Treating Bulging Discs & Sciatica

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Disclosures

• Depuy Spine
  – Teaching and courses

• K2 Spine
  – Complex Spine Study Group
Disclosures Take 2

• I am a spine surgeon
• I like spine surgery
• I believe in spine surgery
• I make a living performing and researching spine surgery
Overview

• Introduction/The Spine
• Bulging Discs
• Radiculopathy, AKA Sciatica
• Treatment
  – Non-operative
  – Operative
• Cauda Equina Syndrome
The Spine

- Bone
- Muscle/Ligament
- Disk
- Nerve
The Bones of the Spine

- 7 Cervical vertebrae
- 12 Thoracic vertebrae
- 5 Lumbar vertebrae
- The Sacrum
Vertebral body

- Body
- Pedicle
- Transverse process
- Superior articular process
- Lamina
- Vertebral foramen
- Spinous process
- Cortical rim
- Cancellous

Superior articular process

Facet for articular part of tubercle of rib

Demi-facet for head of rib

Inferior articular process
Lumbar vs. Cervical

10X Load

Cervical
Thoracolumbar
Lumbar

Cervical
Thoracolumbar
Lumbar
Muscles and Ligaments

• “Tension Band” function
• Provide the support for the bones and discs
  – Some of the strongest muscles in the body
• Help unload the discs and bones
The Intervertebral Discs

- Shock Absorbers
- Stabilizers
- Hydraulic Lifts
Structure

• Outer Layer
  – Annulus
  – Tough sheath around core
  – Provides Stability

• Central Core
  – Nucleus Pulposus
  – Water filled
  – Rubbery
  – Expands and contracts
Aging Discs

- Lose their water
- Lose their height
- Lose their resiliency
- Lose their strength
BULGING DISCS
What Do Bulging Discs Mean?

• Discs lose protein
• Then lose water
• Then lose resiliency
• Then lose height and bulge
• Sometimes herniate (spit material through the annulus)
What Do Bulging Discs Cause?

- No symptoms (sometimes)
- Back Pain (sometimes)
- Radiculopathy (sciatica)
- Stenosis (sciatica sort of)
- Cauda Equina Syndrome (emergency)
### Back Pain and Bulging Discs

Degenerative Disc Disease does not equal low back pain.

Normal aging process includes:
- Dehydration of nucleus
- Collapse of the disc space
- Sclerosis of the endplates

### Table: Anatomical Findings

<table>
<thead>
<tr>
<th>Study</th>
<th>Subjects</th>
<th>Herniated Disk</th>
<th>Bulging Disk</th>
<th>Degenerative Disk</th>
<th>Stenosis</th>
<th>Annular Tear</th>
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</thead>
<tbody>
<tr>
<td>Boden et al.²⁶</td>
<td>Volunteers &lt;60 yr old</td>
<td>22</td>
<td>54</td>
<td>46</td>
<td>1</td>
<td>NR</td>
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<tr>
<td></td>
<td>Volunteers ≥60 yr old</td>
<td>36</td>
<td>79</td>
<td>93</td>
<td>21</td>
<td>NR</td>
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<tr>
<td>Jensen et al.²⁷</td>
<td>Volunteers (mean age, 42 yr)</td>
<td>28</td>
<td>52</td>
<td>NR</td>
<td>7</td>
<td>14</td>
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<tr>
<td></td>
<td>Volunteers (mean age, 35 yr)</td>
<td>40</td>
<td>24</td>
<td>72</td>
<td>NR</td>
<td>33</td>
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<tr>
<td>Stadnik et al.²⁹</td>
<td>Patients referred for head or neck imaging (median age, 42 yr)</td>
<td>33</td>
<td>81</td>
<td>72</td>
<td>NR</td>
<td>56</td>
</tr>
</tbody>
</table>

*NR denotes not reported.
LUMBAR DISC HERNIATION/ RADICULOPATHY

Also Known As Sciatica
Lumbar Radiculopathy

- Dysfunction in a specific nerve root distribution
  - Pain
  - Weakness
  - Numbness
- Usual pattern is like a stripe down the leg
- Usually associated with disk herniation
“Nerve Pain”

- Burning
- Shocking
- Muscle cramping
- Generally responds poorly to traditional pain medicine
- Hurts to do “everything”
Other Causes of Leg Pain

• Cauda Equina Syndrome
  – Giant disc herniation

• Lumbar spinal stenosis
  – Spinal arthritis pinching multiple nerves
  – Usually older patients, usually both legs, less specific areas

• Problems with blood flow to the leg
  – Worse with exercise, better with rest

• Peripheral neuropathy
  – Diabetes, other illnesses
  – Stocking/glove pattern (starts at the toes, like a sock)

• Non-spinal nerve compression
  – No nerve compression on spine MRI

• Problems in the leg (knee or hip arthritis)
Lumbar Spine Nerve Roots

**L4 Neurologic Level**
- Motor: Tibialis Ant.
- Reflex
- Sensation: L4

**L5 Neurologic Level**
- Reflex
- Sensation: L5

**S1 Neurologic Level**
- Motor: Peroneus L. + b.
- Reflex
- Sensation: S1
Epidemiology

- Estimated incidence of symptomatic lumbar disc herniation 1-2%
  - Highest prevalence age 45-64
- Suspected risk factors
  - Sedentary lifestyle
  - Frequent driving
  - Chronic cough
  - Pregnancy
  - Smoking
  - Heavy lifting
Pathophysiology

Nerve Root Compression

Vs.

Inflammatory Response to Disc Material
Mechanical Compression

• Mixter and Barr describe discectomy for sciatica in 1934
• Animal studies show decreased nerve root nutrition with mechanical compression
• Histology shows intraneural edema
Biologic Response

• Radiculopathy in response to pieces of disc, without compression
• Animal model requires both displacement of nerve and exposure of disc material for radiculopathy
• Some inflammatory proteins have been identified in this process
NON-OPERATIVE TREATMENT
Natural History

- Multiple studies, multiple “interventions”
- 80% improve by six weeks
- 90% by twelve weeks
- 93% by 24 weeks
Non-Operative Interventions

• Medications
  – Anti-inflammatories
  – Pain medicine
  – Nerve pain medicine
Physical Therapy/Braces

• “Limited” evidence for braces in radiculopathy

• Physical therapy effective
  – Type equivocal
  – STAY ACTIVE!
Non-Operative Interventions

- Manipulation/Acupuncture
  - Unproven
  - Up against natural history, which is good
  - Some patients find good relief
  - Not dangerous
Epidural Steroid Injections

- Numbing medication and steroid (anti-inflammatory) next to the nerve
- Usually require special training (x-ray, anesthesiologist)
- Conflicting evidence whether they prevent surgery
- They help with pain! (usually)
“My Take”

- Natural history usually benign
- Non-operative options not dangerous
  - Acupuncture and chiropractic manipulation
- Physical Therapy effective
- Injections more invasive, not certain to prevent surgery, but definitely can improve comfort
OPERATIVE TREATMENT
Disc Herniation Surgery - Lumbar

- 1” incision
- Make a hole in lamina
- Pull nerve out of the way
- Remove bulging part of disc
  - Not whole disc
- Home the same day vs overnight in the hospital
Surgery trials

- Scandanavia 1970-1971 - 126 pts randomized surgical vs non-surgical
- At 1 yr, surgery pts did better than non-surgery
- At 4 yrs, trend for surgery better but not significant
- At 10 yrs, equivalent results
  - Residual pain primarily back pain
Neurologic Symptoms

- Weakness in 64 pts initially
  - Recovery unrelated to surgery vs conservative treatment
  - At four years, 20 pts with weakness
  - At ten years, 5 pts weak, equal between two groups
- Sensation similar to weakness
  - 35% had sensory dysfunction at 10 years
- Lumbar mobility equivalent between groups
Weber Conclusions

• Surgery better than conservative treatment but the difference becomes less noticeable over time
• 60% nonoperative treated patients have satisfactory result
• 3 month delay before surgery is “advisable” to allow for recovery with conservative measures
Maine Lumbar Spine Study

- 507 patient cohort, 275 surgery, 232 non-surgery
- Discectomy versus “non-operative treatment”
- Surgery group more satisfied
- No difference in return to work or function
- Less benefit of surgery in less symptomatic patients
SPORT Trial

- Prospective, Randomized NIH Trial 2000-2004
- 13 centers in U.S.
- 2 year follow-up
- Outcomes Measures
  - Patient survey scores
  - Work status
  - Satisfaction with care and with symptoms
  - Progress since enrollment
SPORT Trial

• Some conflict in interpretation
  – Lots of randomized patients switched groups
• Treatment Effects
  – Surgery significantly better in patient scores, self-rated improvement at 3 months, one year, two years
  – Treatment effect narrowed, but stayed significant between 3 mo and 2 years
  – Surgery worse for job status at 6 weeks, but equal at 3 and 6 months, one and two years equivocal
Surgery Need Is Questioned In Disk Injury

People with ruptured disks in their lower backs usually recover whether or not they have surgery…. The study … found that surgery appeared to relieve pain more quickly but that most people recovered eventually and that there was no harm in waiting.

And that, surgeons said, is likely to change medical practice.

The study … is the only large and well-designed trial to compare surgery for sciatica with waiting.
Conclusions

• 60-80% of patients don’t need surgery if they wait 6-12 weeks
• Surgery very effective if pain does not improve with non-op treatment
• Everybody gets back pain eventually
Conclusions

• Over time, surgery and non-surgery do the same (but non-surgery takes longer to get there)
  – Outlook is good either way
• Recurrence is about the same either way
  – About 3% per year
• Surgery trials are very hard to do!
“What I Want”

• Non-operative treatment for six weeks
  – Early evaluation by surgeon/interventionalist
  – PT, possible injection, oral pain meds
• Surgery at six weeks or 3 months if not better
• I will have back pain in the future
Case

- 29 yo female R posterior thigh and leg pain x 12 months
- Large extruded disc L5-S1
- No relief with PT, injections
- Taken to OR for laminectomy, discectomy, L5-S1
- Immediate relief of leg pain post-op
CAUDA EQUINA SYNDROME
Cauda Equina Syndrome

- Loss of control of bowel or bladder
  - Go and don’t know it
- “Whole leg” weakness
- Numbness around the rectum or genitals
- Rare
- Emergency Evaluation (ER)
Treatment

• Surgery
  – All trials have excluded diagnosis of cauda equina
  – Timing is debatable
    • Generally regarded as emergency/urgency
    • Data supports within 48 hours
    • Animal data implies earlier is better
  – Open (instead of minimally invasive)
Thank You

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