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”

**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
  - 3rd-5th decade of life
- Male preponderance
- Prevalence: 1-3% of population
- Symptoms:
  - Leg pain
  - Weakness
  - Paresthesias
  - 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

A PROSPECTIVE INVESTIGATION

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
CAUDA EQUINA SYNDROME

- Severe compression of cauda equina
  1. Severe leg pain and/or weakness
  2. bowel & bladder dysfunction
  3. saddle anesthesia
- Due to massive disc herniation / lesion

Treatment: Emergent Surgery

Lumbar Spinal Stenosis

- Narrowing of spinal canal
  - Degenerative
  - Congenital
- Older Individuals (over 50)
- Symptoms are variable:
  - Back pain
  - Radiculopathy
  - Neurogenic claudication

- Symptom severity doesn’t always correlate with severity of stenosis!
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

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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
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

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*