

Which Spinal Conditions Can
Be Surgical?

What Operation is Best and
are the Outcomes Worth it?

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Marek Szpalski, M.D., Ph.D.

- **Degenerative**
- **Trauma**
- **Deformity**
- **Tumors**
- **Infection**



- **Degenerative**

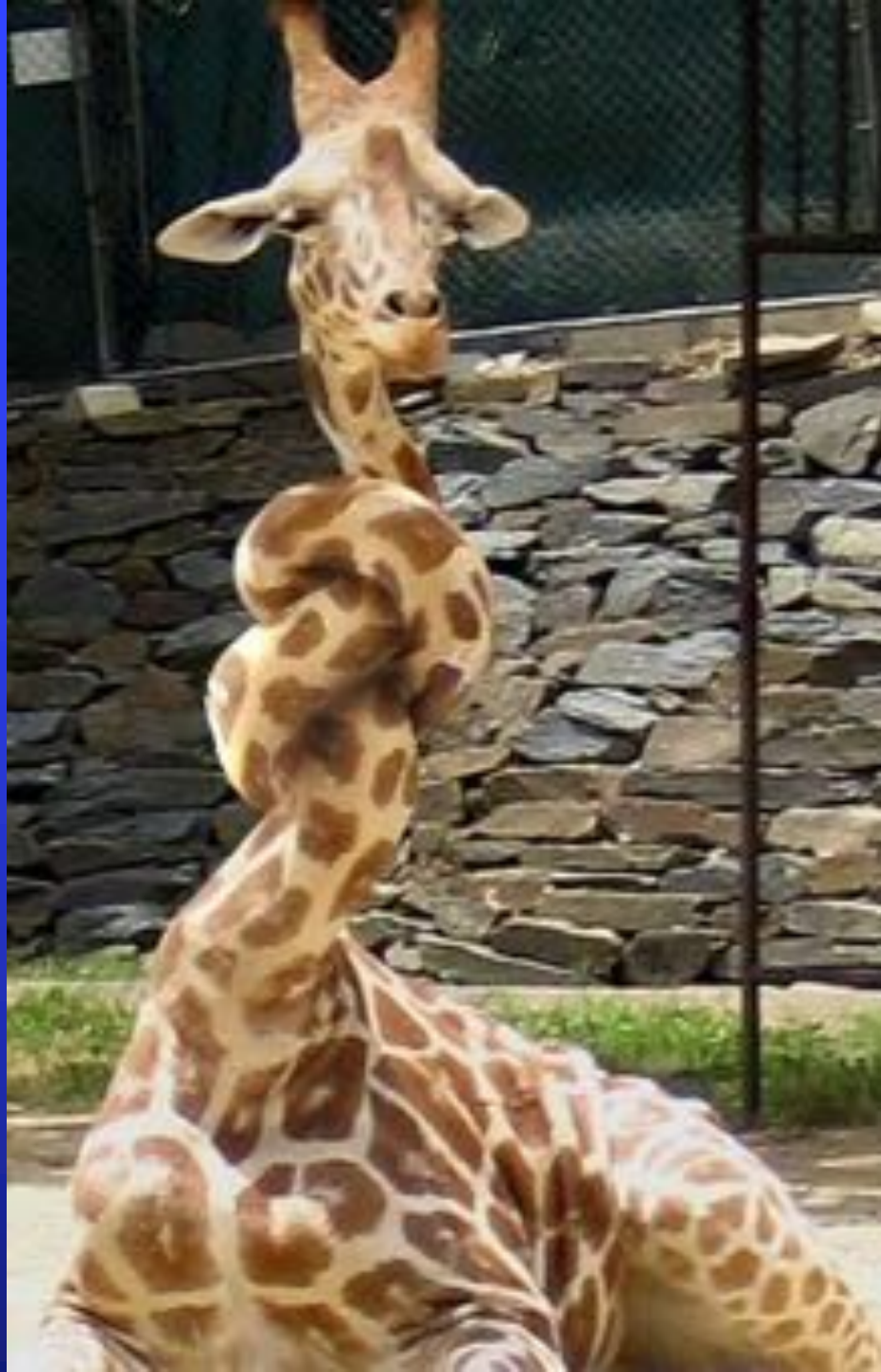
- **Trauma**

- **Deformity**

- **Tumors**

- **Infection**

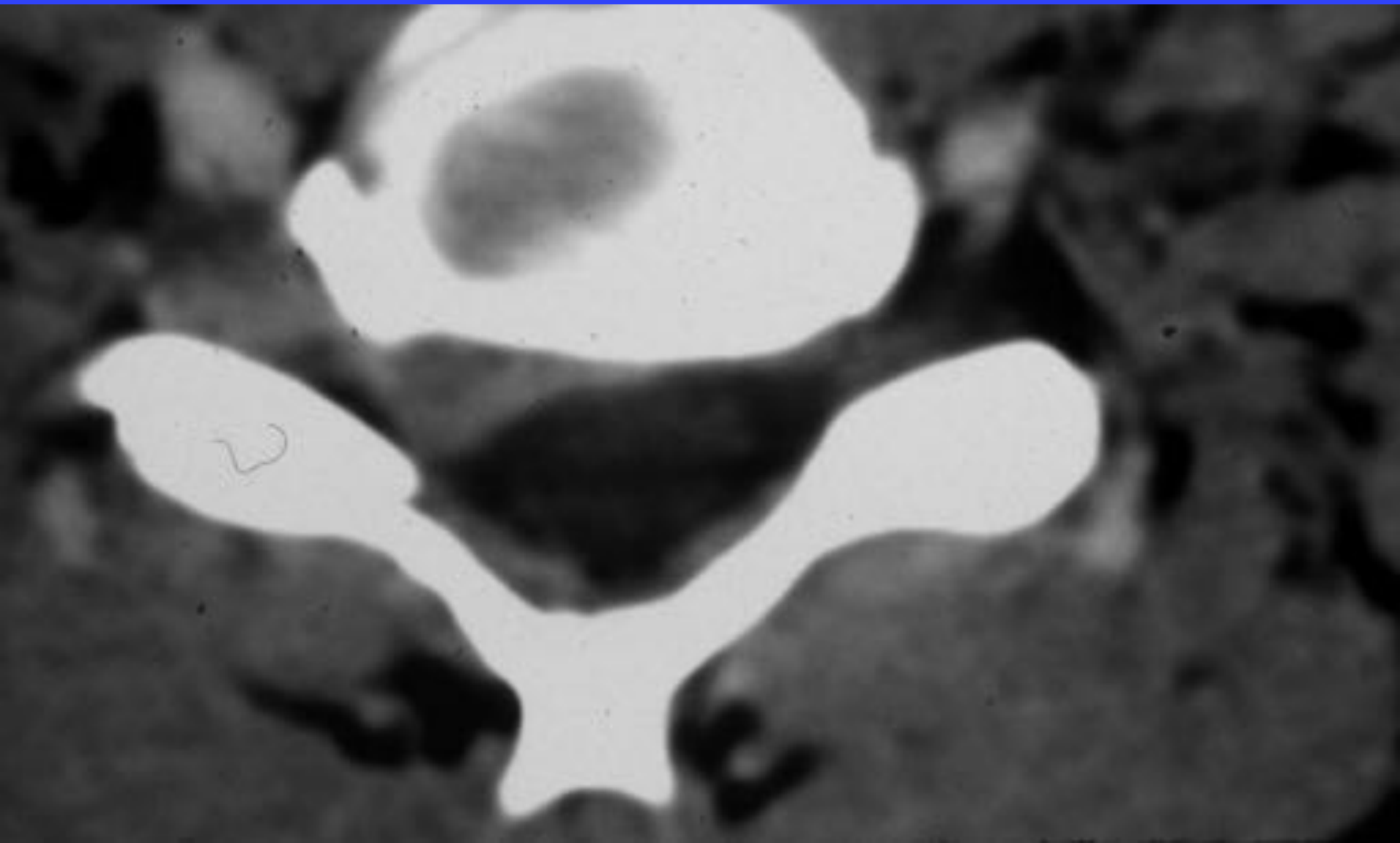
- **Cervical hernia**
- **Cervical degeneration**
- **WAD**
- **Lumbar hernia**
- **Lumbar degeneration**
- **Lumbar stenosis**
- **Degenerative spondylo**
- **Lytic spondylolisthesis**

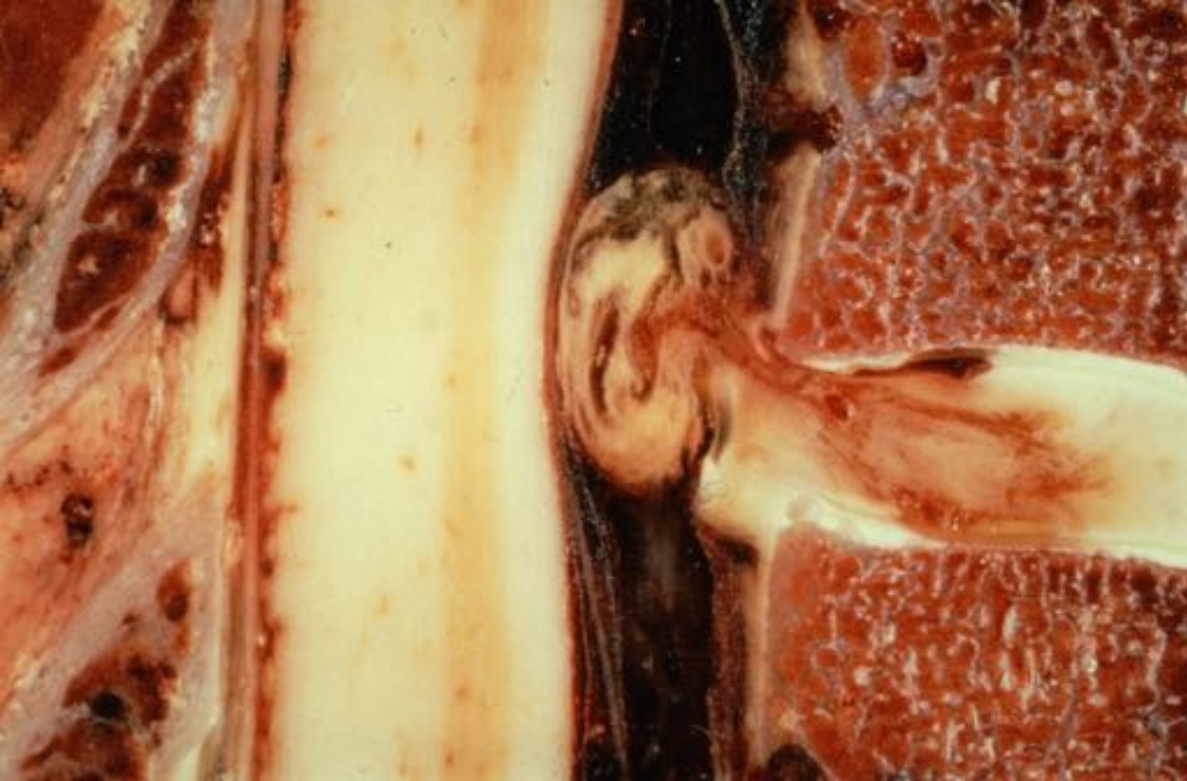


Cervical hernia & degeneration

- **NEUROCOMPRESSIVE LESION**
 - radiculopathy
 - myelopathy
- **MECHANICAL INSTABILITY**
- **NECK PAIN & OCCIPITAL HEADACHE**
- **OSSIFICATION PLL**

Cervical hernia





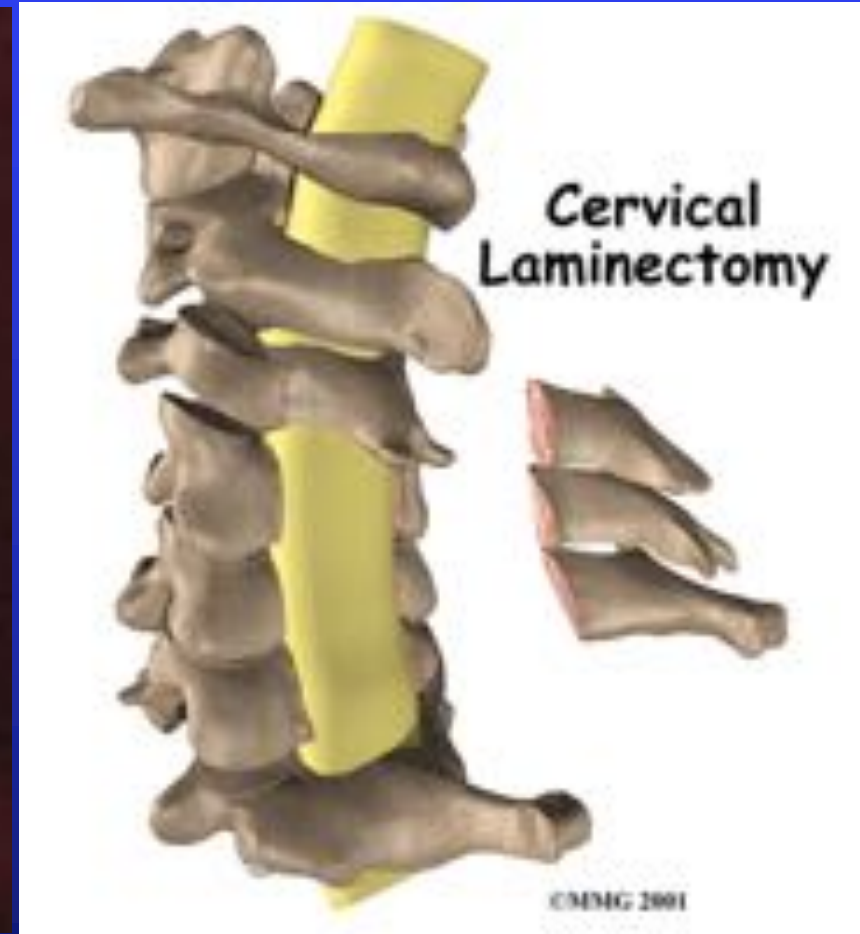
Cervical Spondylosis: neuroforaminal stenosis





Cervical laminectomy/plasty

- high incidence of neurological deficit
- poor reputation



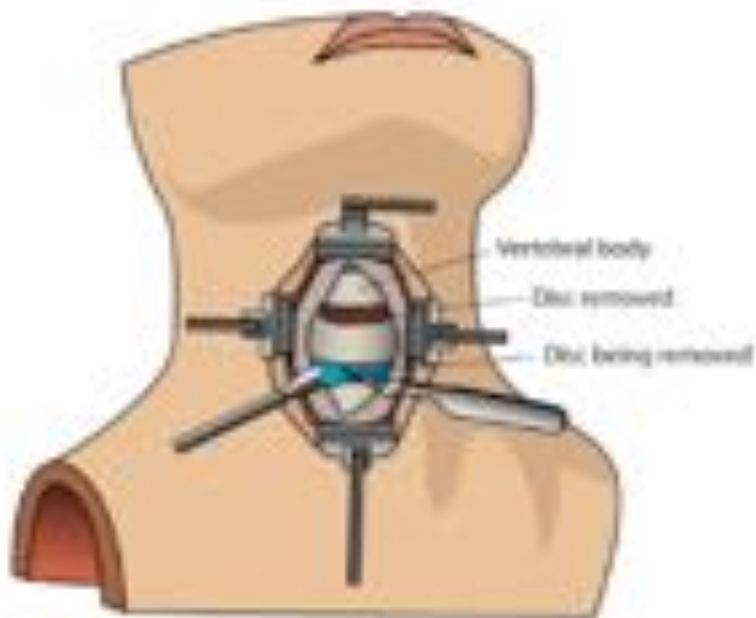
Anterior decompression & fusion

Benefits of successful fusion

- prevention of further spur formation
- regression of remaining spurs
- reduction of lig. flavum buckling through disc space distraction
- easy approach
- possibility to decompress both canal & nerve roots

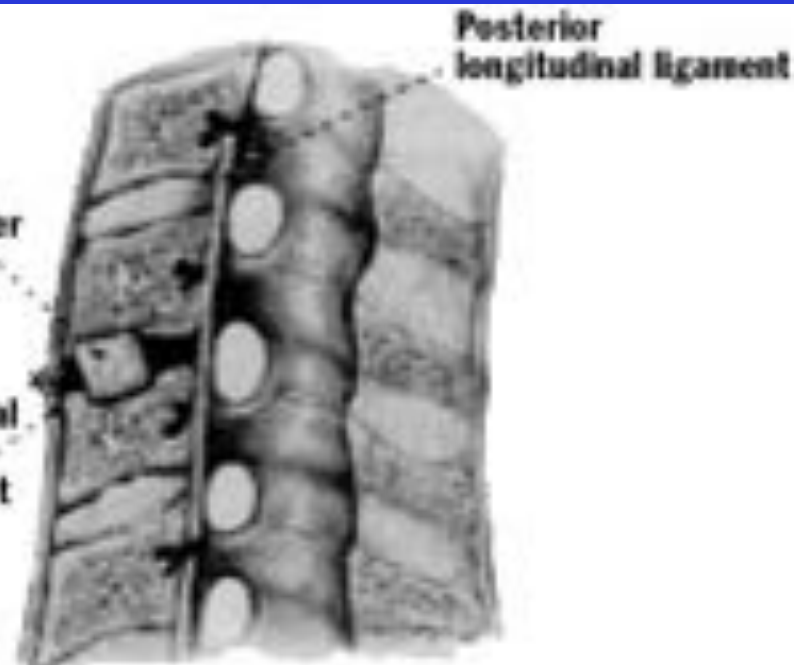
Cervical hernia & degeneration

- **1955 Robinson & Smith**

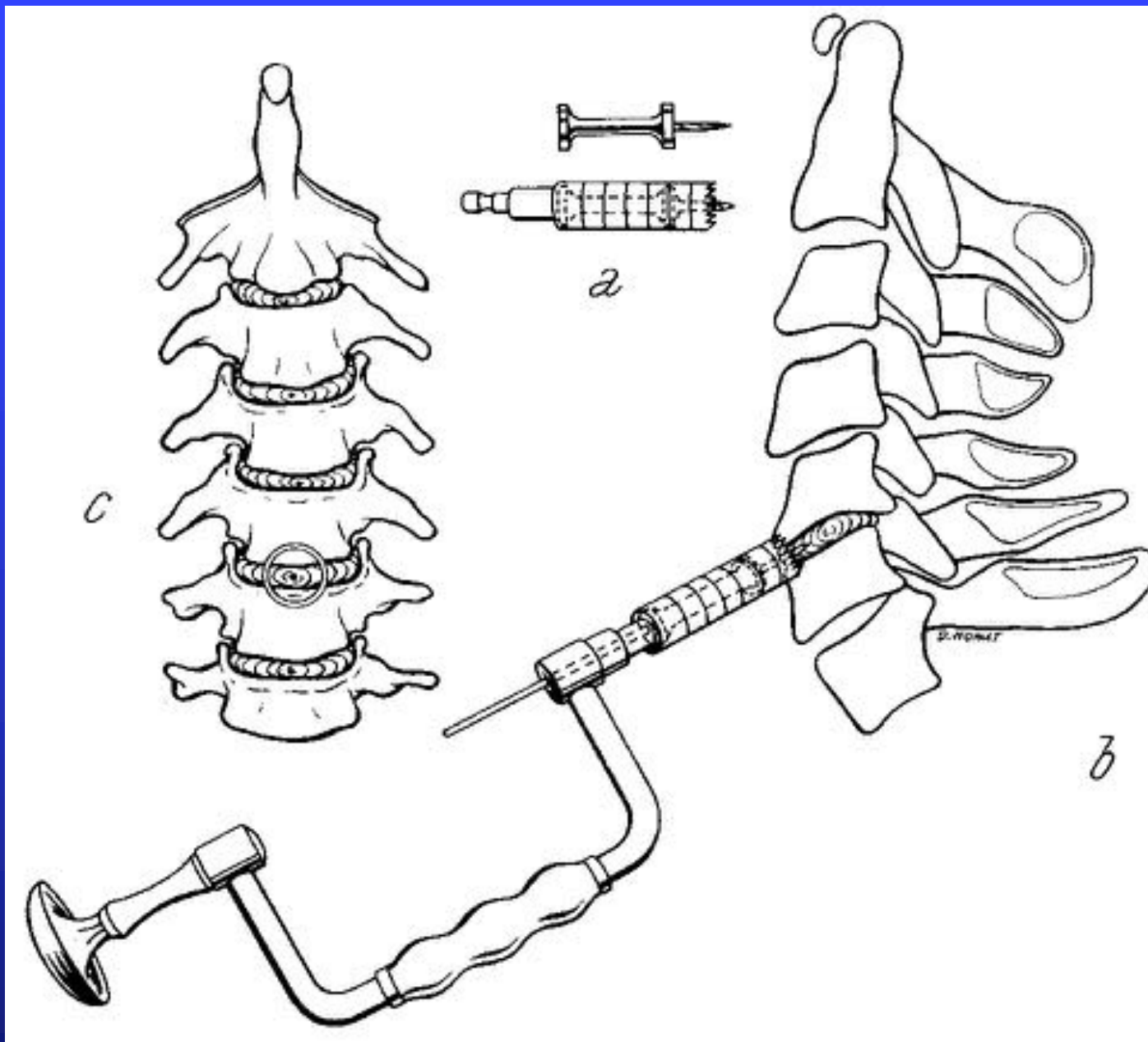


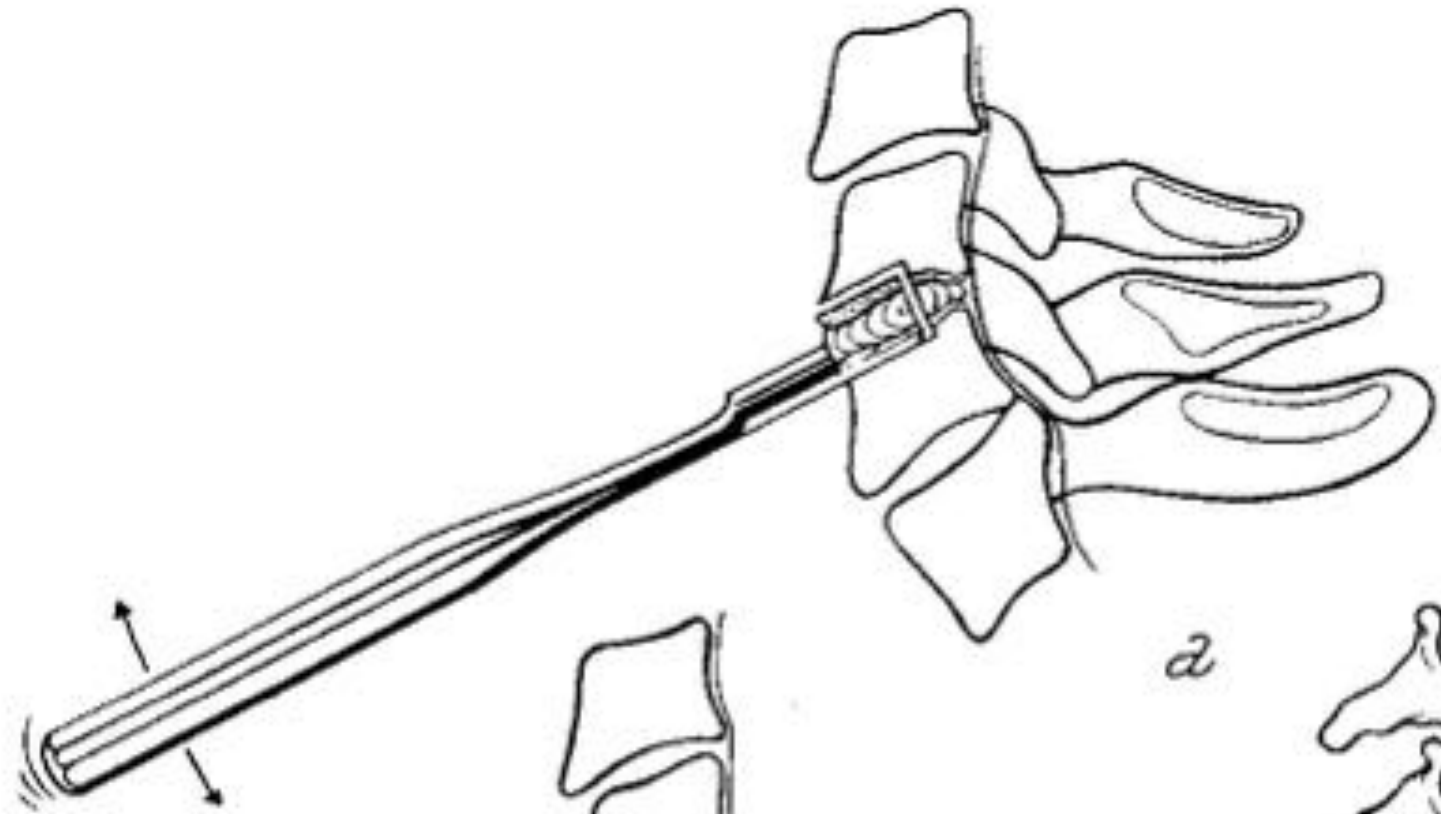
Bone block under compression

Anterior longitudinal ligament sutured over anterior aspect of I.v. space.

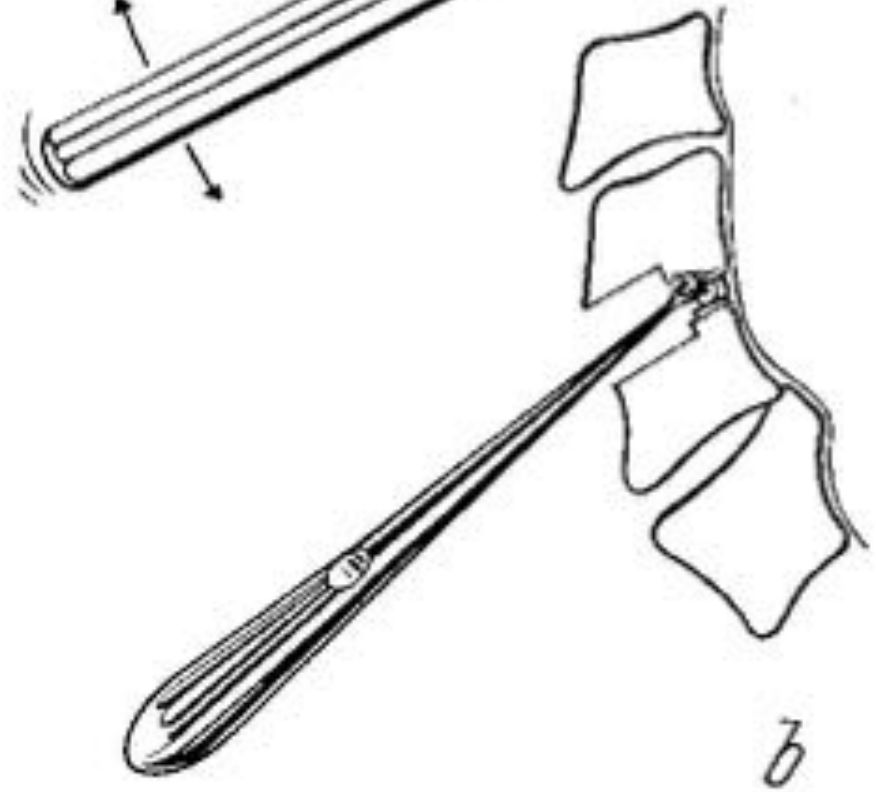


- 1956 Cloward / Crock

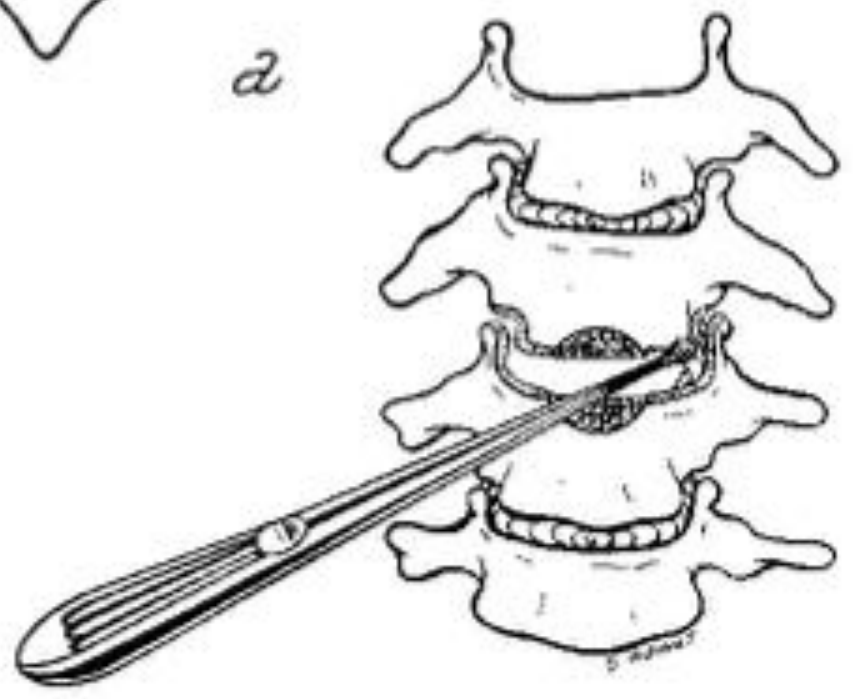




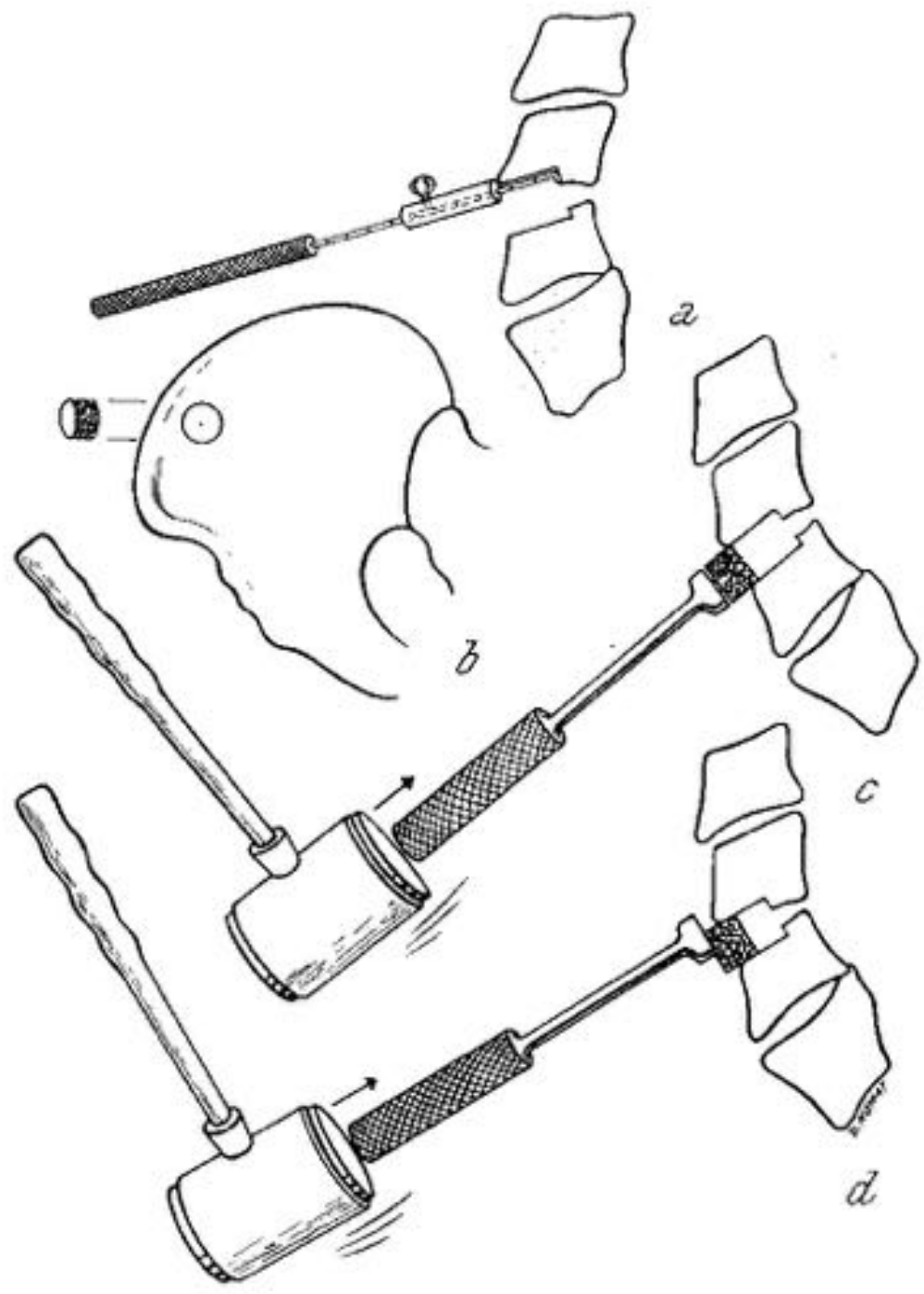
a



b



c





Cervical disc prosthesis

Medscape

www.medscape.com



Prodisc-C



Prestige ST

ACDF & CDR

POTENTIAL COMPLICATIONS

- Quadriplegia
- Vascular catastrophes
- Oesophageal lacerations
- Claude-Bernard-Horner
- Dysphagia & transient C-B-H
- Haematoma
- Non-union
- Infection
- Insufficient (lateral) decompression

Evaluation of treatment effectiveness for the herniated cervical disc: a systematic review

Gebremariam et al, Spine 2012

- No evidence for effectiveness of conservative treatment (nonsteroidal anti-inflammatory drugs, cortisones, and physical therapy) compared with surgery was found
- Although there is moderate evidence for the effectiveness of some surgical interventions, no unequivocal evidence for the superiority of 1 particular surgical treatment was found.
- Worldwide, most patients receive supplementary implants; however, cervical discectomy without graft may be preferred because of similar outcomes, lower costs, and possibly a lower risk of adjacent-level disease
- More high-quality RCTs using validated outcome measures (including adjacent level disease) are needed.

Surgical Treatment of Cervical Radiculopathy: Meta-analysis of Randomized Controlled Trials

Gutman et al, Spine 2018

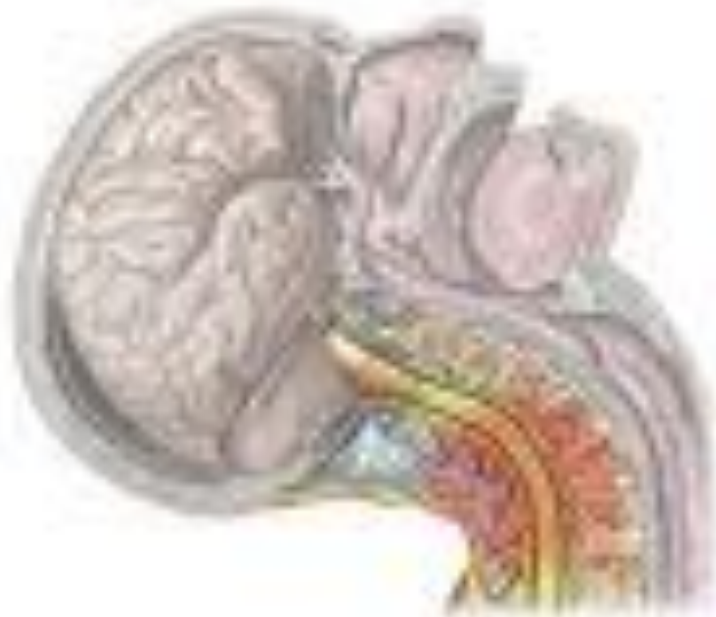
- Anterior cervical discectomy and fusion (ACDF)
- Cervical disc replacement (CDR)
- Minimally invasive posterior cervical foraminotomy (MI-PCF)
- All three techniques are effective in treating cervical radicular symptoms. MI-PCF has the lowest rate of adverse events whereas CDR has the lowest rate of secondary procedures
- There is insufficient evidence to show which technique is the most effective and provides the longest-lasting symptom relief

Resection does not help: Fuse



Whiplash Associated Disorders

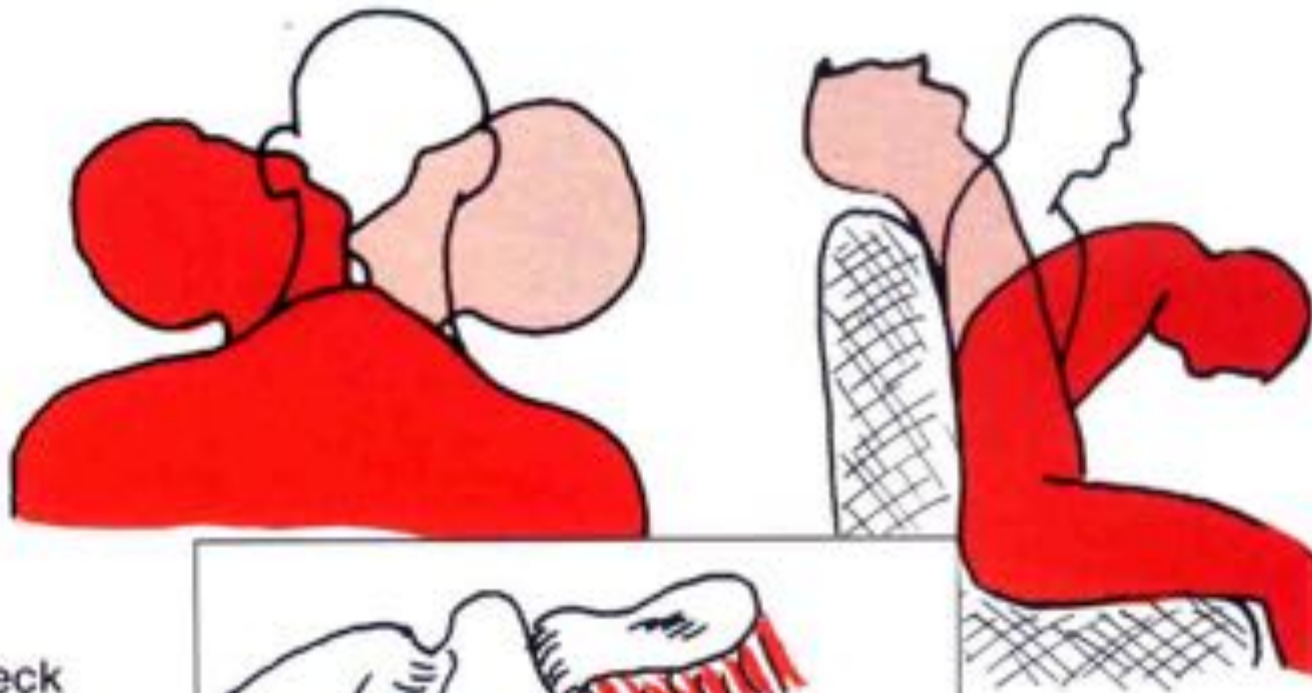
Hyperextension



Sprain or strain of cervical tissues

Hyperflexion





neck
bone
(vertebra)

disc

bone



tear of
ligament

spinal
nerve

stretched
ligament

What is the evidence?

- **NO collar**
- **Early mobilisation**
- **NSAI**



Prevention !!!





Ψ



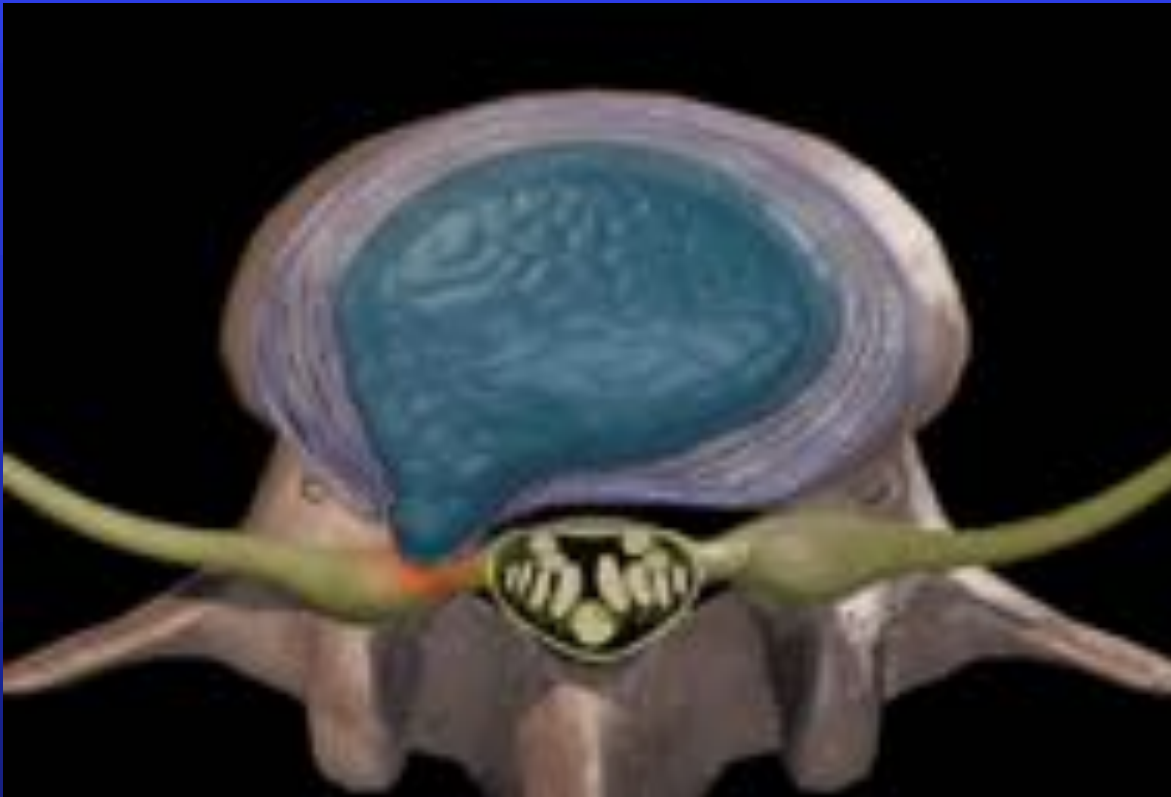
Lumbar spine



Lumbar disc herniation

We must speak the same language!

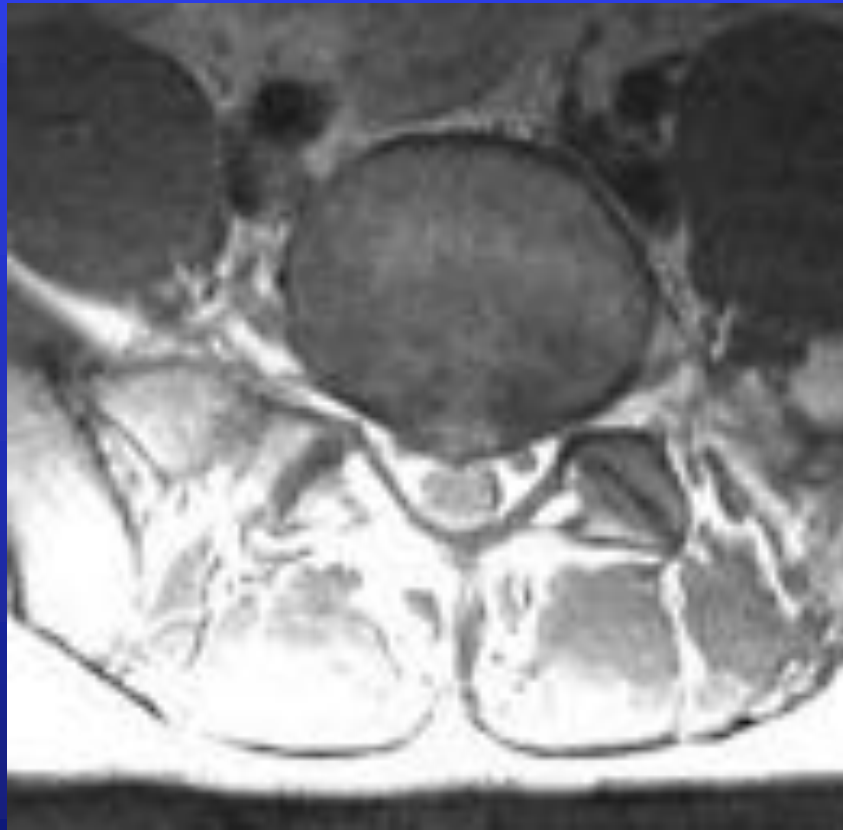
Hernia -- Protrusion -- Bulging



Lumbar disc herniation

We must speak the same language!

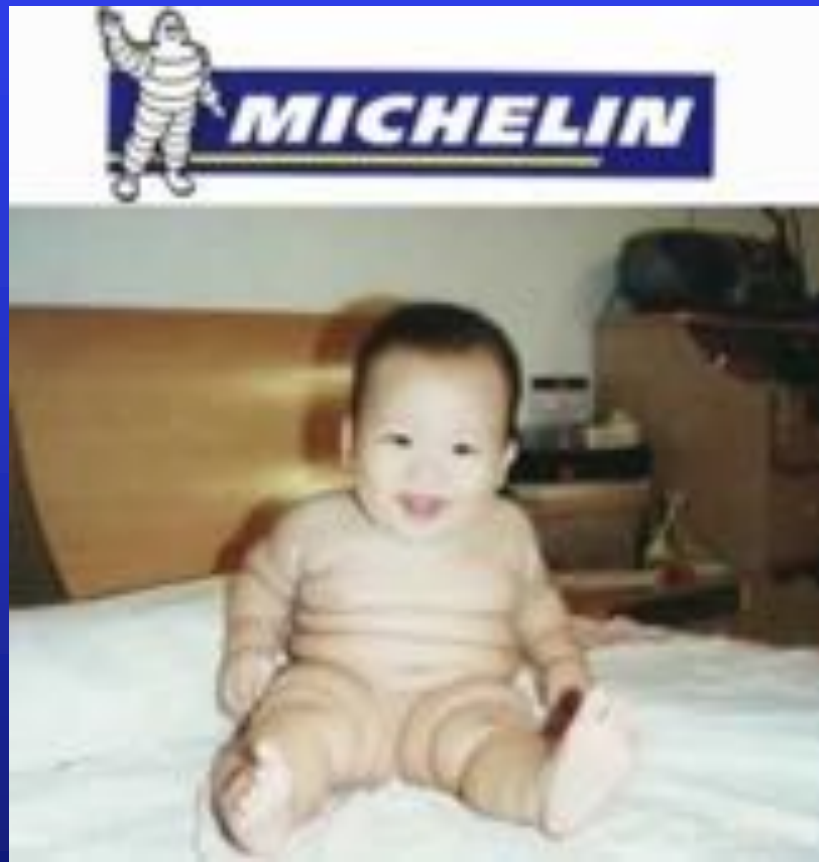
Hernia -- **Protrusion** -- Bulging



Lumbar disc herniation

We must speak the same language!

Hernia -- Protrusion -- **Bulging**



Lumbar disc herniation: conservative treatment

- Only a few days of rest – if any
- NSAID – Muscle relaxants – Analgesia
- Physiotherapy – (Manipulation?)

Optimal duration of conservative treatment for lumbar disc herniation depending on the type of herniation

Nakagawa et al, J Clin Neurosci. 2007

Optimal duration of intensive conservative therapy should be less than 1 month

Surgical vs nonoperative treatment for lumbar disk herniation: the Spine Patient Outcomes Research Trial (SPORT) observational cohort

Weinstein et al, JAMA 2006

Patients with persistent sciatica from lumbar disk herniation improved in both operated and usual care groups.

Those who chose operative intervention reported greater improvements than patients who elected nonoperative care.

One-level one-sided lumbar disc surgery with and without microscopic assistance: 1-year outcome in 114 consecutive patients

Türeyen J Neurosurg, 2003



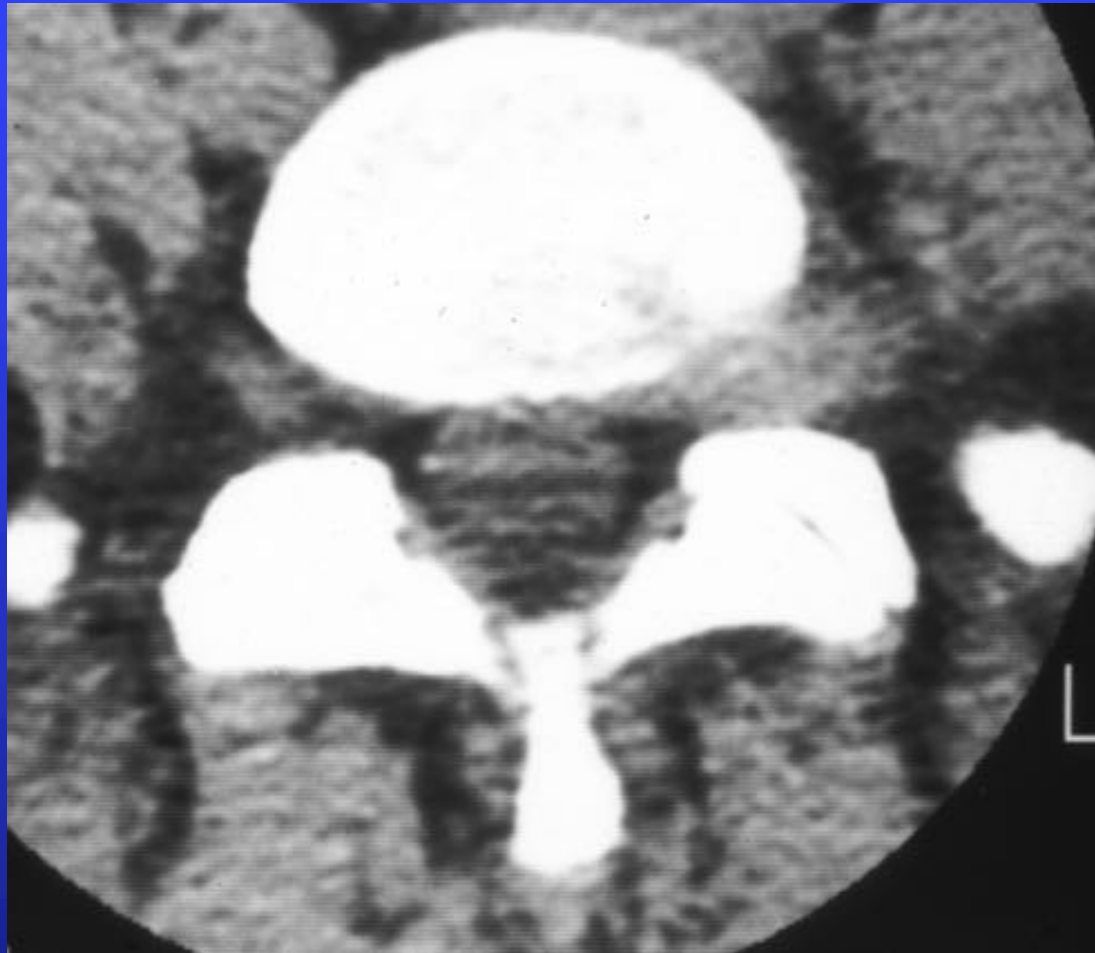
Interestingly, the results of this study indicated that microsurgery does not reduce hospitalization time, nor does it improve the overall surgery-related outcome

Does microscopic removal of lumbar disc herniation lead to better results than the standard procedure? Results of a one-year randomized study.

Tullberg et al. Spine, 1993

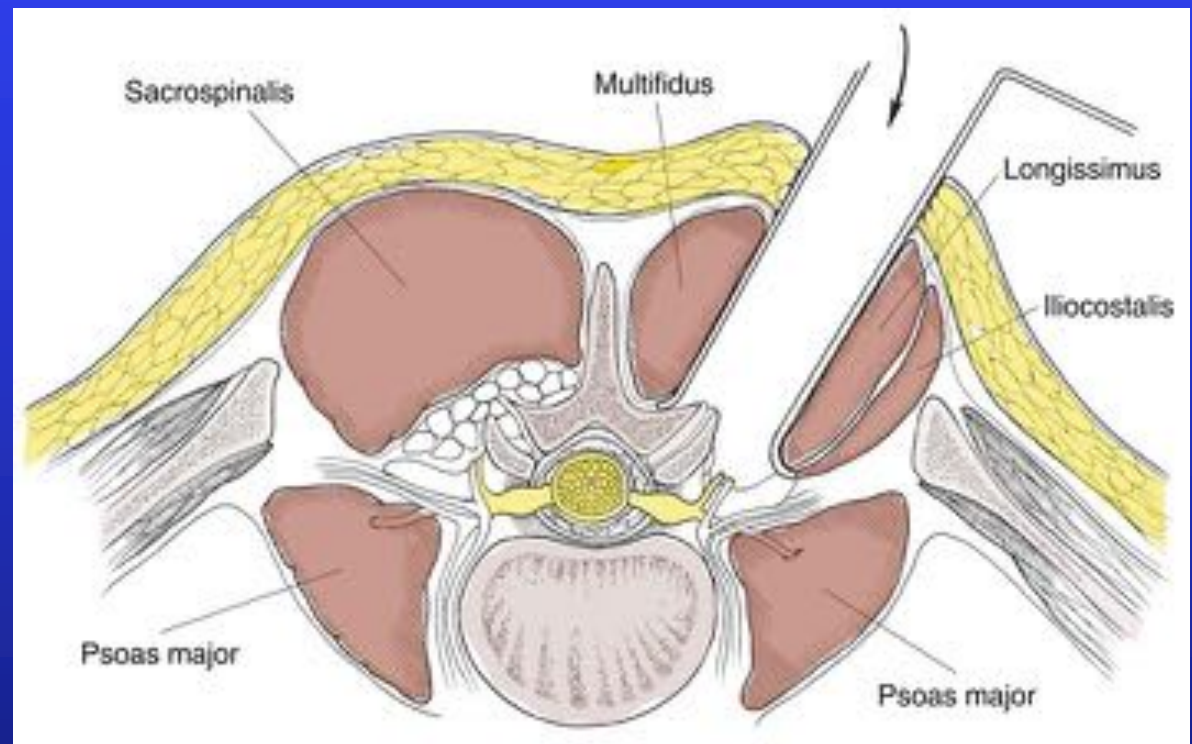
No differences regarding perioperative bleeding, complications, inpatient stay, time off work, or end result

Lateral disc herniation



Lateral disc herniation

- Wiltse approach
- Facetectomy

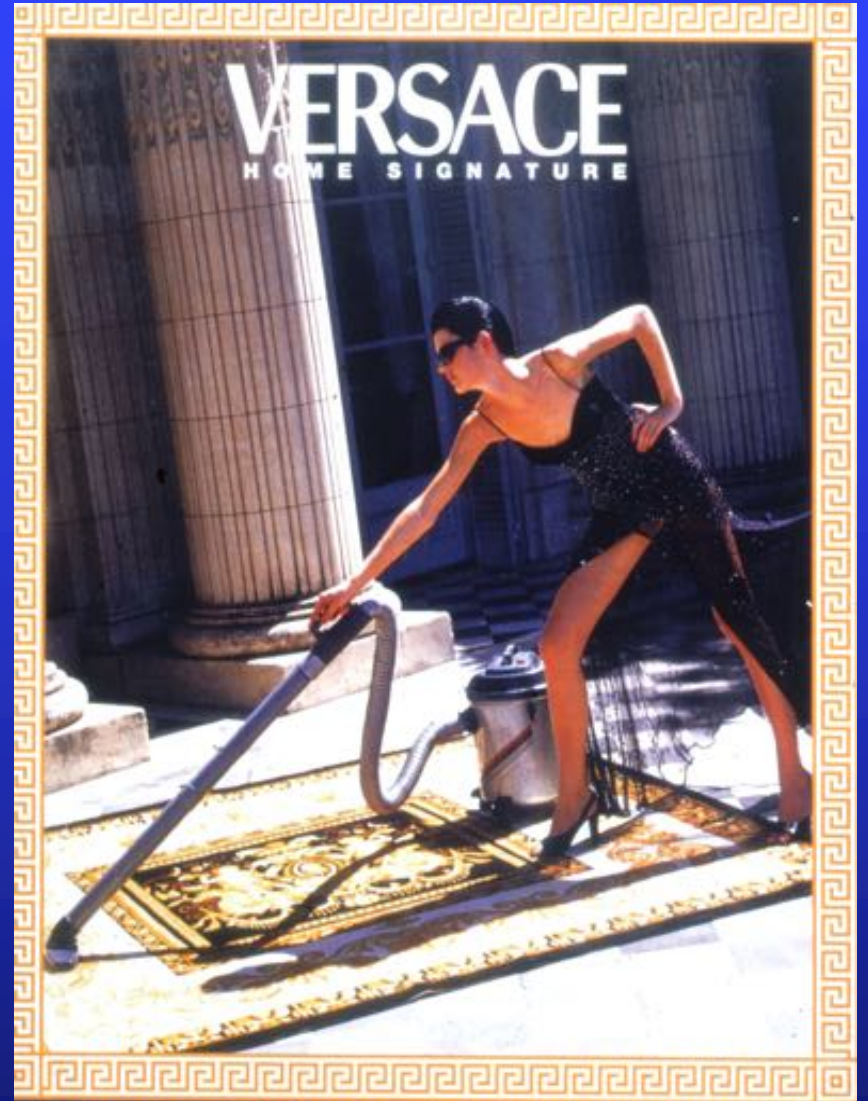
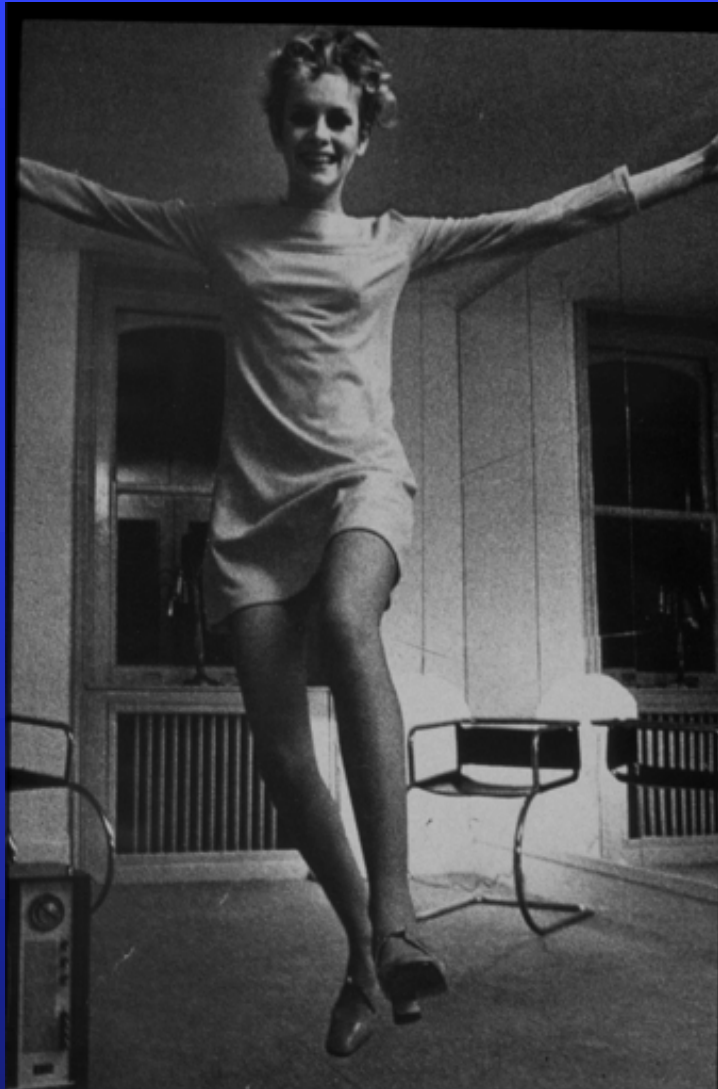


Lumbar spine degeneration / Spondylosis

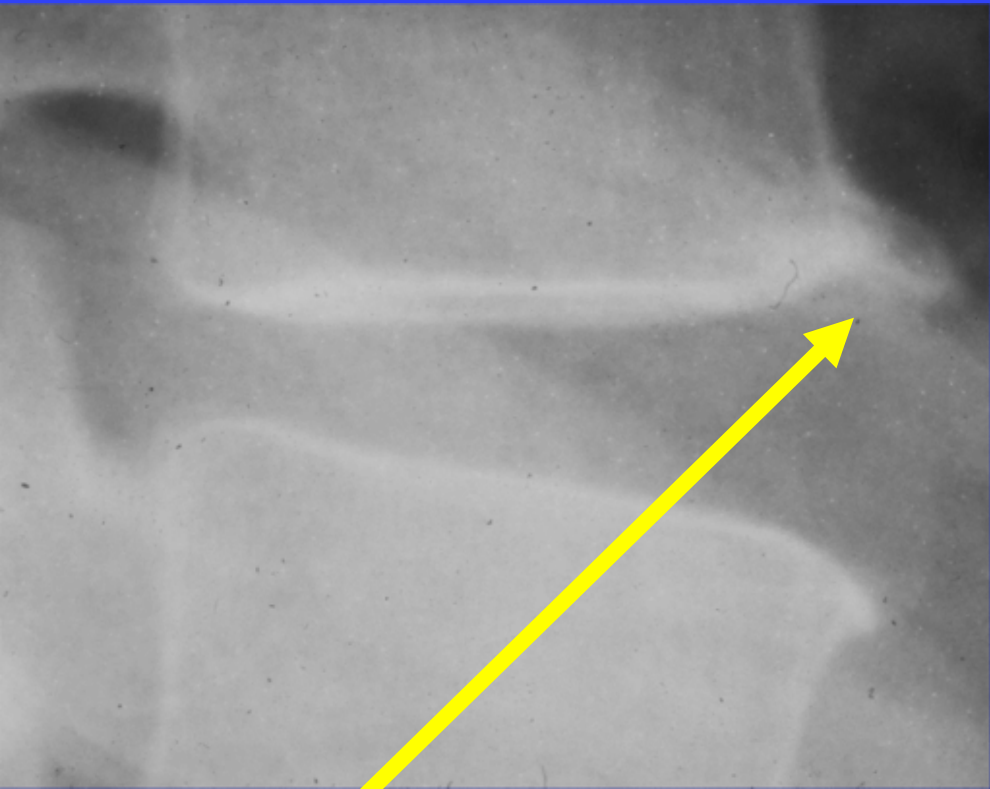
- It is physiological !!!!!
- Genetics
- Smoking habits
- Weight
- Work profile



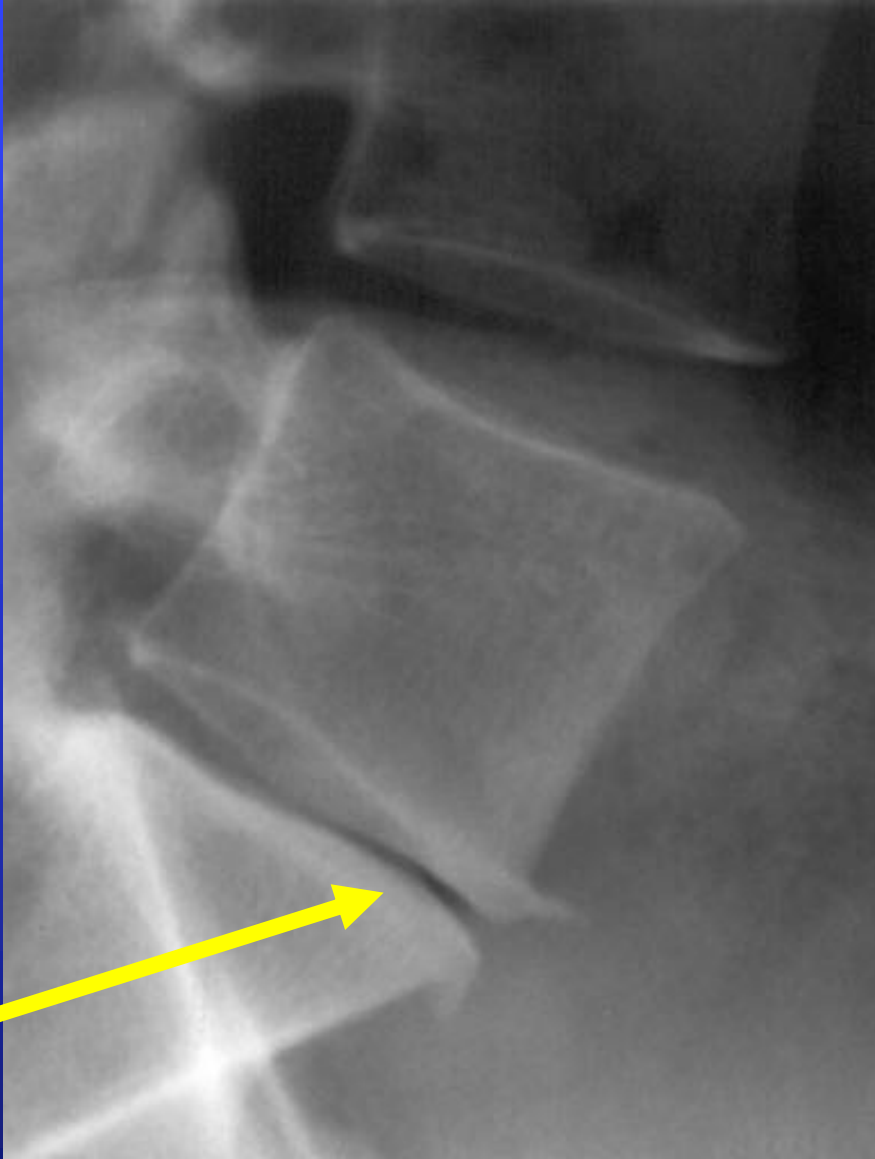
Prevention



Lumbar degeneration -spondylosis



McNab spur



Knutrtsen sign

CAREFUL: With increased rate of diagnostic testing,
comes a downstream increase of surgical procedures ...

VOMIT

Syndrome

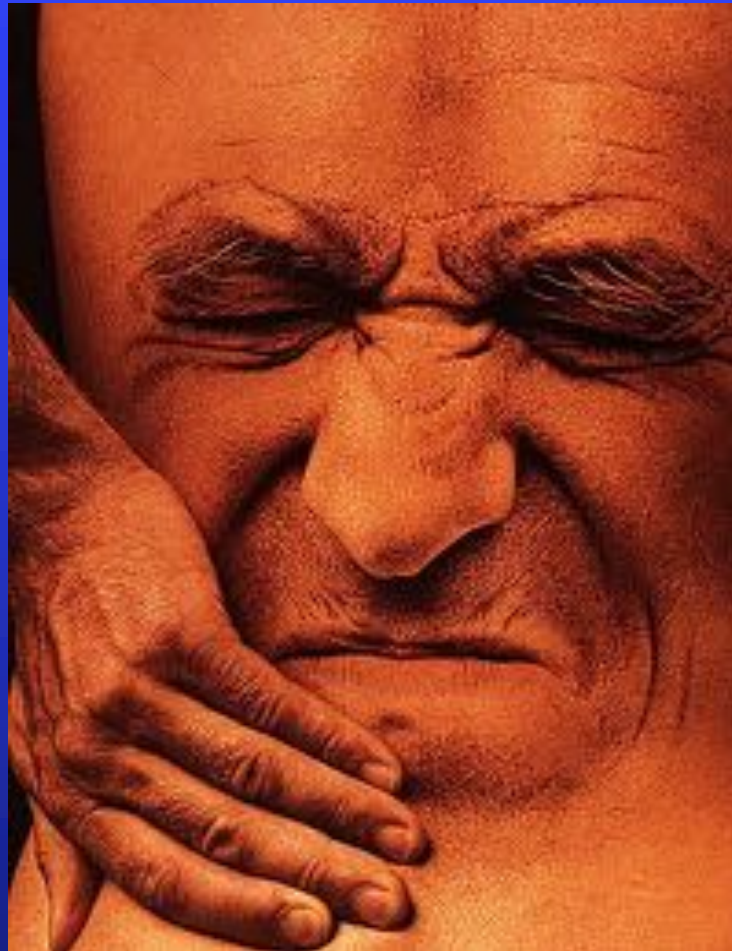
Victim **O**f **M**edical **I**maging **T**echnologies



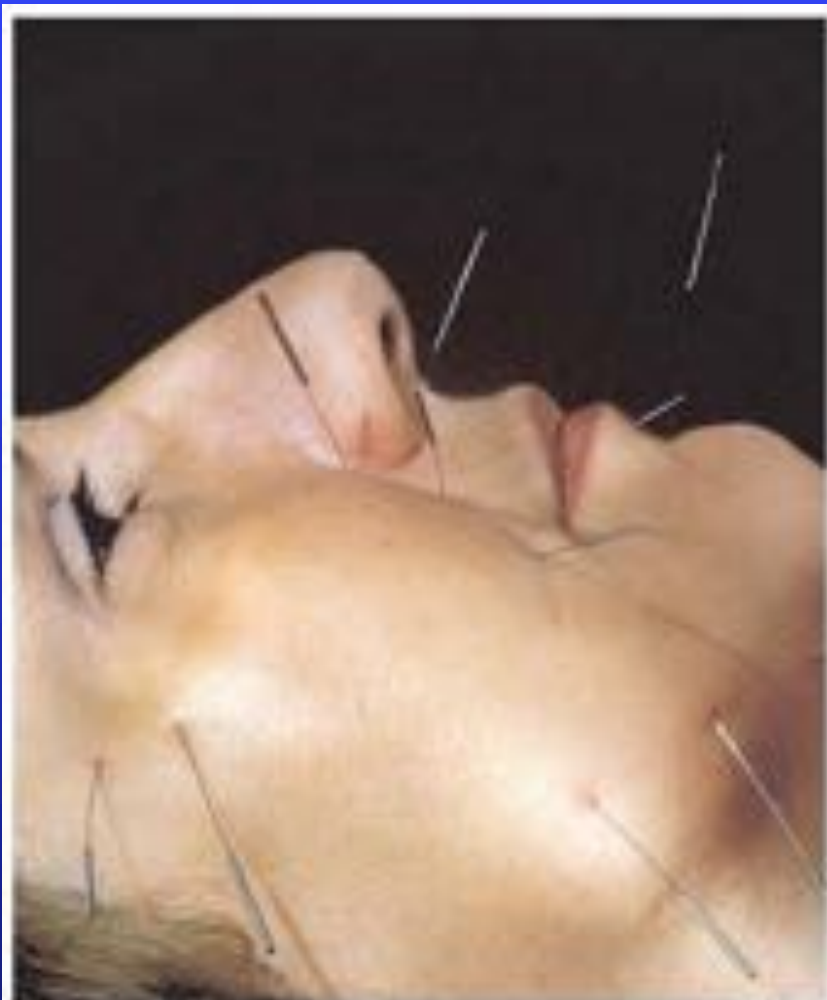
HIZ

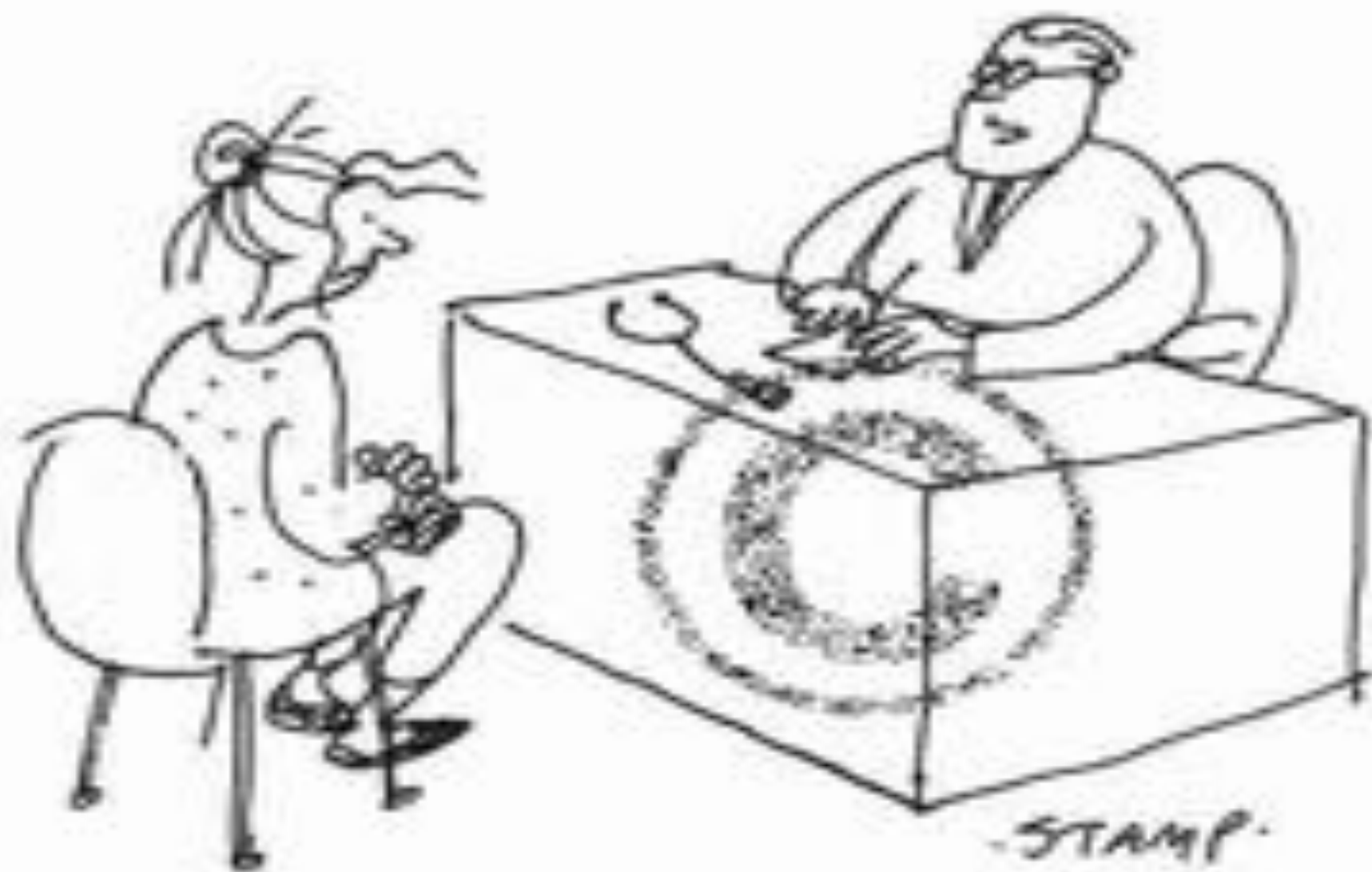


Low back pain due to lumbar degeneration -spondylosis



- No bedrest
- Physiotherapy
- Alternative medicine Anything does





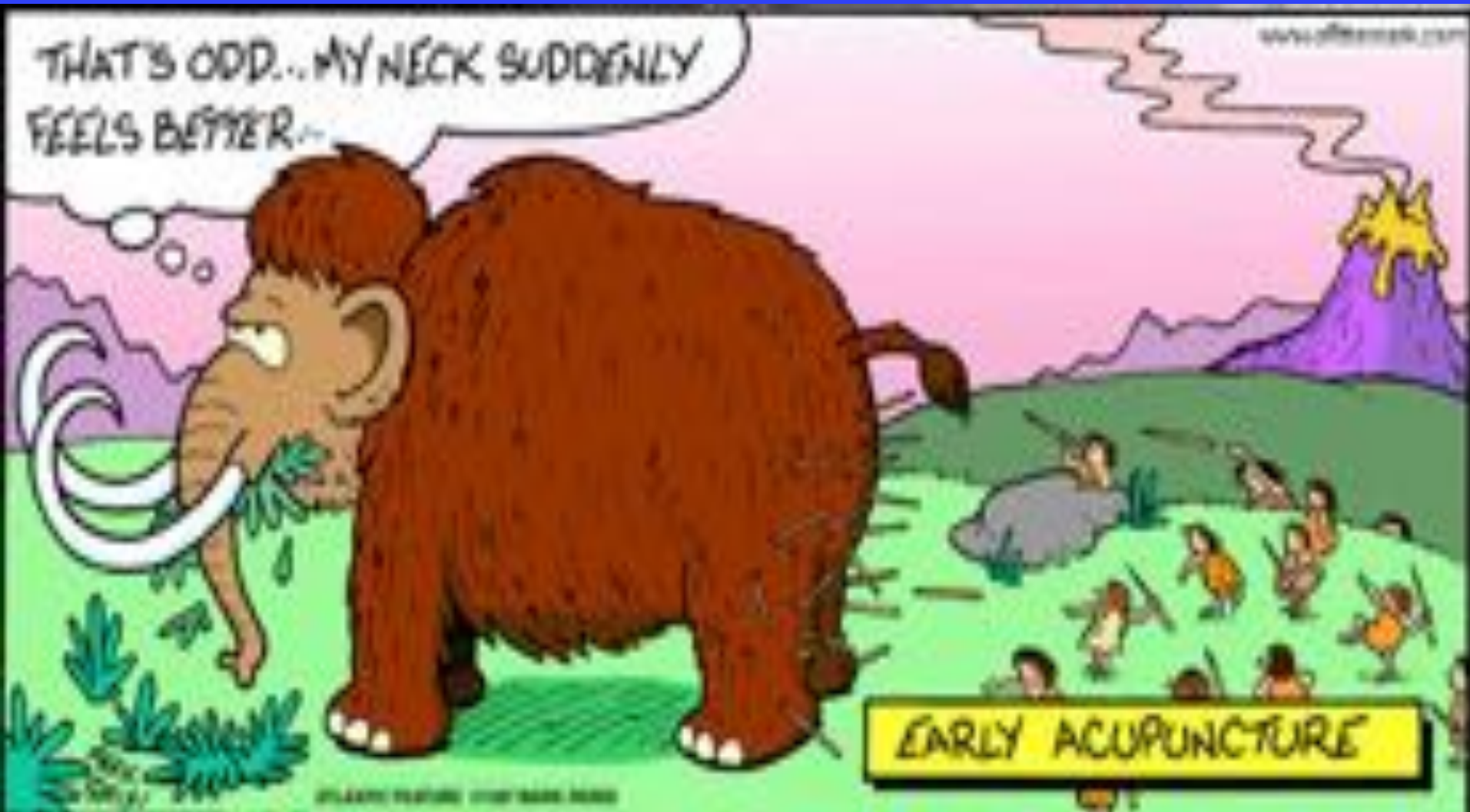
"Try distance healing if you like,
but it's a bit of a long shot..."



Larson

Testing whether laughter is the best medicine

Acupuncture



Surgical fix

Painful disk and facet joints



Fusion

Spinal Fusion

Established Role:

- deformity



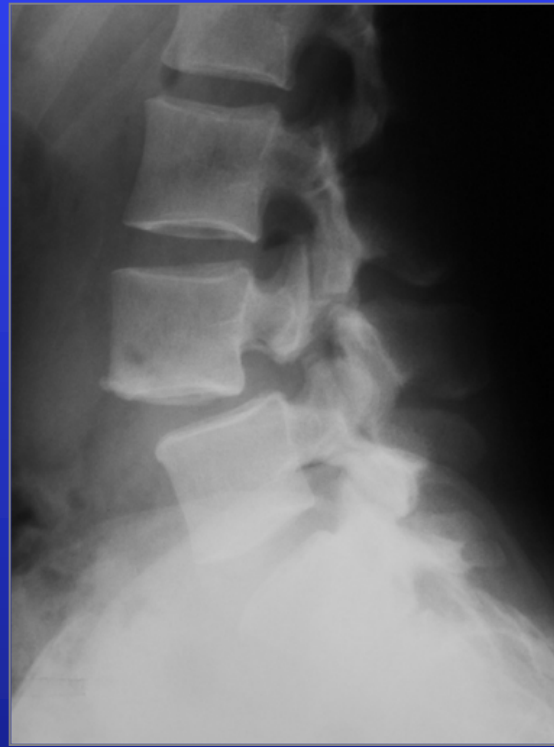
■ eradication of disease

■ true instability

Spinal Fusion

Clear Indications:

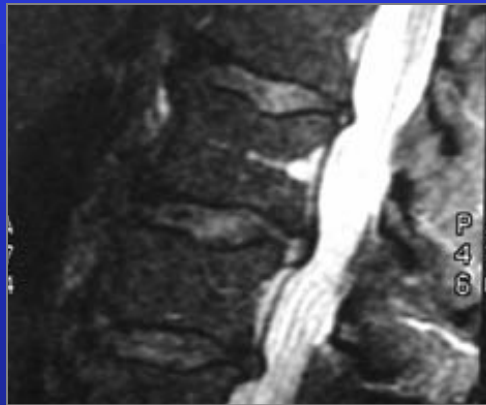
- **symptomatic instability**



Spinal Fusion

Indications Unclear:

- degenerative back pain
- spinal canal stenosis
- “stable” spondylolisthesis



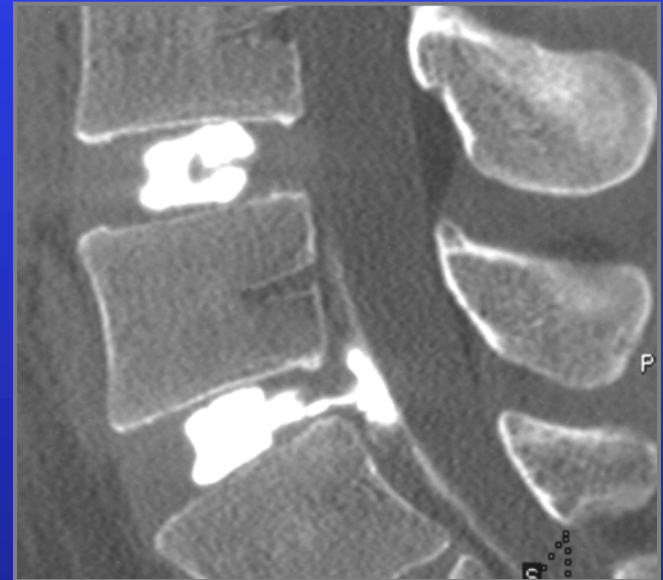
Spinal Fusion

- major surgical procedure
- significant hazards
- success rate relatively low
- treatment of “last resort”



Spinal Fusion

Major limiting factor = accurate diagnosis
surgical success rate can be no better
than the diagnostic success rate



We need a "pain scan"!

Spinal Fusion indications

- **Chronic disabling low back pain interfering with daily activities**
- **Symptoms present > 6–12 months**
- **Failed conservative management including appropriate exercise programme**
- **Realistic expectations**

Spinal Fusion

Caution:

- **Psychological disturbance**
- **Multiple level degeneration**
- **Previous surgery**
- **Worker's Compensation**



Anti-Raucher-Forum e.V.

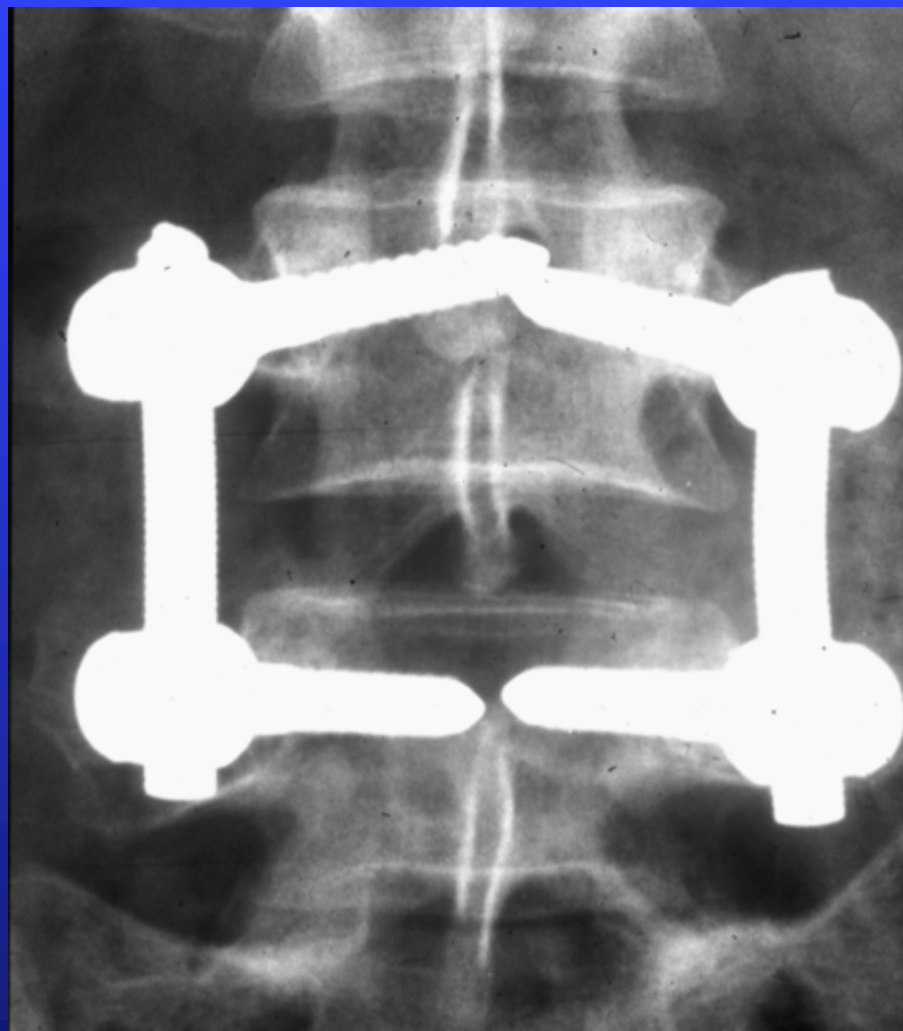
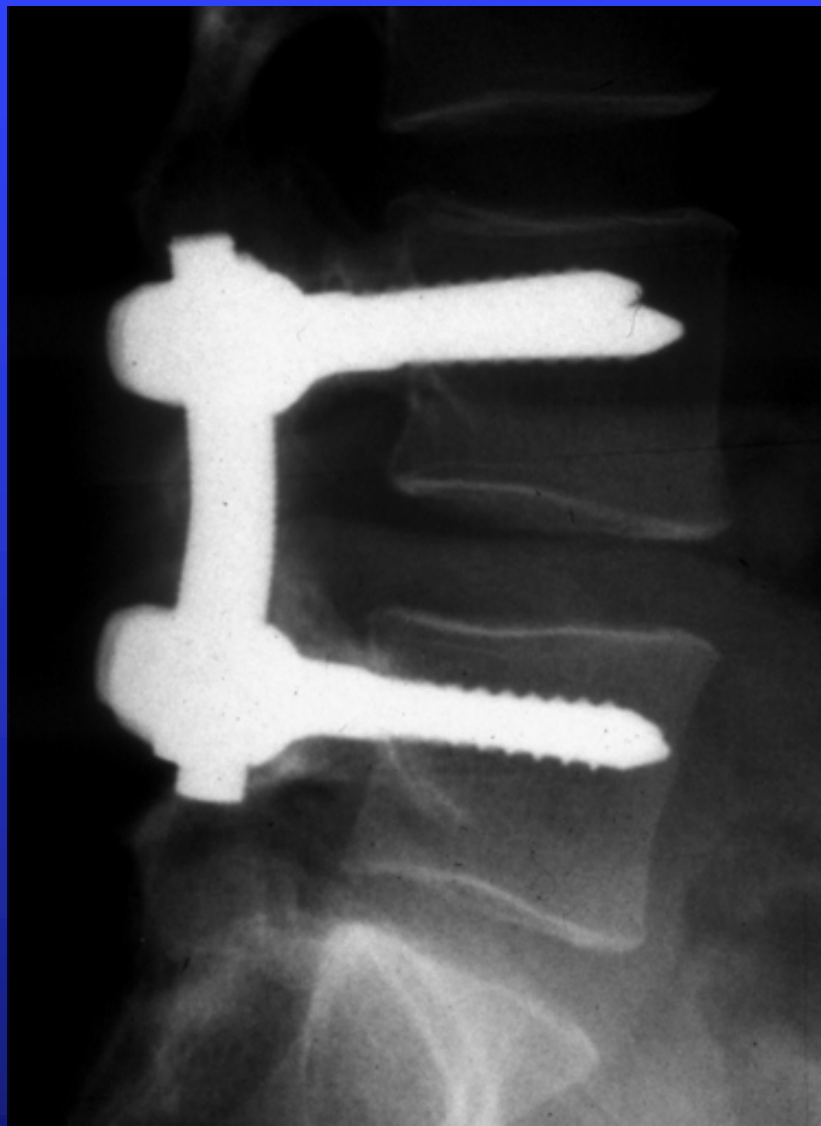


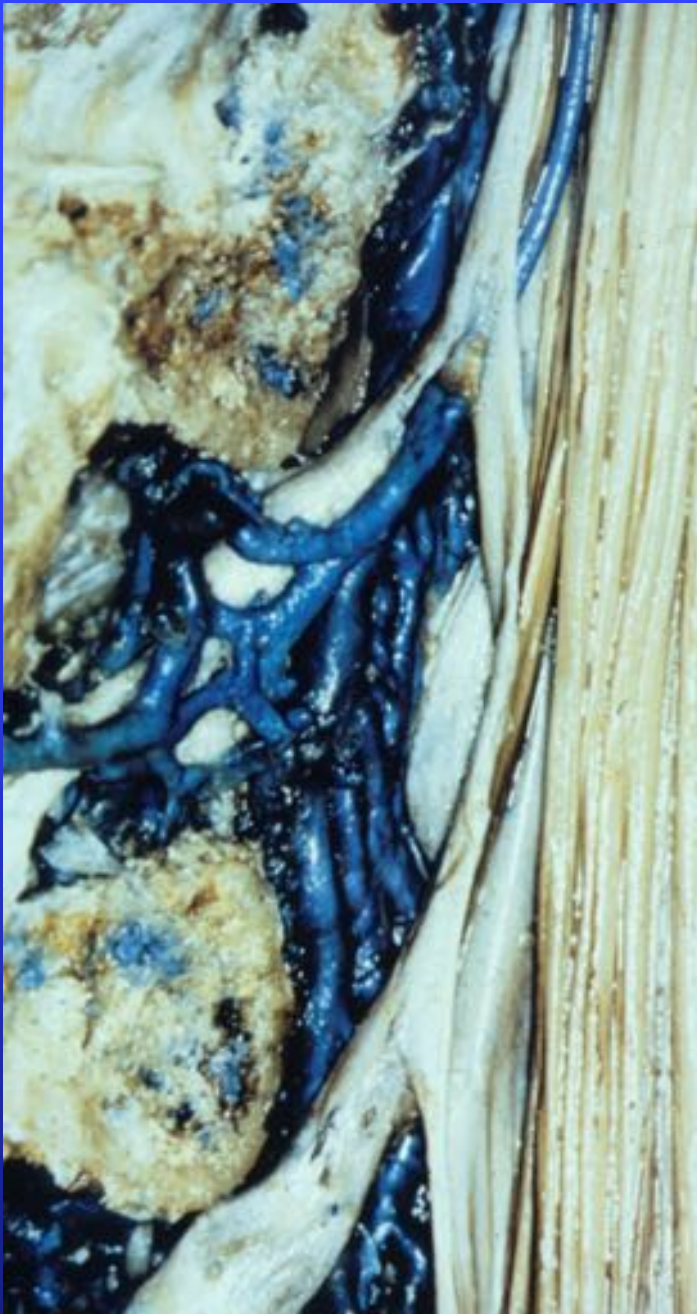
Spinal Fusion

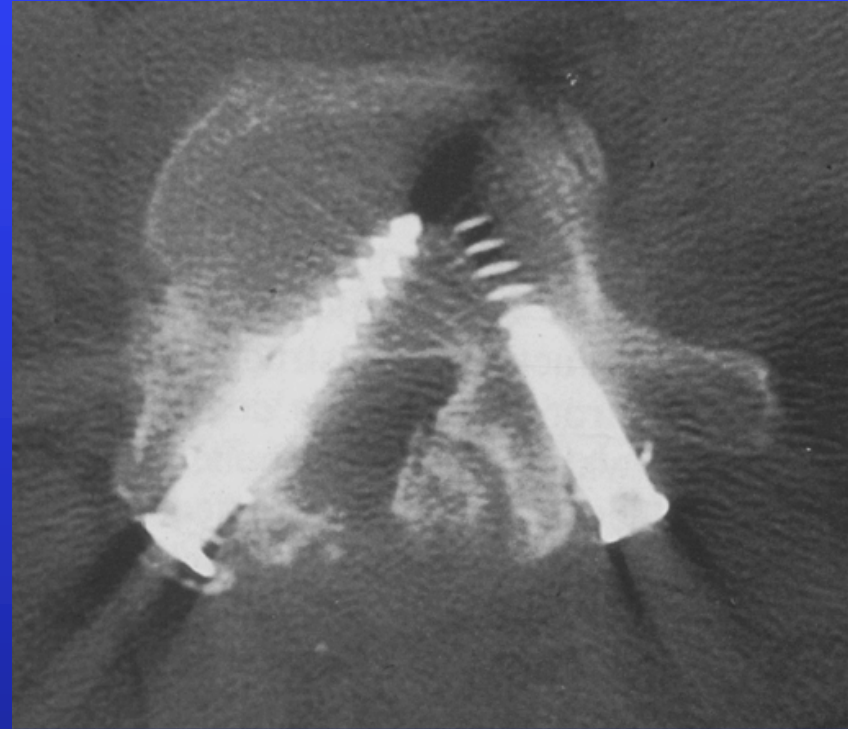
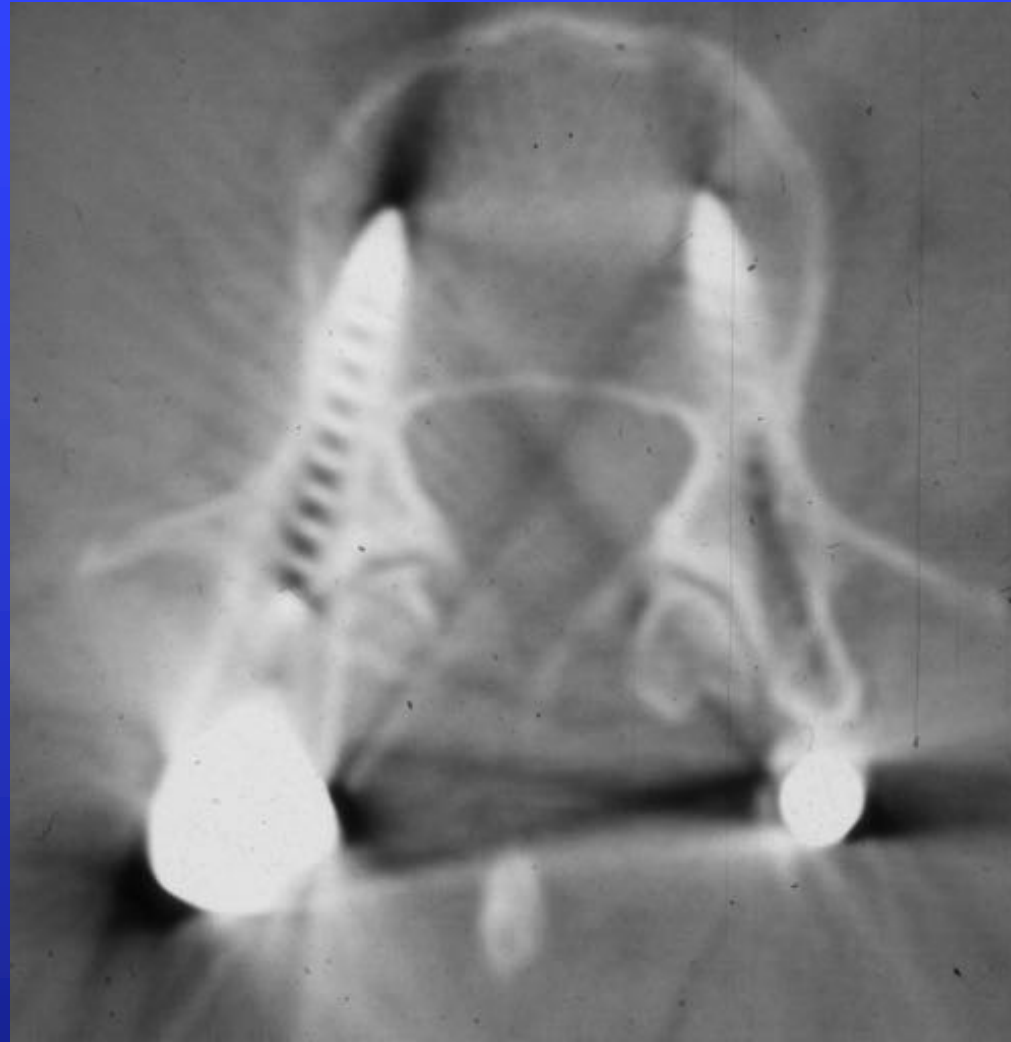
Regional/World-wide:

- **variation in rates of procedures**
- **variation in techniques**
- variation reflects the uncertainty of optimal treatment
- insufficient data comparing different treatment options

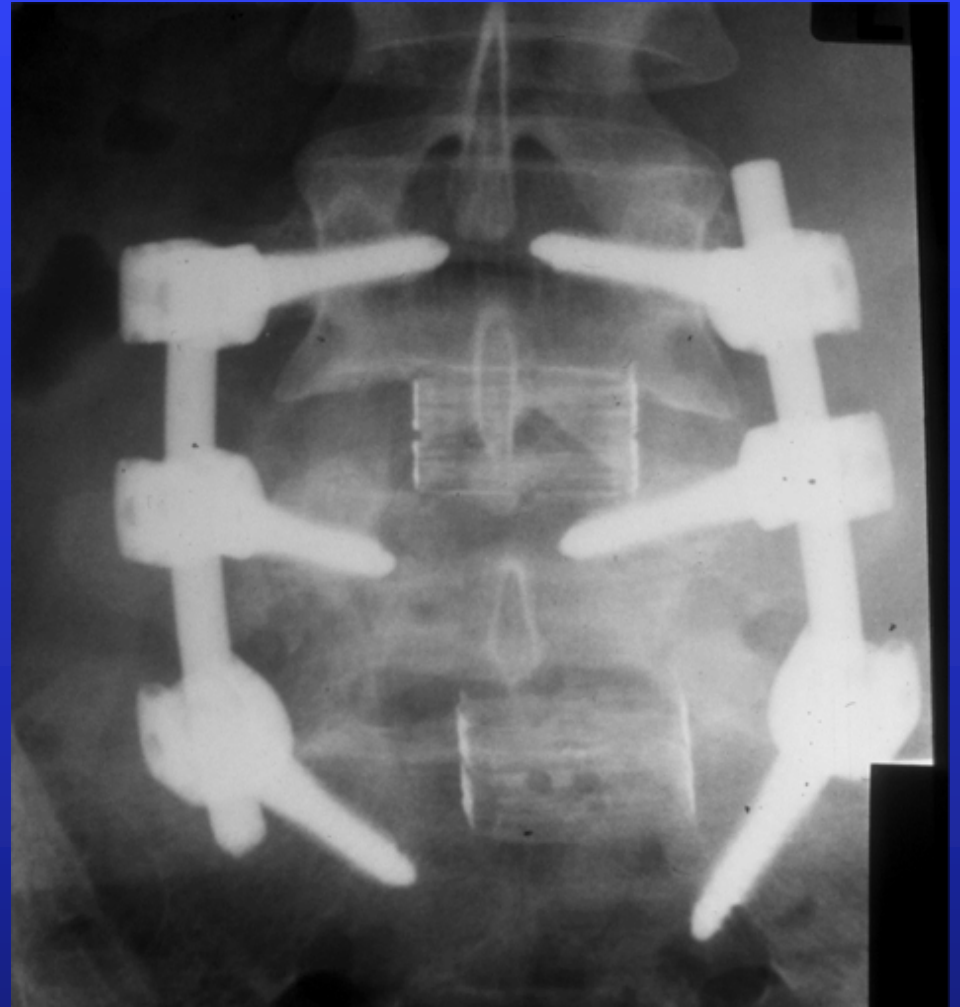
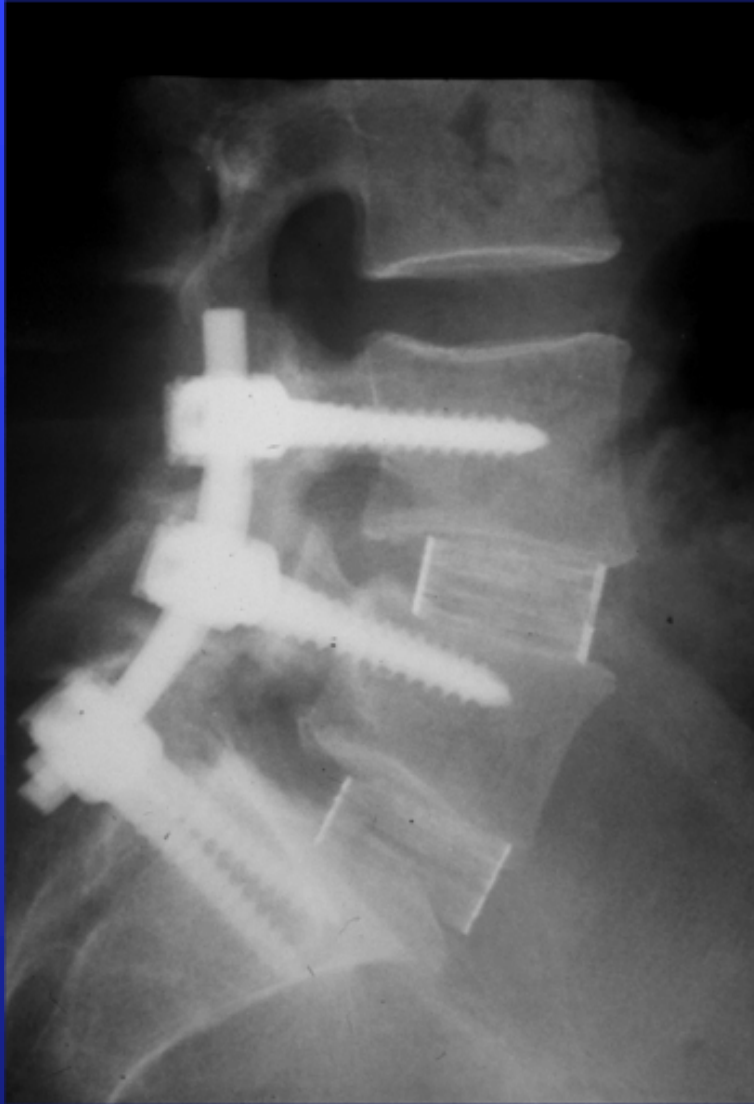
Roy-Camille 'discovered' the pedicle

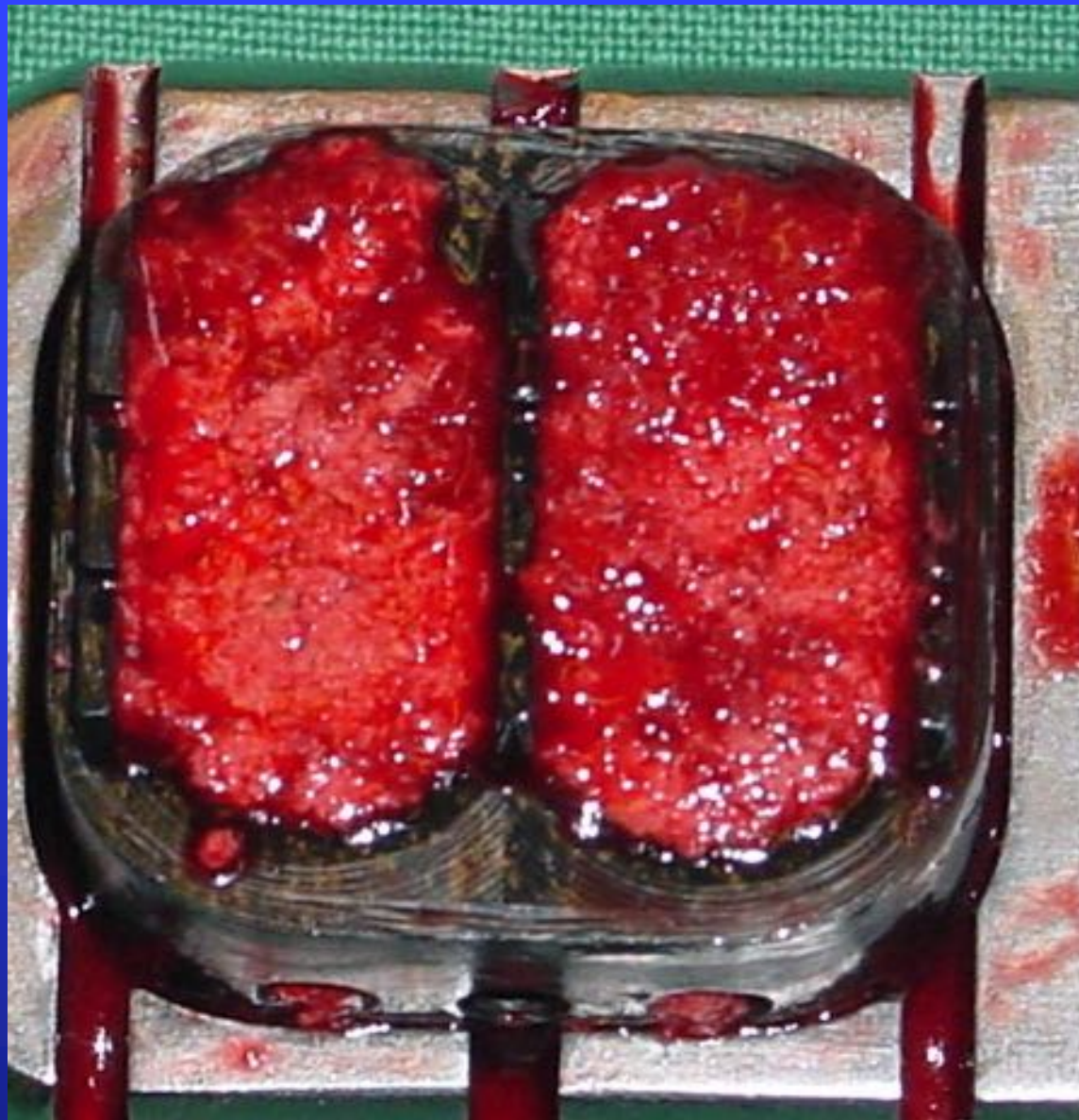






360° fusion





Where is the evidence?



The Cochrane Collaboration

**The Cochrane Database of Systemic Reviews
Massage for LBP**

Furlan AD et al

Cochrane Database Syst Rev. 2006

**The Cochrane Database of Systemic Reviews
Multidisciplinary biopsychological rehab for sub-
acute LBP in working age adults**

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Surgery for degenerative lumbar spondylosis**

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- “There is no evidence about the effectiveness of any form of decompression or fusion”
- urgent need for high quality RCT’s

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- “There is no evidence about the effectiveness of any form of decompression or fusion”
- urgent need for high quality RCT’s

Surgery for Low Back Pain?

- Patient's choice – patients bears responsibility
- Fusion is an option
- Odds are :60-70% chance to be satisfied
- 360° fusions do better

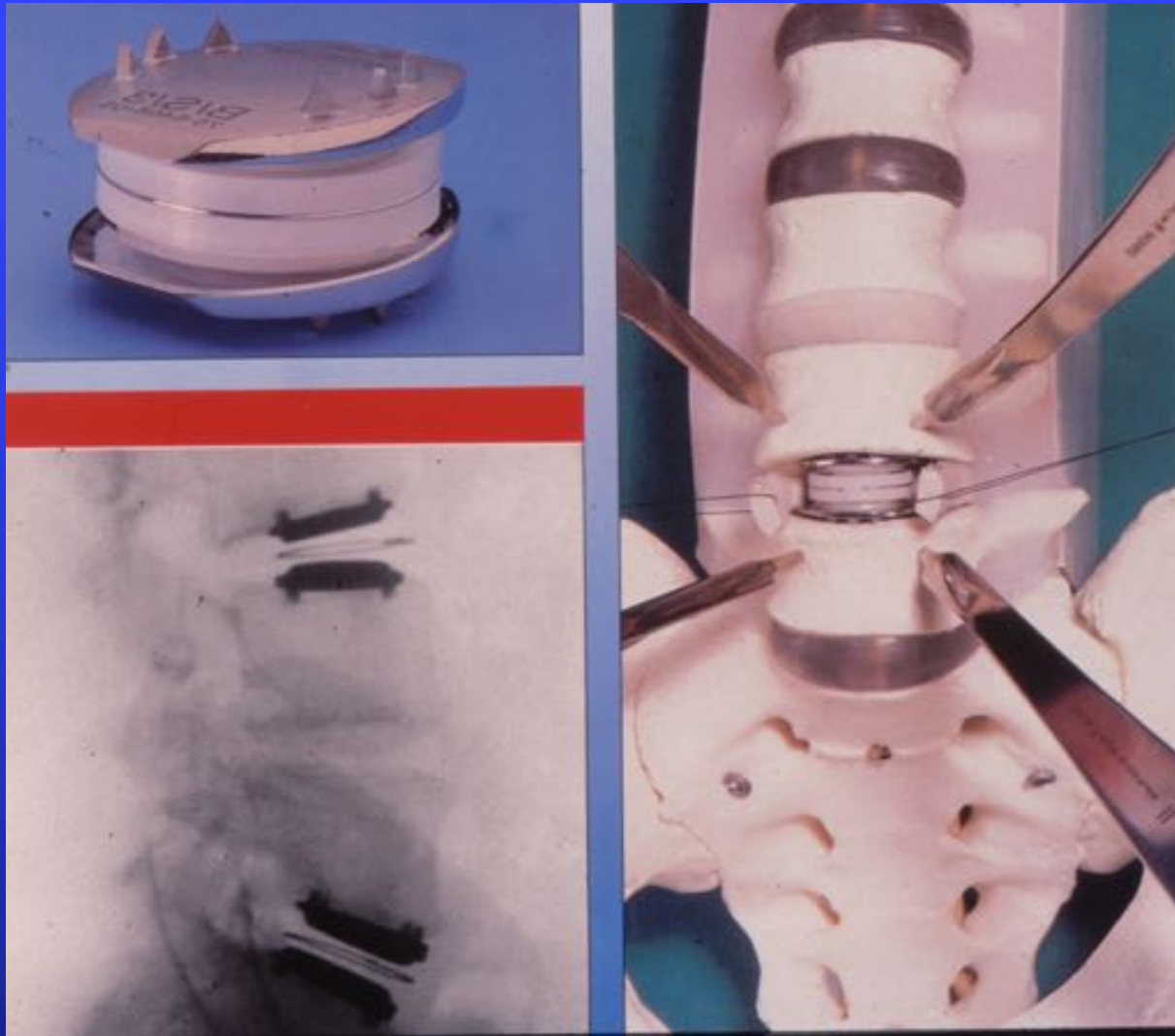


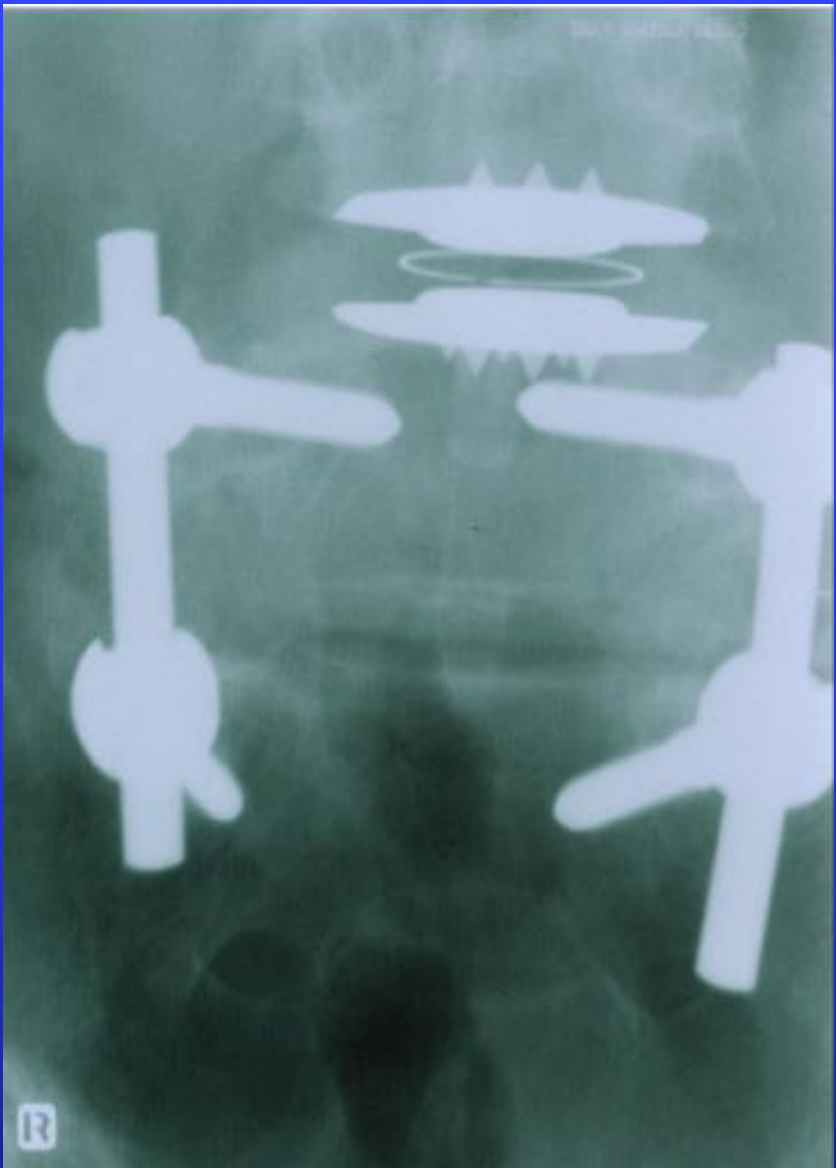
**Bad results of fusion is
drive for search of
'alternative' treatments**

Why look for fusion alternatives?

- **Accepted that spinal fusion delivers inconsistent results**
- **If there is no correlation between fusion and clinical success there is no need to achieve a solid fusion?**
- **Preservation of motion expected to reduce the incidence of adjacent segment disease?**

Disc Prosthesis?





Motivation for TDR Development

Suggested Advantages:

- **Removal of pain generating structure (Disc)**
- **Restore motion, disc height, spinal alignment**
- **Reduce or eliminate fusion problems (“Fusion Disease”)**
- **Restore normal loads on facet joints, ligaments, endplates and adjacent segments?**

Motivation for TDR Development

Disadvantages:

- **Subsidence (endplate fracture or erosion)**
- **Migration or displacement**
- **Long term material stability, polyethylene and metal wear debris**
- **Revision access and complications!**
- **Inability to reproduce normal mechanics?**

TDR: Summary

- **indications are limited**
- **short term results may be equivalent to fusion surgery**
- **concern regarding durability of TDR & other non-fusion techniques justified**
- **unlikely that failure will not occur (all other joint replacements do fail)**
- **high risk of serious complications with revision surgery**

TDR

Evidence Based Medicine ?

that operation alone could bankrupt
the system



Of course retail
price would drop,
but stil

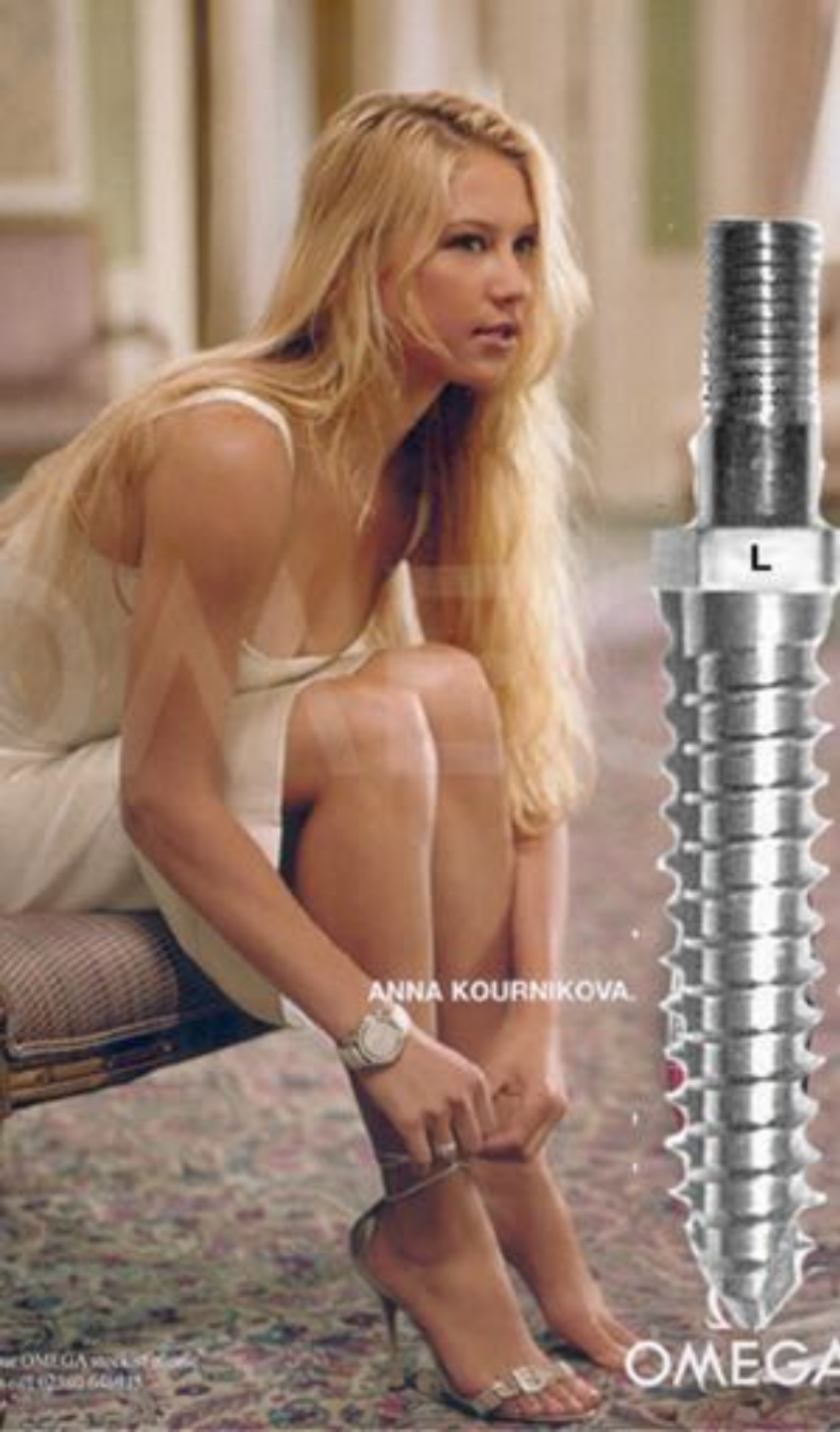
We must be pro-active

- Registries \Rightarrow Spine Tango



- Cost-effectiveness
- Cost-utility

The industry can be very
persuasive ...



ANNA KOURNIKOVA

OMEGA

OMEGA SAATCHI & SAATCHI
1 (214) 664-1111



Often a new device gets FDA approval or CE-mark

- After demonstration of initial promise in the hands of expert clinicians/researchers
- Subsequent application by large group of practitioners may not reach the target
- Hence the abandonment of the procedure
- Ex.: threaded interbody fusion cage



Clinicians & patients should discuss patient's perceptions of their own health before surgery and incorporate this information into patient's expectations concerning the outcomes of surgery

(Katz et al, Spine 1999)

Duality

- Oath of Hyppocrates
- Reality of cost – restraints
- Where do we stand?

**Of two
evils I
always
choose the
one I have
not tried
before**

May West



Evidence based medicine is
good,

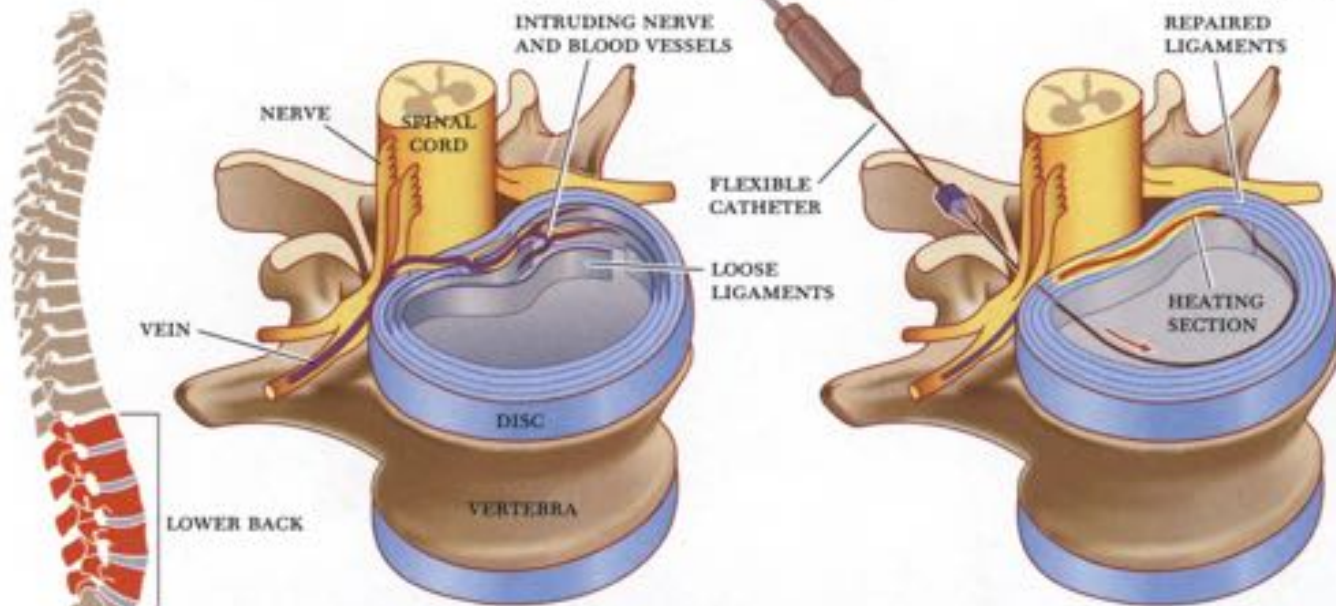
Cost-utility is the next step up



Bad results of fusion is drive for search of 'alternative' treatments

Beating the Back Ache

A new procedure could revolutionize disc surgery



Damage: The ligaments that encase a disc may tear and loosen with age. Veins can then invade the disc, accompanied by nerves that get pinched by the weight of the spine.

Treatment: Doctors run a flexible catheter into the disc and heat it to 194 degrees. Heat destroys painful nerve endings and shrinks loose ligaments to reseal the disc.

vertebrae
fortunate
looser
service
blood
panicked
such
problem
ture,

A Randomized, Double-Blind, Controlled Trial: Intradiscal Electrothermal Therapy Versus Placebo for the Treatment of Chronic Discogenic Low Back Pain.

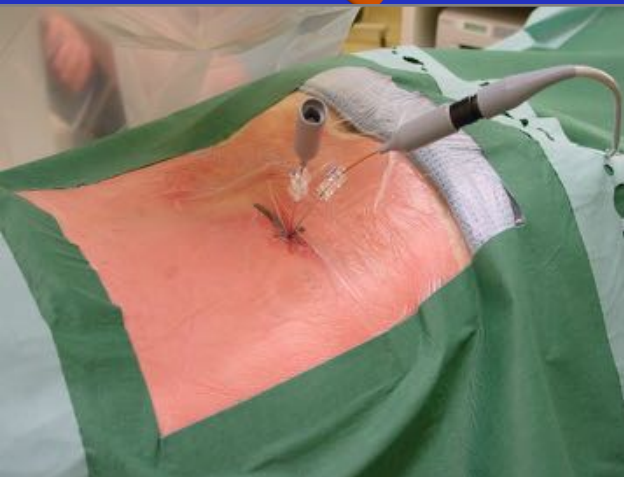
Freeman et al, Spine 2005

Independent technician connected catheter to generator and either

1. Delivered thermal energy (Active)

OR

2/ Did not (Sham)



▪ double blind

A Randomized, Double-Blind, Controlled Trial: Intradiscal Electrothermal Therapy Versus Placebo for the Treatment of Chronic Discogenic Low Back Pain.

Freeman et al, Spine 2005

1/ No subject in either arm met criteria for successful outcome

2/ Further detailed analysis showed no significant change in outcome measures in either group at six months

3/ This study demonstrates ***no significant benefit*** from IDET over placebo



MISS

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, Florida's largest physician-directed center for the treatment of the spine. 13 board-certified/eligible physicians at one location (including spine surgeons, neurologists, neuro-radiologists, medical spine specialists and pain psychologists, together with a team of over 100 support personnel) offer complete spinal care for both diagnosis and treatment.

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 satisfying 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.



Small Back Surgery scar

She'll be back to work in two or three weeks... painless 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 and speak to one of our nurses about our **72-Hour Diagnostic Evaluation Program**. It provides your visit to the Institute, three nights in a luxury hotel on the Gulf of Mexico and local transportation. With our help, you could be back to your normal self faster than you ever imagined.

Florida Spine Institute

A National Spine Care Group
2250 Drive Street, Clearwater, FL 34625

1-800-477-7746

Call To Receive A Free Video About Laser Surgery



"Mr. Osborne, may I be excused? My brain is full."

Lumbar spinal stenosis



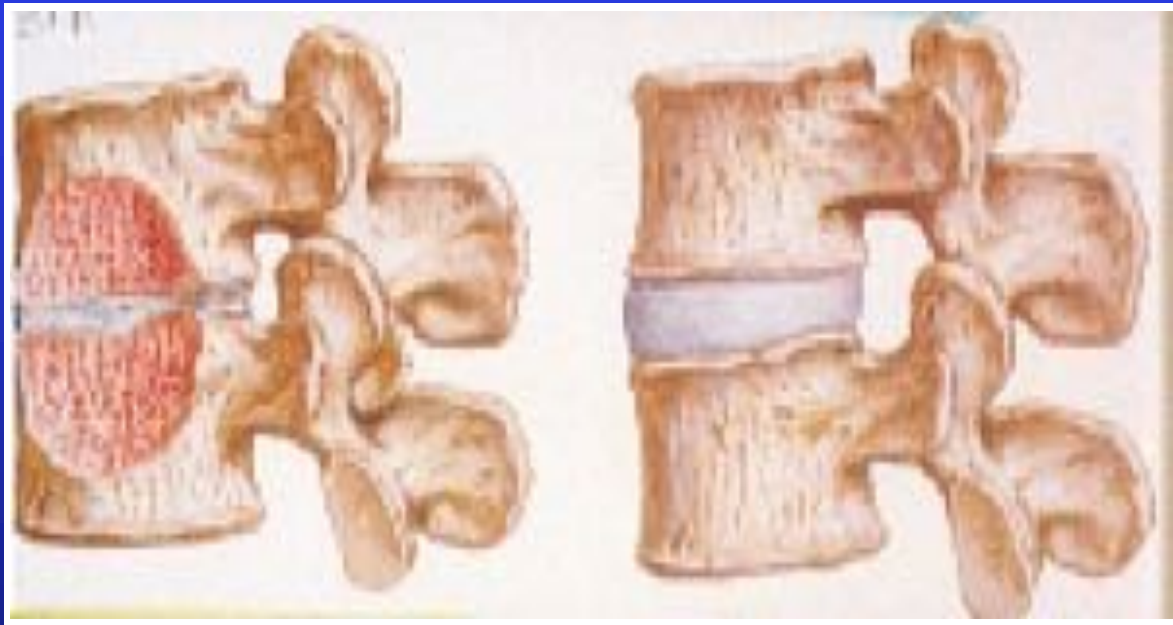
DEFINITION

- DURA/CAUDA EQUINA COMPRESSED IN A NARROW CANAL = “CENTRAL” STENOSIS



DEFINITION

NERVE ROOT/DORSAL ROOT
GANGLION OR SPINAL NERVE
TRAPPED IN ITS PATHWAY =
“LATERAL” STENOSIS



CLINICAL PRESENTATION

- LOW BACK PAIN (LBP)
- NEUROLOGIC SIGNS AND SYMPTOMS
 - Neurogenic claudication
 - Radiculalgia
 - Cauda Equina Syndrom

SURGERY



SURGICAL TREATMENT

- Laminectomy/Flavectomy/Arthrorectomy



LAMINOTOMY

with

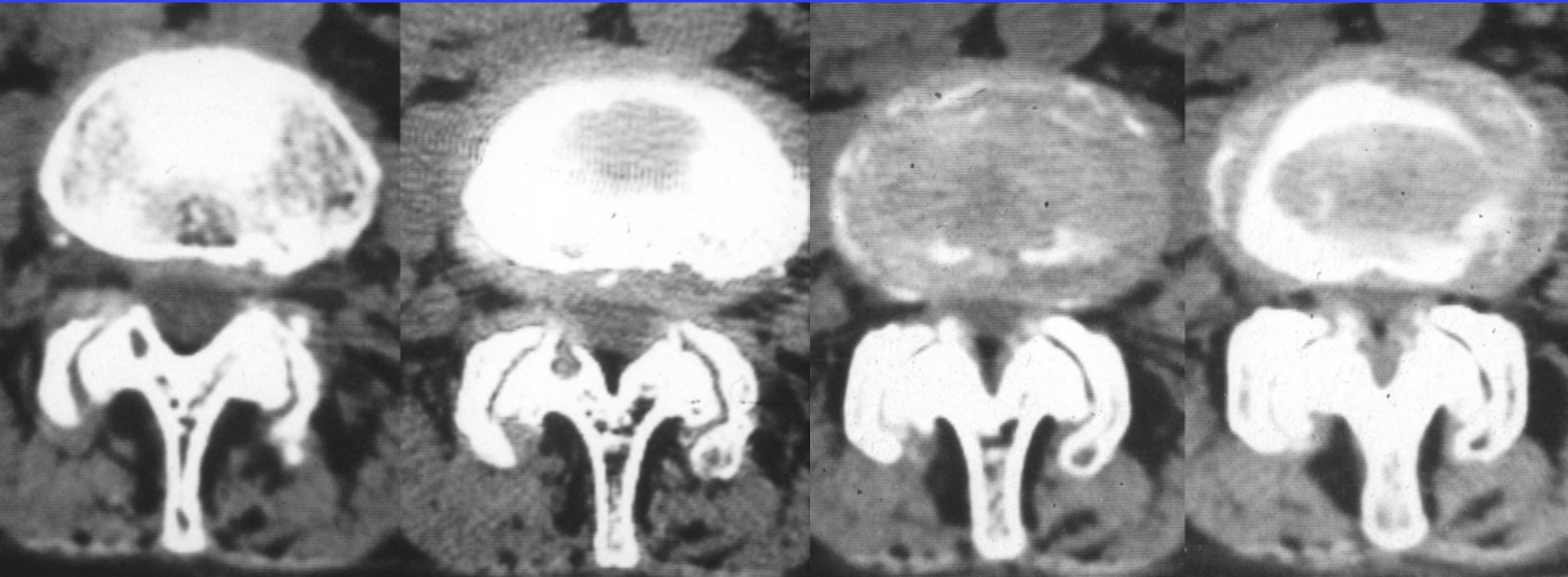
PARTIAL ARTHRECTOMY

=

LAMINARTHRECTOMY

Degenerative spondylolisthesis





Isthmic spondylolysis

- Fatigue fracture
- Hereditary but not congenital
 - Caucasians > blacks
 - > 20% Alaskan Inuit
 - Never found in foetus or stillborn

Isthmic spondylolysis

- Gymnasts & acrobats



The Natural History of Spondylolysis and Spondylolisthesis

45-Year Follow-up Evaluation

William J. Beutler, MD,* Bruce E. Fredrickson, MD,* Albert Murtland, MD,†
Colleen A. Sweeney, MA,* William D. Grant, EdD,* and Daniel Baker, MD†

At 30 year follow-up:

“No subject reported any severe low back pain episodes”

- 12 with no pain, 11 with mild intermittent pain 1 with moderate low back pain

The Natural History of Spondylolysis and Spondylolisthesis

45-Year Follow-up Evaluation

William J. Beutler, MD,* Bruce E. Fredrickson, MD,* Albert Murtland, MD,†
Colleen A. Sweeney, MA,* William D. Grant, EdD,* and Daniel Baker, MD†

At 45 year follow-up:

No difference in SF-36 compared to normals

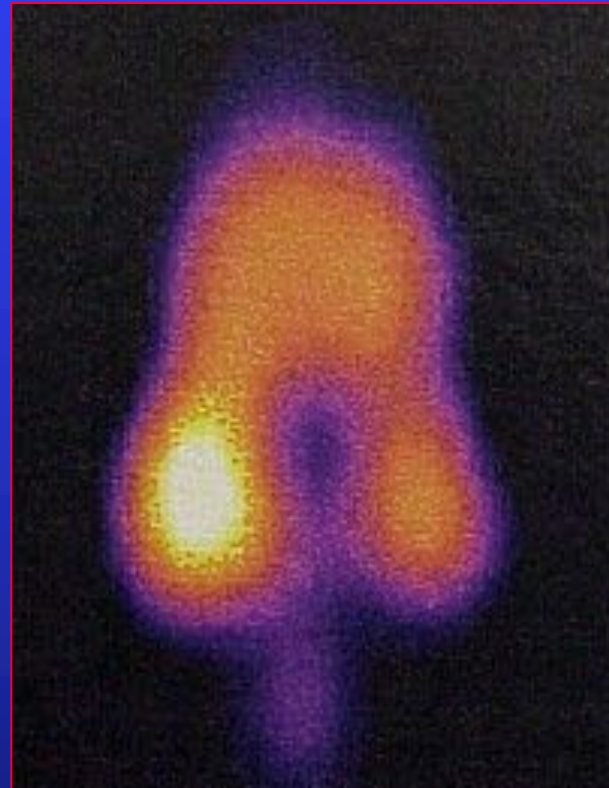
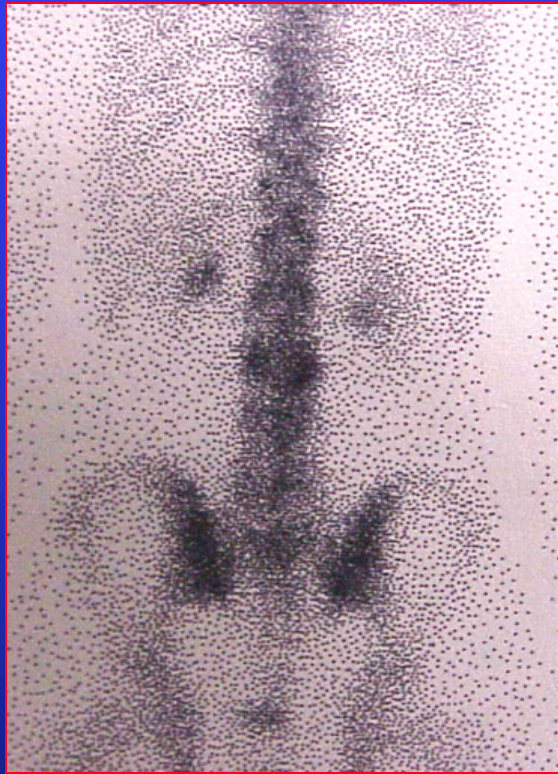
14 subjects reported episodes of back pain lasting > 5 days

8 subjects reported a day of lost work over their lifetime

3 had narcotic use for low back pain over their lifetime

A spondylolysis is seldom the cause of pain

- There is no need to operate

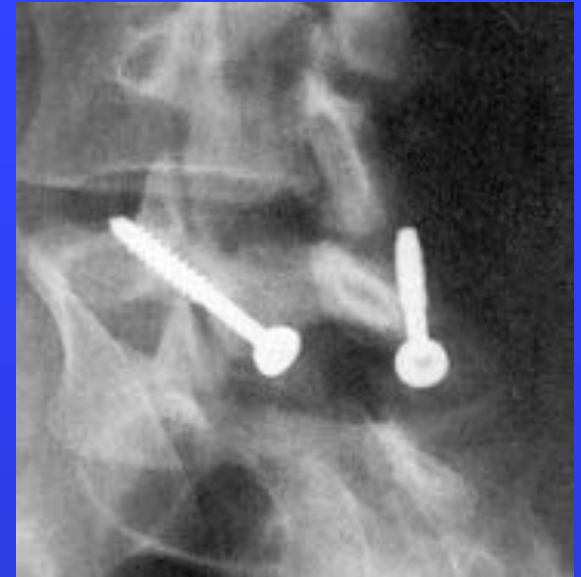


Aim of Surgery

- Resolve pain
- Restore anatomy of spinal segment



Buck JE



Direct repair of the defect in
spondylolisthesis.

J Bone Joint Surg (B) 1970; 52.



Morsher E, Gerber B, Fasel J.

Surgical treatment of spondylolisthesis by bone grafting and direct stabilization of spondylolysis by means of a hook screw.

Acta Orthop Trauma Surg 1984; 103:175-8.



Tokuhashi Y and Matsuzaki H.

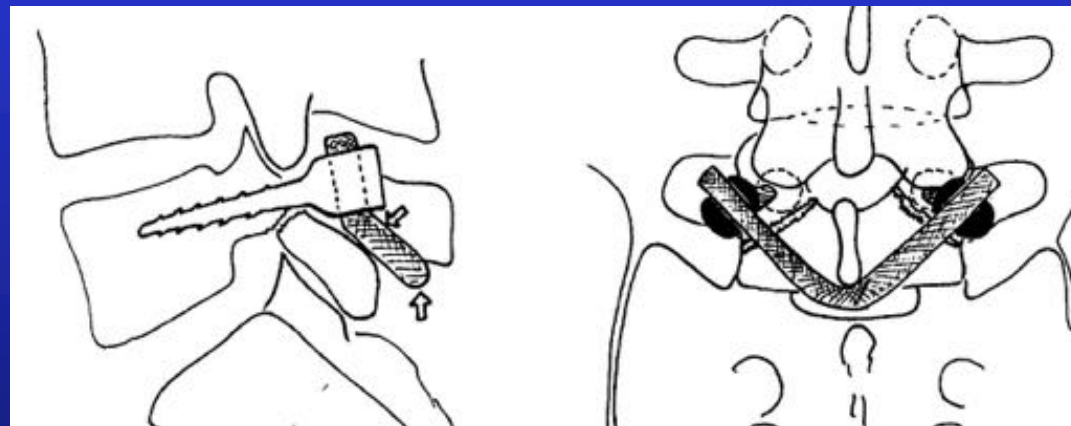
Repair of defects in spondylolysis by segmental pedicular screw hook fixation. A preliminary report.

Spine 1996; 21:2041-5.

Gillet Ph and Petit M.

Direct repair of spondylolysis without spondylolisthesis, using a rod-screw construct and bone grafting of the pars.

Spine 1999;24(12):1252-6



Conclusions

- Direct repair is a successful procedure

Substantial relief of pain (85%)

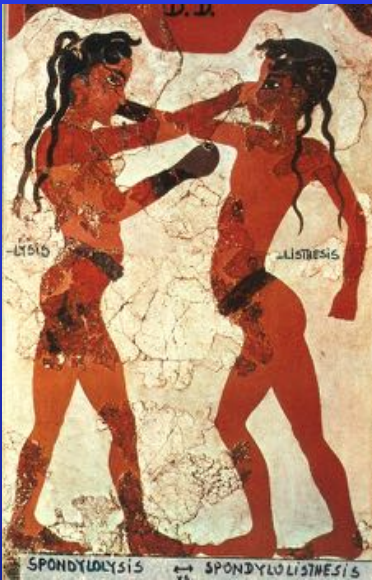
Return to sport (79%)

Acceptable rate of complications (13%)

5% fusion 5y fup

- **If it was the source of pain**

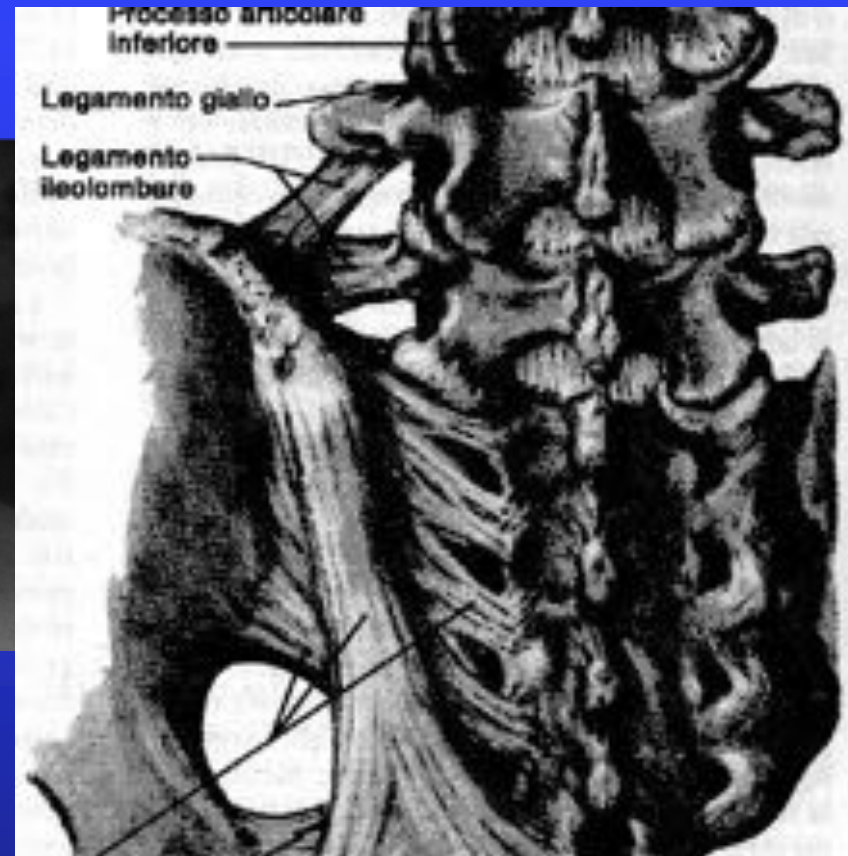
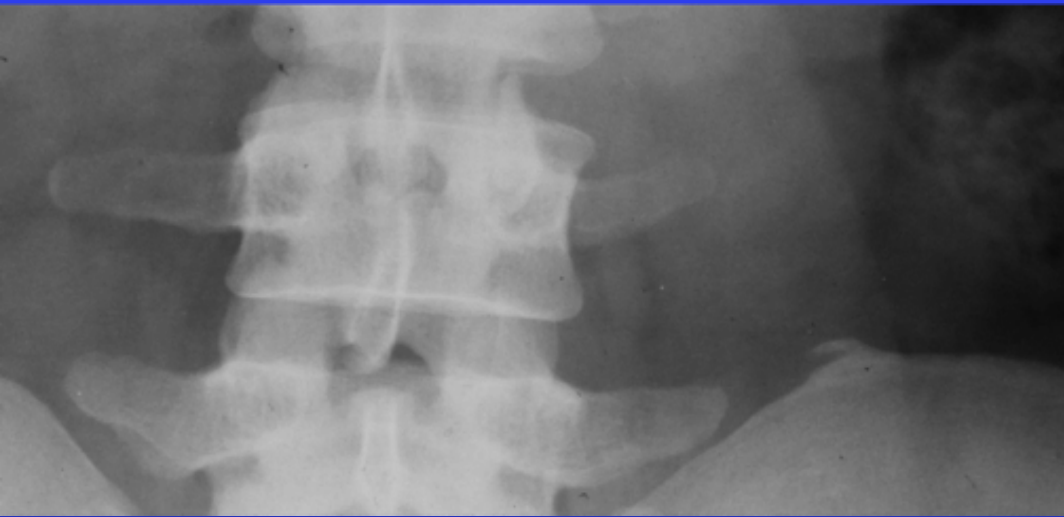
Spondylolisthesis

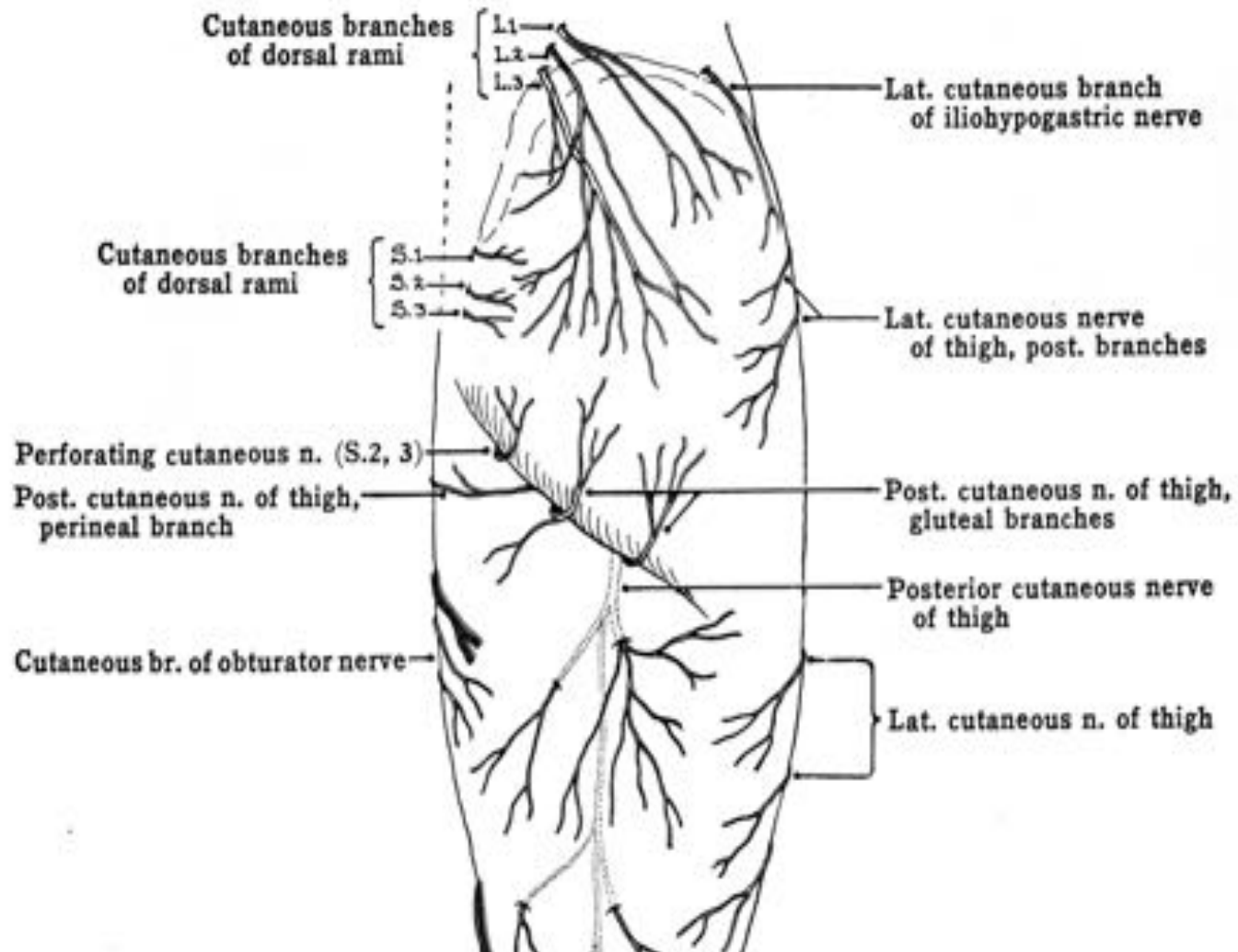


- Fusion in situ?
- Reposition and fusion?



Ilio-lumbar ligament







Surgery of the spine:

Orthopaedics versus Neurosurgery?

‘Spine Surgeon’

