Surgery in Lumbar Disc Herniation

Selection of patients, Indications and techniques

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NAME ?
HAGAR


WHAT'S YOUR PROBLEM ?
BACK PAIN !
CHRIS BROWNE 5-29

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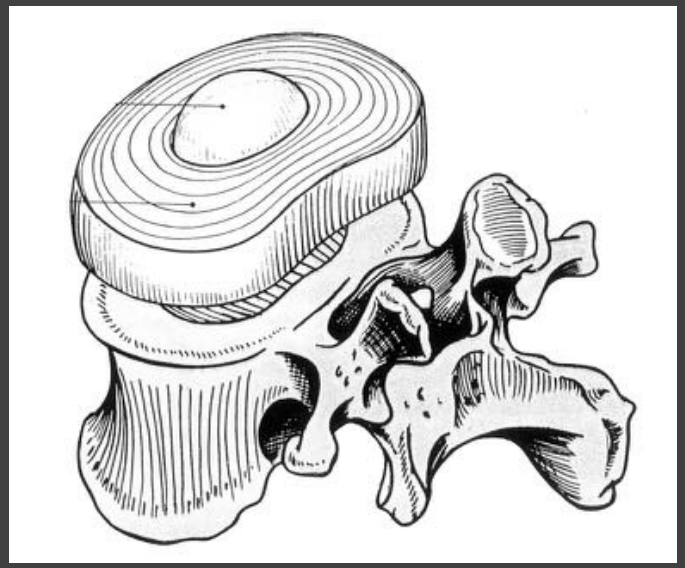

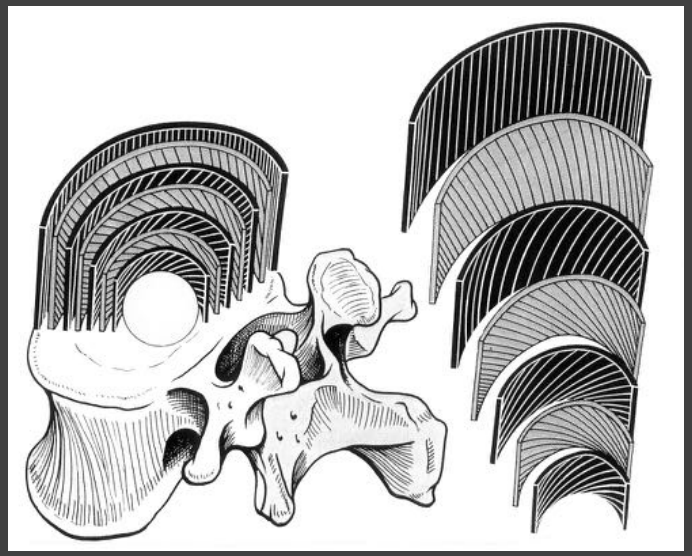

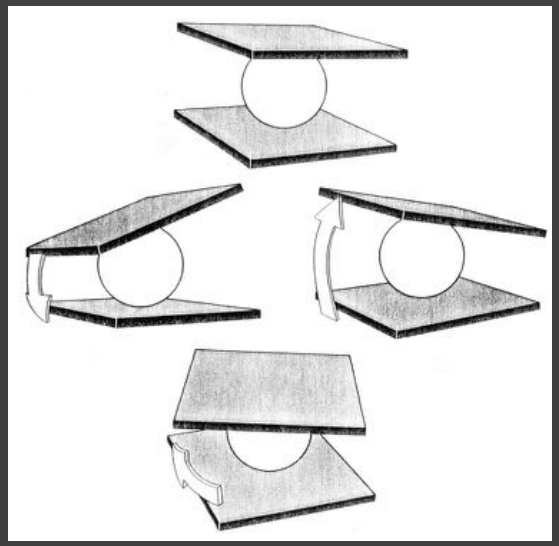

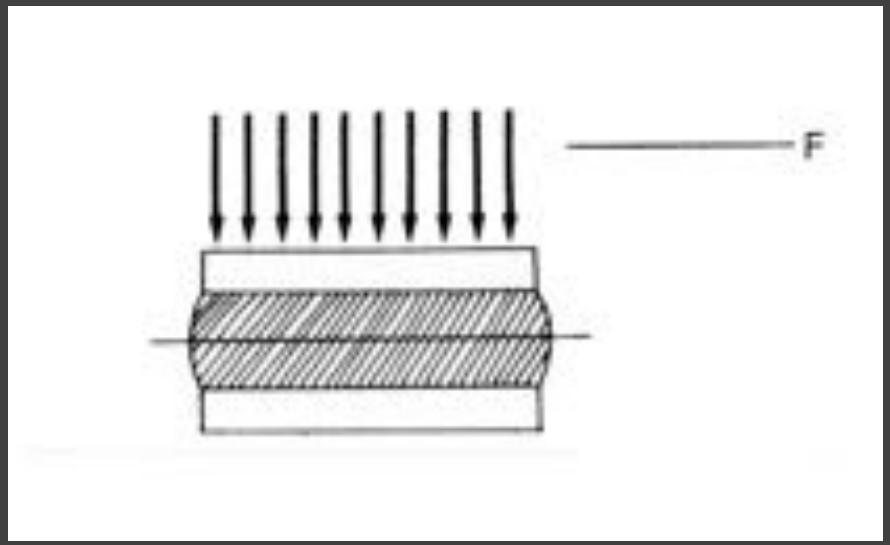
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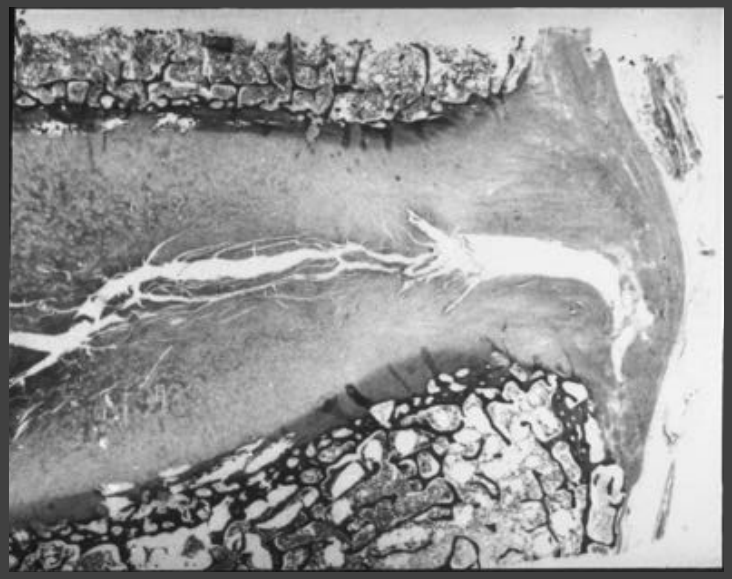

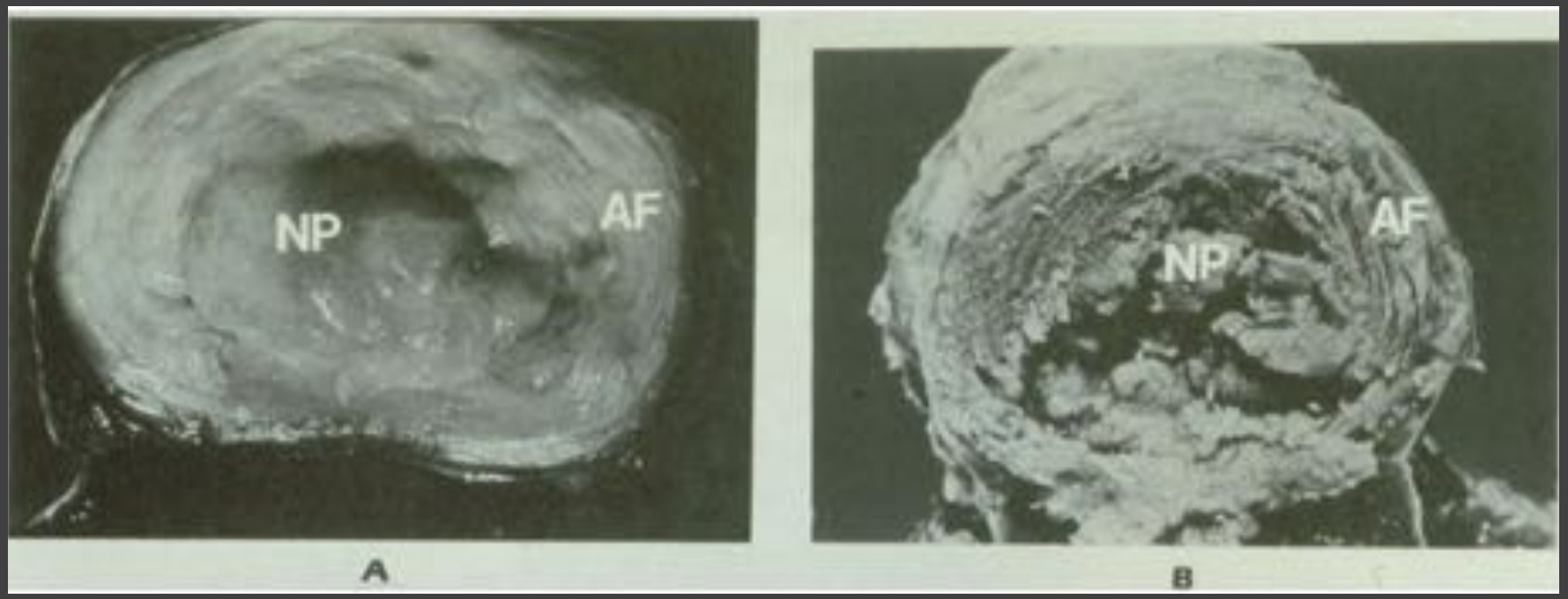
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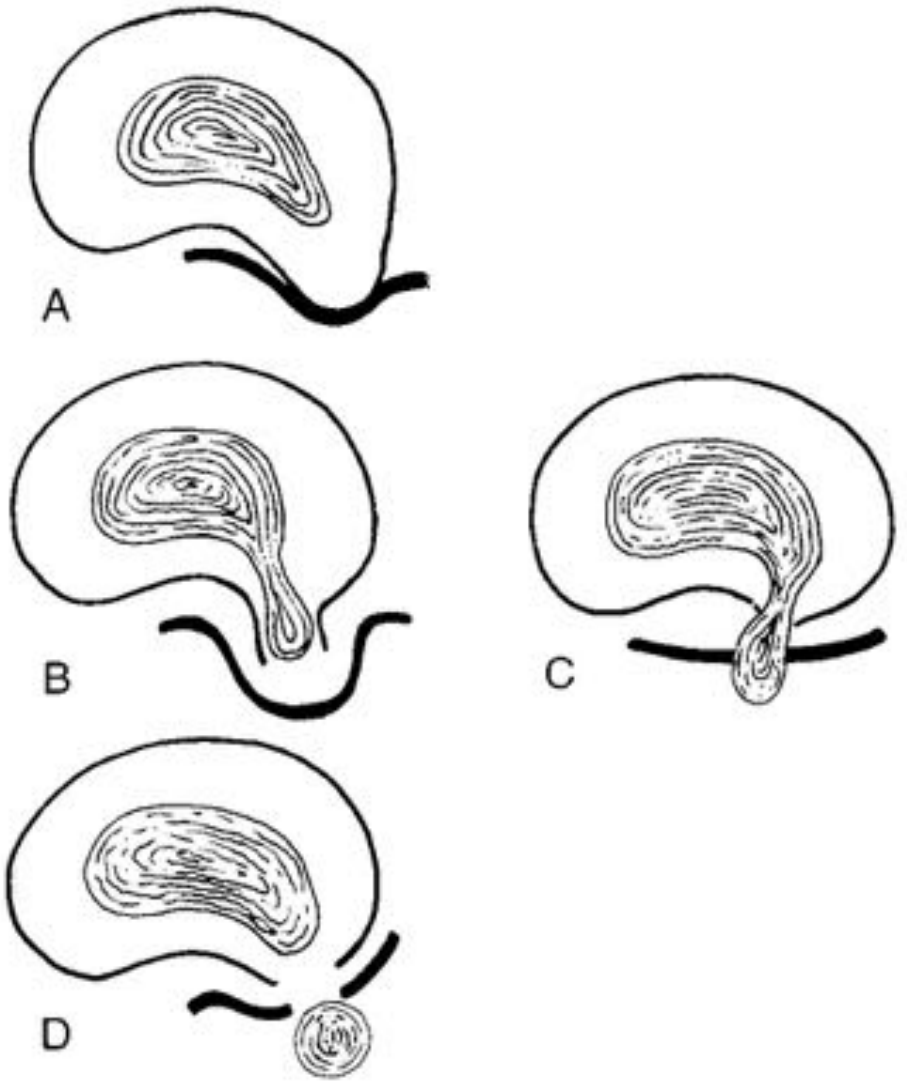
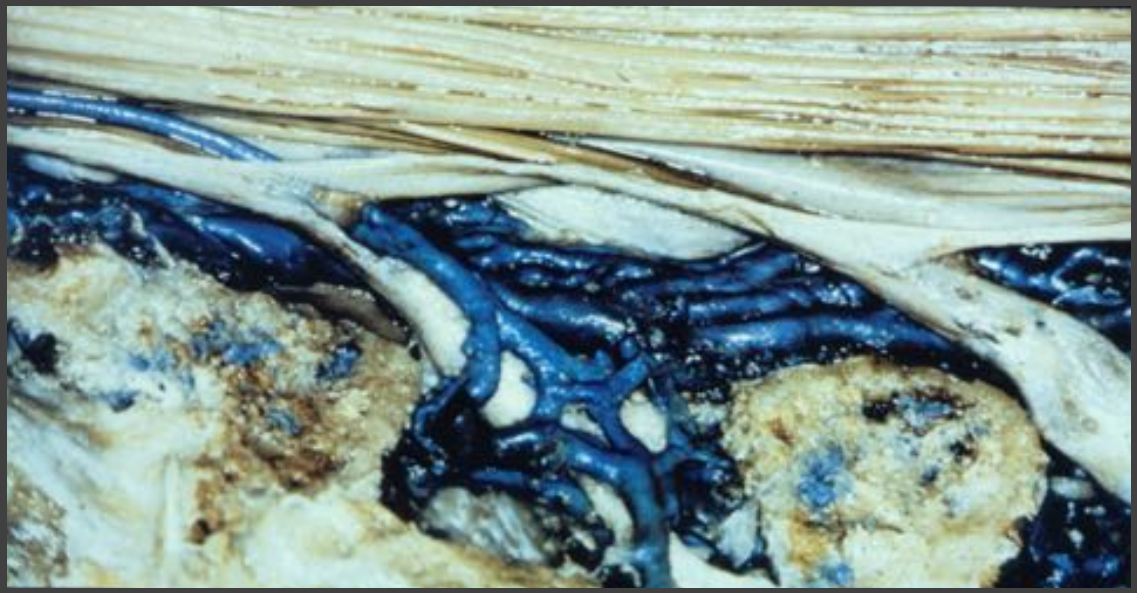


Figure 1. *A*, Contained disc *protrusion*. *B*, Noncontained subligamentous disc *extrusion*. *C*, Noncontained transligamentous disc *extrusion*. *D*, Noncontained disc *sequestration*.

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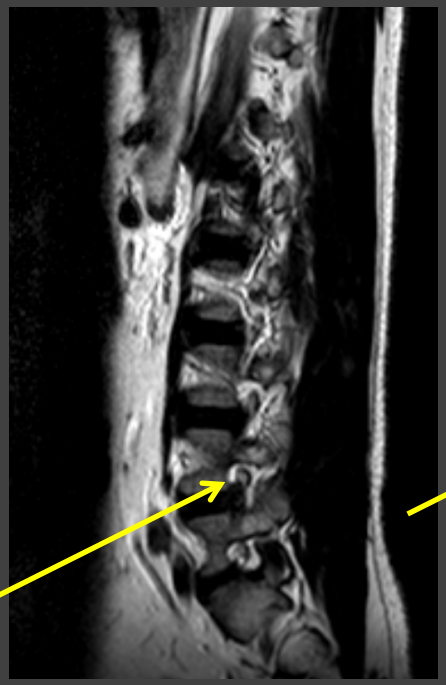

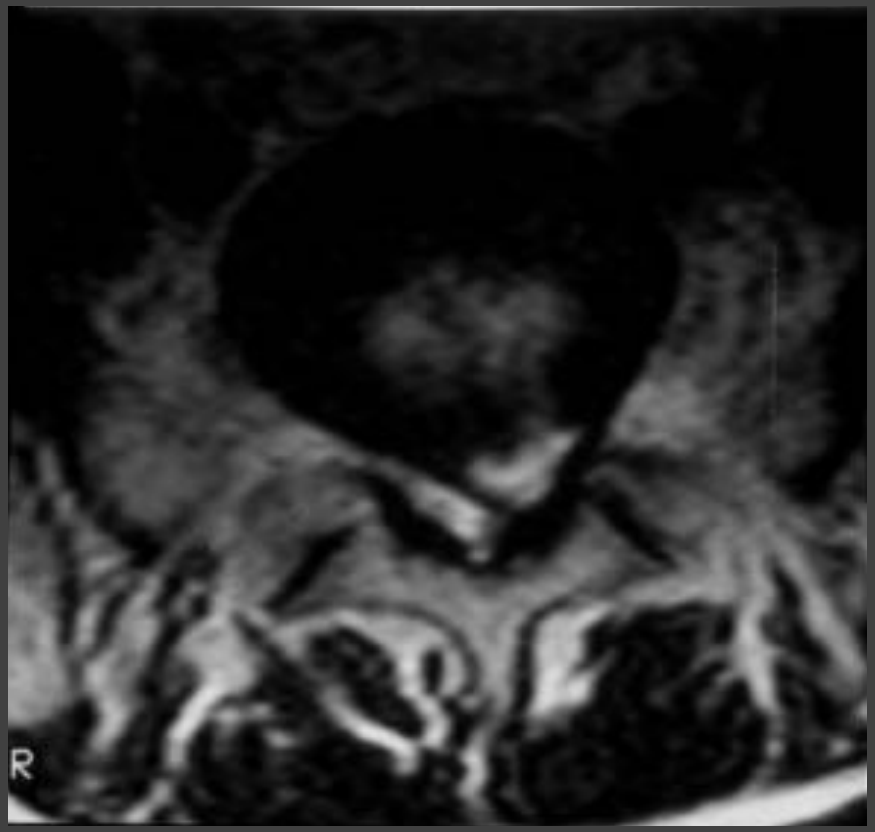
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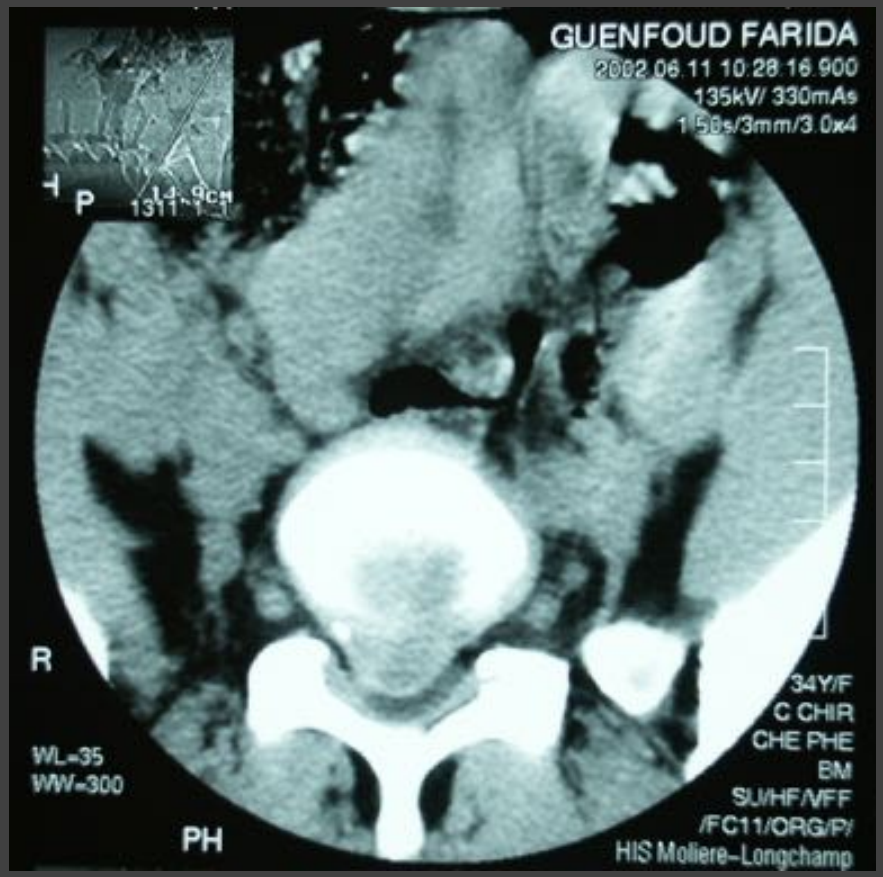
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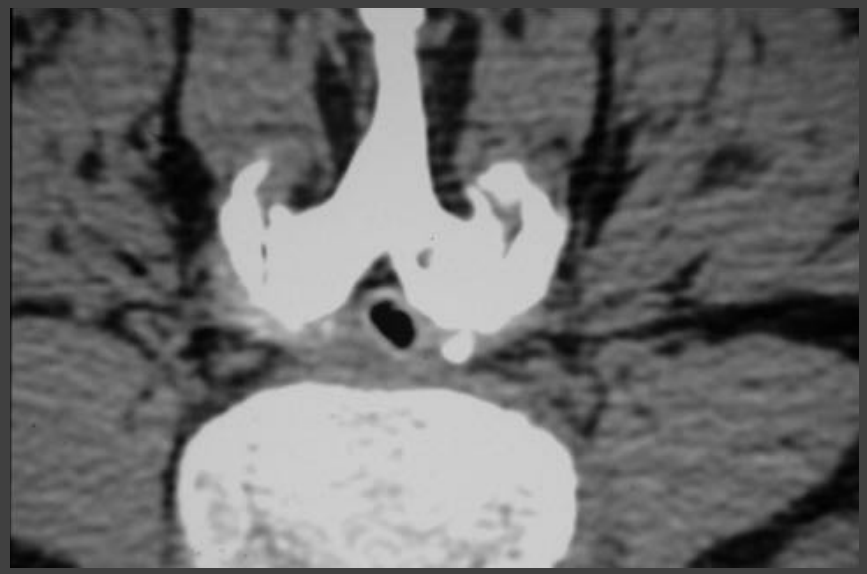
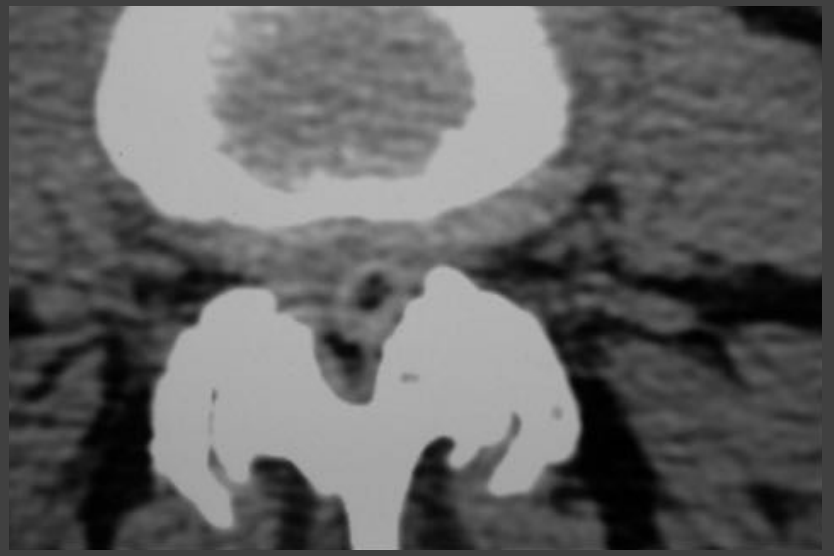




Reliabilty of MRI in disc herniation

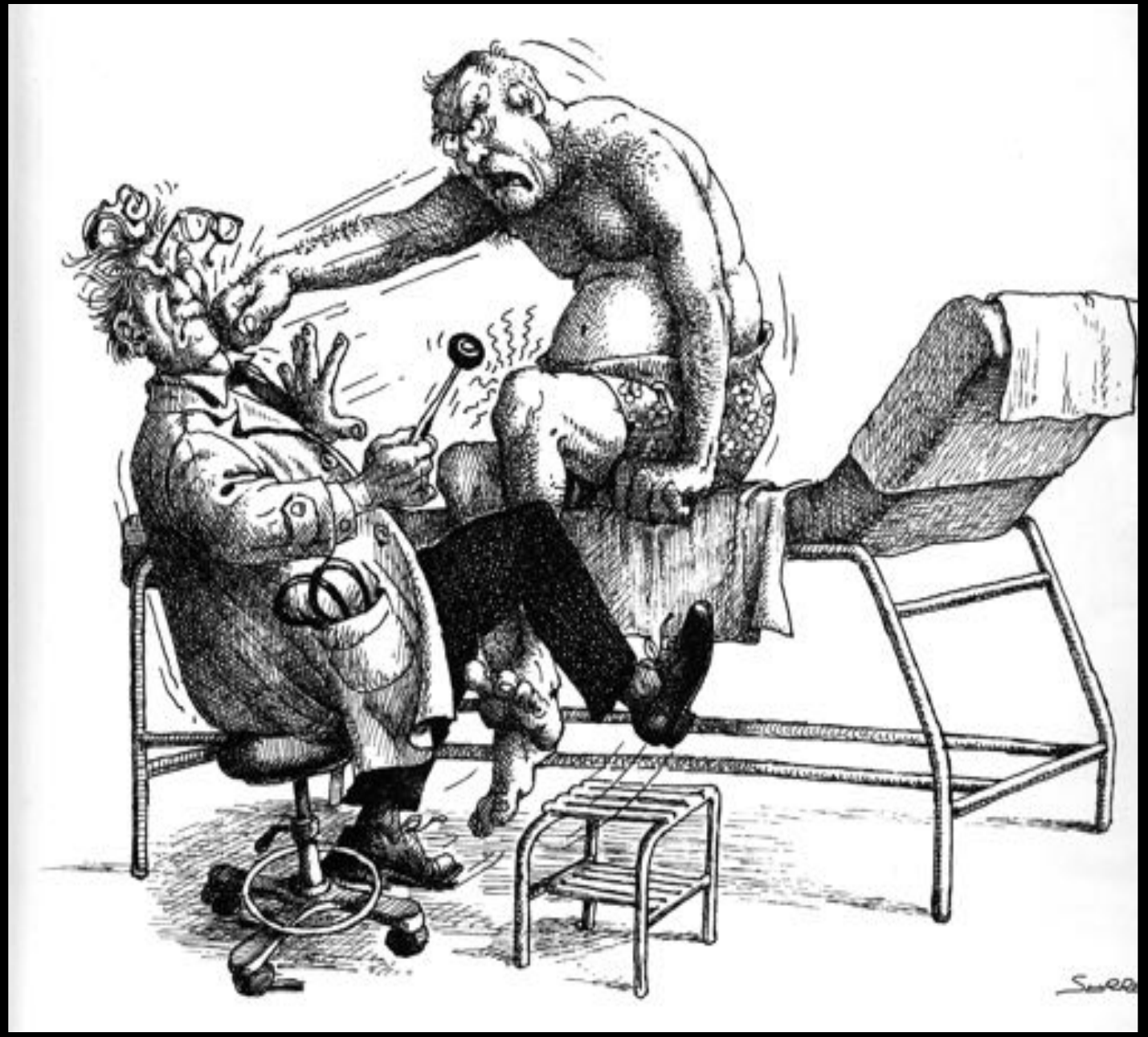
- Inter reader reliability
- Disc morphology good (kappa 0.81), thecal compression moderate (kappa 0.54), nerve root impingment moderate (kappa 0.47)
  - Lurie JD et al. Spine 2008;33:991-998

MRI interpretation in herniated disc

- Radiologist vs Clinician interpretation
- Level of herniation 93.4 % - 3.3 disagreement
- 3.3 % radiologist did not confirm clinician finding of HD
- Morphology 42.2 % (kappa 0.24)
- Axial location (kappa 0.81), Disagreement left/right 3.3 %
  - *Lurie JD Spine 2009;34:701-705*

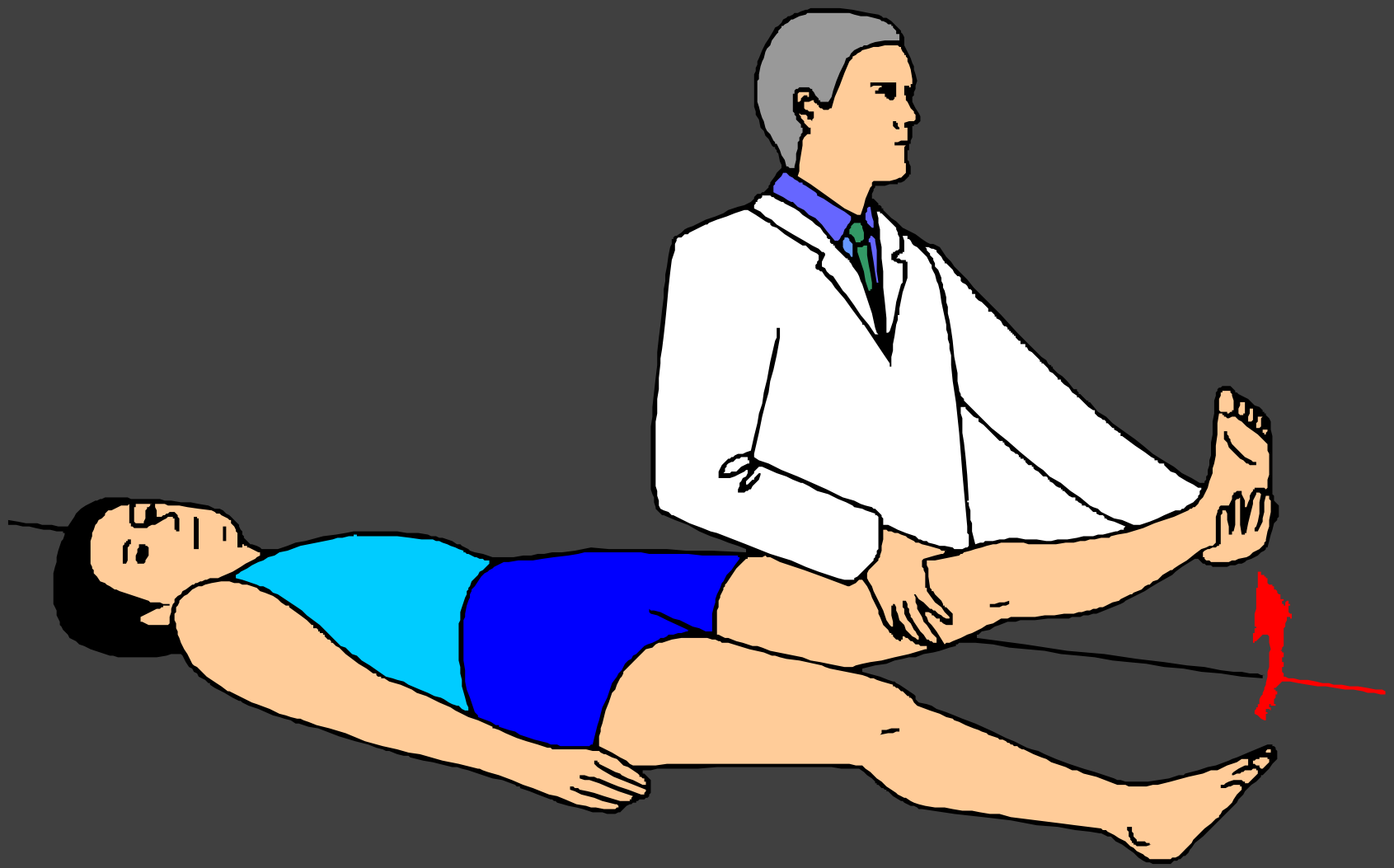
Always a pathology?

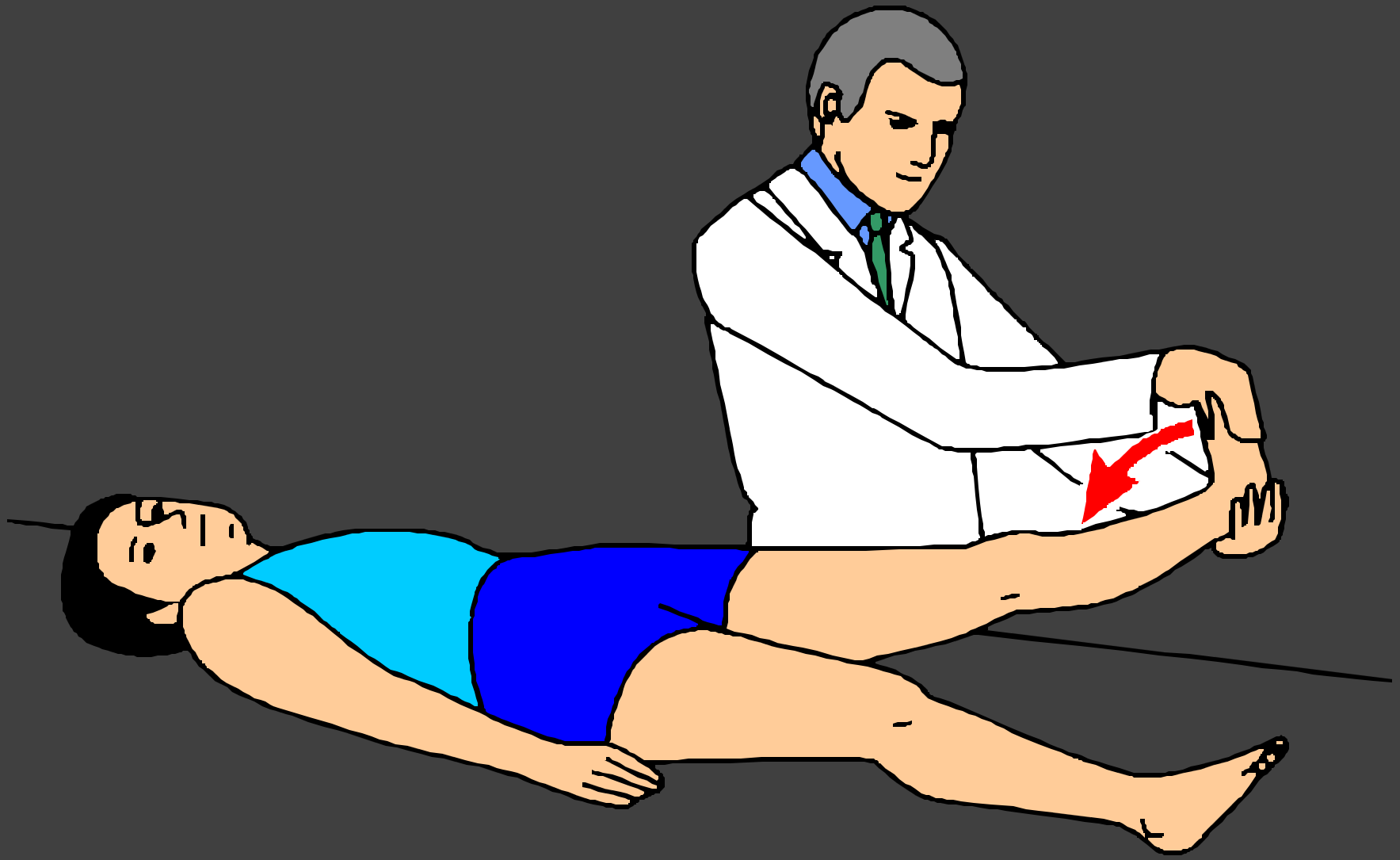
- Asymptomatic subjects (Boden et al 1990)
  - Discal protrusion
    - > 39 ans : 35 %
    - > 60 ans: 99 %
  - Herniated Disc 10 – 20 % (Jensen et al. 1994)

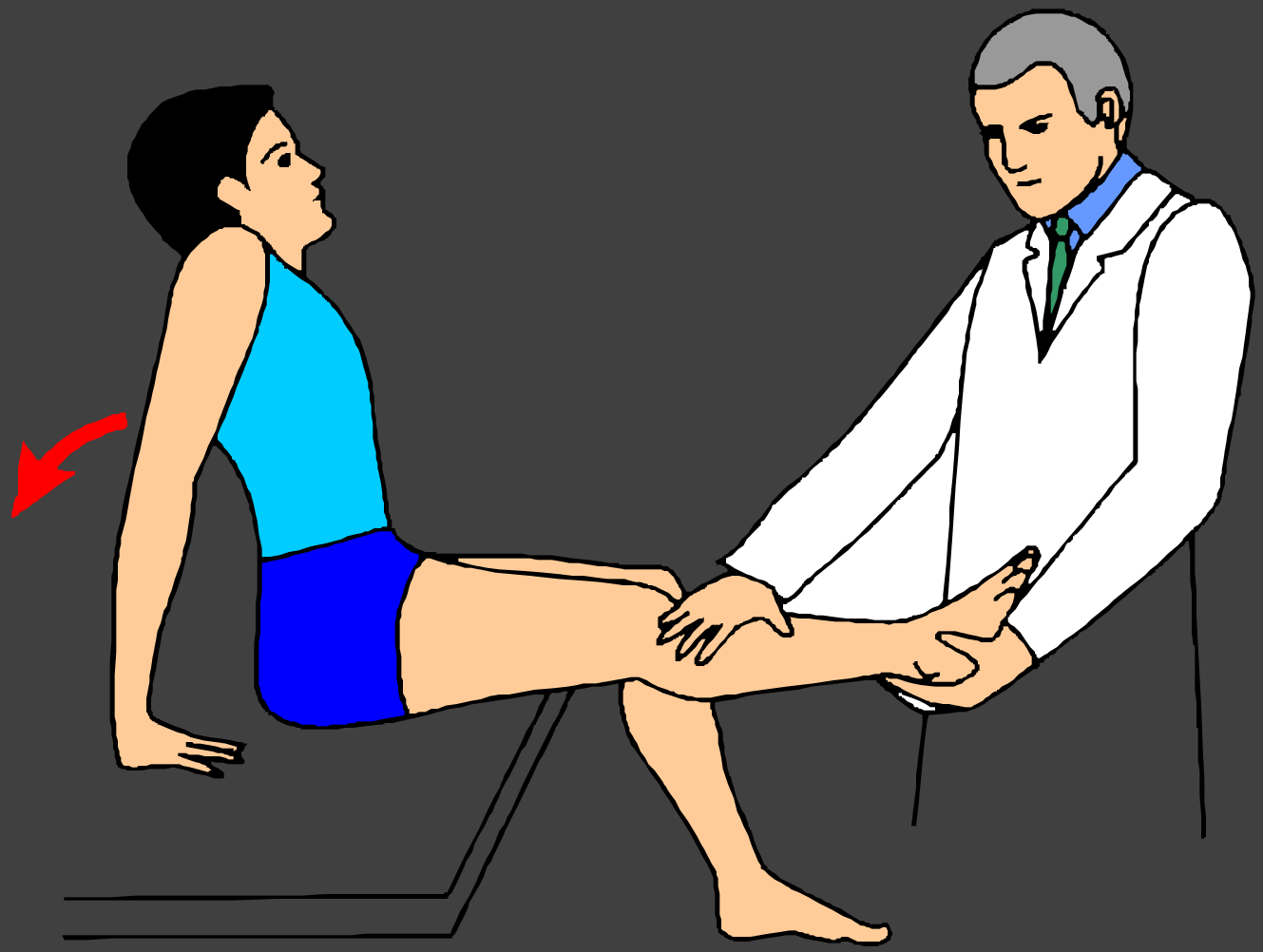


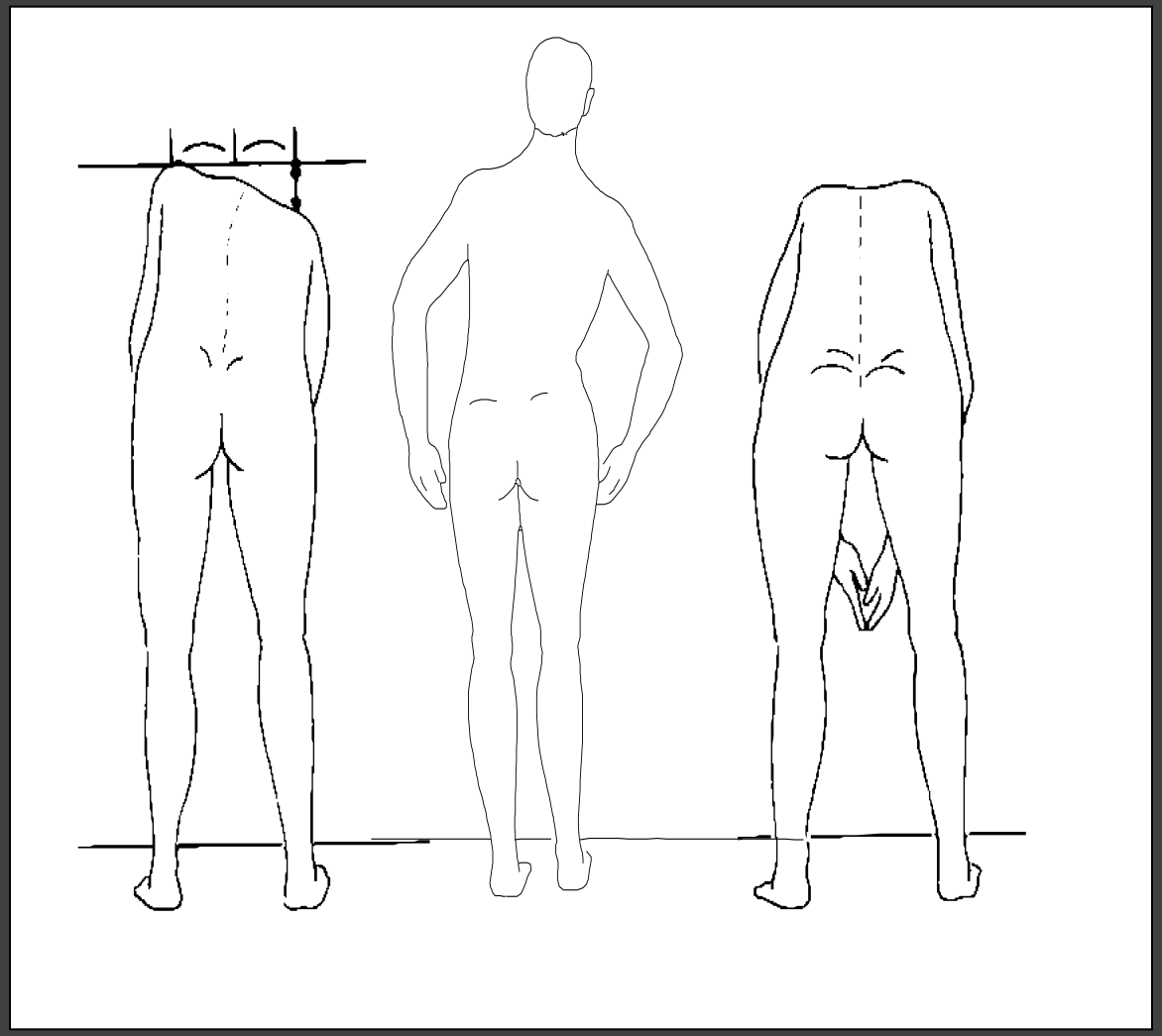
Mainly a psychiatrist !!

Fig 2. Ernest Laségue (1816-1883). In this picture we appreciate the maneuver to provoke the so-called Laségue sign.

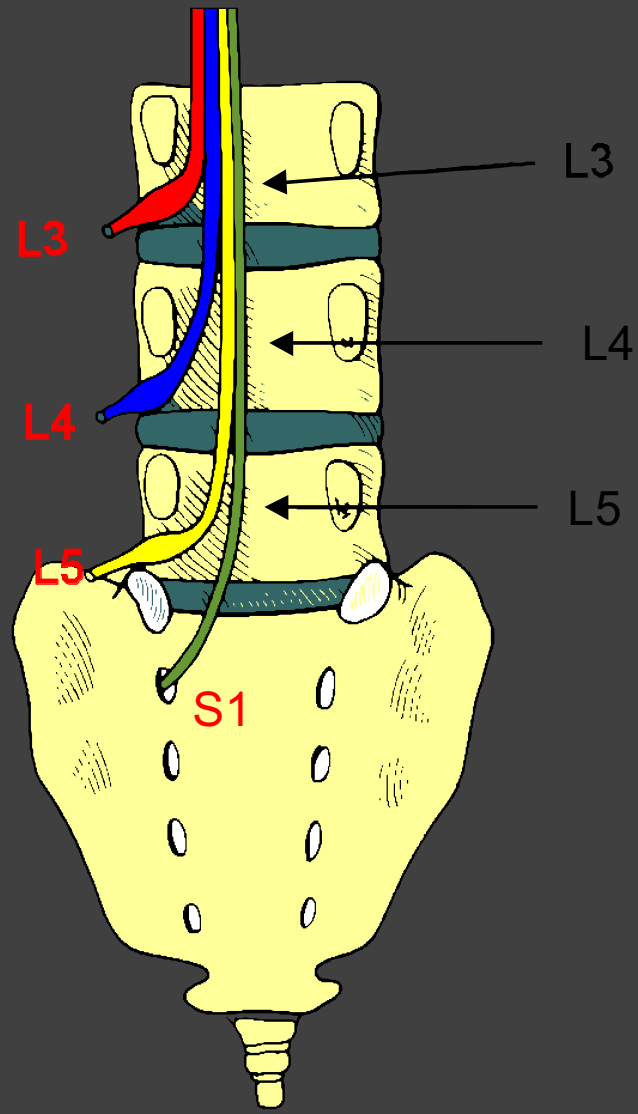






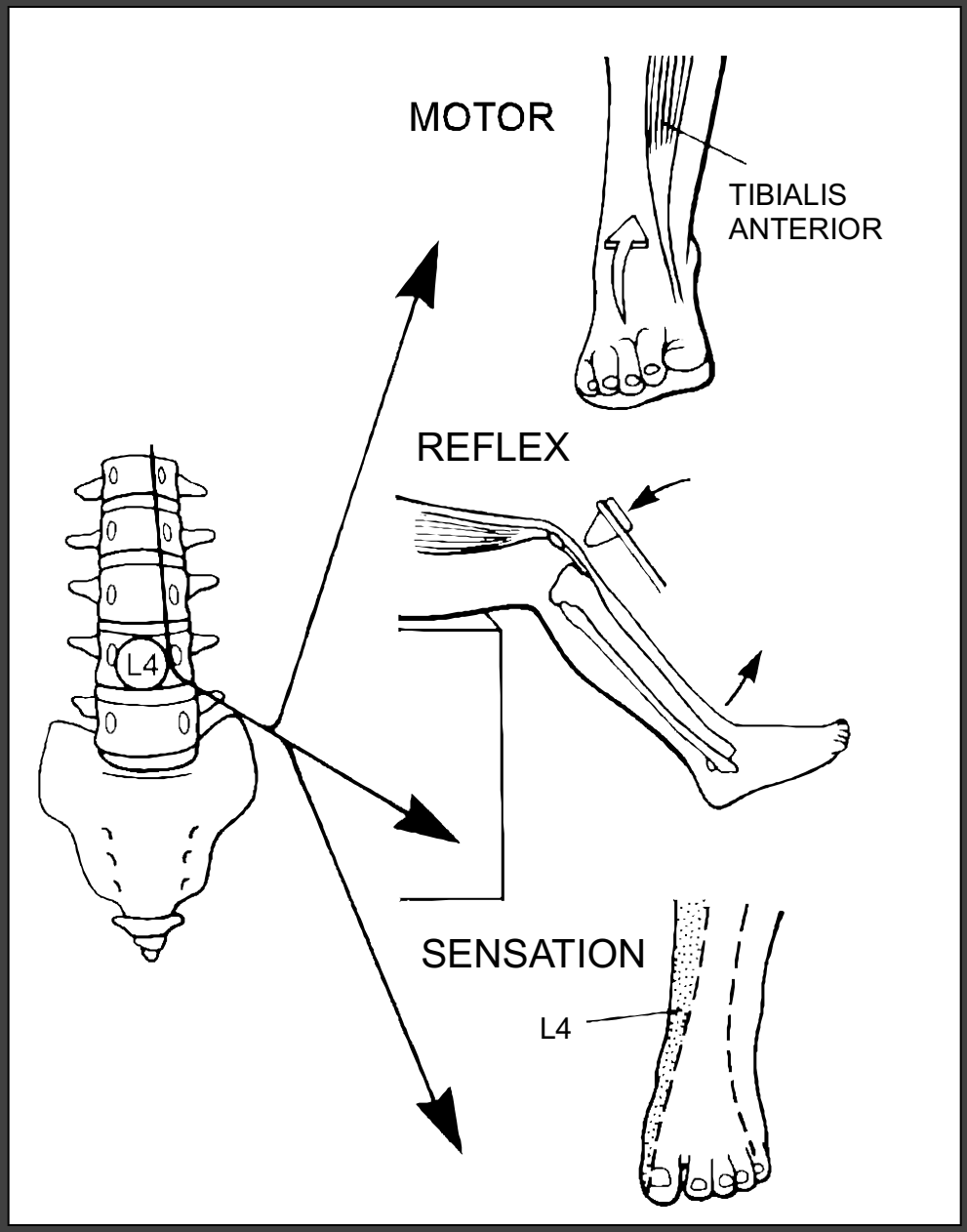


Scoliosis VS Trunk list



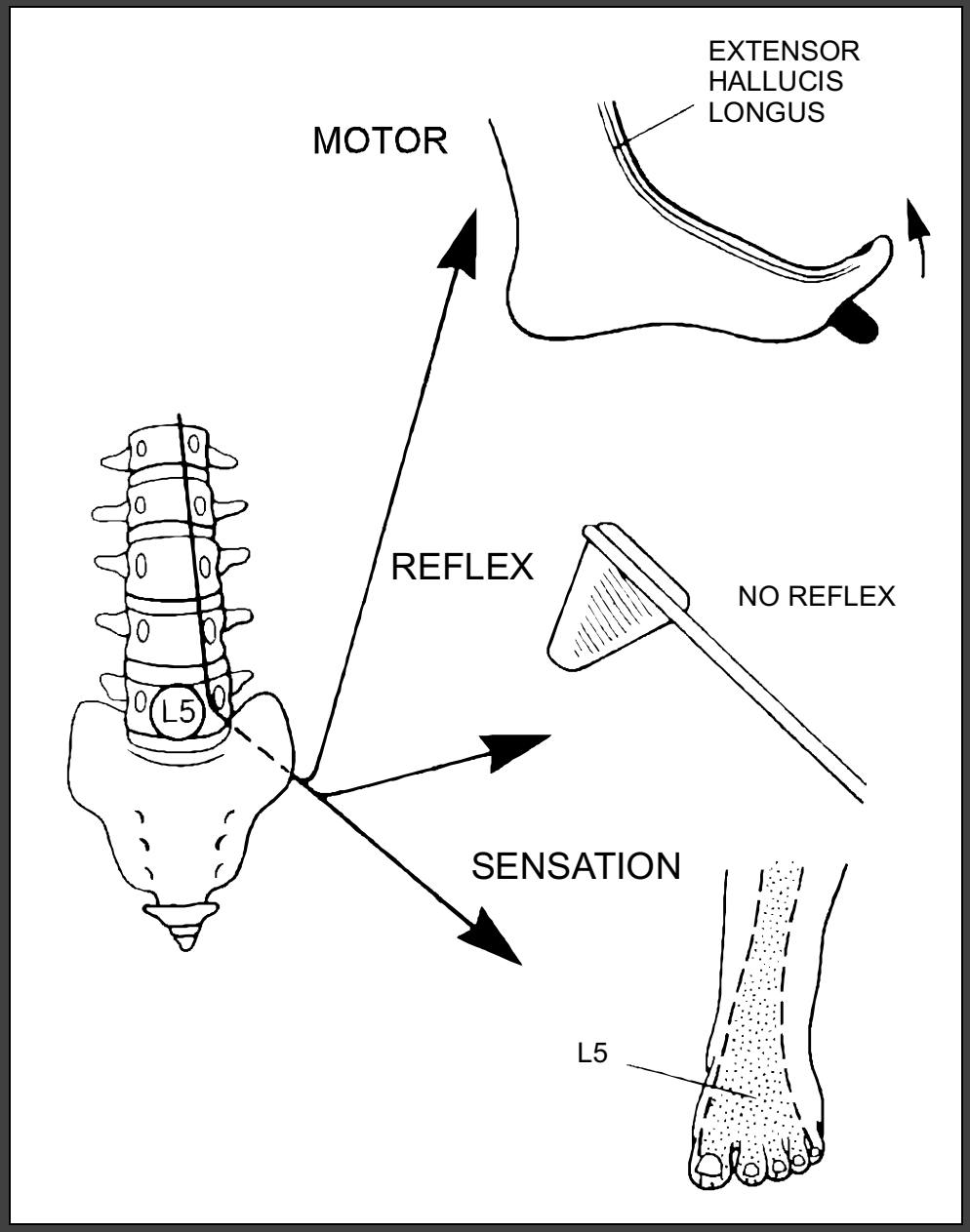
Dermatomal distribution by each nerve root level

L4



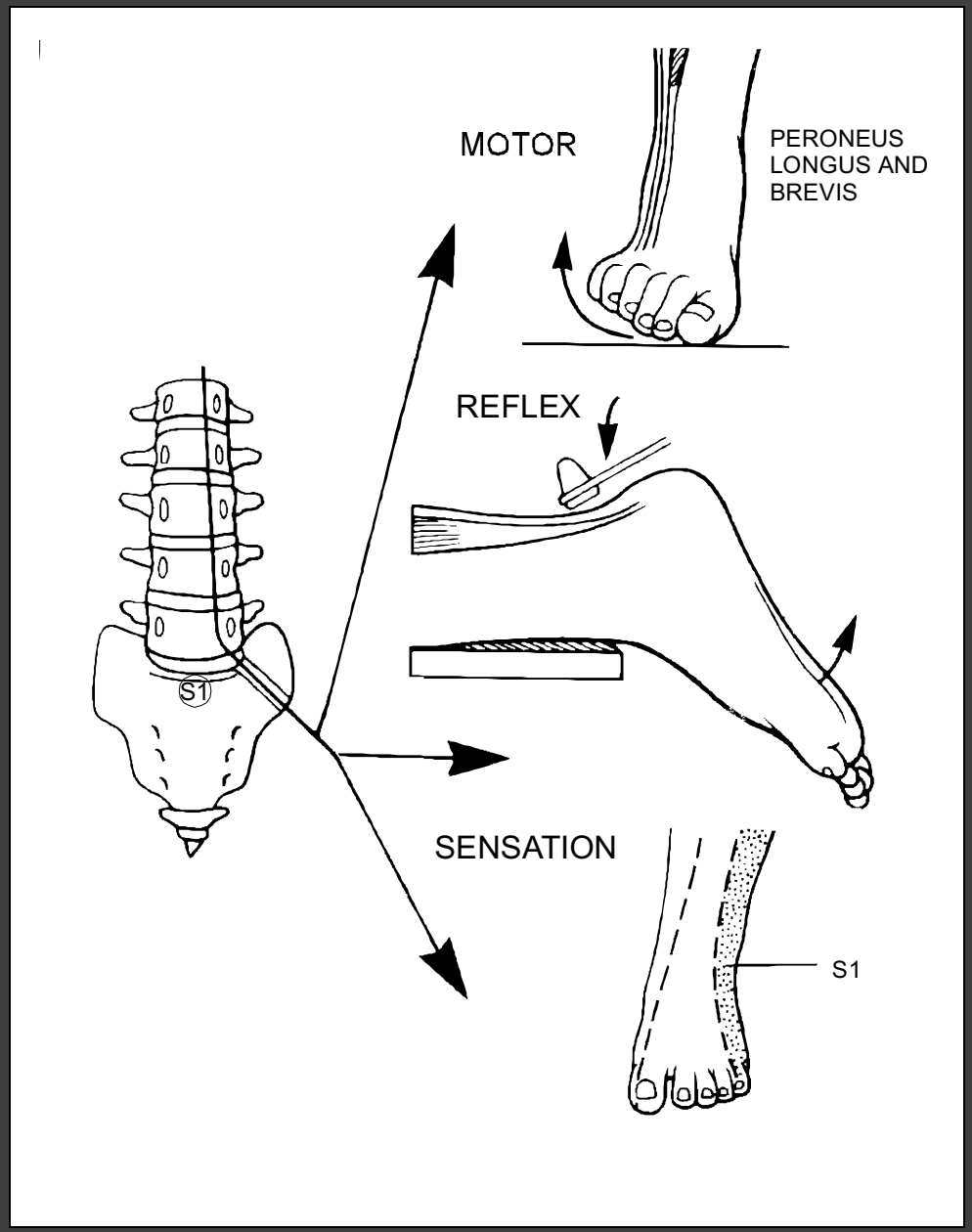
NERVE ROOT
COMPROMISE

L5



NERVE ROOT
COMPROMISE

S1



NERVE ROOT COMPROMISE

ACCURACY OF PHYSICAL EXAMINATION IN HERNIATED DISC

Examination	Sensitivity	Specificity
Ispilateral SLR	0.80	0.40
Crossed SLR	0.25	0.90
Ankle dorsifl. weakness	0.35	0.70
Great toe ext. weakness	0.50	0.70
Impaired ankle reflex	0.50	0.60
Sensory loss	0.50	0.50
Ankle plantar flex. weakness	0.06	0.95
Quadriceps weakness	0.01	0.99

} Combined (or) specificity = 0.90

From : Deyo et al. JAMA 268: 760-5, 1992

Treatments

- Conservative
  - Rest, physio, NSAIDs
  - Epidurals
- Chymonucleolysis : coming back in US !!!
  - Chymopapaïne
- Surgery
  - Discectomy
  - Microdiscetomy
  - Percutaneous (laser, transforaminale…)

Treatments

- 90 % improvement with conservative treatment
- 1 recurrence = 50 % of later recurrences
- 2 reccurences = almost 100 % of later recurrences
  - McCullogh Spine 1996;18:1662-71

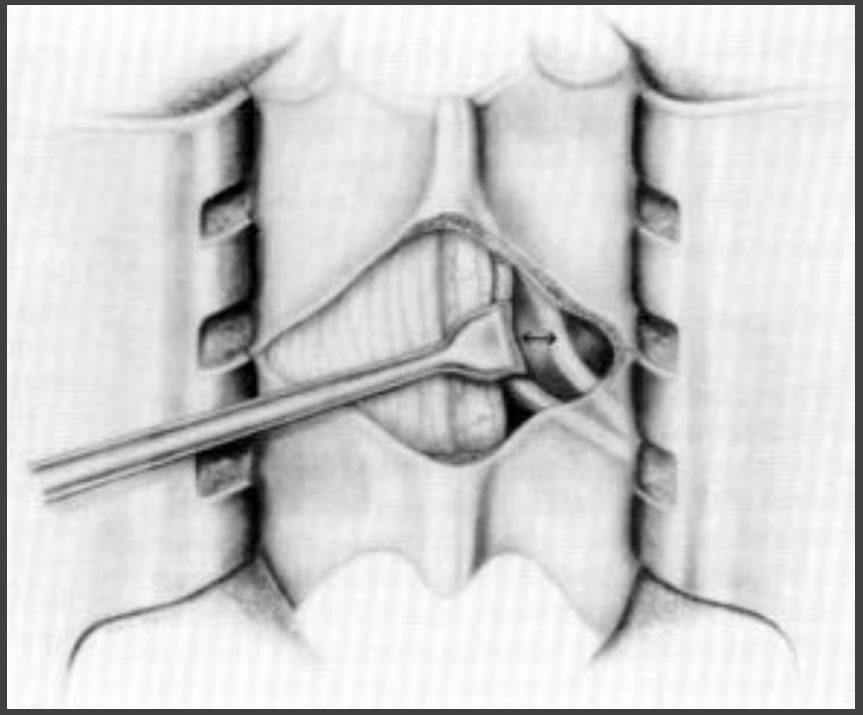
- Better and faster early improvement with surgery but no differences at 10 years.

The origin of knowledge on HNP

WJ. Dandy, WJ. Mixter and J. Barr

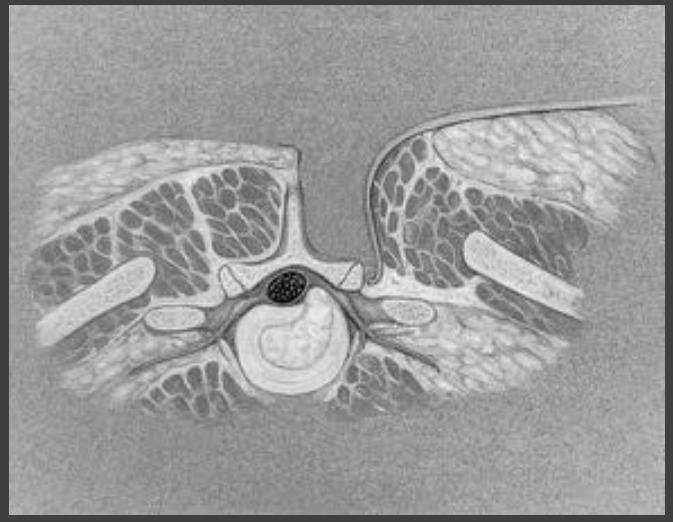
Dandy WJ: Loose Cartilage from Intervertebral Disc Simulating Tumor of the Spinal Cord, Arch Surg, 19:660-672, 1929

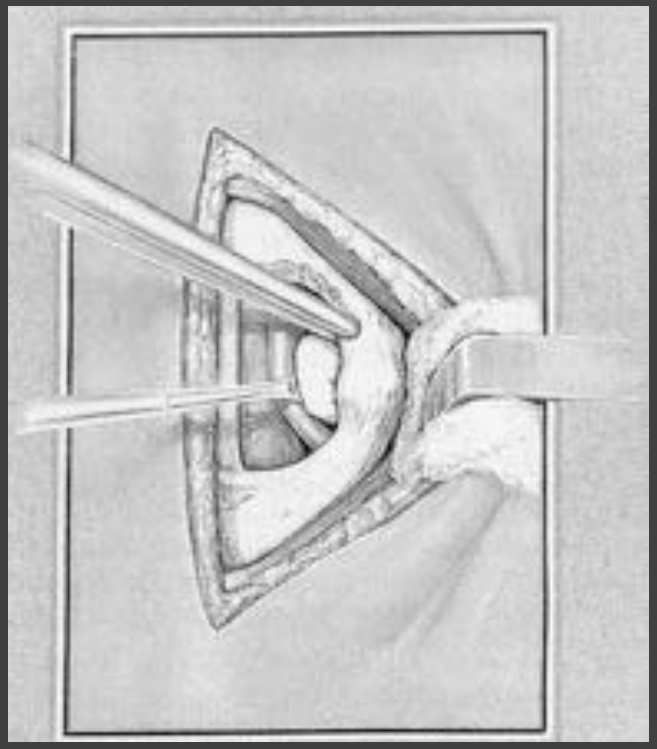
Mixter WJ, Barr J. Rupture of the intervertebral disc with involvement of the spinal cord. *N Engl J Med*. 1934;211:210-4.

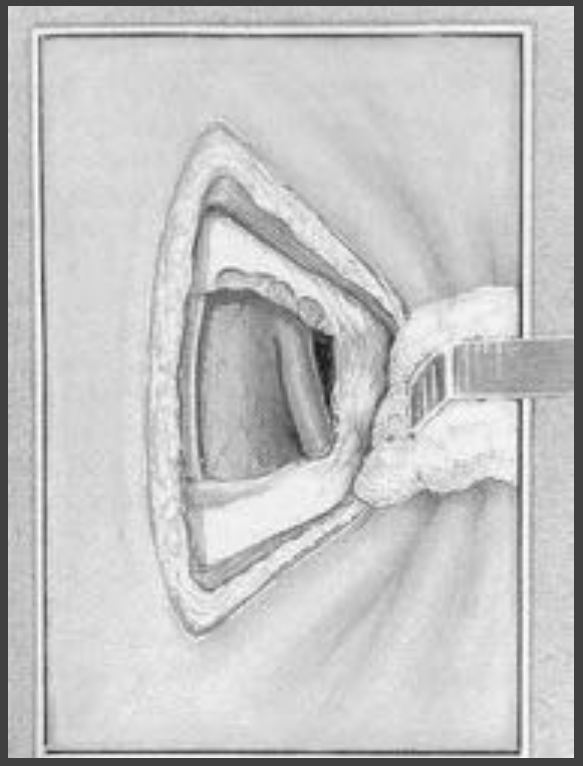


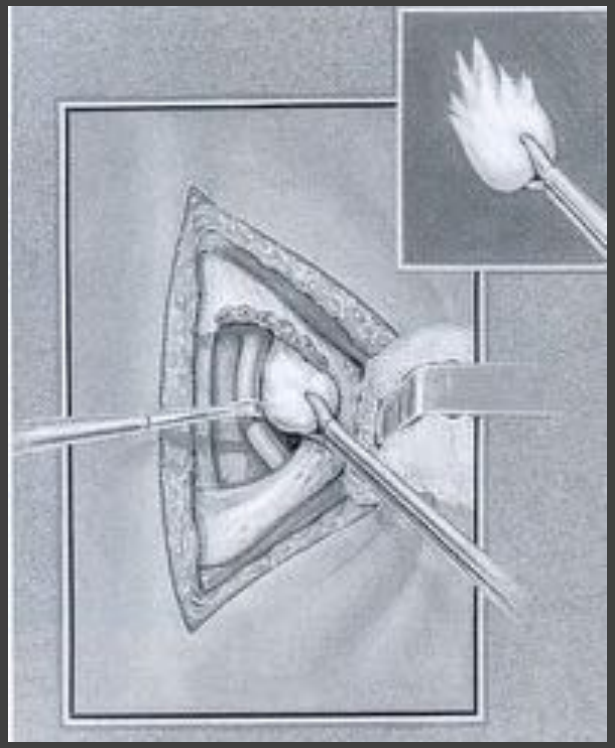
Spengler, 1991

Sicard, 1959

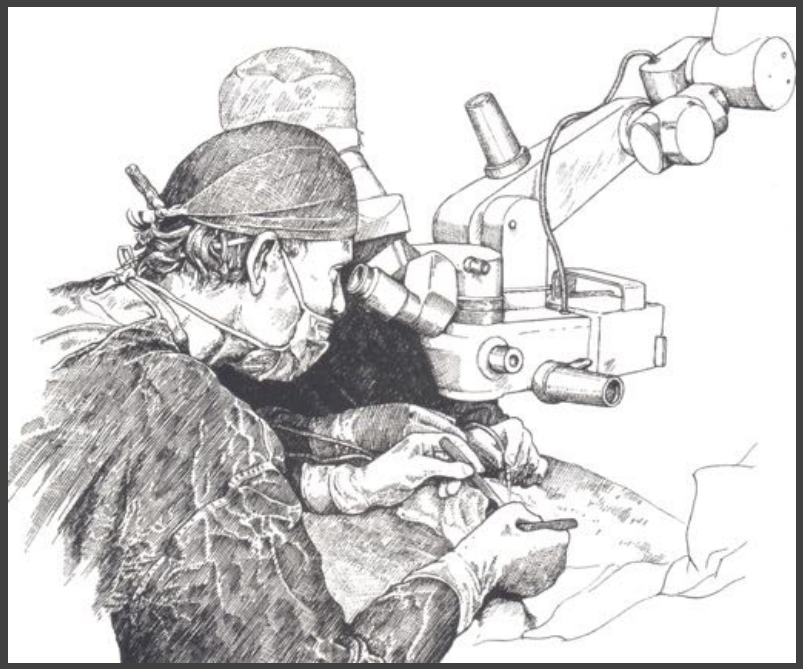




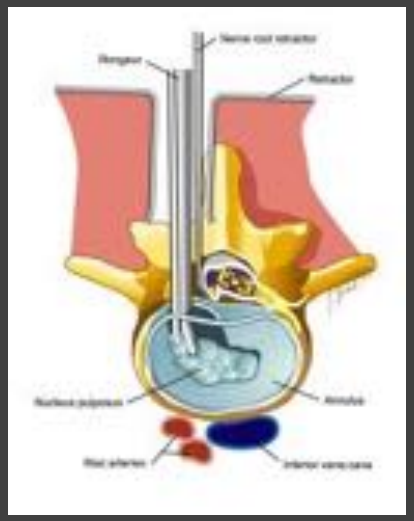


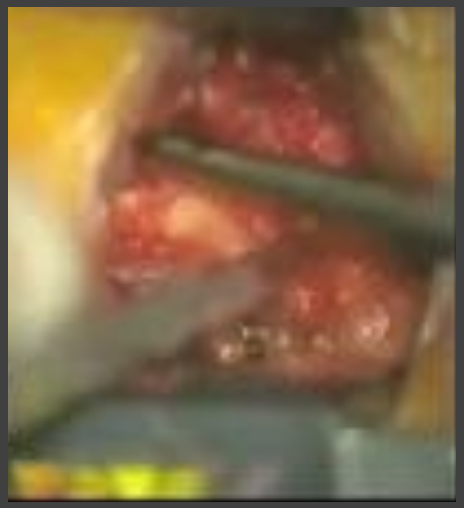


Micro



Micro

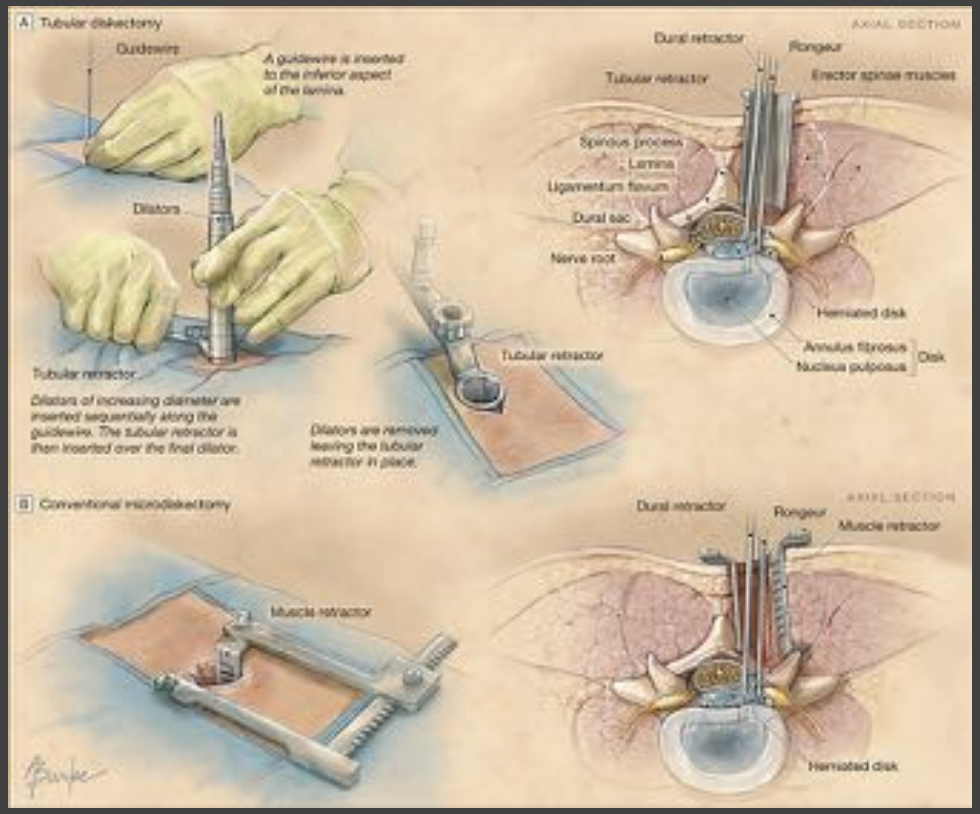


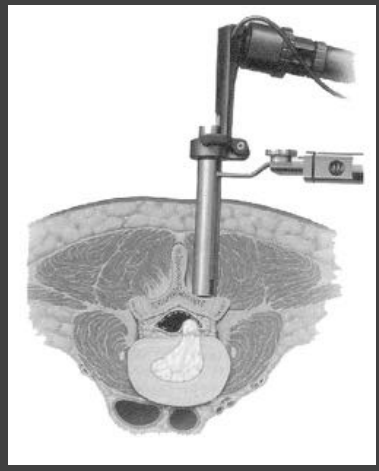


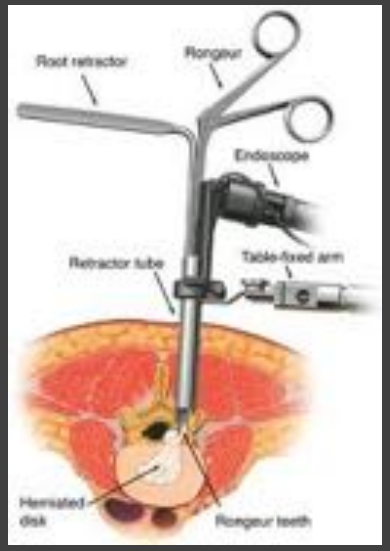
Same principle than standard but smaller approach because of microscope use

Tubular approach

METRx (Medtronic)

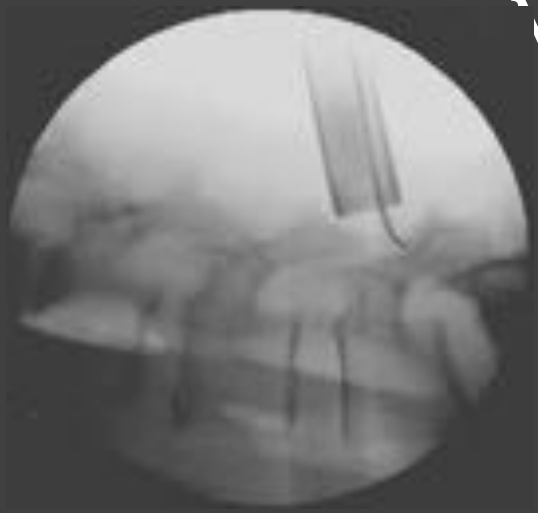


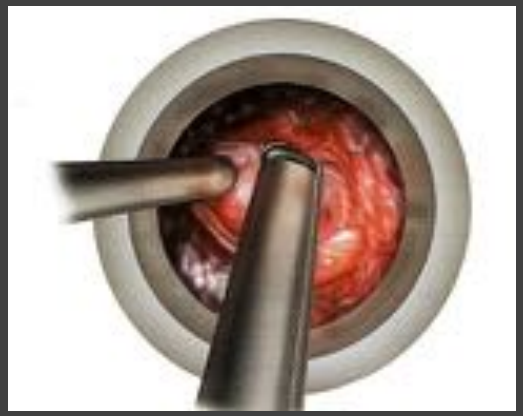


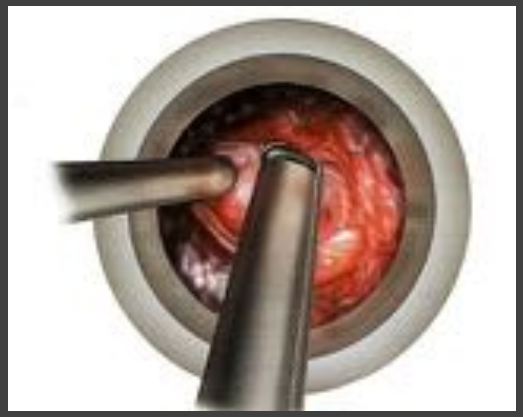


Tubular approach

METRx (Medtronic)





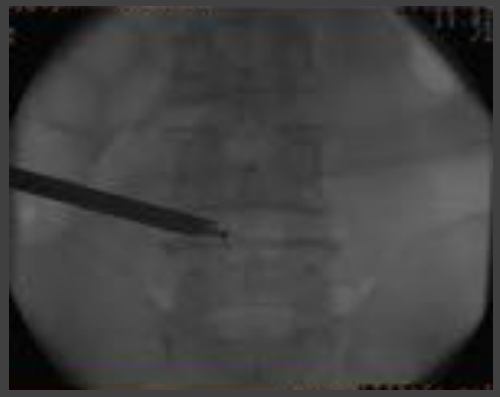


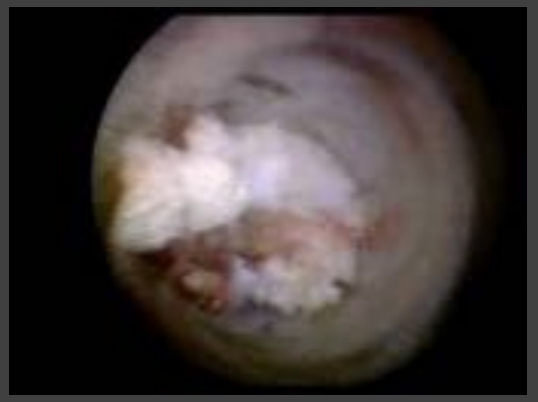
Laser

- Yttrium-aluminium-garner (YAG): introduction mid 80's, limited cavitation by short bursts, pressure decrease principle
- Potassium-titanyl-phosphate (KTP) :green laser, uses fiber-optic, side firing probes,
- Homium:yttrium-aluminium-garnet (Ho:YAG):mid infrared laser absorbed by water, fiber-optic, heat production minimized
- Carbon dioxyde: efficient but no waveguide

H:Yag generator

Transforaminal

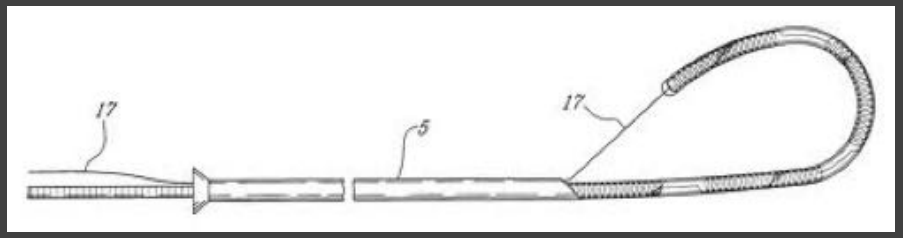


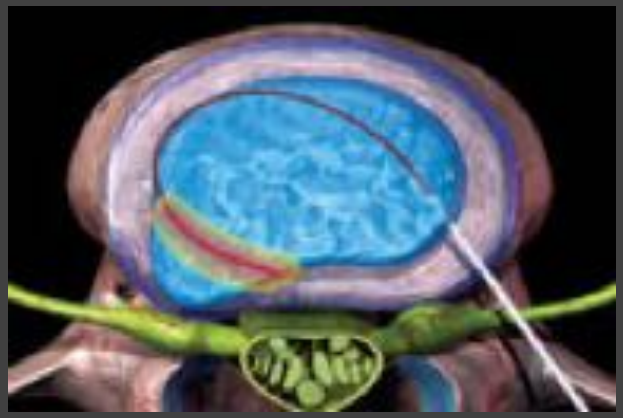


Chemonucleolysis

Risk of nerve root damage and anaphylactic reaction

IDET





IDET

Intra Discal Electrothermic Therapy

MEDICINE

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 158 degrees. Heat destroys painful nerve endings and shrinks loose ligaments to reseal the disc.

By Geoffrey Cowley

THE HUMAN SPINE IS A WONDROUS piece of machinery—and a bulky one. Most of us suffer back problems at one time or another, but for the millions or more Americans with damaged spinal discs, the pain is no mere annoyance. Some disc problems can make the act of sitting in a desk chair or car seat unbearable. And the traditional remedy—a costly surgical procedure called spinal fusion—is fraught with complications. Nearly 800,000 people endured the procedure last year alone, but the prospects for relief are improving. Early studies suggest that a new treatment called IDET (intradiscal electrothermal annuloplasty) works at least as well as fusion. The difference is that it takes about 15 minutes under local anesthetic. It costs $7,000 instead of $50,000. And patients walk out of the operating suite when it's over. Says one veteran, "It's not much worse than having a tooth filled."

To understand the new treatment, you need a sense of how spinal discs work. Think of a healthy disc as a car tire made of tightly woven ligaments and filled with soft putty (*chart*). Sandwiched between two vertebrae, it makes a good cushion. Unfortunately, the ligaments encasing a disc can loosen and tear after several decades of service. And when that happens, outside blood vessels can invade the disc, accompanied by nerve fibers that don't belong in such a high-pressure environment. The problem is more complicated than a rupture, or "herniation," because the pain originates inside the disc, not in the adjacent nerves it touches. The standard treatment involves destroying the disc and using bone grafts to fuse the two vertebrae it separated.

IDET aims to achieve more by doing less. "We don't throw out the tire," says Dr. Jeffrey Saal, a Stanford spine specialist and coinventor of the technique. "We patch it." The secret is an instrument called SpineCath. Designed by Saal and his brother, Dr. Joel Saal, it consists of a six-inch needle and a fine catheter with a heating element on the end. After tracing a patient's pain to a particular disc, doctors insert the catheter through the needle and heat it to 194 degrees for 16 to 17 minutes. The heat not only kills the invading nerves but also tightens the surrounding ligaments, creating a new seal.

The technique is still in its infancy—only 700 patients have been treated—but the early results look promising. In small studies, roughly 80 percent of the recipients have enjoyed reduced pain and greater mobility, and half of those taking narcotic painkillers have ended up drug-free. No one knows how long the benefits will last; heat-treated discs may develop new tears over time. The beauty of IDET is that most patients *would probably try it again.*

With Claudia Kalb

Newsweek

Automated Percutaneous Discetomy
APD

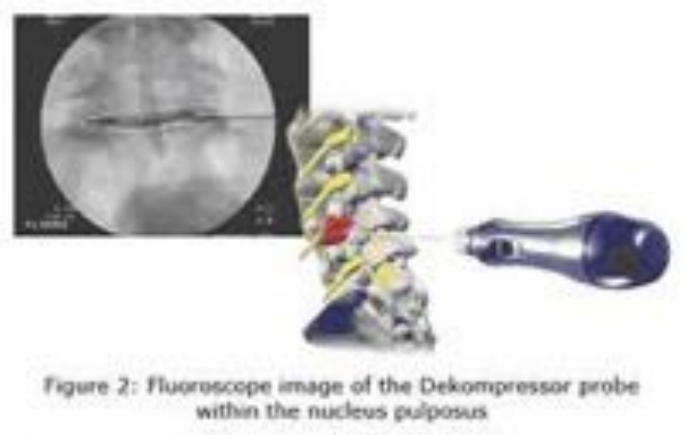
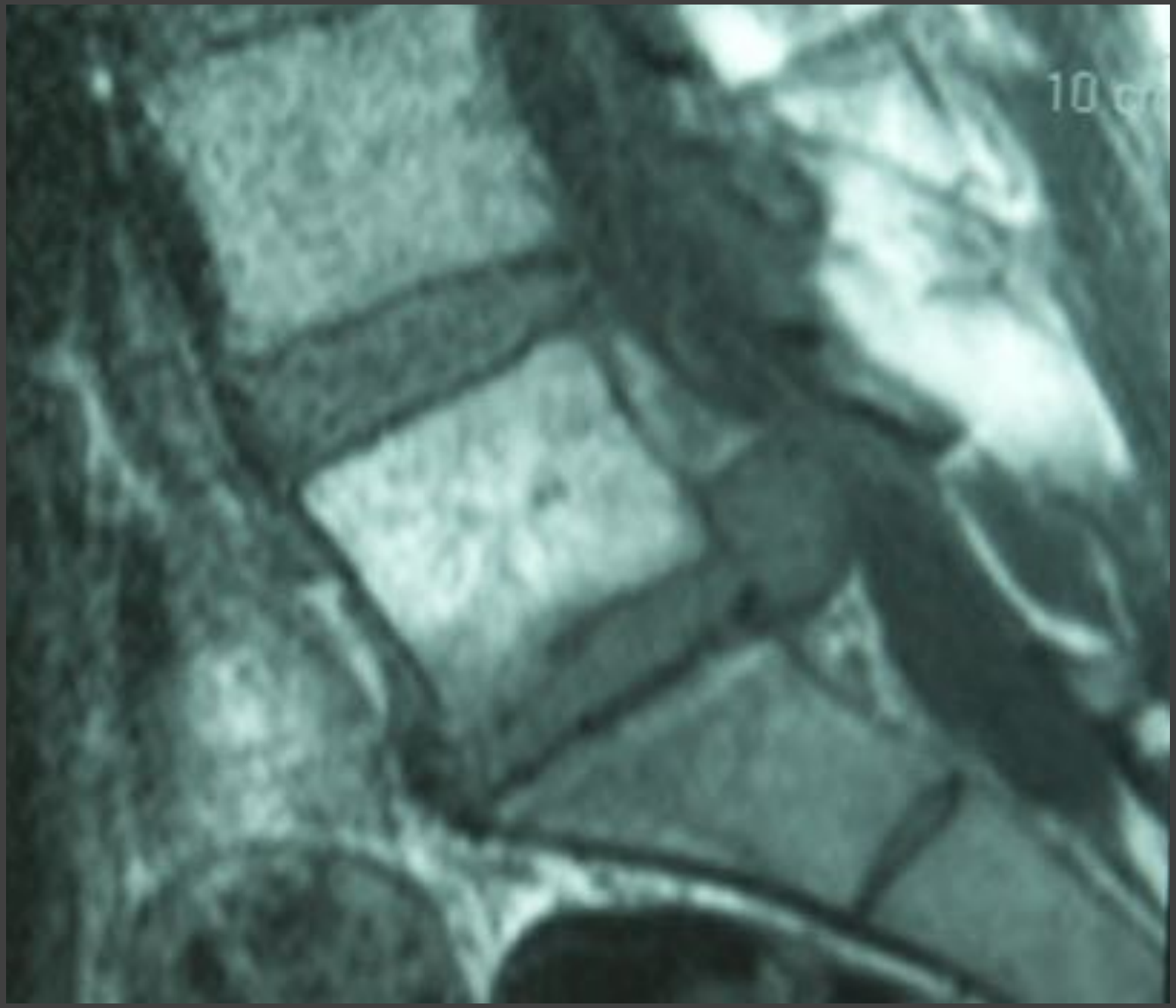


Figure 2: Fluoroscope image of the Dekompressor probe within the nucleus pulposus

Ozone nucleolysis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Indications for Surgery Absolute

- Cauda equina syndrome with bladder and/or bowel paralysis
- Important motor deficit (progressive or not): indication for surgery, even if motor deficit not progressive. *(Weber (1993): patients with an important, but non progressive, motor strength deficit eventually recover).* However, this is usually at the cost of excruciating pain and anxiety which ishard to justify

RED FLAGS

- ***Possible cauda equina syndrome***

History

  - Saddle anesthesia
  - Bladder dysfunction (retention, incontinence…)
  - Severe or progressive neurological deficit in lower extremities

Examination

  - Anal sphincter laxity
  - Perianal/perineal sensory deficit
  - Major motor weakness, foot drop, quadriceps weakness plantar flexors weakness...

Indications for Surgery Relative

- Lack of significant progress with conservative treatment (4 to 8 weeks)
- Patient's difficulty to cope with pain or prolonged inactivity
- Recurrent condition

Indications for Surgery

- Always trial of conservative treatment except red flags
- Clinical presentaion strictly correlated to imaging
- Severe pain or neurological deficit

Does Size Matter ?

Surgical results of microdiscectomy techniques

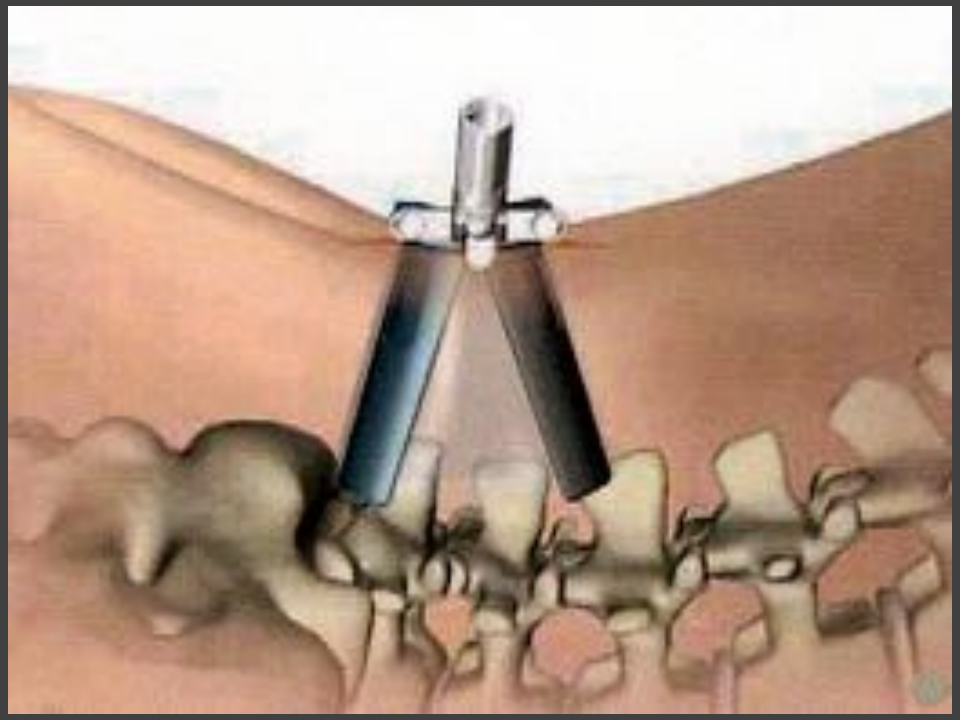
Results of standard discectomy

- Immediate better results with surgery but no diffrence at 6 months. After 7 years more sciataica in conservative treatment.
  - *Hakelius A. Acta Orthop Scand 1970 129(suppl) :1-76*
- Better improverment at 1 year but no diffrences at 1 and 4 years. 9 % sciatic pain in both groups.
  - *Weber H. Spine 1983 8:131*-140
- If severe paion and confirmed HD beeter pain relief and function.
  - Hoffman RM et al. J Gen Int Med 193 8: 487-496
- Better clinical result at one year with surgery. No difference in employment .
  - *Atlas SJ et al. 1996 Spine 21: 75S-78S*

Worker's compensation and litigation

- Results worst
  - *Herron LD et al. Clin Orthop Related Res 1996 325: 148-155*
- No added benefit of surgical treatment vs conservative after 2y
  - *Atlas SJ et al. Spine 2010;35:89-97*

Less muscle damage ?



Does minimally invasive lumbar disc surgery result in less muscle inj
Conventional surgery ? A randomize controlled trial.

Marts MP et al. Eur Spine J 2010; June 16; Ahead of print

No difference CPK and MRI of multifidus

Evidence

Discectomy

- Standard vs Micro
  - No difference for bleeding, hospotal length, complications ou scar tissue . Micro longer.
    - *Tullberg et al. Spine 1993;18:24-27*
    - *Lagarrigue et al. Neurochirurgie 1994;40:116-20*
    - *Henrikson et al. Br J Neurosurg 1996;10:289-293*

- Standard vs Microendoscopic
  - No difference
    - *Huang TJ et al. J Orthop Res 2005;23:406*-11

Evidence

Discectomy

- Automatic percutaneous vs Chymo
  - APD results inferior
    - *Revel et al. Spine 1993;18:1-7*
    - *Krugluger et al. Int Orthop 2000;81:167-9*

- Automatic percutaneous vs Micro
  - APD results inferior
    - *Chatterjee et al. Spine 1995;20: 734-8*
    - *Haines et al. J Clin Neurosc 2009;9:411-7*
- Transforaminale
  - ??????????????

Evidence
Discectomy

- Percutaneous Endoscopic vs Micro
  - Same results
    - *Mayer HH & Brock M. J Neurosurg 1993;78: 216-25*
- Laser vs Chymo
  - Laser results inferior
    - *Steffen et al. Orthop Trans 1996;20:388*
- Laser vs Epidural
  - Same results
    - *Livesey et al. J Bone Joint Surg 2000;82:74*

Recent Evidence Discectomy

- Micro vs Standard: Spine Tango Registry
  - No difference
    - *Porchet F et al. Eur Spine J 2009;18:S360-S366*
- Micro vs Tubular
  - No difference
    - *Franke J et al. Eur Spine J 2009;18:992-1000*
- Micro vs Tubular
  - No difference on Roland Morris
  - Inferior results on patient self rerporting
    - *Arts MP et al. JAMA 2009 ;302:149-158*

Evidence
Discectomy

- Cochrane report
  - No difference micro vc classical
  - No evidence for any other minimally invasive technique
    - *Gibson Jn & Waddell G. Cochrane Database Syst Rev 2007;18:CD001350*

IDET

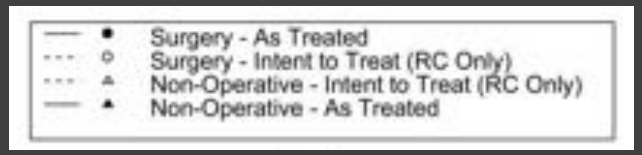
- No better than a sham procedure
  - *Freeman BG et al. Spine 2005; 30:2369-77*

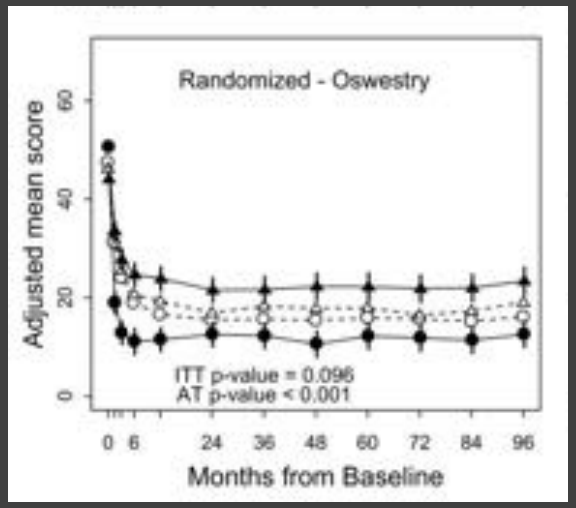
Spine Outcome Research Trial
SPORT

- Better results for surgery after 4 years (ODI, SF36) but work status.
  - *Weinstein JN et al. Spine 2008;33:2789-2790*
- Cost effective over 65 (cost per QALY 34 k $ similar to tratment of high blood pressure)
- Less cost effective in general poulation (cost per QALY 69.5 k $)
  - *Tosteson AN et al. Spine 2008;33:2108-2115*

Spine Outcome Research Trial
SPORT - 8Y results

- Greater improvement then non surgical group
- Little to no degradation in outcome between 4 and 8 years
- Big crossover 49% non-op crossed to surgery





Lurie JD et al. Spine 2014;39: 3-16

Patient's preferences and expectation for care

- 67 % prefered surgery 28% conservative
- Surgery preference: younger, low level of education, high level of unemployment and/or disability. Higher pain, worse mental functioning, more back pain.
- Patient's expectation for benefit for non operative care was the most powerful single predictor of preference.
  - *Lurie JD et al. Spine 2008;33:2663-2668*

Recurrence

- 1 Y 6%
- 2 Y 8%
- 3 Y 9%
- 4 Y 10 %
  - *Weinstein JN et al. Spine 2008;33:1289-2800*

The Belgian Experience

Herniated Disc

Donceel & Du Bois. Eur Spine J, 1998

- 3956 records (1992,1993,1994) from the largest belgian sickness fund (covers over 45 % of population).
- All patients working or on compensated unemployment
- Individual follow-up of 18 month to 3 years
- The fund pays for health care costs as well as for salary replacement after the first month

The Belgian Experience

Herniated Disc

Donceel & Du Bois. Eur Spine J, 1998

- Period of work incapacity and return to work decided by medical adviser of sickness fund (6 first month with regard to the patient ’s actual or last job, after 6 month extended to all occupations the patient may have access to according to his or her career and education.

The Belgian Experience

Herniated Disc

Donceel & Du Bois. Eur Spine J, 1998

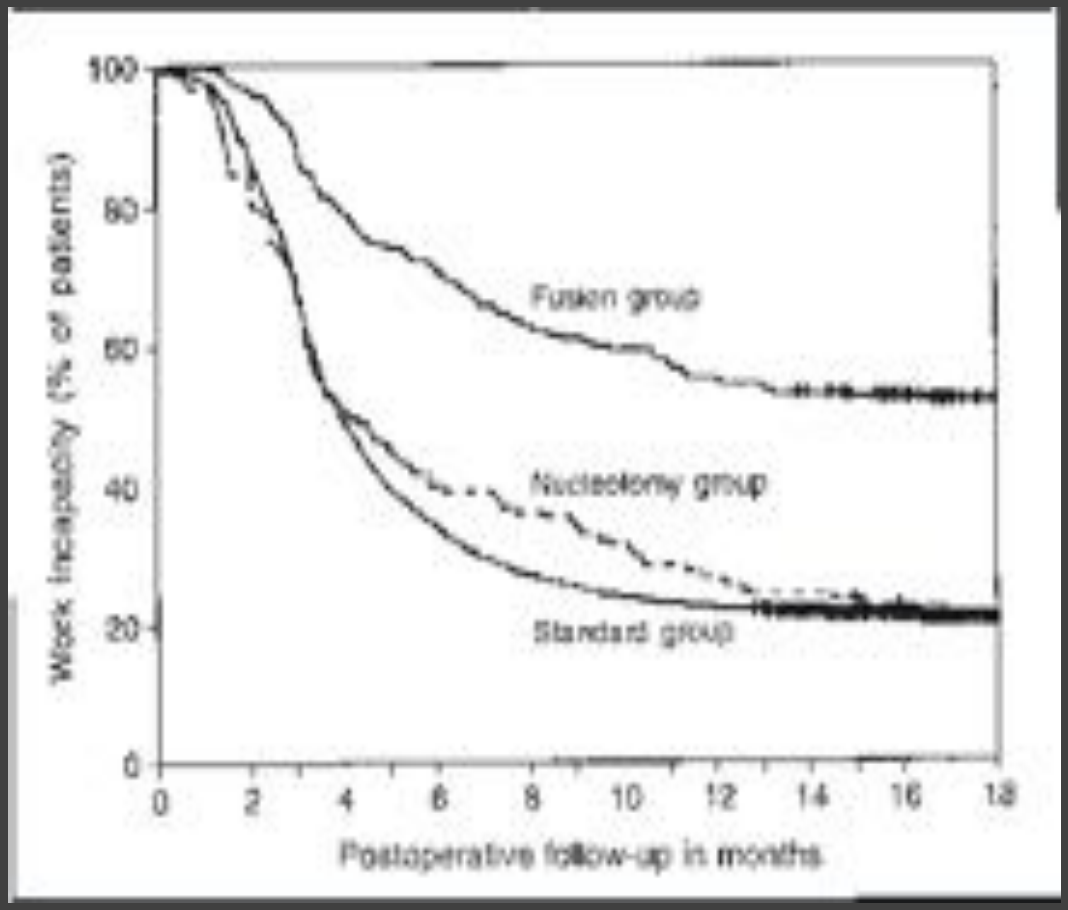
- Age
- Gender
- Preoperative duration of sicklisting
- Profession
  - Blue collar
  - White collar
  - Self employed
- Daily compensation
  - < 25 euros
  - > 25 euros
- Compensable accident
  - Worker ’s comp
  - Other (automobile etc…)
- Type of surgery
  - Surgical discectomy
  - Percutaneous discectomy
  - Discectomy + fusion
- Duration of hospital stay
- Type of hospital
  - University
  - Non University
- Surgical discipline
  - Orthopedic surgeon
  - Neurosurgeon
  - General surgeon

The Belgian Experience

Herniated Disc

Donceel & Du Bois. Eur Spine J, 1998

Duration of sickleave



The Belgian Experience

Herniated Disc

Donceel & Du Bois. Eur Spine J, 1998

- Factors associated with a work incapacity of over 12 (logistic regression)
  - Preoperative sicklisting
    - > 1 month (O.R. 2.6 $p<0.001$)
    - > 6 months (O.R. 30.0 $p< 0.001$)
  - Discectomy + fusion (O.R. 2.8 $p< 0.001$)
  - Age
    - > 30 (O.R. 2.0 $p< 0.001$) / > 40 (O.R. 2.8 $p<0.001$) / > 50 (O.R. 8.0 $p<0.001$)
  - Blue collar worker (O.R. 1.5 $p<0.001$)
  - General surgeon (O.R. 2.3 $p<0.001$)
  - Daily compensation < 35 euros (O.R. 1.6 $p<0.001$)
  - Unemployement (O.R. 1.9 , $p<0.001$)

Complications

- Tendancy to underestimate complications
- Review on 79.500 patients (all spine surgeries)
- Complications thoracolumbar 18%
- Propective studies 20%, retrospective 16% !!!
  - *Nasser BS et al. J Neurosurg Spine 2010;13:144-157*