Lumbar spinal fusion

G R C Howie FRACS (Orth)

Ascot Hospital, 90 Green Lane East, Remuera, Auckland 1050
howie@howie.co.nz
www.howie@howie.co.nz
Declaration of interests

Lecture fees (RNZCGP, Auckland University of Technology) 2010 – 2015 $1426.57
Travel expenses and accommodation – paid by ACC
Shares, royalties, consultant fees form implant companies – nil
Ownership of imaging or rehabilitation facilities - nil
The global burden of low back pain

Low back pain (LBP) is well documented as an extremely common health problem. It is the leading cause of activity limitation and work absence throughout the world.


Copyright G R C Howie
Causes of acute back pain

Muscle spasm
Disc “injury”
Facet joint “injury”
Fracture
Tumour
Instability
Referred
Nerve compression incl. cauda equina
Is this really an accident?

49% of patients referred to a spinal specialist as ACC have either:
  • Not had an accident (at all)
  • Have not had an injury which would cause the problem
  • Have significant pre-existing radiological disease
  • Have had previous similar episodes (recurrent instability)

100% of patients have bent down in previous 48 hours (from telephone survey of 200 Aucklanders aged 30 – 70)
Treatment of acute back

Drugs: paracetamol
NSAID’s
Muscle relaxants
Diazepam
Tricyclics
Prednisone
Epidural steroid injections
Manipulation
Massage
Bed rest

Show me the evidence.
Efficacy of paracetamol for acute low-back pain: a double-blind, randomised controlled trial

Our findings suggest that regular or as-needed dosing with paracetamol does not affect recovery time compared with placebo in low-back pain, and question the universal endorsement of paracetamol in this patient group.
Conclusions Paracetamol is ineffective in the treatment of low back pain and provides minimal short term benefit for people with osteoarthritis. These results support the reconsideration of recommendations to use paracetamol for patients with low back pain and osteoarthritis of the hip or knee in clinical practice guidelines.
A new study provides the strongest evidence that anticholinergic drugs may increase the risk for dementia in older adults. The drugs implicated are commonly used, estimated to be taken by about 20% of the older adult population for many conditions. They include popular antihistamines sold over the counter as sleep aids, such as diphenhydramine (Benadryl, McNeil-PPC Inc), or for allergy relief, such as chlorpheniramine; oxybutynin and tolterodine for overactive bladder; and the tricyclic antidepressants, such as doxepin or amitriptyline, even when used at low doses for migraine prevention or neuropathic pain.
Psychotropic medications, including antidepressants, benzodiazepines, and particularly opiate and non-opiate analgesics, are associated with a significantly increased risk for homicide, new research shows. Jari Tiihonen, MD, PhD, professor, Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden, and colleagues found that antidepressants increase the homicide risk by 31% and that benzodiazepines increase the risk by 45%.

Further, the use of opiate and non-opiate analgesics was associated with a two- and threefold increased risk for homicide, respectively. Interestingly, antipsychotics were not associated with an increased homicide risk.
The risk of heart attack or stroke can occur as early as the first weeks of using an NSAID. The risk may increase with longer use of the NSAID. This risk appears greater at higher doses.

NSAIDs can increase the risk of heart attack or stroke in patients with or without heart disease or risk factors for heart disease.

In general, patients with heart disease or risk factors for it have a greater likelihood of heart attack or stroke following NSAID use than patients without these risk factors because they have a higher risk at baseline.

There is an increased risk of heart failure with NSAID use.
Avoid imaging tests for low back pain without specific indications. Avoid imaging within first six weeks in absence of history of cancer, AAA, or neurological deficit.

From Choosing wisely

But, from Sackett et al, are the beliefs of the community about the value of the interventions incompatible with the guidelines?

BOGSAT – see urban dictionary
"I don’t think it’s anything serious, but, just to be sure, I’m going to bill you as if it is."
Red Flags

• HISTORY OF CANCER
• Significant trauma
• Weight loss
• Steroids / immune suppression
• Age over 65
• Severe unremitting night pain
• Pain worse lying down
• Cauda equina syndrome
Causes of chronic low back

- Disc protrusion / post discectomy
- Annular tear
- Modic changes (infection??)
- Congenital issues – sacralization / SBO
- Fracture
- Facet joint disease, including cyst
- Scheuermann’s disease in males
- Spondylolisthesis – isthmic / degenerative / dysplastic
- Tumour
- Abnormal discogram
- Obesity

Copyright G R C Howie
Disc degeneration in asymptomatic patients

3110 patients in 33 papers

Disc degeneration: 37% incidence in 20 year olds and 96% in 80 year olds

Disc protrusions: 29% at 20 to 43% at 80

Annular fissure: 19% at 20 to 29% at 80 years

W. Brinjikji et al. AJNR 2015
Non-surgical alternatives to fusion

Exercise/s – which?
- Massage
- Manipulation
- Acupuncture
- TENS
- ESI (Epidural steroid injection)
- Facet joint injection
- Sacro-iliac injection
- Radiofrequency rhizolysis
- CBT (Cognitive behavioural therapy)
- Mindfulness
- Zen therapy
- Acceptance

Literature review Spine, 2014, 39, 1314
Surgical alternatives to fusion

IDET – Intra-Discal Electrotherapy
Discectomy
Decompression
Soft stabilization
Interposition arthroplasty
Spinous process stabilizers
Total disc replacement

Copyright G R C Howie
Scott's parabola: the rise and fall of a surgical technique

PROMISING IDEA

- 'Of possible value - but only as a research tool'
- Encouraging reports

Widespread enthusiasm
- General introduction
- Doubts creep in
- Damaging survey reported
- Condemned by several authorities
- Falls into disuse
- Operating theatre staff ponder possible uses for large quantities of expensive, obsolete equipment

Used only in highly specialised circumstances
Scott’s parabola – the rise and fall of new therapies

The new therapy is quickly abandoned when exposed to critical analysis

BMJ 2001;323:1477.
Is there something wrong with the scientific method?
By Jonah Lehrer

The decline effect is troubling because it reminds us how difficult it is to prove anything. We like to pretend that our experiments define the truth for us. But that’s often not the case. Just because an idea is true doesn’t mean it can be proved. And just because an idea can be proved doesn’t mean it’s true. When the experiments are done, we still have to choose what to believe.
Spinal fusion for chronic low back pain – patient selection

Literature review 1966 – 2010

No sub set of patients with CLBP could be identified for whom spinal fusion is a predictable and effective treatment.


Copyright G R C Howie
Pain Drawing

Draw location of your pain or body outlines and mark how bad it is on pain line at bottom of page.

Ache: Burning: Numbness: Pins & Needles: Stabbing: Other:

---
---
---
---
---

Back

Please draw your face

Left

Right Right

Front

Left

28/5/13

BP 3/7/10
LP 4/8/10
ODZ 4/0

23/10/13

Fus 21/11/14

5 6/13

Fus 6-8/10

ODZ = 584

7 6/15
Who does well?

Patients with overt limited disc disease
Patients with a job
Patients with a partner
Patients who do not smoke or abuse drugs
Patients who will exercise and follow instructions
Those who do well with conservative management also do well with surgery
Primary lumbosacral fusion

All patients January 2010 – December 2013 – total number 37
Single level fusion
No previous surgery
Majority with associated disc protrusion
29 good  3 fair  2 poor  2 late fusion other levels  1 non-union
78% good result
Lumbosacral fusion post discectomy / decompression

All patients January 2010 – December 2013 – total number 23
Single level fusion
All previous surgery
17 good  6 poor (all ACC patients) 1 non-union
74% good result
Acute sciatica with LBP
8mm high 11mm wide cage
Approaches to fusion – back, front or side?

PLF – posterolateral fusion
PLIF – posterior interbody fusion
TLIF – transforaminal interbody fusion
ALIF – anterior lumbar interbody fusion
Direct lateral / X-Lift
Oblique lateral
Per sacral

Copyright G R C Howie
Bone material

The Gold Standard – autogenous iliac crest
Morcellized bone from laminectomy / decompression
Allograft bone – femoral ring or morcellized bone
Xenograft
Coral
Calcified materials
BMP – bone morphogenic protein
Watch this space

Copyright G R C Howie
Fixation methods

No fixation
Wire
Wire with rods
Spinous process plates
Facet screw fixation (Magerl trans laminar screws)
Pedicle screws
Anterior plates with screws
Why fixation?

Improved fusion rates
Correction of scoliosis / coronal imbalance
Correction of lost lordosis / sagittal imbalance
What cost fixation?

Real absolute costs
Interference with adjacent facet joints
Stiff constructs
Nerve injury
Metallosis – alloy dependent
Need for removal

Copyright G R C Howie
Interbody support

Autogenous Tri-cortical graft
Femoral allograft
Interbody cages: carbon fibre cage (with PEEK), metal mesh, metal cages, PEEK cages
Solid PEEK wedges
Expansile cages
Complications of surgery

Anaesthetic: allergies / cardiac / ventilation issues / pressure areas esp. ulnar nerve / iv site

Surgical: bleeding / transfusion / nerve injury / dural tear / infection / imaging difficulties / screw problems / DVT / constipation

Late: loss of fixation / non-union / adjacent segment degeneration

Copyright G R C Howie
Adjacent segment degeneration

Disease related
Bone related
Approach related
Implant related
Number of segments
Age related

Lehman, Spine, 1987, 12, 97
Mannion et al Spine, 2014, 17, 1373
ASD following posterior lumbar fusion

Five year incidence:
One level 9%, two level 16%, three or four level 28%

Ten year incidence:
One level 17%, two level 34%, three plus level 41%

91% follow up of 902 patients
W Sears, Sydney 2010
Adjacent segment degeneration – long term follow up case series

Standing lateral radiographs taken at 13 +/- 4 years post randomization surgery / non-operative care.

Fusion was associated with lower disc height. Reduced disc height had no influence on patient self rated outcomes (pain or disability)

Mannion et al, Spine, 39, 17, 1373 -1383
Subdiagnosis and outcome after spinal fusion for degenerative disc disease – two decades of literature

Trends:
Better fusion rates and outcomes with instrumentation for degen. spondylolisthesis.
Better results without instrumentation in non-spondylolisthesis group
Highest complication rates in degenerative scoliosis but best outcomes.

Bono and Lee Spine 2005, 30, 227
Disabling LBP after lumbar disc herniation and Modic changes

Better results of lumbosacral fusion in patients with Modic type I change. Onimus 1997

But 35% prevalence Modic I change one year post discectomy. El Barzouhi 2013

No correlation disabling back pain and Modic changes (type 0 12% - I 16% - II 11%)
Retrospective review with minimum two-year follow-up of 52 patients treated between 1989 and 1998 with a variety of fixation methods.

A good result was defined as a pain level of less than four out of 10 and an Oswestry Disability Score of less than 30%. Only 13 patients achieved a good result. The best results were seen in the patients with rigid fixation (8 out of 21). A fusion rate of 100% was achieved in patients who had an interbody cage and rigid fixation.

Social factors are important criteria for patient selection. No patient without a “significant partner” achieved a good result.
Hello there, I trust this is what you are after?
Good indications for spinal fusion

Advanced Lumbosacral disc degeneration
Post discectomy (> 12 months)
Isthmic spondylolisthesis
Degenerative spondylolisthesis
Loss of lordosis / sagittal imbalance
Stenosis above fusion
Degenerative scoliosis (improvement in QALY similar to Joint replacement)
Rehabilitation after Lumbar Spinal Fusion

Early start of rehab at 6 weeks gave inferior results to those who began at 12 weeks
Spine 2012, 37, 1803

Group based intervention better than video instruction or intensive physiotherapy
Spine 2003, 28, 2561
New trends and new hopes

MISS – minimally invasive spinal surgery
Soft stabilization, e.g., topping off
Softer rods
Screws for osteoporosis

Not yet:
Stem cell therapy
Growth factors
Hello there

I trust this is what you are after?

“Try to focus less on a cure and more on a treatment you can afford.”
5 step plan for chronic pain

Understanding
Accepting
Calming
Balancing
Coping

REMEMBER Advice on activity and appropriate reassurance is empowering

Ann Fam Med 2013: 527 - 534