Back pain

John O’Dowd
RealHealth Institute
London
Overview

• Back pain general thoughts
• Biomechanics
• Psychosocial aspects
• Non operative care
• Preop investigation
• Surgery
What is back pain?

- Postural pain
- Injury
  - Soft tissue
  - Annulus
- Degenerative
  - Disc
  - Facet joint
  - Other
- Spondylolysis/listhesis
- Scoliosis
- Non spinal pathology
Back pain

Prevalence

- 14-30% Day of asking
- 30-40% Within one month
- 60% Lifetime
Back pain

• Acute episodes
  – 50% settle completely in 4 weeks
  – 15-20% persist > 1 year
  – 70% will have 3 or more recurrences

• 20% of all patients (50% population)
  – Back symptoms for long periods
Probability of return to work

100%

Time off work

2 years
Britain 1993

• 52 million lost working days
• 106 million days Sickness and Invalidity Benefit
• 150 million days total work incapacity
Incidence

• Static
• Total work incapacity days increasing exponentially
• Chronic low back disability increasing faster than any other form of incapacity
Low back disability

• Closely related to
  – Non medical factors
  – Occupational factors
    • Job satisfaction
    • Income
    • Socioeconomic factors
NHS cost

- £480 million

**Additional costs**
- 0.5 million private consultations £35 million
- 7.2 million private pt sessions £144 million
- Non prescribed medicine £18 million
- 52 million days off work £3.8 billion
- 106 million DSS benefits £1.4 billion
Spine pathology v back pain

100% vs time

2 years
RED FLAGS

Presentation  <20 yrs   >55
Significant trauma

Constant progressive or non mechanical pain
Night pain not relieved in supine position
Thoracic pain or abdominal pain

Past history  
Carcinoma
Systemic steroids
Drug abuse
HIV

Unexplained weight loss, Systemically unwell
Persisting severe limitation of lumbar flexion

Widespread neurology
Saddle anaesthesia, difficulty urinating, fecal incontinence.
Structural deformity
Overview

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- Surgery
The Myth of Instability
Harmon P.  
Indications for Spinal Fusion in Lumbar Diskopathy, instability and arthrosis Anatomic and functional pathology and review of the literature  
Clin Orthop Relat Res 1964;34:73-91
Footnote.

-Spinal instability is a clinical triad of low back pain, gluteal pain and thigh pain. It is due to disc degeneration and is not laminal hypermobility…or spinal hypermobility since anatomic hypermobility is not always productive of symptoms.
I no longer believe in the definition of instability that Gus White and I have popularised, but personally believe in two hypothesis; yours-the altered load pattern and mine-increased micro motion of neutral zone.”

Private communication August 2006.
Mechanical back pain is due to abnormal load patterns transmitted to the vertebrae because the degenerate disc is no longer isotrophiic and transmits load unevenly.
Isotrophic disc

Load

non-isotrophic disc

Load
Other suggested cause of Mechanical Back Pain

- Annulus and other ligaments stressed by abnormal movement
- Why then does disc replacement and flexible stabilization cure 50% of patients perhaps despite the fact that movement continues and posterior annulus is still present?
Chemical causes in the disc.

- Chemical events may well be the cause of some acute episodes of lumbago, but if deemed causative of chronic low back pain why are not all degenerate discs painful, and how do we explain the mechanical dimension of the pain, posture and load?
Facet joints.

• Facet joints can be painful but if a major cause why was facet fusion alone never successful?
• No relationship between degree of facet arthrosis and back pain in long term follow up of spondylolisthesis (Remes et al Eur Spine J. 14 (9) 833-42)
• Described as cause of disc replacement failure but never any evidence given
Function of the disc
To allow Movement
To transfer load.
Towards a better understanding of low-back pain: a review of the mechanism of the lumbar spine
Rheumatol Rehab 1975 Aug 14(3):129-43
- Nachemson A.

- Emphasised the relationship between pain and mechanical loading based on his work on intradiscal pressure measurements
- Demonstrated the pattern of loading in different positions, reduced when lying down and increased when sitting or bending and especially bending forward and lifting
Relative increase and decrease in intradiscal pressure in different supine, standing, and sitting postures, compared to the pressure in upright standing (100%).
Posture and load is central to back pain, not movement. It is the positions we are in that cause pain. We can be perfectly comfortable, and then we load the spine. The important loading of the spine is by muscle action.
Even in a stable compression fracture pain is due to abnormal loading and not movement, braces help pain by reducing muscle activity, and stopping patient moving into a position where load is increased—ie flexion, not stopping micromovement.
If Load, and not Movement causes pain...

• Explains the clinical history of the effect of posture, sitting, leaning forward, standing and unloading (pool & recumbence) on back pain

• explains success of manipulative techniques and rehab programs that may alter the position of tissues in the degenerate disc and hence alter loading patterns
If Load, and not Movement causes pain...

- Explains the random success of fusion-sometimes the fusion takes load, and sometimes the fusion is in such a position that the disc can load normally
Explains the random effect of disc degeneration in producing chronic low back pain - a degenerate disc may load normally or evenly dependant on the position and nature of degenerated material.
Explains the often episodic nature of acute back pain - as is dependant on the physical arrangement of the tissues within the disc, the concept of the stone in the shoe. This can change fortuitously or due to a physical event.
In Vivo Stress Measurement can predict Pain on Discography

McNally D, Shackleford I, Goodship, Mulholland RC
Spine Nov 15 1996 Vol 21 (22) 2580-2587
In Vivo Profilometry
Characteristics of a painful disc

• Multiple stress concentrations in the postero-lateral annulus
• Depressurised nucleus
• Marked broadening of the annulus
• High spot loading in the nucleus
• 90% of discs with above characteristics were painful
Laparoscopic Spinal Surgery  J.K.O,Dowd  
Eur Spine J. (2000) S3-S7  also reported at NASS San Francisco  1998

- 54 cases,  66 levels
- 22 Laparoscopic - 23 open- 3 posterior
- **Excellent 15%,  Good 30%,  Fair 4%**
- Unchanged 17%,  Worse 10%
- Felt that supplementary posterior fixation necessary
- Had a number of radicular complications
Paul C. McAfee 1999
NASS, Chicago

- Best proof of fusion is trabecular bone outside the cage
- Clinical results not dramatically different from other types of fusion
Results

von Mises stress distribution in the cancellous core under 0.3 mm displacement (uniform compressive load)
Results
A. Polikeit, L.-P. Nolte and T.E. Orr

• Increases of von Mises stresses with all models
• 1000 Newtons increase loads between 160% and 400%
• cages changed load transfer from periphery to beneath cage
• with flexion loads increased beneath cage to 560%
Syncage results did not reach clinical significance. Pseudarthrosis was not of relevance to results.

Femoral ring results were better and reached clinical significance. Was this because transfer of load by integrated bone is better than transfer by un-integrated metal?
Conclusion

If we can alter our mindset concerning back pain from it being movement related to being load related, this alters our approach to both the operative and non operative management of low back pain in all its various guises and the rationale and length of bracing of stable spinal fractures.
Overview

- Back pain general thoughts
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- Preop investigation
- Surgery
Incidence of back pain

- Yearly consultation rate 6% (3,000)
- 90% will cease to consult after 6/52
- Low level of psychological distress
- Employed
- Happy at work
- Sudden onset
- Short time before consultation
- Confined to low back pain for 1 year on medication
- 2250 of these still have pain or disability
- 300 still consulting after 12 months
- 21% of these become symptom free and stop consulting after 12 months
- 25% of these remain symptom free after 12 months
- 90% will cease to consult after 6/52

From Croft MBJ 1998, Macfarlane Pain 1999

Female
Older age
> 1 episode
High psychological distress
Poor self-related health
Low level of physical activity
Dissatisfaction with employment
Duration of pain
Leg pain
Widespread pain
Restriction of spinal mobility

Incidence of back pain associated with:
- Female
- Older age
- > 1 episode
- High psychological distress
- Poor self-related health
- Low level of physical activity
- Dissatisfaction with employment
- Duration of pain
- Leg pain
- Widespread pain
- Restriction of spinal mobility

From Croft MBJ 1998, Macfarlane Pain 1999
## Bothersomeness

- 1464 patients consulted with back pain (9.3% of pop)
- Analysis of 929 follow-ups at 6 months

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
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<td>28.1</td>
<td>45.4</td>
<td>53.5</td>
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<tr>
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<td>3.3</td>
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<td>0</td>
<td>3.2</td>
<td>13.1</td>
<td>51.1</td>
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Dunn & Croft Spine 2005
The problem of back pain

About 50% of the population will experience back pain in any year.

About 9% of the population will consult their GP on account of it

Across London this equates to 720,000 GP consultations
Of the people who consult their GP 37% will rate their pain as very bothersome.... and 14% as extremely bothersome.

Across London this equates to 100,000 people.
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<th>Intensity</th>
<th>Distress</th>
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<td>Throbbing</td>
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<tr>
<td>Shooting</td>
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<td>1</td>
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<td>Stabbing</td>
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<td>2</td>
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<tr>
<td>Sharp</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Cramping</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Gnawing</td>
<td>4</td>
<td>2</td>
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<td>Hot-burning</td>
<td>6</td>
<td>3</td>
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<tr>
<td>Aching</td>
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<td>Heavy</td>
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<td>4</td>
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<tr>
<td>Tender</td>
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<td>1</td>
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<td>Splitting</td>
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<td>1</td>
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<tr>
<td>Tiring-exhausting</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Sickening</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Fearful</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Punishing</td>
<td>4</td>
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G & T Test

One minute hand in ice

G & T Test
The relationship between MRI appearance of the lumbar spine and LBP, age and occupation in males

- 149 working men, office workers to draymen
- Disc degen age related commonest at L5/S1
- LBP commoner with age but not related to degen
- No relation between occupation and MRI
- 45% had abnormal MRIs
- 32% of asymptomatic subjects had abnormal MRI
- 47% of subjects with LBP had normal MRI

Savage et al Eur Spine J 1997
Three year incidence of LBP in an initially asymptomatic cohort

Jarvik et al Spine 2005

- 148 veterans: MRI, R & M, SF 12 followed 4 monthly for 3 years
- 123 repeat MRI at 3 years 67% reported pain
- Self identified depression 2.3x more likely to develop back pain
- No association between new LBP and endplate changes, disc degeneration, annular tears of facet degeneration
- New imaging findings rare

Medicolegal implications
Prediction of chronicity & disability

The development of chronicity following an episode of musculoskeletal pain is predicted by:

• Psychosocial factors not physical or biological  Burton 1995
• High initial pain level, social class  Rose 1997
• Distress as measured by MSPQ, fear avoidance and catastrophizing Linton 2005
• Work load  Linton 2005
Return to work

15 - 40% still off work
1:4 chance of being still off work at 1 year

5 - 20% still off work
1:1 chance of ever returning to job

1-10% still off work
1% chance of working again

Of 25 people still off work
6 will still be off at one year

Of 25 people still off work at 1 year
18 will not be back at work in 6/12
Catastrophizing = focus on threat,

- rumination,
- magnification,
- helplessness

“I can feel my neck click when I move”

overestimating threat,

“the bones are crumbling and I’ll be paralysed”

underestimating resources to deal with it

“nobody understands how to fix it, and I just can’t bear any more pain”
Catastrophic thinking enhances attentional interference

• student volunteers, electric stimulation, auditory task discrimination
• measurement of tendency to catastrophise
• threat induced: expectation of shock or told pain fibre stimulation

Conclusions
• catastrophisers showed marked task interference after threat
  – amplification of somatosensory information
  – priming of fear mechanisms
Why does back pain become chronic?

**Biological factors**
- Mechanical
- Inflammatory
- Neural

**Psychological factors**
- Personality
- Attribution
- Learning

**Societal factors**
- Family
- Work
- Legal
- Benefits
Dear Doctor
I think Mrs A. needs reviewing by an orthopaedic surgeon. She has not responded to any of my treatment. I am worried that there may be something serious......

Where now?
Something serious missing…

• Ongoing disability predicted by yellow flags (not physical injury)
• Patient persuaded by physio reason for failure to recover ‘something serious’
• 3 month wait for expert opinion or scan
• Lack of alternative care pathway

Pain + Fear + Inactivity (patient) + inactivity (doctor) = Disaster
Yellow flags

- Belief back pain is harmful or potentially severely disabling
- Fear avoidance behaviour or reduced activity level
- Tendency to low mood and social withdrawal
- Expectation that passive treatment rather than active participation will help
Yellow flag analysis

- What do you think is cause?
- Do you worry about getting better?
- What treatment do you need?
- How does your employer and work colleagues helping?
- How do you cope with your pain?
- When will you be back to work?
Orebro questionnaire  

- 24 questions focusing on yellow flags
- Questions on
  - Work absence and job satisfaction
  - Pain experience
  - Anxiety and depression
  - Physical limitations due to pain
  - Expectations of recovery
- Scored into three categories of risk
- 70-80% prediction of long term sick leave at 4 weeks pain duration
RealHealth primary care yellow flag check list

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes</th>
<th>Severe</th>
<th>Mild</th>
<th>Quite</th>
<th>No</th>
<th>Severe</th>
<th>Multidisciplinary assessment recommended</th>
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<td>Have you had sick leave for a similar problem?</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Any two in red box or three in amber box</td>
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<tr>
<td>Is your pain causing you ‘Stress’ or low mood ?</td>
<td>No</td>
<td>Mild</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Is your pain stopping you doing things?</td>
<td>No</td>
<td>Mild</td>
<td>Severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Is your employer keen to have you back to work?</td>
<td>Very</td>
<td>Quite</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>How bad is the pain at its worst (out of 10)?</td>
<td>2-6</td>
<td>7-8</td>
<td>9-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>When do you think you will get back to work?</td>
<td>Days</td>
<td>Weeks</td>
<td>Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Are there things you can do to ease your pain?</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Is your pain due to damage?</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>
Measure of disability, QOL etc

Worse group

Best (normal) group

Difference related to psychosocial factors

days  weeks  months  years
Re Mr JP

I would be grateful if you could offer an appointment to see Mr P.

He has a long standing problem of back pain which has gradually got worse.

In 1998 I sent him to have an MRI scan which showed some compression of the root at L5/S1 level on the right side and he does have referred pain along the sciatic nerve.

I would much appreciate I you reassess him.

Kindest regards
Mr JP age 58 unemployed (>10 years) scrap metal dealer low back pain >1 yr

Pain and bothersomeness
   Pain score last week 7/10
   Pain very bothersome

Distress
   21/30 on psychological screening (70%)
   High levels of depression, anxiety and distress
   Notes past history of depression

Physical
   38/50 on limitation of walking, household chores, shopping and sleep (76%)

General Health
   Self rated health ‘poor’. Smokes 30/day

Beliefs
   Very high risk that the pain will become persistent 10/10, and that physical activity will make the pain worse. Fear avoidant 10/10. Told spine crumbling in 1998.
Case study 2

- TI male age 39
- IT specialist technical support analyst in services
- Off work 4 months low back pain
- Mechanical low back pain
- Catastrophic view of damaged discs

- Attended 4 week programme
- Return to work plan with UNUM provident case manager
- Immediate return to work following end of programme
- Manager attended last day
- Initially 3 days/week, 4 days by 5th week
- Full time by 22 weeks
- Pacing drive to work
- Pacing software on computer
- Back to work full time within 4 months
- 1 x 20 minute break per day for stretch and relax
<table>
<thead>
<tr>
<th>Measure</th>
<th>Before</th>
<th>After</th>
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<td>Disability</td>
<td>60</td>
<td>27</td>
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<td>Confidence</td>
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<td>14</td>
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<tr>
<td>Catastrophise</td>
<td>28</td>
<td>12</td>
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<tr>
<td>Fear of move</td>
<td>40</td>
<td>26</td>
</tr>
<tr>
<td>Walk</td>
<td>88</td>
<td>275</td>
</tr>
<tr>
<td>Stand</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Stairs</td>
<td>21</td>
<td>55</td>
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</table>
Overview

• Back pain general thoughts
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• Psychosocial aspects
• Non operative care
• Preop investigation
• Surgery
Non surgical treatment

- Nothing
- Rest
- Pills
- Manipulation
- O’Dowd’s herbal rub
- Injections
- Rehabilitation
  - Core stability
  - Fitness
  - Spine care
Effectiveness of the back school. A review of the results of evidence based evaluation

*Nentwig CG Orthopade 1999 28:958-965*

- 18 rcts
- 5 systematic reviews
- 2 metaanalyses
- 5 task force guidelines
Effectiveness of the back school. A review of the results of evidence based evaluation

*Nentwig CG Orthopade 1999 28:958-965*

- Limited to strong evidence for effectiveness
- Clear effects on knowledge and behaviour change up to 6 months
- 3/5 task forces recommend back school for acute back pain in the work place
RCT for evaluation of fitness programme for patients with chronic lbp

Frost et al 1995 BMJ 310:151-4

- Randomised, blinded observer
- 71 patients
  - Control back school 35
  - Fitness programme over 4 weeks 36
- Significant differences at 6 month follow up
A prospective, randomised 5 year follow up study of functional restoration in chronic lbp

Bendix et al 1998 ESJ 7:111-119

- FRP (3 weeks)
  - Intensive physical training
  - Ergonomic training
  - Pain management
  - Education
- 5 year follow up 89%
- 238 patients
  - 106 v control
  - 132 v less intensive programme
A prospective, randomised 5 year follow up study of functional restoration in chronic lbp

*Bendix et al 1998 ESJ 7:111-119*

- Over 5 years, significantly
  - Fewer contacts with health care system
  - Fewer days of sick leave

- No difference
  - Pain
  - Disability
  - Medication usage
  - Sports activity
Back schools for non specific low back pain

van Tulder et al

• 15 rct’s
• 3 trials high quality
• back schools may be effective for patients with recurrent and chronic low back pain in occupational settings, but little is known about their cost effectiveness
Injection therapy for subacute and chronic lbp

Nelemans et al

• 21 rcts
• 11 v placebo
• only 8 achieved 50 methodological score
• no convincing evidence
Conclusion

- Acute back pain
  - NSAID
  - Muscle relaxant
  - Information
    - Work
    - Primary care
  - Early return to function
  - De-medicalise
Conclusion

• Simple chronic lbp
  – Back school ( in occupational setting)
  – Exercise therapy
  – FRP +/- pain reduction
• increase fitness and knowledge
• Work place intervention
• Self responsibility
Cost to return to work one patient

![Bar chart showing costs in thousands of dollars for SCS, Conv., Surgery, and PRP treatments. SCS has the highest cost, followed by Conv., Surgery, and PRP.](link to image)

Turk 2002
Functional restoration programme

• 1998 definition
  – Bendix
    • Physical exercises
    • Increased stamina
    • Psychological counselling
    • Patient education

• 2006 definition
  • Cognitive behaviourally driven
  • Physical reconditioning
  • Education
  • Work re-entry strategy
Cognitive impairment

Physical impairment

Social / occupational dimension
FRP

- Mayer Gatchel & Kishino Spine 1985
- Frost *Physiotherapy* 2000
  - Template for modern FRP
  - Multidisciplinary, team working
  - 70-75 hours
    - 50% activity
    - 50% education
Randomised controlled trial to compare surgical stabilisation of the lumbar spine with an intensive rehabilitation programme for patients with chronic low back pain: the MRC spine stabilisation trial

Jeremy Fairbank, Helen Frost, James Wilson-MacDonald, Ly-Mee Yu, Karen Barker, Rory Collins and for the Spine Stabilisation Trial Group

BMJ 2005;330;1233-; originally published online 23 May 2005; doi:10.1136/bmj.38441.620417.8F

• 2005
• Oxford/UK
• 349 patients, pain > 1 year
• multicentre, randomised to spinal fusion or outpatient functional restoration programme
• No difference in outcome at two years except in Oswestry disability score

• Conclusion
  – No clear evidence that surgery is better than an intensive rehabilitation programme
Surgery versus intensive rehabilitation programmes for chronic low back pain

- Spinal fusion surgery has only modest, if any, effects

If there is no firm evidence on surgery for chronic low back pain, are intensive rehabilitation programmes a relevant treatment option for patients?

A recent meta analysis recommended intensive treatment programmes ... less intensive treatment seems to be ineffective.

The recently issued European clinical guidelines recommend multidisciplinary rehabilitation for patients with chronic low back pain who have failed monodisciplinary treatments, and several national clinical guidelines also support this approach.

Nevertheless, it is still important to determine which patients will benefit most from such rehabilitation and will be suitable for entering these programmes.
Results
At two years, 38 patients randomised to rehabilitation had received rehabilitation and surgery whereas just seven surgery patients had received both treatments.
Total cost per patient was £7830 (SD £5202) in the surgery group and £4526 (SD £4155) in the rehabilitation arm, a significant difference of £3304.
Mean QALYs over the trial period were 1.004 (SD 0.405) in the surgery group and 0.936 (SD 0.431) in the intensive rehabilitation group, giving a non-significant difference of 0.068 (−0.020 to 0.156).
The incremental cost effectiveness ratio was estimated to be £48 588 per QALY gained (−£279 883 to £372 406).
What treatments work for back pain?

In this section
- Key points about treating short-term back pain
- Treatments for short-term back pain
- Key points about treating long-term back pain
- Treatments for long-term back pain

Back pain can make you feel miserable, but it usually gets better on its own. And there are a range of treatments that can help relieve the pain and keep you moving. Your doctor may offer you a combination of these treatments.

We've divided the treatments into those for back pain that lasts for 12 weeks or less (acute or short-term back pain) and pain that goes on for longer than 12 weeks (chronic or long-term back pain).

Key points about treating short-term back pain

- Staying in bed doesn't help if you have back pain. It won't make you any better, and could be harmful. **Stay as active as you can.**

- Doctors often advise paracetamol tablets for short-term pain relief. There hasn't been much research on them, but they may help.

- Drugs called nonsteroidal anti-inflammatory drugs (such as ibuprofen) can relieve back pain. But they can have side effects.
Treatments for long-term back pain

Which treatments work best? We've carefully weighed up the research and divided the treatments into categories.

You can find out more about each treatment by clicking on the links below.

For help in deciding which treatment is best for you, see How to use medical research in your health decisions.

Treatments that work

- **Multidisciplinary treatment programmes**: These are run by a team of professionals, including doctors, psychologists, and physiotherapists. [More...]

Treatments that are likely to work

- **Antidepressants**: These drugs relieve depression and may also help with pain. Doctors often use a type of antidepressant called a tricyclic antidepressant for bad back pain. Examples of these are imipramine, amitriptyline, nortriptyline and doxepin. [More...]

- **Exercise, including back exercises**: This is a programme of exercises designed to strengthen your back, keep you flexible and increase your general fitness. [More...]

- **Painkillers**: These include over-the-counter treatments such as paracetamol, as well as stronger painkillers you can only get on prescription. [More...]

- **Back schools**: These schools offer a series of classes where you learn how your back works and what can go wrong with it. [More...]

- **Behaviour therapy**: This involves learning how to change your behaviour and thoughts about your pain to help you to cope with it. [More...]


Patient assessment Physical examination and case history:
diagnostic triage, to identify spinal pathology, nerve root pain, and
prognostic factors (yellow flags) are recommended.

Conservative treatments:
CBT, exercise therapy, brief educational interventions, and multidisciplinary (bio-psycho-
social) treatment recommended
Back schools, and short courses of manipulation can also be considered.
Physical therapy (TENS, heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets) cannot be recommended.

Pharmacological treatments:
antidepressants, weak opioids and NSAIDs, muscle relaxants and capsicum plasters recommended; strong opioids can be considered

Invasive treatments:
Acupuncture, epidural corticosteroids, facet steroid injections, local facet nerve blocks, intradiscal injections, trigger point injections, botulinum toxin, prolotherapy, radiofrequency facet denervation, intradiscal radiofrequency lesioning, intradiscal electrothermal therapy, radiofrequency lesioning of the dorsal root ganglion, and spinal cord stimulation cannot be recommended for CLBP
Conclusion

• 2006
• Inappropriate for patients to undergo surgery for spinal pain without
  – Multidimensional assessment
  – Early cognitive intervention
  – Functional restoration programme
• Patients undergoing surgery post FRP optimum results as psychosocial dimension assessed and managed
Overview

• Back pain general thoughts
• Biomechanics
• Psychosocial aspects
• Non operative care
• Preop investigation
• Surgery
Indications

Establish pathological diagnosis
- Xray
- MRI / CT
- SPECT

Establish pain source
- Clinical assessment
- MRI / SPECT
- Provocative testing

Suitability for surgery
- Physical health
- Illness behaviour
- Secondary gain
- Psychometric testing

Measure patient impact
- Pain
- Disability
- Quality of life
Why?

- To add some science to the art of clinical assessment
Why?

- Diagnosis
- Plan interventive treatment
- Predict outcome of surgery
- Audit / research
Difficulty

- Fractured tibia
- Spinal fracture
- Spinal tumour
- Radicular pain
- Back pain
- Postoperative back pain
How

• Clinical assessment
• Non invasive imaging
• Invasive imaging
• Response to pain pathway interruption
  – Denervation
  – Surgery
Problems

- No gold standard in back pain
- Clinical picture referenced to imaging
- Imaging referenced to invasive tests
- All referenced to outcome of surgery

i.e. good surgical outcome=pain source identified
Efficacy

• Technical efficacy
• Diagnostic efficacy
• Therapeutic efficacy
• Outcome efficacy
Efficacy

• Technical efficacy
  – Image resolution
  – Safety
  – Reproducibility

• Diagnostic efficacy

• Therapeutic efficacy

• Outcome efficacy

Efficacy

- Technical efficacy
- Diagnostic efficacy
  - Ability to distinguish patients with versus without disease
    - Sensitivity
    - Specificity
- Therapeutic efficacy
- Outcome efficacy

Efficacy

- Technical efficacy
- Diagnostic efficacy
- Therapeutic efficacy
  - Integration into patient care
  - Is management modified
- Outcome efficacy

Efficacy

- Technical efficacy
- Diagnostic efficacy
- Therapeutic efficacy
- Outcome efficacy
  - Has test improved patient outcomes
  - Relative cost effectiveness

Leg pain

- 50 female
- L5 root pain
- Marginal MRI
- Root block
- L5 n root decompression
Non invasive imaging

- Xray
- MRI
- SPECT / isotope studies
- High incidence of irrelevant pathology
- High degree of interobserver error
- Low correlation with surgery outcomes
  - Except
    - Degenerative scoliosis
    - Degenerative spondylolisthesis
mri

- High incidence of asymptomatic pathology
- Variable correlation with provocation tests
- Modic changes
- Annular tears
• 302 asymptomatic females
• Increasing degenerate discs with age
  – age < 20 6%
  – age 21-40 > 1/3
  – age > 60 78%

Powell et al 1986 Lancet: 1366
mri accuracy in disc herniation

- sensitivity: 90%
- specificity: 70%
- +ve predictive value: 80%
- -ve predictive value: 80%
End plate changes

• Type I
  – End plate fissuring, vascularised fibrous tissue in marrow
    • ♦ T1
    • ♣ T2

• Type II
  – Yellow marrow in the vertebra
    • ♣ T1
    • -or♦ T2

• Type III
  – End plate sclerosis
    • ♦ T1
    • ♣ T2

Modic 1988
End plate changes

• 56 patients with discogenic back pain
• 152 disc levels
• 21/23 discs with Modic changes +ve pain
• 69/129 levels with no Modic changes painful

Braithwaite et al 1998, ESJ 7:363
Accuracy

Modic changes as pain predictor

- sensitivity 23.3%
- specificity 96.8%
- +ve predictive value 91.3%
- -ve predictive value 46.5%

Braithwaite et al 1998, ESJ 7:363
High Intensity Zone

- Focus of high intensity on a sagittal T2 weighted spin echo MRI
- Posterior annulus
- Separate from the nucleus
- Inflammation
- Vascular granulation tissue

Aprill & Bogduk 1992, BJR 65:361
Annular tears

- Prospective
- Blinded to MRI results
- 92 HIZ’s in 73 patients
  - 48% L4/5
  - 35% L5/S1
- Significant correlation
  - Abnormal disc morphology & HIZ
  - HIZ and concordant pain in abnormal discs

Lam et al. 2000, ESJ 9:36
HIZ

- 58 patients
- 152 discographies
  - 108 degenerate
  - 86 annular tears
  - 70/86 concordant pain
- 27 HIZ’s
  - 24 +ve pain provocation

## Accuracy

**HIZ as pain predictor**

<table>
<thead>
<tr>
<th></th>
<th>Lam</th>
<th>Saifuddin</th>
</tr>
</thead>
<tbody>
<tr>
<td>sensitivity</td>
<td>81%</td>
<td>26.7%</td>
</tr>
<tr>
<td>specificity</td>
<td>79%</td>
<td>95.2%</td>
</tr>
<tr>
<td>+ve predictive value</td>
<td>87%</td>
<td>88.9%</td>
</tr>
<tr>
<td>-ve predictive value</td>
<td></td>
<td>47%</td>
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</table>

*Lam et al 2000, ESJ 9:36*
SPECT

- Facet joint pain
- Pseudarthrosis
- 49 female
- Polio
- Fusion aet 15
- Back pain
Invasive imaging

- Nerve root injection
- Discography
- Facet injection
Invasive imaging

• Nerve root injection
• Discography
• Facet injection
Invasive imaging

- Nerve root injection
- Discography
  - Morphology
  - Pain reproduction
- Facet injection
Invasive imaging

- Nerve root injection
- Discography
- Facet injection
Invasive imaging

- Nerve root injection
- Discography
- Facet injection

Fraser et al 1987  
JBJS 69B: 26

- 18g needle 2.7%
- Two needle technique 0.7%

McCulloch & Waddell  
BJR 51:498

- 3/1500 0.2%

Antibiotic prophylaxis
Invasive imaging

- Nerve root injection
- Discography
- Facet injection

- Morphological
  - Adams et al 1986
  - Gibson et al 1986
- Volume/pressure
- Pain provocation
Invasive imaging

- Nerve root injection
- Discography
- Facet injection

Nottingham

1. Normal disc
2. Contrast to ant or post annulus
3. Contrast to both
4. Ground glass + leak
Invasive imaging

- Nerve root injection
- Discography
- Facet injection

Adams et al

1. Cottonball
2. Lobular
3. Irregular
4. Fissured
5. Ruptured
Invasive imaging

- Nerve root injection
- Discography
- Facet injection

- Pressure sensation i.e., no pain
- Dissimilar pain
- Similar pain
- Reproduction
Invasive imaging

- Nerve root injection
- Discography
- Facet injection
Gold standard

- Surgical outcome
Prediction of Fusion Outcome

• 35 patients with chronic low back pain
• Ex fix
• Discogram
• Xray, facet blocks

Esses et al 1989  Spine 14: 594
Prediction of Fusion Outcome

- Retrospective review
- Successful surgical outcome
  - +ve provocation 82%
  - -ve provocation 52%

Colhoun et al 1988  JBJS  70B:267
Prediction of Fusion Outcome

- Retrospective follow up study
- 2 year follow up
- 53 patients
- ALIF
  - Discography alone 50% success
  - + (mri, ct, myelo, emg) 78% success

Gill & Blumenthal 1992, Spine 17:940
Facet injections

- 126 patients
- Diagnostic facet injections
  - 82 fusion
  - 44 non operative treatment
- No correlation between result of facet injection and
  - Surgical outcomes
  - Outcomes of non operative treatment

Esses & Moro 1993  Spine 18:185
Conclusion

Pain source in back pain

• Clinical picture
• Non invasive mri
• Invasive discography
Overview

• Back pain general thoughts
• Biomechanics
• Psychosocial aspects
• Non operative care
• Preop investigation
• Surgery
The role of surgery in the painful spine

- Established
  - Spinal trauma
  - Spinal deformity
  - Spinal tumour
  - Leg and arm pain

- Not established
  - Axial back pain
Lumbar spine

• Leg pain
  – Acute disc herniation
  – Nerve root canal stenosis
  – Central lumbar stenosis

• Back pain
  – Identifiable mechanical instability
    • Spondylolysis
    • Spondylolisthesis
  – Non specific
    • DDD
    • Black disc disease
    • Instability
Surgery in low back pain

- What is low back pain?
- What is the pain source?
- What are the indications?
- What is the evidence for surgery?
- What type of surgery?
- Which approach?
Pathological indications

• Hard
• Relative
• Soft
Hard indications

• Degenerative
  – Spondylolisthesis
  – Scoliosis
Adult scoliosis
Relative indications

• Spinal stenosis
• Disc herniation
• Iatrogenic
  – Previous decompression
  – Previous fusion / pseudarthrosis
  – ‘Failed low back’ syndrome
Soft indications

- Spondylosis
- Segmental instability
- Discogenic pain
- Degenerative disc disease
- Black disc disease
- Back pain
Which operation?

- IDET
- Fusion
  - Non instrumented PLF
  - Instrumented PLF
  - ALIF/cages
  - 270°/360°
  - Stabilisation
    - Graf
    - Dynesys
  - Disc replacement
  - Genetic manipulation/innoculation
Evidence based medicine

- International panel review
- Cochrane review
- Metaanalysis
- **Randomised controlled trial**
- Comparative study, >2year FU
- Inventor series
- Uncontrolled case series
- Presentations
- Internet promotional material
- Press coverage
aspirin
v
spinal fusion
Incredible surgery on my back saved my career as a goalie

Daily Mail
July 1997
300 cases
‘New disc’
Return to sport
Surgery rates

SCO  ENG  SWE  NZ  AUS  NOR  DEN  NL  USA

0.13  0.19  0.33  0.4  0.44  0.49  0.64  0.73  1
Who needs the operation?

- Patient
- Doctor
- Insurance company
- Lawyer
- Healthcare system

and why.....?
One of These Women Had Back Surgery Yesterday.

Can you spot which one? At first glance, it’s hard to tell.
She feels great. She’s already out enjoying a day at the beach. And she’s free from the signs you’d expect of a recent back surgery. Why?
Because she received laser surgery at the Florida Spine Institute, the largest spine care center in the United States.
At one location, 19 board-certified eligible physicians (including spine surgeons, neurologists, neuroradiologists, medical spine specialists and pain psychologists, together with a team of over 150 support personnel) offer complete spinal care for both diagnosis and treatment. The experts at the Florida Spine Institute help over 7,000 patients a year.
Laser surgery has proven to be virtually risk-free and almost painless for patients lucky enough to be appropriate candidates. But it is available at very few medical centers in the United States or Canada. The Florida Spine Institute is proud to be one of them.
Unlike traditional back surgery, this remarkable new state-of-the-art technique allowed our sunbathing patient to enter the hospital in the morning and be discharged by noon. The incision is so small no stitches were even needed… just a tiny bandage.

She’ll be back to work in two or three weeks… painfree at last… and have nothing but a great tan to show for it. Which one is she? It’s Susan, in the middle. Now doesn’t that make the future look brighter than ever for back patients like you?
Laser surgery is only one of the many state-of-the-art treatments available at the Florida Spine Institute.
Call 1-800-477-7746 and speak to one of our nurses about our 72-Hour Diagnostic Evaluation Program. It includes, in addition to your visit to the Institute, local transportation and an optional three night stay in a luxury hotel on the Gulf of Mexico.

With our help, you could be back to your sunny self faster than you ever imagined.

Florida Spine Institute
The Experts in Neck and Back Care
2250 Drew Street, Clearwater, FL 34625
1-800-477-7746 or 813-298-5168

Call to receive a free information packet and video about laser surgery.
O’Dowd’s Herbal Rub

• Success rates
  – Low back pain  50% in 4 weeks
  – Sciatica       90% in 6 weeks
  – Cervical disc  90% in 3 months
O’Dowd’s spinal surgery emporium

• IDET
• Chymopapain
• Non instrumented fusion
• Instrumented fusion
• ALIF
• PLIF
• 360
• Graf ligament
• Dynesys
• Disc replacement
Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials

Gordon C S Smith, Jill P Pell

- BMJ 2003
- No RCT’s of parachute use identified
- Individuals who insist that all interventions need to be validated by a RCT need to come down to earth with a bump
Clinical reality

• Evidence based approach
  – Fashion
  – Reducing capacity for RCT’s in surgery

• Reality of clinical practice
  – Informed patient pressure
  – No evidence against
  – No treatment
  – Non operative
  – Operative
    • I wouldn’t
    • All non operative exhausted
    • Full insight
    • An option

• Currently
  – Funders losing interest in EBM
  – Main interest now is in cost effectiveness
Back pain

- Role of surgery at all
- Surgical technique
- Evidence based spinal surgery
- Cost effectiveness
Indications

Establish pathological diagnosis

Suitability for surgery

Physical health
Illness behaviour
Secondary gain
Psychometric testing

Measure patient impact

Pain
Disability
Quality of life

Establish pain source

Clinical assessment
MRI / SPECT
Provocative testing

Proving sources of pain
Clinical assessment
MRI / SPECT
Provocative testing

Measure patient impact

Pain
Disability
Quality of life

Suitability for surgery

Physical health
Illness behaviour
Secondary gain
Psychometric testing

Establish pathological diagnosis

Xray
MRI / CT
SPECT
What this is

• Market driven healthcare

V

• Patient care driven healthcare
Which operation?

- IDET
- Fusion
  - Non instrumented PLF
  - Instrumented PLF
  - ALIF/cages
  - $270^\circ/360^\circ$
  - Stabilisation
    - Graf
    - Dynesys
  - Disc replacement
  - Genetic manipulation/innoculation
Aim

• 10 questions
• 10 “answers”
• One conclusion
Is there a role for surgery at all?

• The main issue today
• Established ???
Low back pain analysis

Pedicle screw fixation in spinal disorders *European View*
Boos and Webb *ESJ 1997 6:2-18*
2001 Volvo Award Winner in Clinical Studies: Lumbar Fusion Versus Nonsurgical Treatment for Chronic Low Back Pain
A Multicenter Randomized Controlled Trial From the Swedish Lumbar Spine Study Group
Fritzell et al 2001  Spine  26:2521

- 19 centres
- 294 patients  98% follow up
- Age 25-65, clbp > 2 years, spondylosis at L4/5, L5/S1 or both
- 4 way randomised
  - 3 surgical groups n=222
    - PLF with TLSO for 5 months
    - PLF + PF (DePuy Acromed VSP)
    - PLF+PF+ALIF or PLIF
  - Non surgical group  n=72
    - Variable including
      - Physiotherapy
      - Education, cognitive & functional training
      - Pain rx
Results

• Back pain reduction
  – Surgical group 33% (64 to 43)
  – Non surgical group 7% (63-58)
  – Pain improved most during first six months and then deteriorated

• ODI reduction
  – Surgical group 25% (47 to 36)
  – Non surgical group 6% (48-46)

• Depressive symptom reduction (Zung)
  – Surgical group 20%
  – Non surgical group 7% (p=0.12)

• Self rating better or much better
  – Surgical group 63%
  – Non surgical group 29%

• Back to work
  – Surgical group 36%
  – Non surgical group 13%

• Surgical early complication rate 17%
Randomised controlled trial to compare surgical stabilisation of the lumbar spine with an intensive rehabilitation programme for patients with chronic low back pain: the MRC spine stabilisation trial

Jeremy Fairbank, Helen Frost, James Wilson-MacDonald, Ly-Mee Yu, Karen Barker, Rory Collins and for the Spine Stabilisation Trial Group

BMJ 2005;330;1233-; originally published online 23 May 2005; doi:10.1136/bmj.38441.620417.8F

- 2005
- Oxford/UK
- 349 patients, pain > 1 year
- multicentre, randomised to spinal fusion or outpatient functional restoration programme
- No difference in outcome at two years except in Oswestry disability score

Conclusion
- No clear evidence that surgery is better than an intensive rehabilitation programme
Are surgeons responsible for the back surgery epidemic?

• Are health care professionals the cause of the back pain epidemic

• Kostuik 2005
  – Total disc arthroplasty
  – Implantable cardiac defibrillator
Boike W et al

- Car manufacturing community Michigan
- Pattern of spine care had spiralled out of control
- Pattern of care diverged from evidence based standards
- Led to community based recommendations
  - Physician behaviour
  - Evidence based practice
  - Screen for psychosocial issues
  - etc
Have we established results for fusion?
Does interbody fusion confer an advantage?
Chronic low back pain and fusion. A comparison of three surgical techniques. A prospective multicentre randomised study from the Swedish Lumbar Spine Study Group

Fritzell et al et al 2002
Spine 27: 1131-1141

- **294 patients randomised**
  - 222 surgery
    - 73 posterolateral fusion
    - 74 + pedicle fixation
    - 75 + interbody fusion
      - 56 ALIF
      - 19 PLIF
  - 72 non surgical

- **Age 25-65**
  - 2 years low back pain
  - Spondylosis
  - Previousis non operative treatment
Results

• 91% independent review
  – Pain and disability reduced all groups (ns)
  – Instrumented groups
    • Longer surgery
    • More blood transfused
    • Longer hospital stay
  – Early complication rate
    • Non instrumented 6%
    • + pedicle fixation 16%
    • + ALIF/PLIF 31%
  – Fusion rate
    • Non instrumented 72%
    • + pedicle fixation 87%
    • + ALIF/PLIF 91%

• “no obvious disadvantage in using the least demanding technique”
• Outcome not related to operation or surgeon

Fritzell et al et al 2002 Spine 27: 1131-1141
Can we hear the message?

• In back pain

• Outcome is not influenced by
  – Surgeon
  – Operation

• Patient selection
  – Psychosocial screening and treatment
    • RealHealth Institute
  – Secondary gain
    • Florida
What are the potential advantages of disc replacement?

• Maintain movement
• Adjacent segment problems at long term follow up
Charite
ESJ October 2005
*Putzier et al*

- Charite I-III 1984-1988
- First consecutive 86 discs (71 patients (1984-1991))
- Average follow up 17 years
- No significant difference in clinical outcomes between the three types
  - i.e. design not important
- 11% required revision surgery
Charite

- 60% spontaneous fusion
- Spontaneous fusion had better clinical outcomes
- Even revision to fusion cases had significantly better clinical outcomes than mobile discs
- Mobile discs had no adjacent segment changes, BUT clinically less good than ankylosed
- Overall 17% adjacent segment degeneration rate equivalent to fusion studies

- Did they get the message?
Charite

- As a result of these results, in 2005 the Charite clinic has stopped doing disc replacement
Is disc replacement an evidence based treatment?
Total disc replacement for chronic low back pain: background and a systematic review of the literature

Questions:

• clinical results ?
• radiological results ?
• motion ?
• adjacent segment degeneration ?
• complication rate ?
• salvage ?
• what is the optimal indication ?
Results

• Short term results (1-68 months) comparable to fusion
• No measurement of
  – Loosening
  – Subsidence
  – Polyethylene wear
• Up to 26% demonstrate no movement at follow up
• 411 patients
  – No infection
  – 6 venous injuries
  – 2 arterial injuries (1 at removal)
• Conclusion
  – Insufficient data to support its use
  – Experimental
Cochrane 2005

• 31 RCT’s
  – Little information on
    • Occupational outcomes
    • Outcomes beyond 2-3 years

• Preliminary data on disc arthroplasty
  – Conclusions not possible
Are we completely mad

- Patients
Google/Medline index

- <1 Healthy
- >1 Topical
- >10 Concern

- Disc replacement 4,220,000 / 739  5710
- Spine arthroplasty 185,000 / 317  583
- Charite disc replacement 16,600 / 33  503
NICE

• National Institute of Clinical Excellence
• One of four regulatory bodies
• Review process anonymous
  – NHS obliged to provide funding and resources if NICE recommends
  – Private sector follow

• Disc replacement pre Sept 2004
  – Literature search October 2002
  – Not recommended
November 2004
Guidance changed

• What changed
  – Hard to tell
  – The only difference was the Geisler paper

• What does the guidance say
  – Little evidence beyond 2-3 years
  – Indications
    • Herniated lumbar intervertebral disc
    • DDD lumbar spine
    • Post laminectomy syndrome lumbar spine
    • Low back pain refractory to conservative Rx > 6 months
NICE

• Efficacy quoted
  – 63%, 79% good/excellent
  – Quote Giesler

• Complications
  – 16%-45%
  – Re operation rates 3-24%
  – Listed
    • Pain
    • Infection
    • Vascular damage
    • Presacral nerve injury
Neurological complications of lumbar artificial disc replacement and comparison of clinical results with those related to lumbar arthrodesis in the literature: results of a multicenter, prospective, randomised IDE study of Charite intervertebral disc

*Geisler et al J Neurosurg (Spine 2) 1:143-154, September 2004*

- 304 patients
  - 205 Charite, 3rd generation
  - 99 BAK ALIF + iliac crest bone graft

- Results
  - ODI no significant difference at 12 and 24 months
  - VAS no significant difference
    - Also compared to historical cohorts ns
  - Neurological adverse events no significant difference
Geisler et al

- Control group  BAK stand alone
- Non peer reviewed
  - Invited submission
- Conflict of interest
  - In the paper all authors “have a financial interest in subject matter contained in this manuscript”
  - Study and all participants funded by Depuy
- Low rate of adverse events
  - Efficacy study under ideal conditions
  - Enthusiastic surgeons
The Treatment of Disabling Single-Level Lumbar Discogenic Low Back Pain With Total Disc Arthroplasty Utilizing the Prodisc Prosthesis
A Prospective Study With 2-Year Minimum Follow-up

Rudolf Bertagnoli, MD,* James J. Yue, MD,† Rahul V. Shah, MD;† Regina Nanieva, BA;† Frank Pfeiffer, MD;† Andrea Fenk-Mayer, MD;† Trace Kershaw, PhD;§ and Daniel S. Husted, MD†

• ODI 54%
• VAS 40%
Nottingham series

- Prospective study
- Open from November 1994
- Laparoscopic from January 1995
- 51 cases
- 64 levels
  - 22 laparoscopic
  - 3 conversions
  - 23 open (13 two level)
  - 3 PLIF
Pain - anterior BAK

- Pre op
- 3 months
- 6 months
- 12 months
- 24 months

Values:
- Pre op: 100
- 3 months: 79
- 6 months: 58
- 12 months: 70
- 24 months: 71
ODI - anterior BAK

Pre op  | 3 months | 6 months | 12 months | 24 months
---|---|---|---|---
100 | 84 | 85 | 75 | 77

Values are percentages.
Failure rate

- 31% anterior cages
- Mean 15 months
- range 2-25
Are we crazy?

- We finally have
  - Safe
  - Evidence based
  - Simple
  - Treatment for back pain
  - In selected patients

- And we immediately
  - Change
  - To a non evidence based
  - Market driven
  - Possibly unsafe
  - Expensive

- Alternative
Conclusion

• Surgery for back pain
  – Works in some selected patients

  – Not really evidence based
  – Too often done for the wrong reason
    • Wrong indication
    • Wrong patient
    • Wrong information

  – Technique not important

  – Inappropriate use of health care resources

  – We should stop
Hippocrates

- Primum non nocere

Thank you