The Role of Surgery in the Treatment of Low Back Pain and Radiculopathy

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WW Fusion Volume by Disorder
2004E %

Tumor/Trauma 11%  Deformity 15%

Degeneration 74%
Pain source in degenerative conditions

- arthrogenic
- discogenic
- neurogenic
The Disc is the Key Structure!
RESEARCH RESULTS
State of the Art

Biomechanical differences
- Altered Loading
- Early tissue failure

Genetic differences
- SNPs for matrix proteins or enzymes

Matrix fragmentation products
- HA-f
- Fibronectin-f
- Collagen-f

Enzyme pattern
- HtrA1

Biochemical Factors ↔

Discogenic Pain

Proinflammatory Cytokines

Increased levels

Similar to cartilage

Increased susceptibility

Receptor differences
- TLRs
Preop Diagnostic

• Patient History, Examination
• X-ray
• CT
• MRI
• Diagnostic Injections
Correlation
Morphology vs. Low Back Pain

(Boden et al., JBJS 72A: 403, 1990)
(Boos et al, Spine 20:2613-2625, 1995)
60 healthy individuals (20-50 yrs.)

- 72% disc degeneration
- 33% anular tears (HIZ)
- 4% disc extrusions
- 3% endplate changes (Modic)

Predominant back – and/or leg pain?
Facet joint injection
Nerv root block
Discography und Testfixation
Operative Techniques

Decompression

Instrumented Fusion

Dynamic Fixation
Microsurgical Decompression in Disc Herniation and Spinal Stenosis
Prospective observational trial:

Patients: 743
Centre/States: 13 / 11
Indication: image proven HNP

I discectomy (n=528) vs. II usual care (n=191)

Age: 40.5 yrs vs. 43.7 yrs
Follow-up: 2 yrs

Weinstein et al JAMA 296:2451-9, 2006
- Significant improvements in both groups
- Greater improvements in operative group vs usual care

Weinstein et al Jama 296:2451-9, 2006
Decompression in Spinal Stenosis
Prosp. randomized / observational trial:

Patients: 289 / 365
Indication: Spinal Stenosis
Levels: 1 or more
I decomp surg (n=394) vs. II usual non-op tx (n=240)
Age: 63.6 yrs vs. 66.3 yrs
Follow-up: 2 yrs

Surgery offers improved outcome over non-op tx for all domains

Weinstein et al. NEJM 358: 794-810, 2008
Spinal Stenosis with local deformity needs instrumented fusion!
Instrumented Fusion: Facts

- Tremendous progress since 1983
- 540,000 Fusions per year worldwide
- Gold standard
Instrumented Fusion: Advantages

- High Primary Stability
- Rapid Mobilisation
- Promotes ingrowth bone graft
Instrumented Fusion: Goals

• Removal of the pain generator(s)
• Immobilisation of the pain generator(s)
• Anatomical reconstruction
Progress in Spinal Fusion: Factors

- Diagnostic tools
- Segmental analysis
- Minimized trauma
- Bone substitutes
Posterior Lumbar Instrumented Fusion (PLIF)
Stenosis with Spondylolisthesis
Anterior Lumbar Interbody Fusion (ALIF)
Principle of the approach
Skin Incision
L4/L5 Access: Ligate iliolumbar vein
Retractorsystem

- More than 1500 patients undergoing retroperitoneal approach since 1997
- 0.4% arterial injury
- 0.8% venous laceration
- 1 case of retrograde ejaculation
- 2 cases of ureteral injury
<table>
<thead>
<tr>
<th>Authors</th>
<th>Technique</th>
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<th>Fusion rate %</th>
<th>Successful Outcome %</th>
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<td>68/82</td>
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<td><strong>Total</strong></td>
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<td><strong>1138</strong></td>
<td><strong>86%</strong></td>
<td><strong>78.50%</strong></td>
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Translation/Degeneration in the first disc cranial to fusion correlates with the number of fused segments and the follow-up time. But translation did not correlate with clinical symptoms.

Spine Arthroplasty: Anterior Column

- Gene Transfer
- Autologous Disc/Chondrocyte Transplantation
- Nucleus pulposus Replacement
- Total Disc Replacement
Total disc prosthesis: Goals

- Removal of disc ("pain generator"?)
- Restoration of disc space height
  - anatomy of facet joints
  - load protection of facet joints
  - distraction neuroforamina, decompression
- Maintenance of mobility
  - physiological loads adjacent segments
- Fusion is not excluded (second line of defense !)
- Easy postop treatment with fast recovery
Summary

• Strong data to support safety and efficacy of Total Disc Replacement
  – Since Prodisc release 2006 >>5000 cases with <0.5% revision rate
  – Multiple RCTs (with 2-5 yr follow-up)
  – 10+ yr follow-up data from Europe
  – TDR results as good as fusion, superior on some measures

• Total Disc Replacement is similar in cost to fusion or less expensive
...because patient Satisfaction is good

90.9%  78.9%  65.0%
Total Disc Replacement:
- Important supplement in the surgical treatment algorithm
- approaches the key structure of segmental degeneration: the disc

Physiotherapy
Medication
Alternative Med

Injections:
- Facet Joints
- Epidural

Percutaneous Surgery (MIS):
- Decompression
- Fusion

Complex Fusion
Spine Arthroplasty
Good judgement comes from experience, and experience comes from bad judgement

- Barry Le Patner -
“medicine is more an art than a science”

“but do not neglect the science”