Current Practices in Lumbar Spine Surgery

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Current Challenges in Pain Management
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Objectives

1. Review pertinent spine terminology
2. Review clinical and radiographic presentations
3. Review surgical & non-surgical interventions
4. Review surgical strategies
Spine Surgeries are on the Rise

Costs are on the Rise

Spine and Related Biologics Revenue Estimate ($ millions)
Rise in Spine Surgery

- Advances in Technology
  - Diagnostic Imaging
  - Surgical Techniques
  - Spinal Implants / Bone Graft Substitutes / Biologics

- Advances in Spine Specialty Training

- The Ageing Population

- Patient’s expectation & desires have increased

Goals of Spine Surgery

- Pain Relief
- Restoring and Improving Function

- Decompressing neural elements
- Providing stability when necessary
- Correcting deformities when present
- Minimizing morbidity
Lumbar Spine Disease

- Degenerative
  - Spinal Stenosis
  - Disc Herniation
- Neoplastic
  - Metastatic Disease
- Infection
- Trauma

Spinal Terminology

- Spondylo : vertebra
- Spondylosis
- Spondylolisthesis
- Spondylolysis
- Myelopathy
- Radiculopathy
- **Spondylolisthesis**
  - Malalignment of vertebrae
  - “Slip”
  - May be degenerative, developmental, traumatic

- **Spondylolysis**
  - Defect in pars interarticularis
  - May lead to a “slip”

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**Myelopathy**

- **Spinal cord** compression

  - Weakness / gait disturbance / coordination & dexterity problems
  - Pain may **not** be a major symptom
  - Cervical / Thoracic

  - Surgery recommended in most cases
Radiculopathy

- Nerve root compression
- Pain / parathesias / weakness in dermatome
- Lumbar / Thoracic / Cervical
- Lumbar radiculopathy (sciatica) most common
- Conservative management in most cases
- Surgery for recalcitrant cases
Lumbar Disc Herniation

- Young patients
  - 3\textsuperscript{rd}-5\textsuperscript{th} decade of life
- Male preponderance
- Prevalence: 1-3\% of population
- **Symptoms:**
  - Leg pain
  - Weakness
  - Parathesias
  - Variable degree of back pain
- Natural History is generally favorable
Protrusion: Annulus is intact

Extrusion: Annulus disrupted, nucleus is in continuity with disc space

Sequestration: Annulus disrupted, nucleus not in continuity ("free fragment")
Abnormal Magnetic-Resonance Scans of the Lumbar Spine in Asymptomatic Subjects

BY SCOTT D. BODEN, M.D., DAVID O. DAVIS, M.D., THOMAS S. DINA, M.D., NICHOLAS J. PATRONAS, M.D., AND SAM W. WIESEL, M.D., WASHINGTON, D.C.

- Individuals age 20-39: 35% had a disc bulge(s)
- Individuals age 60-80:
  - 21% had disc bulge(s)
  - >90% had degenerative change

J Bone Joint Surg Am, 1990

When To Order MRI?

- Persistent pain
- No responsive to conservative treatment
- Weakness
  - persistent or progressive
- Presence of Red Flags
  - concern for malignancy or infection
  - concern of an emergent condition
Indication for Surgery in Lumbar Disc Herniation

- Failed Conservative Management
  - ~6 weeks minimum
- Persistent / Progressive weakness
- Uncontrolled / Incapacitating pain
- Cauda Equina Syndrome
SPORT Study
(Spine Patient Outcome Research Trial)

- Prospective, Randomized Study
- Surgery vs. Conservative Management
- Patients with >6 weeks of sciatica due HNP
- 8 year follow-up
- Intent-To Treat & As-Treated Cohorts

- Surgically-treated patients achieved greater improvement than conservatively-treated patients

Spine 2014

29 year old orthopedic resident
4 months of persistent right leg pain
Interfering with daily activities
Not responsive to therapy & NSAIDs
Single nerve block provided transient relief

Effectively Treated with a L5-S1 Microdiscectomy
54 year old interior decorator
18 month history of intermittent back and left leg pain
Severe and persistent for 6 months
Therapy, Analgesics no longer help
Epidural injection aggravated leg pain

Effectively treated with L4-5 laminectomy & partial discectomy

47 year old truck driver
Chronic intermittent back pain
Occasional buttock & thigh pain
Back pain much worse than leg pain
Standard therapy and narcotics of no help
Injections provide transient relief
“4 bulging discs”

Continue Non-Surgical Management
Spinal Stenosis

- A **decrease** in the cross sectional area of the spinal canal

The Ageing Lumbar Spine

**Disc Degeneration**
(proteoglycan loss / dehydration / loss of disc height)

**Facet Joint Arthrosis**
(hypertrophy / osteophyte formation / synovial cysts)

**Ligamentum Flavum Hypertrophy**

**SPINAL STENOSIS**
Radiculopathy

- Nerve root compression
- Extremity pain & parathesias
- Weakness less common
- Dermatomal distribution
- Gait / coordination preserved
- Absent / diminished reflexes
Neurogenic Claudication

- Leg symptoms made worse with ambulation
- Relieved with sitting
- Less severe when ambulating in flexed posture

- Pain
- Cramping
- Weakness
- Parathesias

The Ageing Lumbar Spine

- Spinal Deformity
  - Degenerative spondylolisthesis
  - Degenerative Scoliosis

- Osteoporosis
Degenerative Spondylolisthesis

Degenerative Scoliosis

Osteoporosis & Spinal Alignment
Natural History of Lumbar Spinal Stenosis

- Generally stable
- Rapid deterioration is rare
- Severe neurologic deficits uncommon
- Dramatic improvement also unlikely

Blau Brain 1978
Tile Clin Ortho 1976

Natural History of Lumbar Spinal Stenosis

- Observational Studies
  - Probably skewed to more mild cases
  - Useful for patient education

- “70 - 15 - 15” Rule*
  - 70% unchanged
  - 15% slightly better
  - 15% slightly worse

Johnnson Clin Ortho 1992
Differential Diagnosis of Lumbar Spinal Stenosis

- Hip Pathology
- Trochanteric Bursitis
- Peripheral Neuropathy
- Vascular Claudication

Hip Pathology

- Often difficult to distinguish hip and spine pathology
- Hip and spine pathology frequently co-exist

**Hip Pathology:**
- Groin pain
- Anterior thigh pain
- Difficulty arising from chair
- Difficulty climbing stairs
- Difficulty in/out of car
- Painful & Limited hip range of motion
Vascular Claudication

- Leg pain Due to arterial insufficiency
- Pain worse with ambulation
- Relieved by stopping
- Night pain with recumbence
  - Relieved with dangling leg
- Presence of vascular co-morbidities

Treatment of Lumbar Spinal Stenosis

- Based upon severity & duration of symptoms
- Based on a knowledge of natural history
- Based on patient’s medical condition
- Based on a patient’s desires
Conservative Options

- Do Nothing
- Improve Physical Condition
  - Exercise
  - Physical therapy
  - Eliminate co-morbidities
    - Weight loss
    - Smoking cessation
- Epidural Steroid Injections

Surgical Indications for Lumbar Spinal Stenosis

- Failure of conservative measures
- Alteration of lifestyle
- Disabling leg pain
  - Neurogenic Claudication
  - Radiculopathy
- Persistent / progressive weakness (uncommon)
Surgical Options

**Decompression**:  
- Relieves neural compression  
- Laminectomy / Lateral Recess / Foraminotomy  
- Adequate when no deformity is present

**Decompression and Fusion**:  
- Relieves neural compression  
- Provides stability / Prevents deformity progression  
- With or without instrumentation

76 year old man  
Severe neurogenic claudication  
Multilevel Spinal Stenosis  
Preserved Lumbar Lordosis
Multi-Level Laminectomy

Indications for Fusion in Lumbar Spinal Stenosis

- Spinal stenosis with **deformity**
  - spondylolisthesis
  - scoliosis

- Spinal stenosis with **instability**
  - true
  - iatrogenic
L3-5 Decompression & Un-Instrumented Fusion

L4-5 Decompression & Instrumented Fusion
Transforaminal Lumbar Interbody Fusion (TLIF)
SPORT Study
*(Spine Patient Outcome Research Trial)*

- Prospective Study
- Surgery vs. Conservative Management
- 13 Spine Centers nationwide (including Case)

2 means of participation:
- Observational (patient chooses treatment)
- Randomized (patient randomized to treatment)

*NEJM* February 2008
SPORT Study
(Spine Patient Outcome Research Trial)

- High Cross-over Rate
  - 67% assigned to surgery actually had surgery
  - 43% assigned to conservative chose to have surgery

- Surgically-Treated Patients:
  - At 3, 6, 12, 24 months were significantly better
  - Oswestry Disability Index
  - SF-36 bodily pain
  - SF-36 physical function

NEJM February 2008

Spinal Tumors

- Most spine tumors are metastatic
- Primary spine tumors are rare
- Advanced metastatic disease leads to
  - Pathologic fracture / Instability
  - Neural compression
- Radiation therapy: Initial treatment in most cases
- Diagnosis: High index of suspicion
  - Back pain & history of malignancy demands MRI!
Metastatic Spine Disease

63 year old woman with remote breast CA
4 month history of progressive back pain
2 week history of inability to walk
Diffuse lower extremity weakness

Emergent Posterior Decompression & Spine Fusion
Spinal Infections

- Vertebral Osteomyelitis
- Septic Discitis
- Epidural Abscess

Epidural Abscess

- Abscess within the spinal canal
  - intraspinal / extradural

- Etiology:
  - may follow a systemic infection
  - Immunocompromised patients

- Symptoms:
  - back pain (severe)
  - myelopathy / radiculopathy
  - fevers / sepsis
  - rapidly progressive
Epidural Abscess

**Diagnosis:**
- high index of suspicion
- MRI

**Treatment:** **Emergent Surgery**
- spinal decompression
- evacuation of abscess

Thank You