Past Surgical History**

- Presenting symptoms prior to the procedure
- Treatments (5Ws, 1H)
- Outcomes (short-term, long-term)
- Complications

**Surgery 1**
- **L5-S1 Decompression**
  - Ind: Leg pain
  - Outcome: Leg pain improved, back pain worsened

**Surgery 2**
- **L5-S1 PSF**
  - Ind: Back pain
  - Outcome: Initial improvement then worsening back pain
  - Cx: Headaches resolved

**Surgery 3**
- **L4-S1 Anterior/Posterior**
  - Ind: Back and leg pain
  - Outcome: Initial improvement, then progressive stooping
  - Cx: None

**Physical Examination**

- Previous Incisions
- Tenderness
- Neurological
- Infection
- Deformity
  - Alignment
  - Balance
  - Joint contractures
- General condition

**Historical Documentation**

- Old operative notes
  - What was done?
  - Complications
  - Implants and materials
- Prior x-rays
  - Why was it done?
  - What improved?
  - What failed?

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Imaging Studies

- Standing Plain radiographs
  - Flexion/extension views
- Standing full-length x-rays
- Cross-sectional imaging
  - CT/CT-myelogram
  - MRI

Other Investigations

- BWK
  - CBC, ESR, C-reactive protein
  - Albumin, total lymphocyte count
- EMG/NCS
- Other Imaging:
  - SPECT CT
  - WBC/Gallium scan

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Preoperative Planning

- Infection
  - Two-stage approach
    - I+D, Implant removal, IV Abx
    - Secondary reconstruction
Case – 58M

• Underwent TLIF/PSIF L4–S1 for back and leg pain within the year with outside surgeon
• Post-op infection, treated with removal of posterior instrumentation and ABX
• Persistent draining sinus and worsening back pain
• ESR/CRP elevated despite ongoing ABX

Case – 58M

• Removal of TLIF cage at L4–S1
• Repeat I+D
• Cultures
• ABX for 3 months
• Brace for comfort

Case – 58M

• Followed ESR/CRP
  • Remained low on and after coming off ABX
• After 3 months off ABX (6 months since TLIF removal) planned reconstruction
  • VCR L4–S1
  • T11 P PSIF

Preoperative Planning

• Infection
• Recurrent/New Stenosis
  • Revision Laminectomy
  • Dural repair/patching
Preoperative Planning

- Infection
- Recurrent/New Stenosis
- Adjacent segment degeneration
  - r/o superimposed deformity
  - Anterior vs. Posterior vs. Combined approach
- Broken/Symptomatic Hardware
  - Posterior Screws
  - Anterior Instrumentation/Cage
  - Hardware removal and reimplantation
    - Removal sets, proprietary screw heads, metal cutting burrs
  - Adding on (compatibility)
- Pseudarthrosis
  - Anterior vs. Posterior vs. 360
  - Existing implants
  - Interbody access
    - ALIF, XLIF, TLIF, PLIF
  - Fusion mass/landmarks (Guidance)
  - Fusion potential
    - patient, fusion bed, graft

Case – 63F

- Adult Scoliosis Surgery
- Revised:
  - L3 PSO
  - T10-Pelvis P3F
  - Trans1
- Progressive Kyphosis
- Back and leg pain
Case – 63F

- Revision L3 PSO
- Bilateral PLIF L5-S1
- T4-Pelvis PSF

Preoperative Planning

- Infection
- Recurrent/New Stenosis
- Adjacent segment degeneration
- Broken/Symptomatic Hardware
- Pseudarthrosis
- Deformity
  - Sagittal/Coronal/Combined
  - Focal/Global, Operated/Adjacent
  - Mild/Severe
  - Bone Quality
  - Solid Fusion?
Comparative Analysis of Clinical Outcome and Complications in Primary Versus Revision Adult Scoliosis Surgery

- 126 Primary, 124 Revision, Minimum 2 year follow up
- Prevalence of overall complications was lower in P than R
  - 45.2% vs 58.2%, p=0.042
- Higher preop and final clinical outcome for P than R (SRS, ODI), but not in patients > 60 years
- Equivalent improvement between P and R over 2 years (SRS, ODI)

Wash U

- 455 revision patients
- 21% reoperation rate

Case ~ 81F

- Hx of Degen Scoliosis
- Underwent MIS Scoliosis correction
  - L1-L5 XLIF
  - Bilateral Wiltse Fusion L1-S1
  - MIS TLIF @ L5-S1
- After surgery:
  - Increased back pain
  - Unable to stand straight
Case – 81F

- L3 PSO
- Revision L5-S1 TLIF
- Dual iliac screws
- T10-Pelvis PSF
Case – 78M

- 2007 presents with degenerative scoliosis
- Surgeon A (2007):
  - XLIF L3-5
  - MIS PSF L3-51
  - Trans1

Pre-op x-rays (AP and lateral)
Pre-op MRI if relevant

Case – 78M

Developed adjacent segment degeneration with coronal and sagittal imbalance
Surgeon B (Jan 2011)
- PSF L2-3

Case – 78M

78M
Progressive imbalance
Unable to stand up straight
Back pain, minimal leg pain
Pre-operative Planning
• Needs large coronal and sagittal correction
• Major osteotomy has high complications

Surgery
• Coronal taper T12-L1, L2-3 (loosen set screw)
• Hyperlordotic 30° L1-2
• Then T10-Pelvis PSF
• T9, T10 kyphoplasties

Patient was walking independently at 6 weeks
Patient was discharged to rehab POD #7
3 weeks in rehab then SNF
Excellent correction
Summary

Comprehensive approach includes:

• Detailed history
  – Current symptoms and prior surgeries
• Physical Exam
  – Assessment of balance
  – Neuro exam
  – Prior incisions
  – Joint contractures
  – Evidence of infection
• Advanced imaging and other tests
• Thorough assessment of pathology at each level and globally
• Careful preoperative planning to inform most definitive treatment

Thank You!