Clinical Presentation of Intervertebral Disc Degeneration

- Many are asymptomatic or minimally symptomatic, episodic
- Axial LBP with or without referred pain to buttock or posterior thigh
- Mechanical LBP, worse with sitting
- Painful forward flexion
- Imaging: radiographs, MRI, discography

Waddell’s Signs Nonorganic Physical Signs

- Tenderness: pain at the tip of the tailbone; pain, numbness, or giving way of the whole leg; pain to light touch
- Simulation: pain with light axial loading of the head or shoulders; pain with pelvic rotation through the hips; reproduction of pain with rolling of the lumbar skin
- Distraction: no pain with a sitting straight-leg (SLR), pain with a supine SLR
- Regional: nonanatomic distributions of weakness or sensory changes (especially in stocking glove distribution)
- Overreaction: moaning, trembling, collapsing, sweating, and multiple emergency admissions

MRI – The Study of Choice

HIZ (Hyperintense zone)

Degenerative bulging discs

Segmental instability

Discography

- MAY be the sole provocative test for pain generation from the intervertebral disc
- Fluid is injected under fluoro, increasing end-plate pressure, and creating a pain response that mimics typical sx
- Adjacent control levels should be pain free
- False positives low in normal patients (10%), but increases dramatically in chronic pain (40%) and abnormal psychometric subjects (83%)

**Table 145.7: Information Available from Discography**

- Patient’s pain response at the involved level
- Pain response at control levels
- Disc morphology
- Disc pressure and injectant volume

PAIN PROVACATION

D. Pelinkovic M.D., M&M Ortho, Naperville, IL
Painful Disc Principle

- Posterior portion of the annulus fibrosis is innervated by fibers of the sinuvertebral nerve, a branch of the dorsal root ganglion, responsible for axial back pain.
- Rat model – pain fibers are not innervated segmentally; sensory information from the disc is conducted to other spinal levels through the paravertebral sympathetic trunks.
- Therefore, decompression of the nerve root at one level is unlikely to help with LBP symptoms.
- Disc material – direct source of chemically irritative substances: phospholipase A2, prostaglandin E, substance P, & lactic acid.

Conservative Therapy

- Vast majority of LBP is due to myofascial strains.
- Incapacitating low back pain with disc degeneration.
  - Consider surgery only after a lengthy trial of non-operative treatments
    - PT
    - NSAIDs
    - Narcotics
    - Aerobic exercises

Current Treatment of Disabling LBP

- Natural History, Prevention Strategies
- Conservative treatment (medications, physical therapy, pain clinic, etc)
- Surgical Options
  - Spinal Fusion
  - IDET (intradiscal electrothermal therapy)
  - Artificial Disc
- Experimental
  - Dynamic stabilization
  - Biologic repair or regeneration of IVD
Surgical Consideration

- Pain and disability for over one year
- Failure of aggressive, surgeon directed non-operative management over at least 4 months
- One or two level disc degeneration on MRI with concordant discogram
- Resolution of litigation and worker’s compensation issues prior to surgery

Types of Lumbar Interbody Fusion

- Anterior Lumbar Interbody Fusion (ALIF)
- Posterior Lumbar Interbody Fusion (PLIF)
- Transforaminal Lumbar Interbody Fusion (TLIF)
- Circumferential Two Incision (360° – combined ALIF and posterior spinal fusion)

Posterolateral Spinal Fusion

- Traditional standard for lumbar stabilization
- Satisfactory outcomes range from 16 to 95%
  - Pseudarthrosis 14-70%
  - Reoperation rate 24%
  - Disability rate 25%
Disadvantages of posterolateral approach

- Small surface area available for fusion
- Tensile forces across the fusion site
- Pedicle screws improve fusion rates, but significant differences in outcome have not been reported
- Wide dissection
- Even a solid fusion allows micromotion at the disc space
- Biomechanical disadvantage in preventing shear and cantilever forces from causing motion in the anterior column

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Theory Behind Interbody Fusion

- Remove the presumptive pain generator – the disc
- Reduce the surgical morbidity associated with muscle stripping (ALIF)
- Wide cancellous beds are available for graft contact and subsequent fusion
- grafts are placed under compression
- Only large graft that place the perivertebral ligaments under tension can restore torsional stiffness to the facetectomized spinal motion segment

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Stand-alone ALIF (L2-S1)

Benefits:
- Stand-alone ALIF
- Zero-profile
- Biomechanically equivalent to a spacer with pedicle screw fixation

ALIF Results

- 125 pts ALIF w/ autogenous bone graft
- Spondylolisthesis, failed PLF, discitis, fx
- 98 of 125 – discogenic pain
- 78% - good relief of axial sx
- 98 of 125 – discogenic pain
- 74% - very much improved; 12% - little improvement; 14% - no improvement or worse after surgery


83 pts, 81% w/ solid fusion in 5yrs.
74% - very much improved; 12% - little improvement; 14% - no improvement or worse after surgery


Posterior Lumbar Interbody Fusion (PLIF/ TLIF) - ADVANTAGES

- Especially useful in LBP accompanied by symptomatic nerve root compression
- Isthmic spondylolisthesis (grade I or II) with radiculopathy
  - Reducing percentage of slip
  - Increasing disc height
  - High fusion rates (96 to 100%)
- Single, posterior approach for interbody and transpedicular fixation
- Avoids hypogastric plexus, anterior vascular structures

Outcomes PLIF

- Spondylolisthesis: 93% fusion rate, 95% excellent clinical results
- W/ adjunctive posterior instrumentation and fusion, 98.9% fusion rate and 86% clinical success
- LBP: 52.8% w/ improved sx

Outcomes TLIF

- No Long term outcomes
- 2 year F/U 90% fusion rates
- 85% had good to excellent results

D. Pelinkovic M.D., M&M Ortho, Naperville, IL
Conclusion

- Evolution of less invasive ways of achieving interbody fusion has expanded its application to various other spinal disorders.
- Interbody fusion can be performed with minimal morbidity to the patients, allowing improved correction of deformity, improved fusion rates, clinical results equal or better than PLIF alone.
- Selection of patients remains the critical component in achieving a high rate of clinical success with these procedures.

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Minimal invasive surgery Goals

- Improved outcomes
- Less Blood Loss
- Less Tissue Damage and Pain
- More Accuracy
- Safety

Patient selection

- Obese
- Muscular
- Elderly

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Surgical Treatment for Herniated Disc Causing Sciatica

- Indications: Persistent leg symptoms despite conservative treatment for at least 6 weeks (to improve the quality of life) and positive imaging study that correlates the clinical symptoms.
  - Microdiscectomy
  - Endoscopic discectomy,
  - Chemonucleolysis, etc.
- Outcome, learning curve, cost, duration of surgery, complications
- SPORT (The Spine Patient Outcomes Research Trial)
  - Weinstein et al, JAMA, 2007: HNP patients did better with surgery in observational cohorts but similar to conservative treatment in randomized cohorts.

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Minimally Invasive Techniques (Laminoplasty or Endoscopic)

- Hemilaminectomy
- Lateral recess decompression
- Contralateral decompression
- Best indicated for congenital stenosis, moderate stenosis, decompression for cases with concomitant instability

Lateral Approach

X - Lif
Oracle
D - Lif

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X-Stop

- 2 yr data
- 100 X-Stop
- 91 Controls
- X-Stop 73% satisfaction
  controls 36%
- 45% improvement in
  symptom severity score
  vs 7% controls

Minimal Invasive - Advantages

- Hospital stay 1.9 days
- Less blood loss
- Less postoperative back pain
- Quicker recovery

Minimal Invasive - Disadvantages

- More Hardware complications
- Learning curve
- Same fusion rate