

Break Out Sessie Spine 2

Johan Van Lerbeirghe



ORTHO.TOMORROW 25.11.23

Neuromodulation of lumbosacral spinal networks enables independent stepping after complete paraplegia

Megan L. Gill^{1,9}, Peter J. Grahn^{2,9}, Jonathan S. Calvert³, Margaux B. Linde¹, Igor A. Lavrov^{2,4,5}, Jeffrey A. Strommen¹, Lisa A. Beck¹, Dimitry G. Sayenko⁶, Meegan G. Van Straaten¹, Dina I. Drubach², Daniel D. Veith¹, Andrew R. Thoreson¹, Cesar Lopez¹, Yury P. Gerasimenko^{6,7}, V. Reggie Edgerton⁶, Kendall H. Lee^{1,2,8,10*} and Kristin D. Zhao^{1,8,10*}

LETTERS NATURE MEDICINE

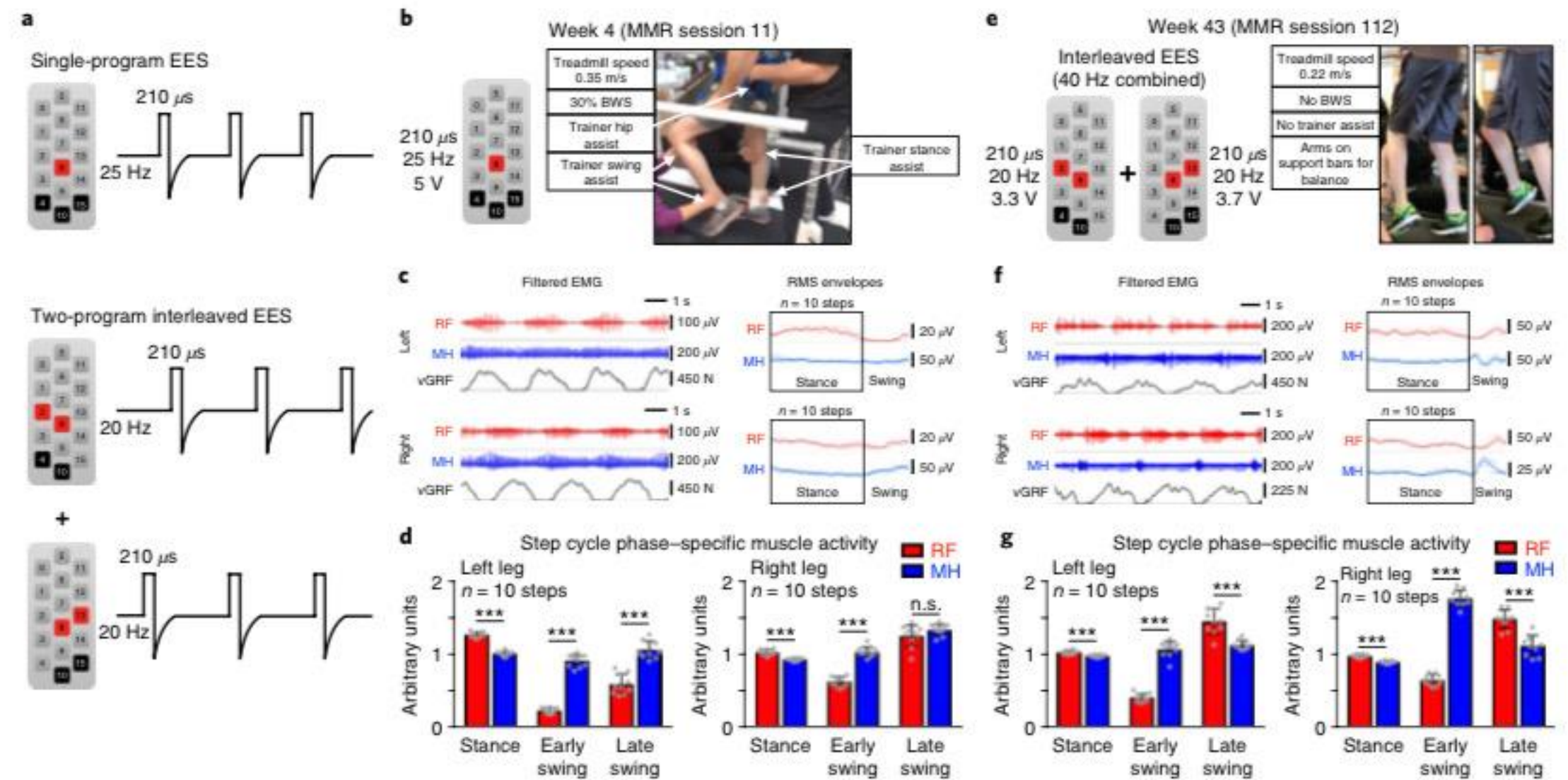
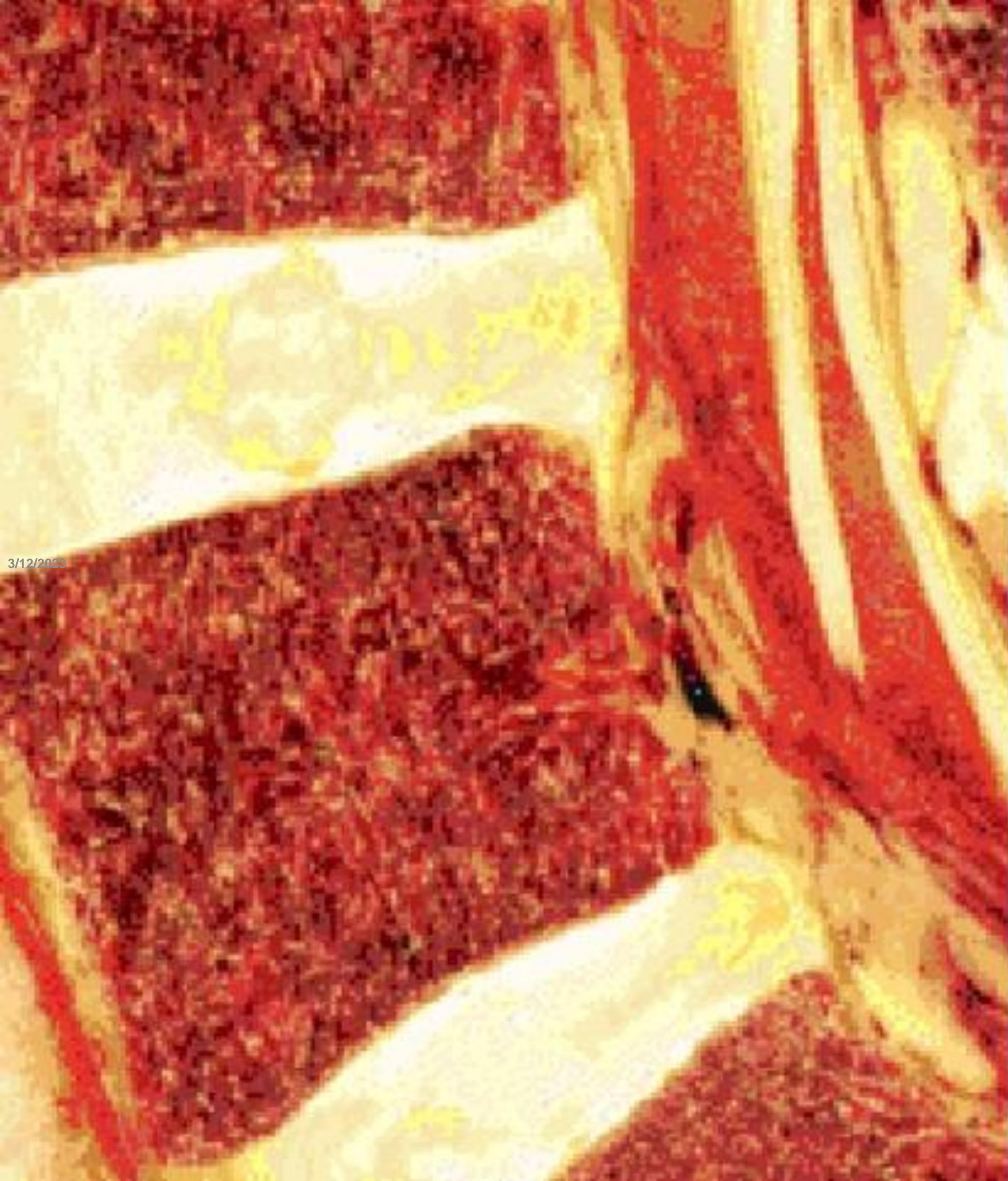


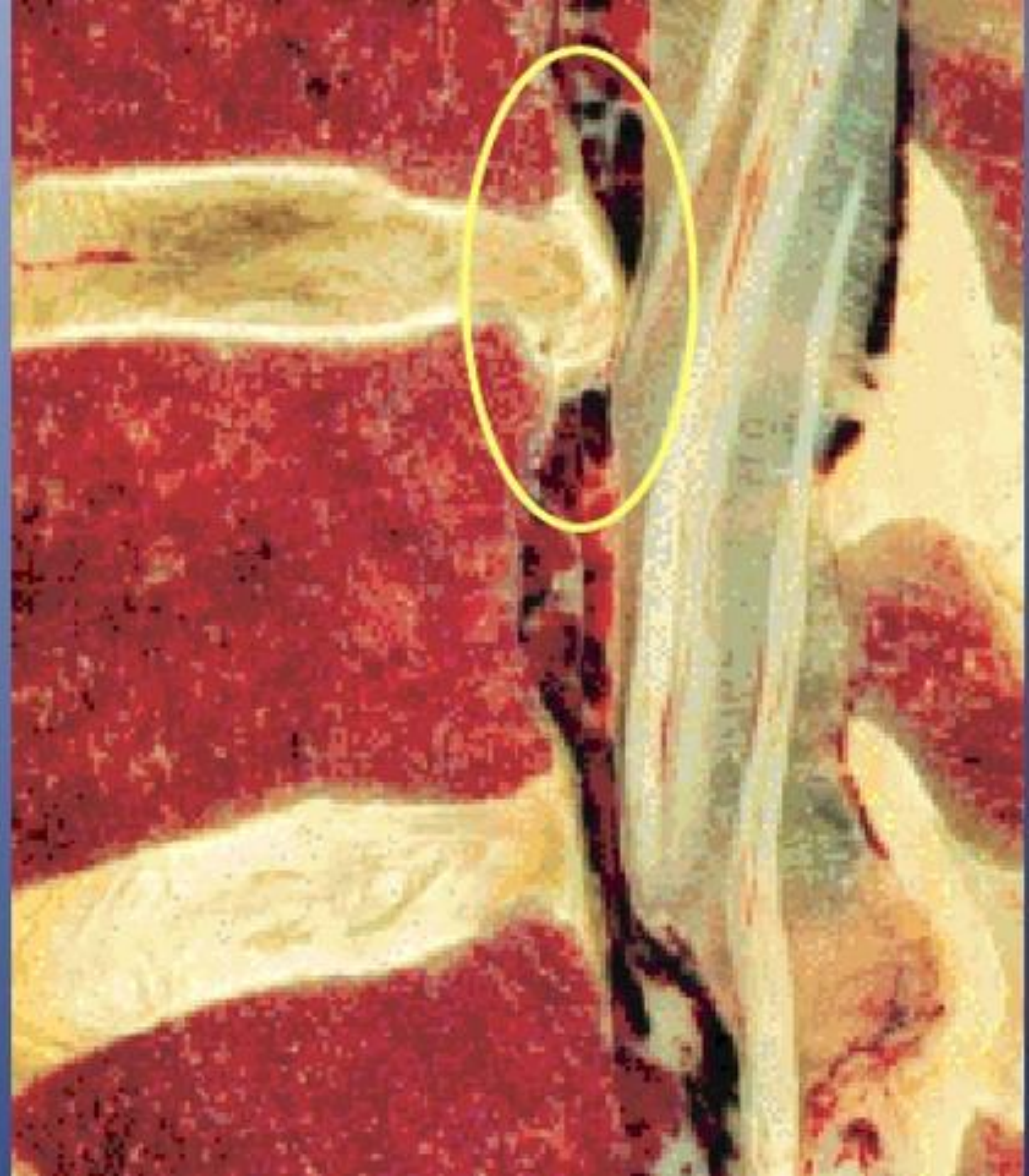
Fig. 1 | Progression of EES-enabled stepping performance on a treadmill. **a**, Schematic depicting single-program EES used during week 4 of MMR and two-program interleaved EES used during week 43 to enable stepping on a treadmill. Anodes, red squares; cathodes, black squares. **b,e**, EES settings and exemplary image from week 4 (**b**) and week 43 (**e**) depicting trainer assistance and BWS needed to achieve stepping. **c,f**, Filtered EMG and averaged RMS envelopes from the RF and MH synchronized to vGRF recordings under each foot at week 4 (**c**) and week 43 (**f**). vGRF, vertical ground reaction force. **d,g**, Differences in RF and MH activity during stance, early (first 50%) swing phase, and late (last 50%) swing phase are shown as means (\pm s.d.) at week 4 (**d**) and week 43 (**g**). RMS envelopes and means were generated from 10 steps of each leg at week 4 and week 43. n.s., not significant; *** $P < 0.001$, two-tailed Mann-Whitney test.

Degeneratieve wervelkolom

J.G. Van Lerbeirghe

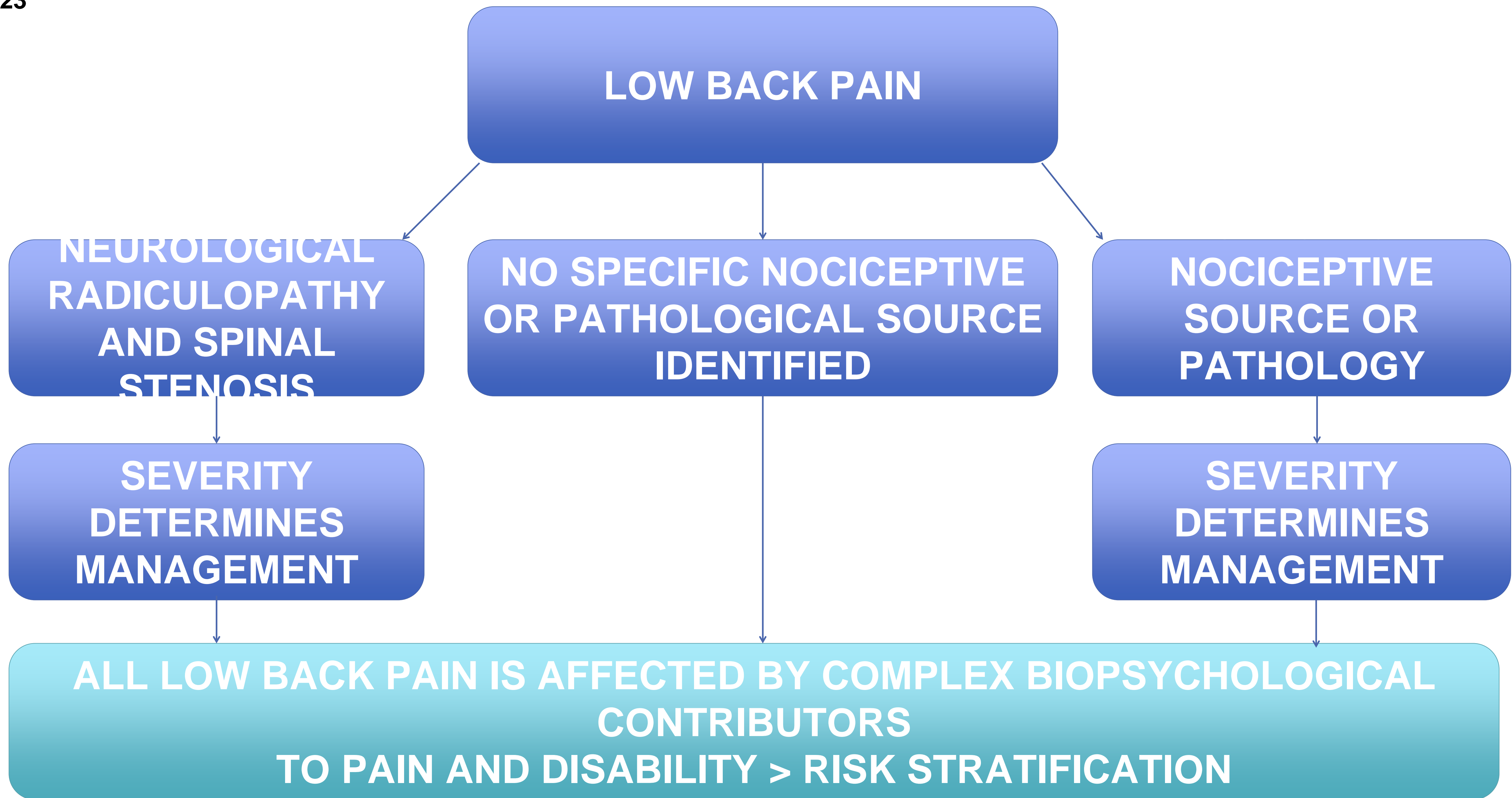


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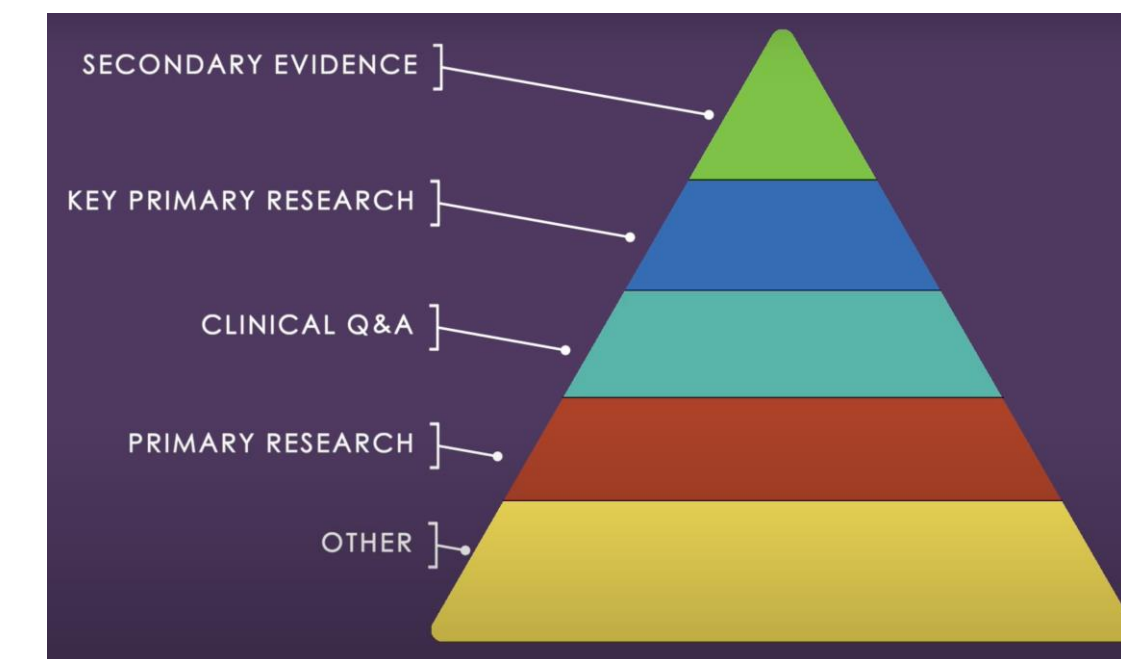
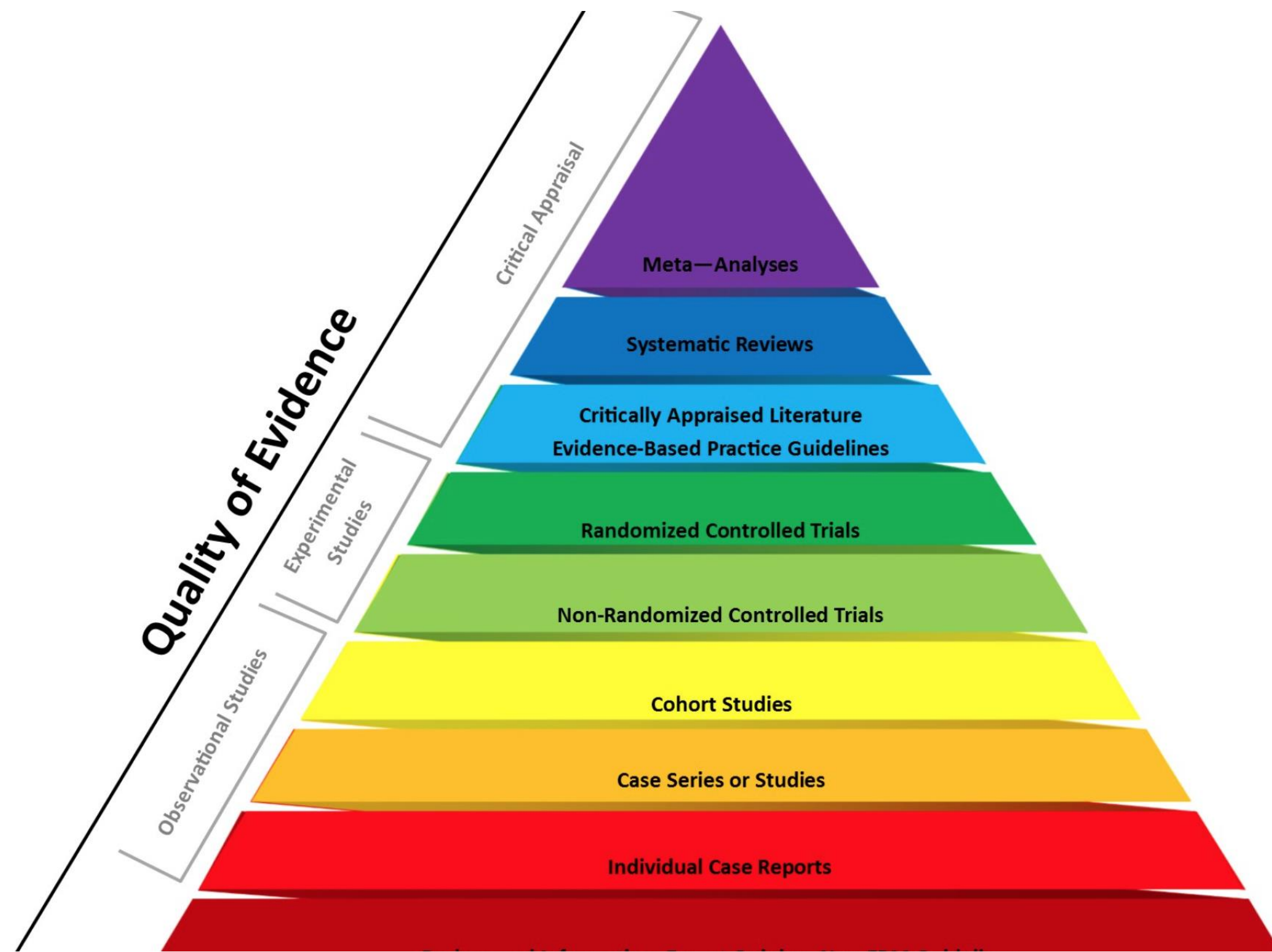


Pathologie Wervelkolom

- 99 % degeneratief
 - 70-80 % in “het Westen” ooit zorg nodig
 - Verdeling in oudere populatie is zelfs niet gekend
 - Ernstige financiële belasting voor het budget, werkgevers, zorg
- 1% Fracturen, Rheuma, Tumoren ..



The scientific method in clinical medicine = evidence



● Low back pain and radicular pain: evaluation and management

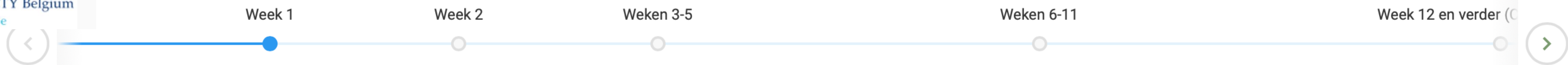


Evidence Based Synopses

2017

[Belgian Health Care Knowledge Centre](#)

. This guideline covers: • Low back **pain** without serious underlying cause (red flags) • **Radicular pain** (including neurogenic claudication) This guideline does not address: • Low back **pain** and **radicular pain** in children (<16 years old) • Serious **spinal** pathology (infection, malignancy and fractures) • Inflammatory causes of low back **pain** (ankylosing spondylarthritis) • Potentially serious neurological or presence of **radicular** symptoms predict response to surgery in people with suspected sciatica? • What is the clinical and cost-effectiveness of disc replacement surgery for people with non-specific low back **pain** ? • What is the clinical and cost effectiveness of **spinal** fusion/arthrodesis in people with non-specific low back **pain** ? • What is the clinical and cost effectiveness of **spinal** decompression



-  Lage rugpijn
-  Radiculaire pijn
-  Eerstelijnszorg
-  Tweedelijnszorg

Zorgpad



Vlaggen




Toolkit

 Örebro Vragenlijst

Week 1 (hyperacute fase)

Anamnese en klinisch onderzoek

 **!! Ga bij recurrenente pijn rechtstreeks naar week 3 tot 5 !!** Rugpijn is recurrent als de nieuwe pijnperiode langer dan 24 uur duurt, en langer dan 1 maand na de vorige pijnperiode optreedt.

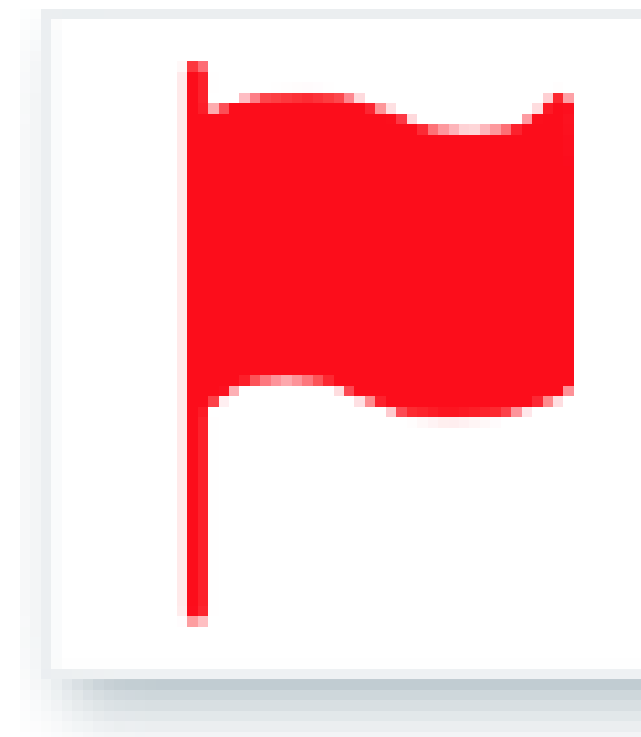
- ▶ Sluit een onderliggende, ernstige pathologie en/of radiculaire pijn uit
- ▶ Bijkomend onderzoek
- ▶ Vergeet niet om de arbeidsomstandigheden van de patiënt te bespreken

AANPAK ➤

<http://lagerugpijn.kce.be/>

RISK STRATIFICATION

- Urgent (immediate)
 - Neurologic deficit (MRC rating scale ≤ 3 , saddle anesthesia , CES..)
 - Trauma
 - Vascular
- Semi-urgent (within 48 h)
 - Pathological fracture
 - Infection
- Less Urgent
 - Inflammatory
 - Tumor

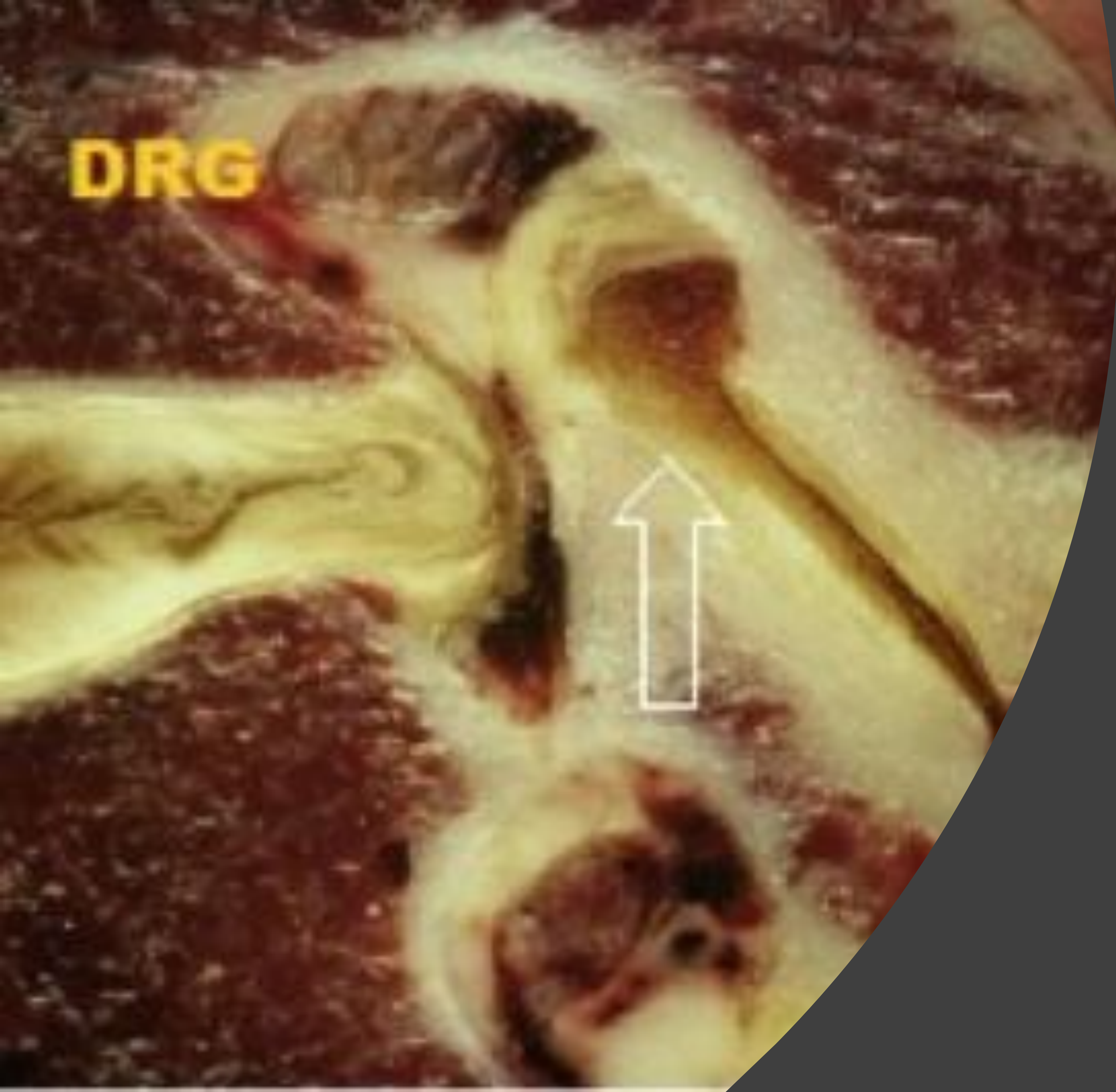


Risk stratification

GOAL: To indentify the patients BEFORE they have ended up in a cycle of chronic pain (12 weken)

Flags





12/3/2023

Ethiology

Ethio

Wear and Tear ?

Genetisch ? (Collageen) ???
Kritiek op Twin Study

Inflammatoir ? (research)

Infectie ?

Meest waarschijnlijk
Combinatie.

>Discopathie

DDD

Trauma

ASD , iatrogeen

Blokwervel

Roken

Overgewicht.

Deformiteit

Werk, belasting

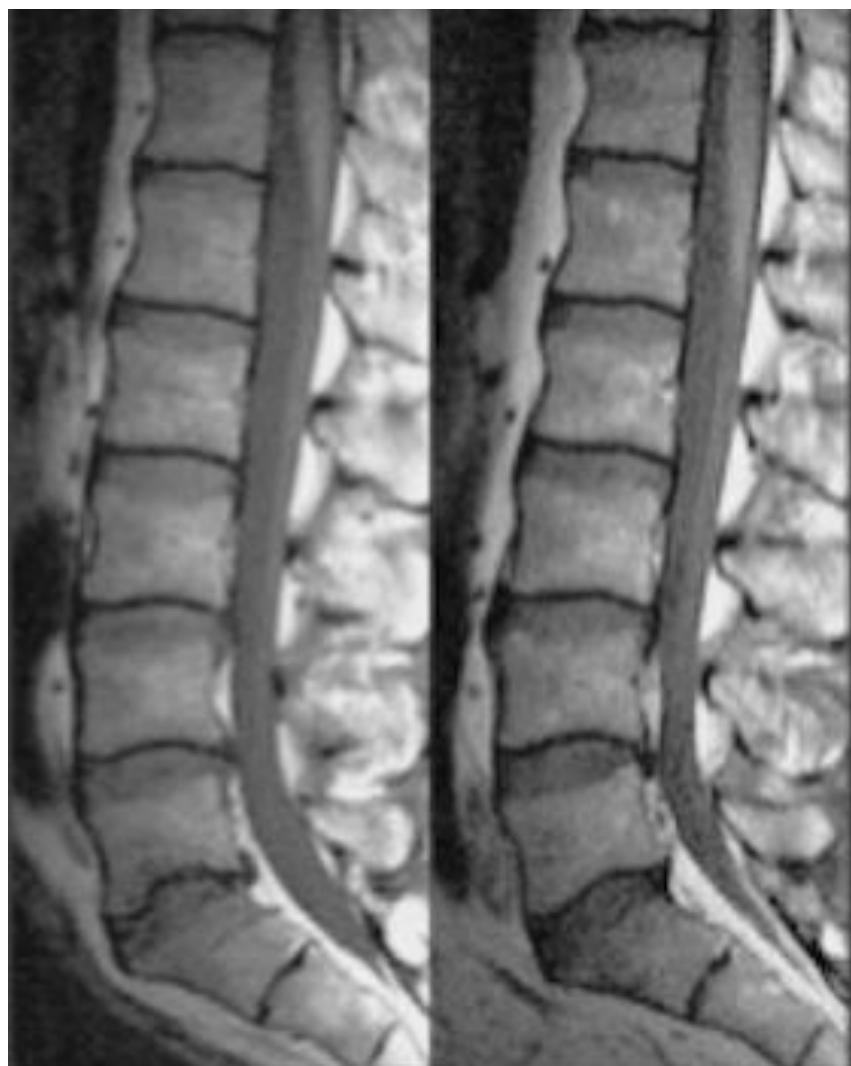
Twin Study

The Twin Spine Study: contributions to a changing view of disc degeneration

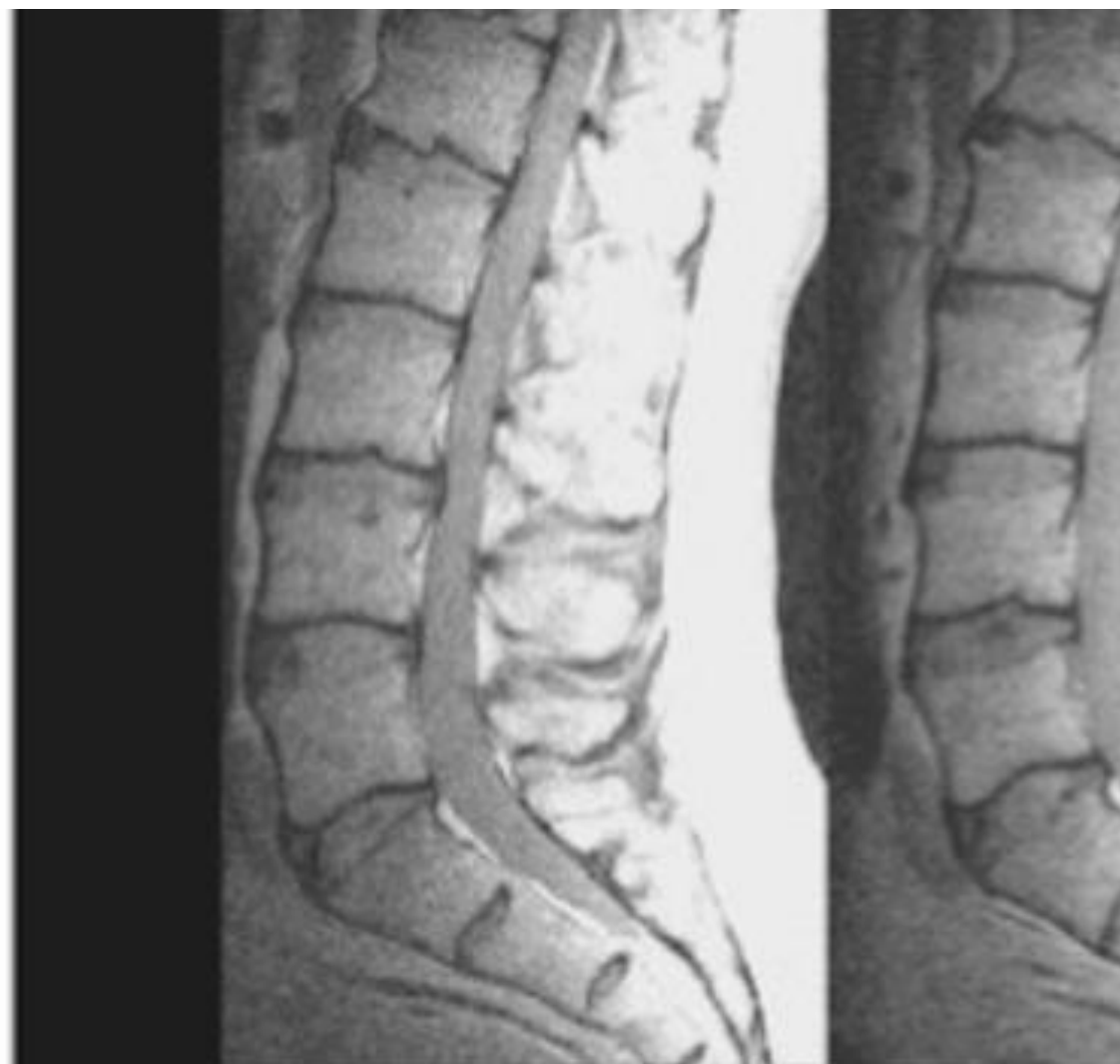
Michele C Battié ¹, Tapio Videman, Jaakko Kaprio, Laura E Gibbons, Kevin Gill, Hannu Manninen, Janna Saarela, Leena Peltonen

1995 Volvo Award in clinical sciences. Determinants of lumbar disc degeneration. A study relating lifetime exposures and magnetic resonance imaging findings in identical twins

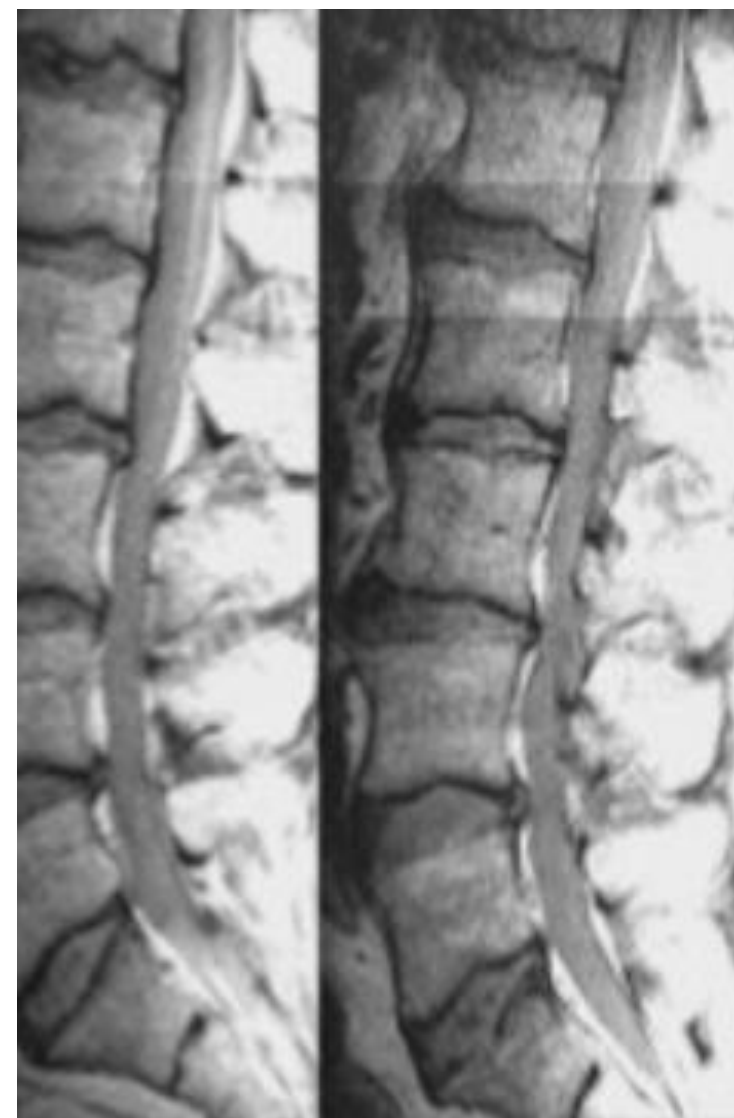
M C Battié ¹, T Videman, L E Gibbons, L D Fisher, H Manninen, K Gill



Journalist / Farmer (44-yr old)



Office worker / Truck driver (56 yrs old)



Farmer / Driver (61 yrs old)



Both sales managers (64 yrs old)



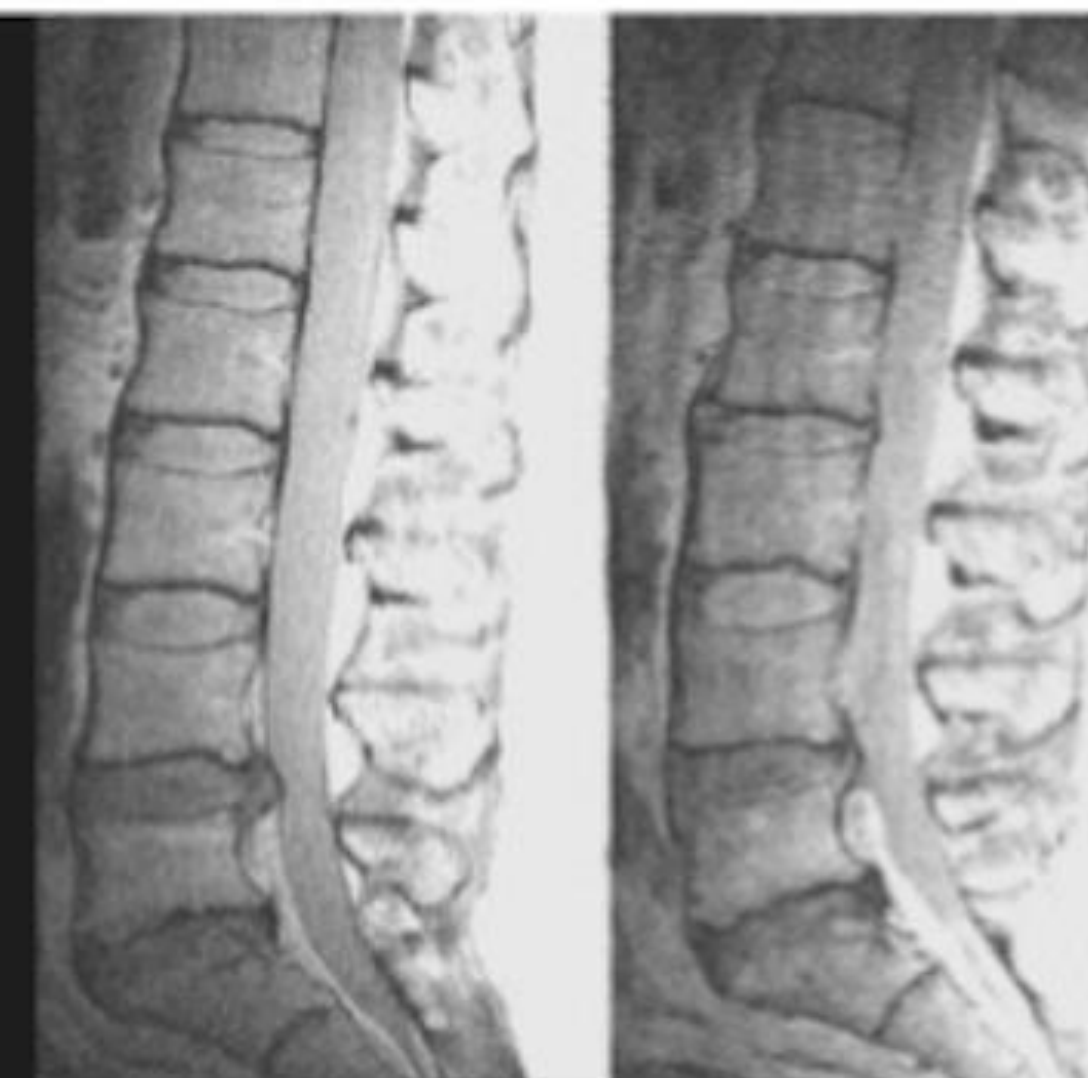
Programmer / Plumber (48 yrs old)



Bus Driver / Carpenter (49 yrs old)



Setter / Farmer 50 yrs old)



Product packager / Taxi driver (49 yrs old)

3/12/2023

Importance of clinical examination (in the degenerative spine)

MRI

in asymptomatic Patients

[AJNR Am J Neuroradiol. 2015 Apr; 36\(4\): 811–816.](#)

PMID: [25430861](#)

Published online 2014 Nov 27. doi: [10.3174/ajnr.A4173](#)

Systematic Literature Review of Imaging Features of Spinal Degeneration in Asymptomatic Populations

[W. Brinjikji](#), [P.H. Luetmer](#), [B. Comstock](#), [B.W. Bresnahan](#), [L.E. Chen](#), [R.A. Deyo](#), [S. Halabi](#), [J.A. Turner](#), [A.L. Avins](#), [K. James](#), [J.T. Wald](#), [D.F. Kallmes](#), and [J.G. Jarvik](#)

- Age of 30 y : +/- 30% of abnormalities/diagnosis
- Age of 60 y : +/- 60% of abnormalities/diagnosis



Best-Evidence



Clinical Diagnostic Rules (CDR)



Based on systematic reviews.

Tom Petersen, Mark Laslett, Carsten Juhl

BMC Musculoskelet disord. 2017; 18:188

**Looking at sufficient evidence to constitute a CDR
(positive LR > 2.0, negative < 0.5)**

Clinical Diagnostic Rules

Intervertebral disc

Facet joints

SIJ

Disc herniation

Spinal stenosis

Spondylolisthesis

Fracture

Peripheral nerve

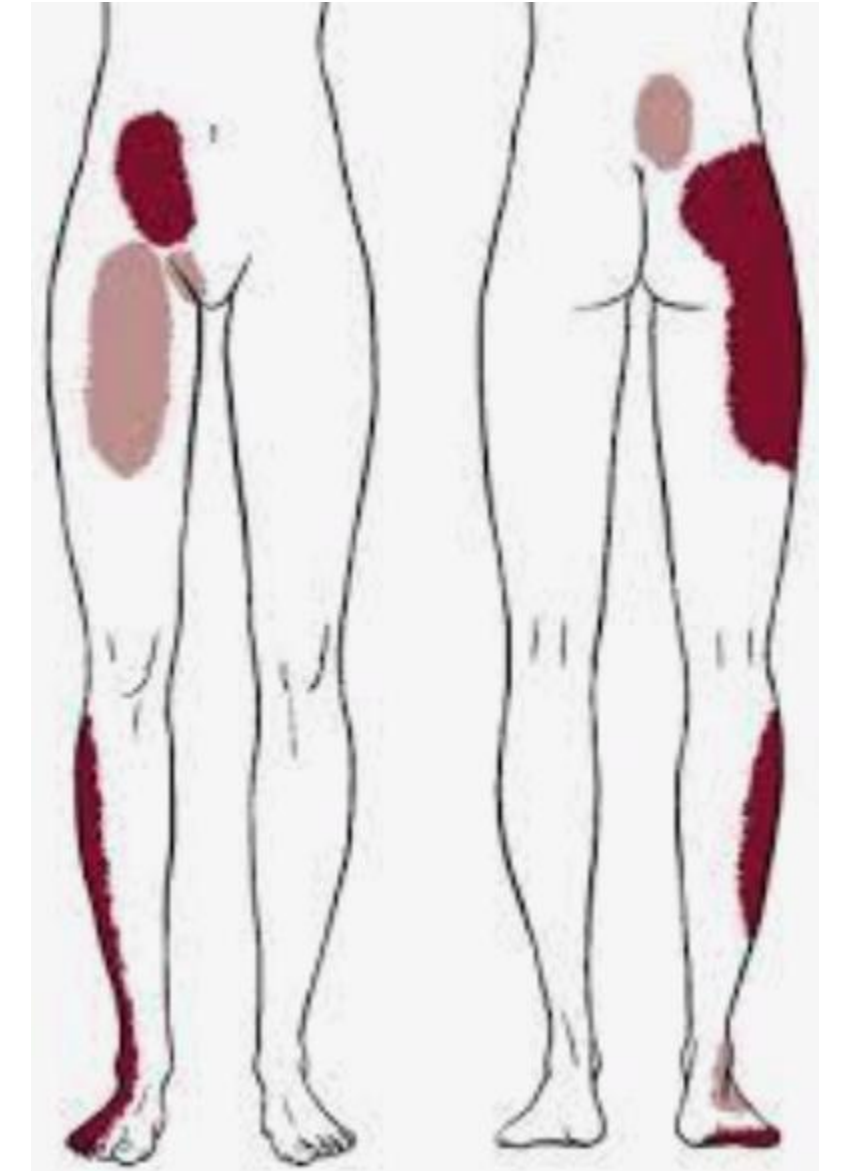
• CDR Spinal stenosis (Cook rule)

- Age more than 48 y
- Bilateral symptoms
- Leg pain more than back pain
- Pain during walking/standing
- Pain relief upon sitting
- Improved walking tolerance with the spine in flexion





SIG



- Laslett Cluster
 - Thigh thrust
 - Distraction test
 - Lateral compression test
 - Sacral Thrust
- Patrick's en Gaenslen test.

Femoral nerve stretch



Anamnese
(medicatie)

Klinisch Onderzoek

- **Inspectie , Palpatie**
- Mobiliteit
- Kracht, sensibiliteit
- Specifieke testing

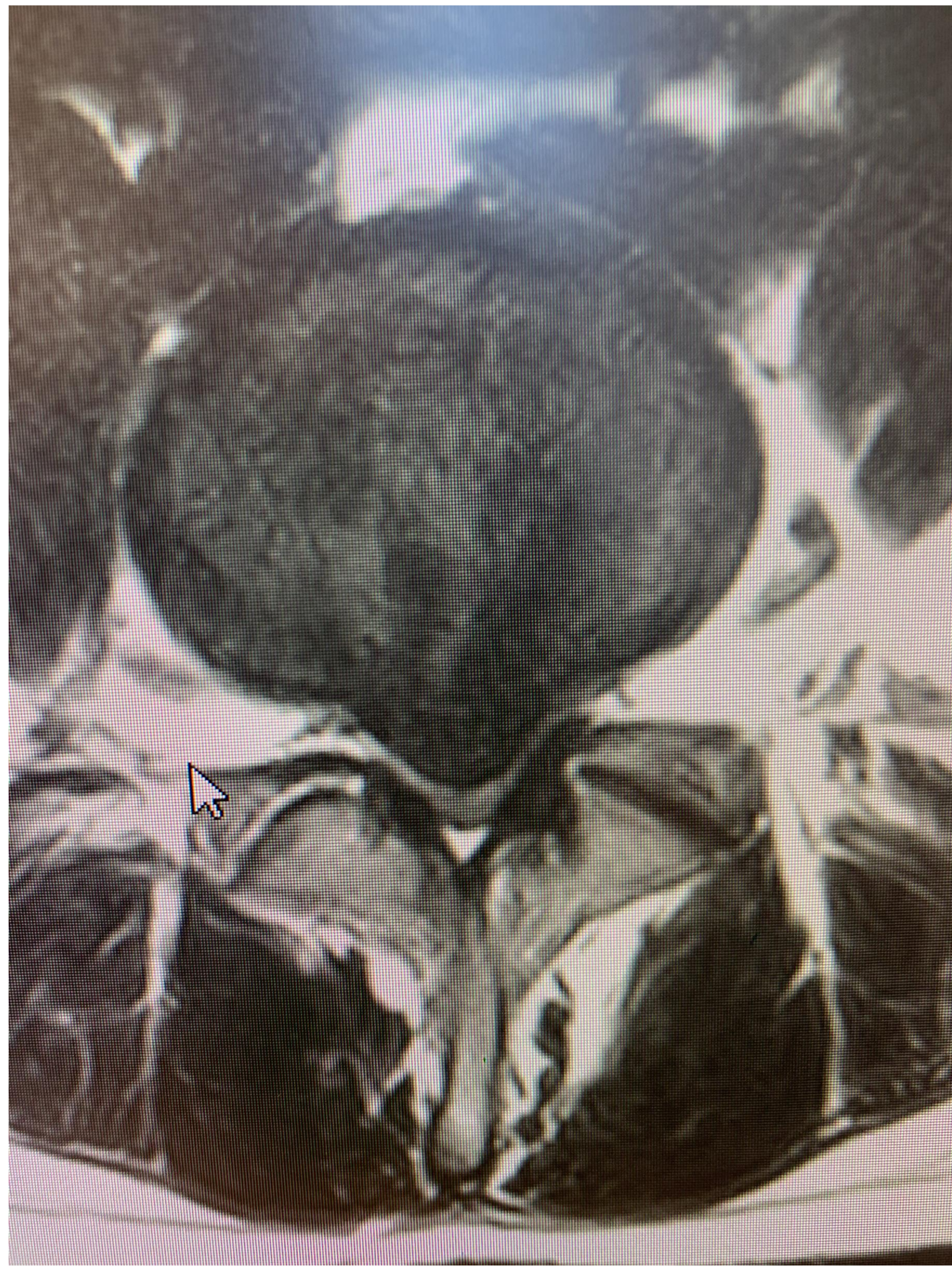


- **Ptosis**
- **Miosis**
- **Anhydrosis**
- **Enophthalmos**

3/12/2023



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All day practice

- Female, 72 y, LBP
 - Referral to spine centre with MRI lumbar spine (spinal stenosis)
 - Progressive gaitdisturbance
 - Irradiating from the back to the knee
 - LBP, seldom groin pain
 - Tramadol, diclofenac and paracetamol.
 - 3 epidural infiltrations
 - 3 facet infiltrations multiple levels





Cervicobrachialgia, Cruralgia and sciatica =

- Examination of :
 - Shoulder
 - Hip, Knee, ..

accordant

Patient Name _____

Examiner Name _____ Date/Time of Exam _____



STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY



MOTOR

KEY MUSCLES
(scoring on reverse side)

	R	L	
C5	<input type="checkbox"/>	<input type="checkbox"/>	Elbow flexors
C6	<input type="checkbox"/>	<input type="checkbox"/>	Wrist extensors
C7	<input type="checkbox"/>	<input type="checkbox"/>	Elbow extensors
C8	<input type="checkbox"/>	<input type="checkbox"/>	Finger flexors (distal phalanx of middle finger)
T1	<input type="checkbox"/>	<input type="checkbox"/>	Finger abductors (little finger)

UPPER LIMB TOTAL (MAXIMUM) + = (25) (25) (50)

Comments:

	R	L	
L2	<input type="checkbox"/>	<input type="checkbox"/>	Hip flexors
L3	<input type="checkbox"/>	<input type="checkbox"/>	Knee extensors
L4	<input type="checkbox"/>	<input type="checkbox"/>	Ankle dorsiflexors
L5	<input type="checkbox"/>	<input type="checkbox"/>	Long toe extensors
S1	<input type="checkbox"/>	<input type="checkbox"/>	Ankle plantar flexors

Voluntary anal contraction (Yes/No)

LOWER LIMB TOTAL (MAXIMUM) + = (25) (25) (50)

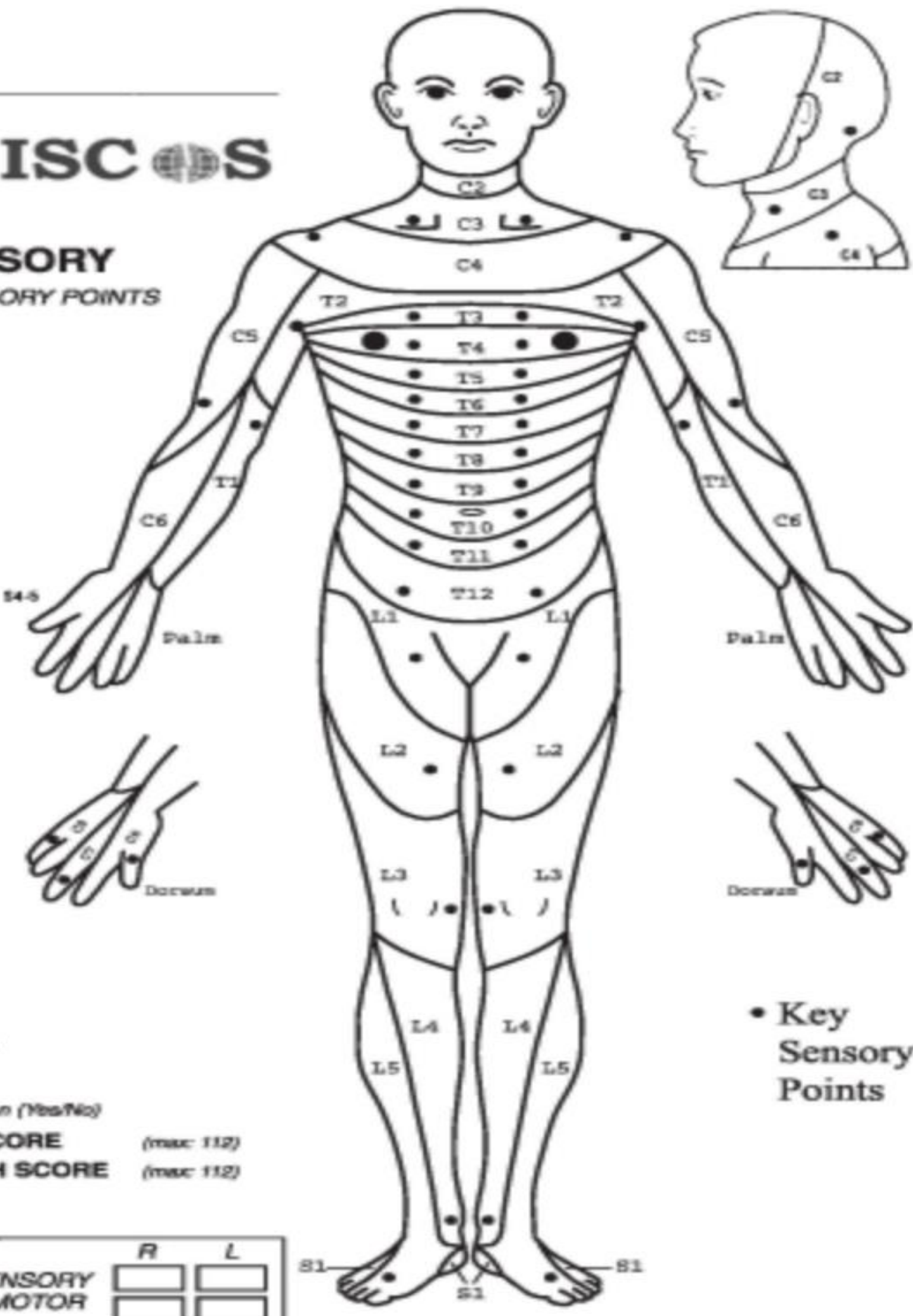
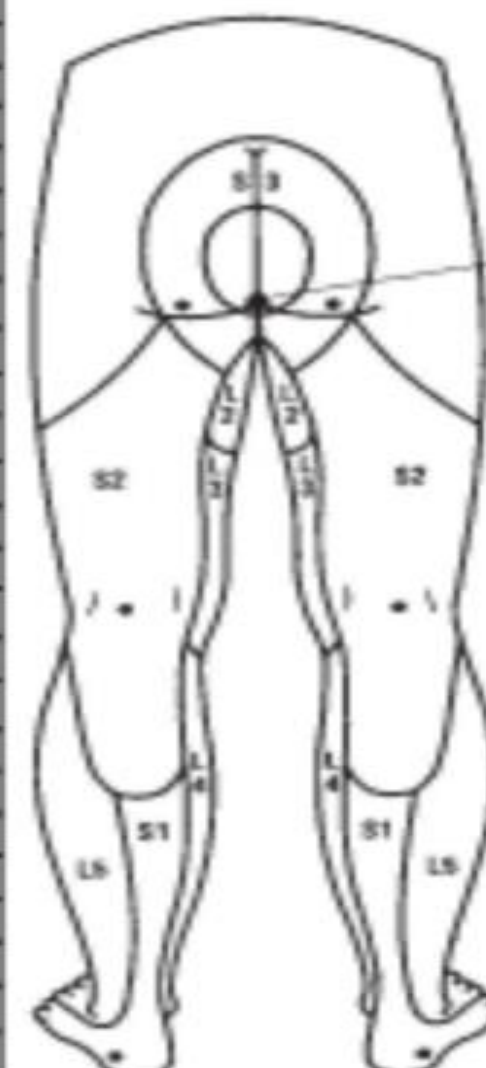
	LIGHT TOUCH		PIN PRICK	
	R	L	R	L
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				

TOTALS (MAXIMUM) + = (56) (56) (56) (56)

SENSORY

KEY SENSORY POINTS

0 = absent
1 = impaired
2 = normal
NT = not testable



• Key Sensory Points

Any anal sensation (Yes/No)
 PIN PRICK SCORE (max: 112)
 LIGHT TOUCH SCORE (max: 112)

NEUROLOGICAL LEVEL <small>The most caudal segment with normal function</small>	SENSORY	R	L	COMPLETE OR INCOMPLETE? <small>Incomplete - Any sensory or motor function in S4-S5</small>	ASIA IMPAIRMENT SCALE	ZONE OF PARTIAL PRESERVATION <small>Caudal extent of partially innervated segments</small>	SENSORY	R	L
	MOTOR	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Klinisch Onderzoek:

1. Krachtsverlies?
2. Sensibiliteit?
3. Verminderde reflexen?

1+2+3 = normaal > GEEN RADICULAIR CONFLICT.

Beeldvorming

- MR
- RX,CT, Spect-CT

TABLE 1. MODIC CHANGES ACCORDING TO CHANGES IN MRI SIGNAL INTENSITY IN ADJACENT VERTEBRAL ENDPLATES

Modic classification	T1	T2	Represents
I	-	+	Vascularized bone marrow and/or edema
II	+	+	Proliferation of fatty tissue
III	-	-	Sclerotic bone



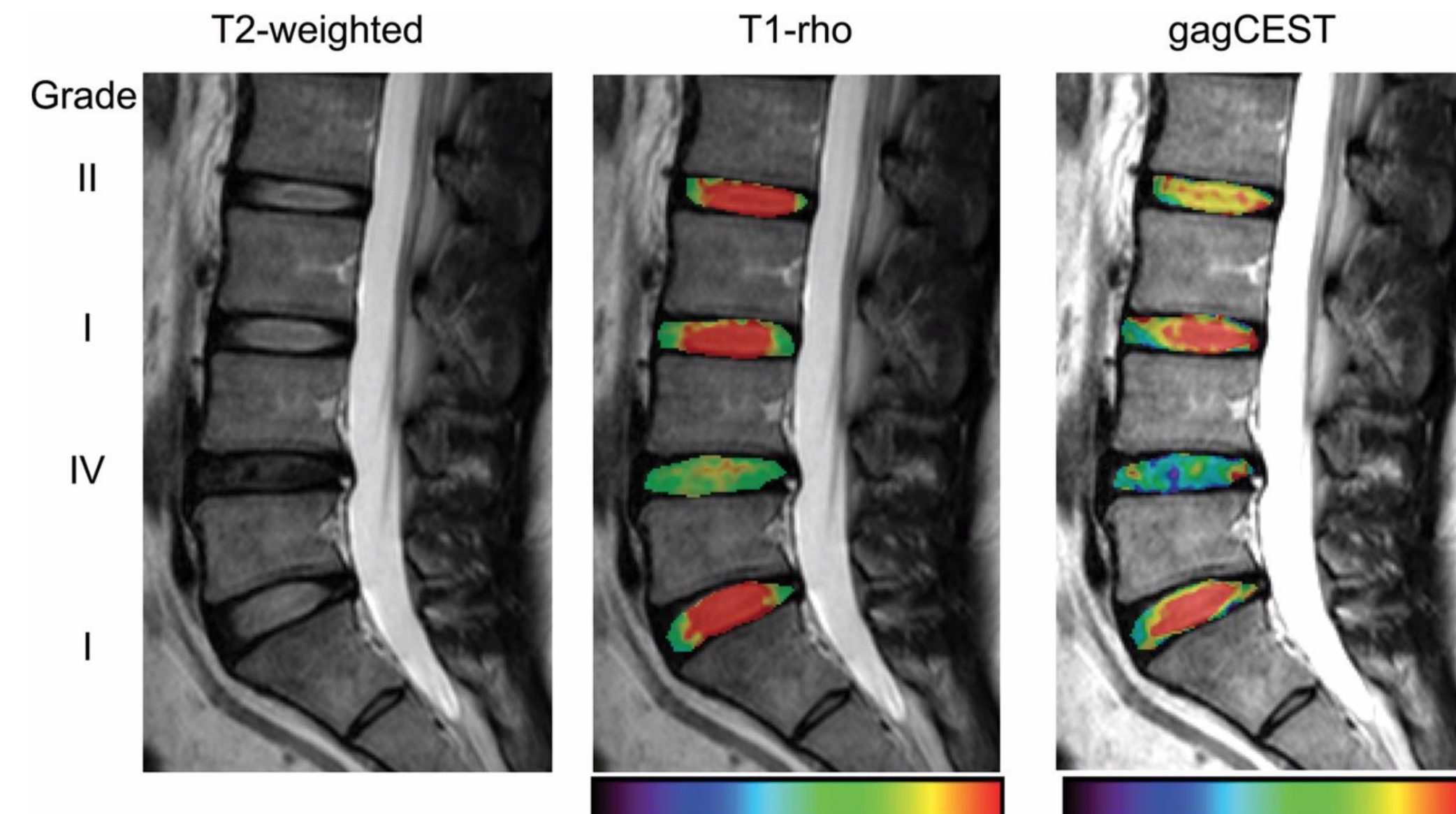
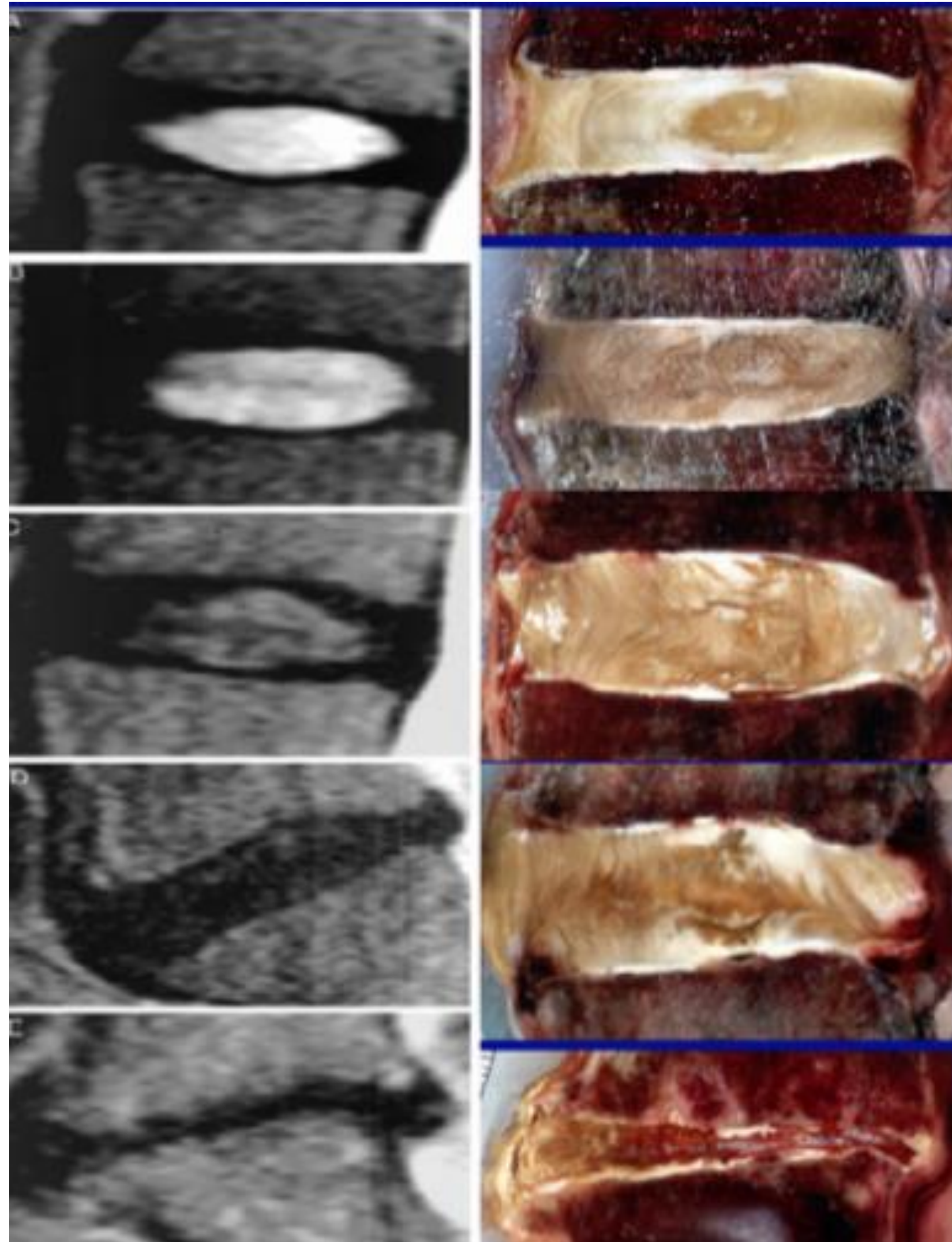
T2



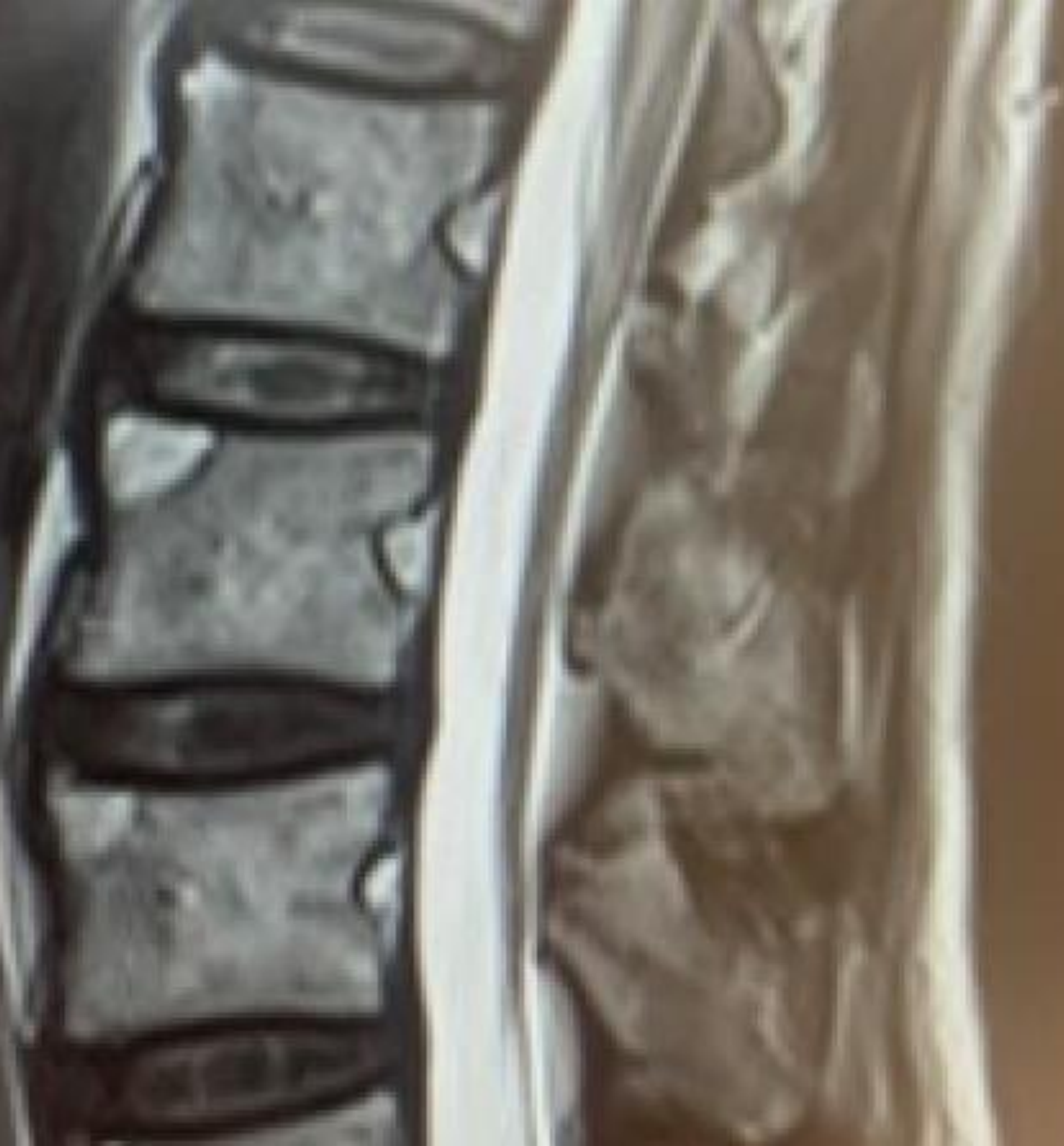
T1



Phirrmann



3/12/2023



Behandeling

Therapie

Conservatief. EDISC

- Geruststellen maar ... opvolgen! (veranderend patroon)
- **Gerichte** infiltraties, PRF, RF
- **Multidisciplinair** chronische pijn. Medicatie. (Spine Units)
- Core Stability oefenschema's
- Yengar Yoga
- Bracing
- (manipulaties, ...)

Effectiveness of conservative treatments for the lumbosacral radicular syndrome: a systematic review

Pim A J Luijsterburg ¹, Arianne P Verhagen, Raymond W J G Ostelo, Ton A G van Os, Wilco C Peul, Bart W Koes

- At present there is no evidence that one type of treatment is clearly superior to others, including no treatment, for patients with a lumbosacral radicular syndrome. (Andulatie matrassen)

Comparative clinical effectiveness of management strategies for sciatica: systematic review and network meta-analyses

Ruth A Lewis ¹, Nefyn H Williams ², Alex J Sutton ³, Kim Burton ⁴, Nafees Ud Din ⁵, Hosam E Matar ⁶, Maggie Hendry ⁵, Ceri J Phillips ⁷, Sadia Nafees ⁵, Deborah Fitzsimmons ⁴, Ian Rickard ⁸, Clare Wilkinson ⁵

- **Effective**
 - Surgery
 - Epidural infiltrations
 - Non-Opioids
- **Not Effective**
 - Opioid, traction, back school, bedrest, brace, percutaneous treatments, ...



3/12/2023

Wanneer opereren ?

Cauda Equina

Uitval MRC < 3

Spinaal Stenose

Sneller herstel versus nadelen

Instabiliteit

Duidelijke etiologie voor de pijn!

Afhankelijk van de patiënt

- Ernst van de pijn
- Tendens tot herstel > Tijdlijn (12 w)
- Pijn tijdens zitten bij een hernia

MRC Power Grading

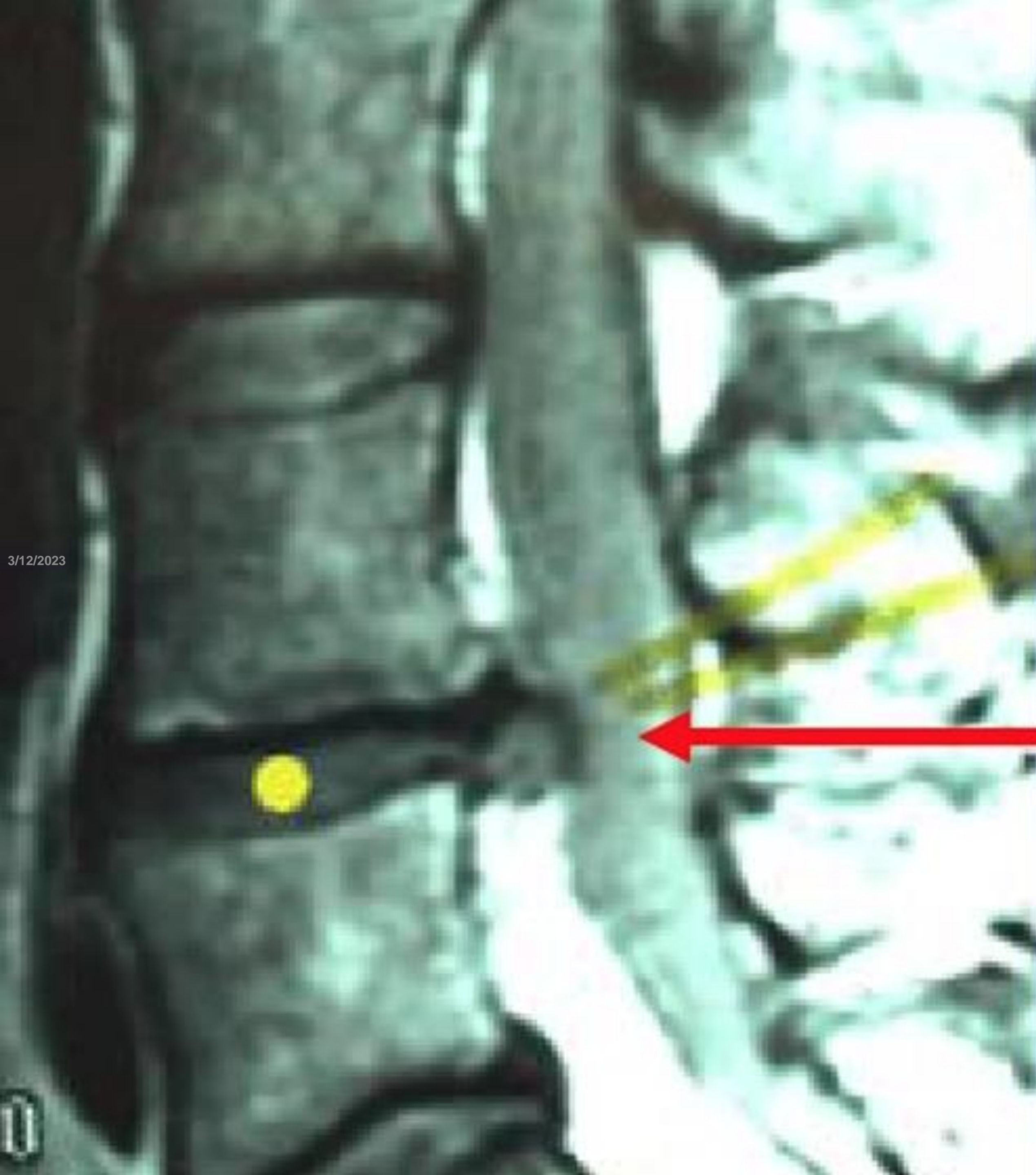
Score	Description
0	No contraction
1	Flicker or trace of contraction
2	Active movement, with gravity eliminated
3	Active movement against gravity
4	Active movement against gravity and resistance
5	Normal power

Cervicobrachialgie

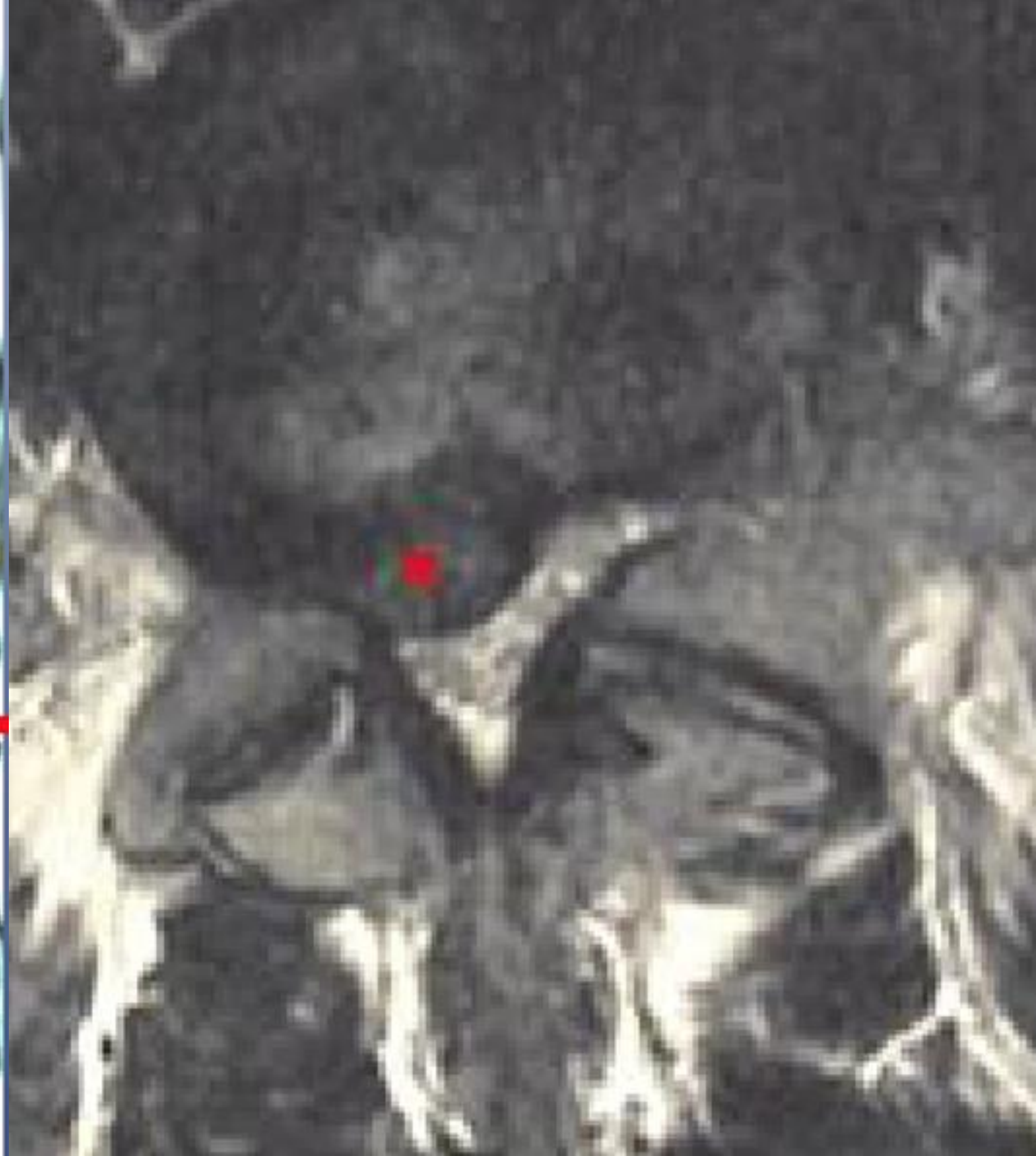
- Elevatie van de arm vermindert de klacht
- Spurling test
- Hoffmann-Trömner reflex
- Hyperreflexie onderste ledematen
- Op de schouder liggen : Schouder<> cervicaal
- Electief schouderonderzoek

HNP, Cauda Equina en Spinaal Stenose

- Mono Radiculair
 - Verloop van de zenuwwortel (niet gerefereerd)
 - Scherpe en uitstralende pijn. (tandpijn in het been)
 - Paresthesieën, gevoelsstoornissen
 - Krachtsverlies.
- Cauda Equina
 - Rijbroek gebied, zadelanesthesie, verlamming
 - Mictie- en defaecatieproblemen
- Spinaal Stenose
 - Cooks rule



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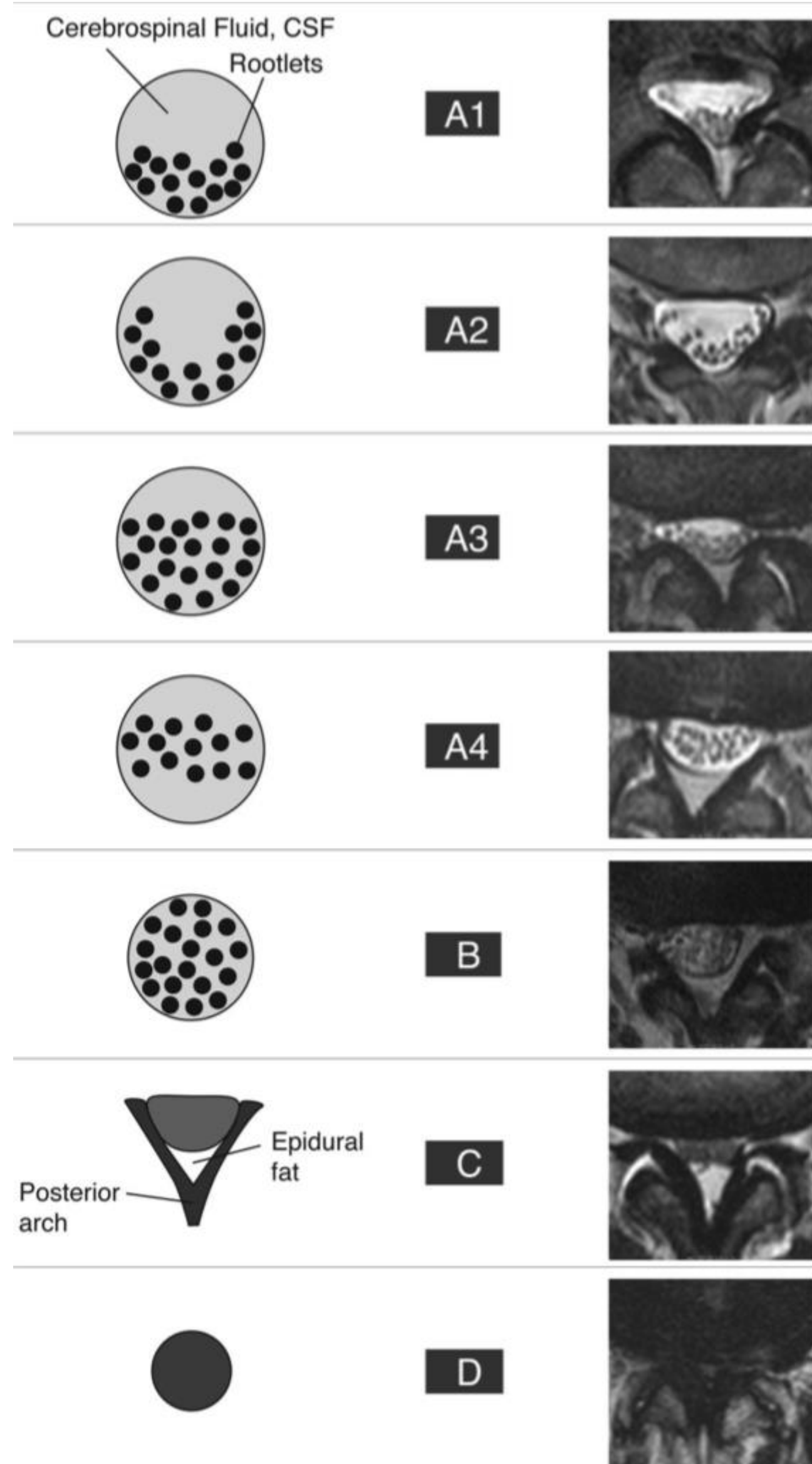




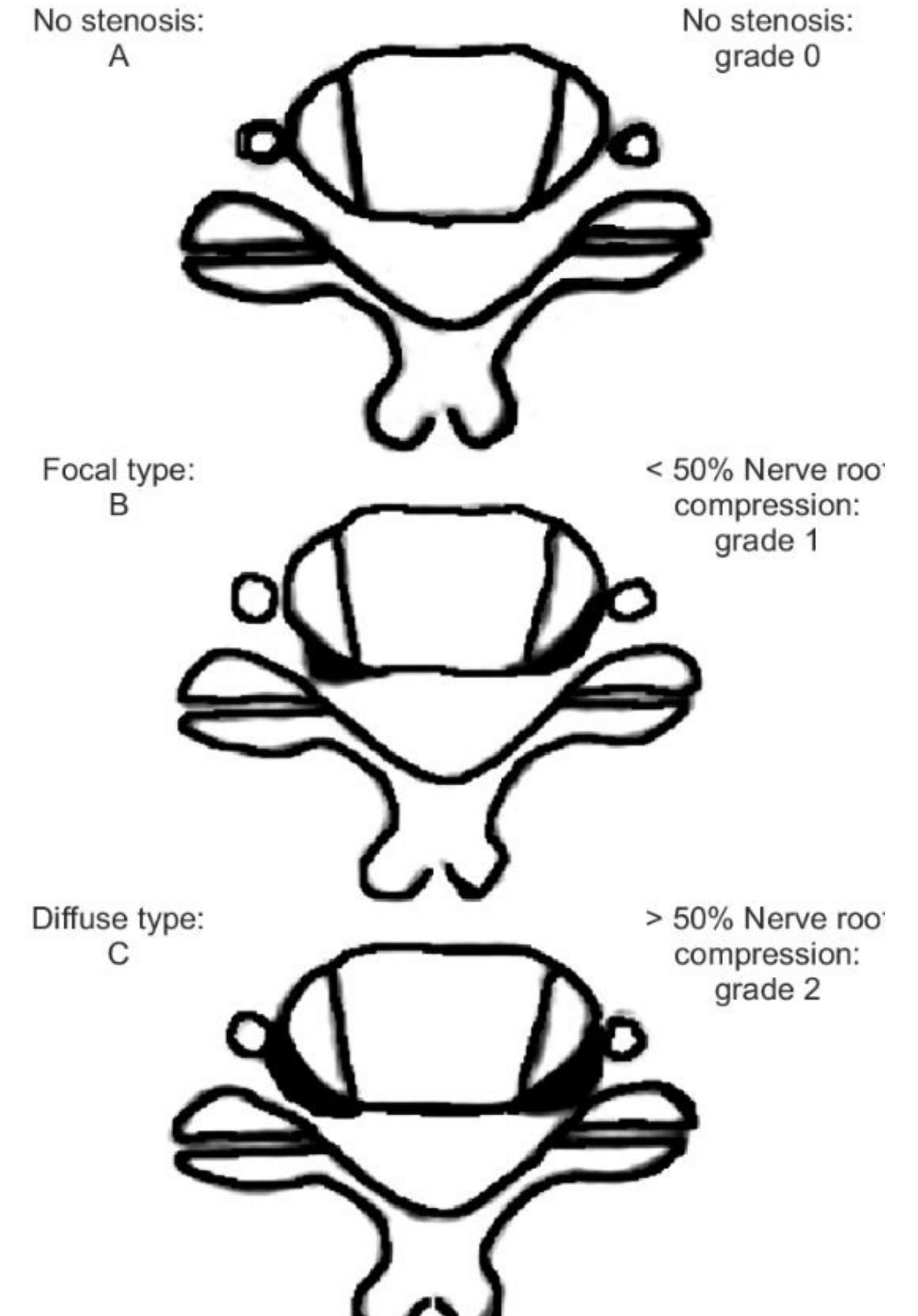
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Centrale SS : Schizas



Laterale recessus of Foraminale SS : Lee



Hoe opereren
MIS?
Instrumented?

>

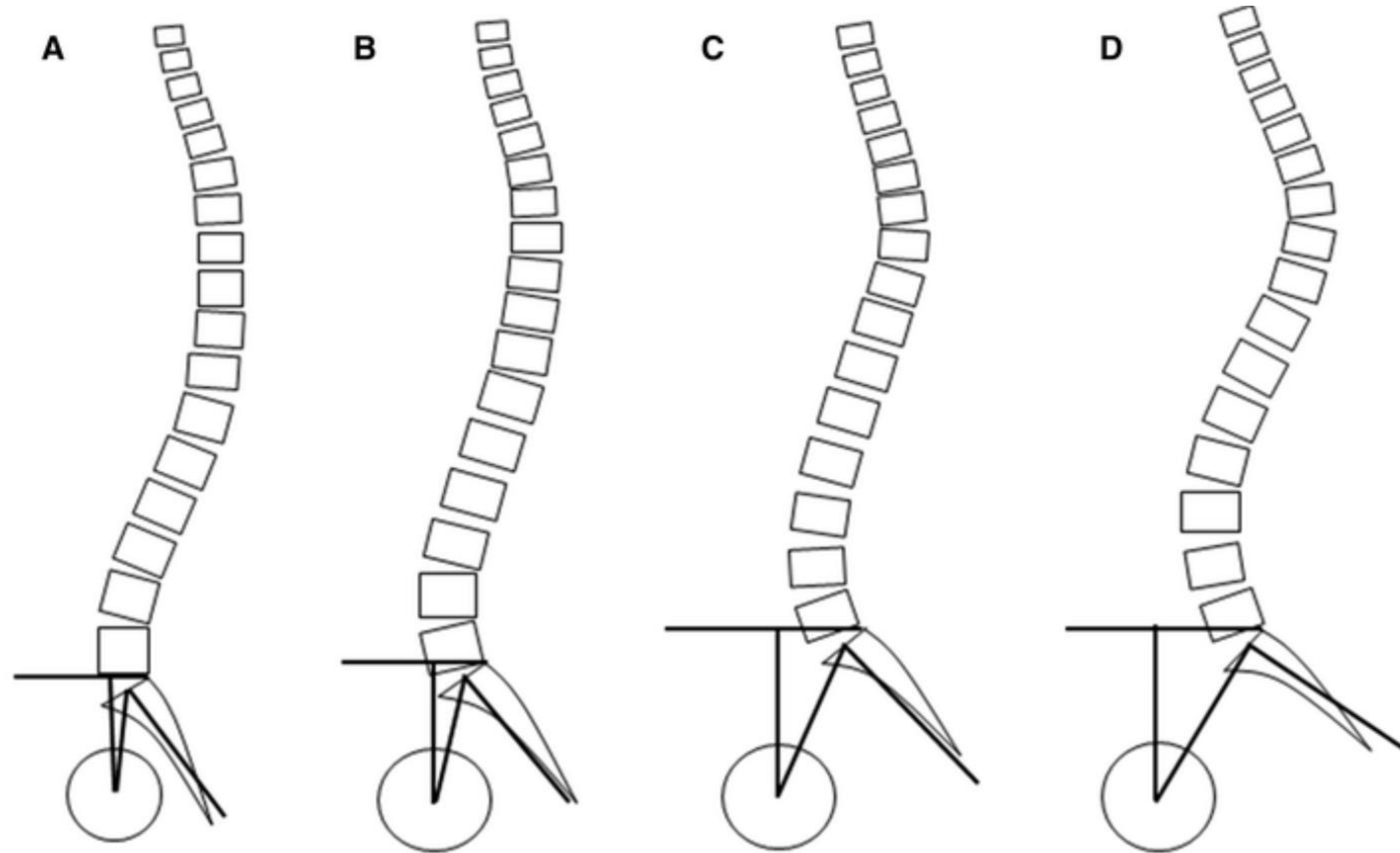
Open

Tube – Microscoop

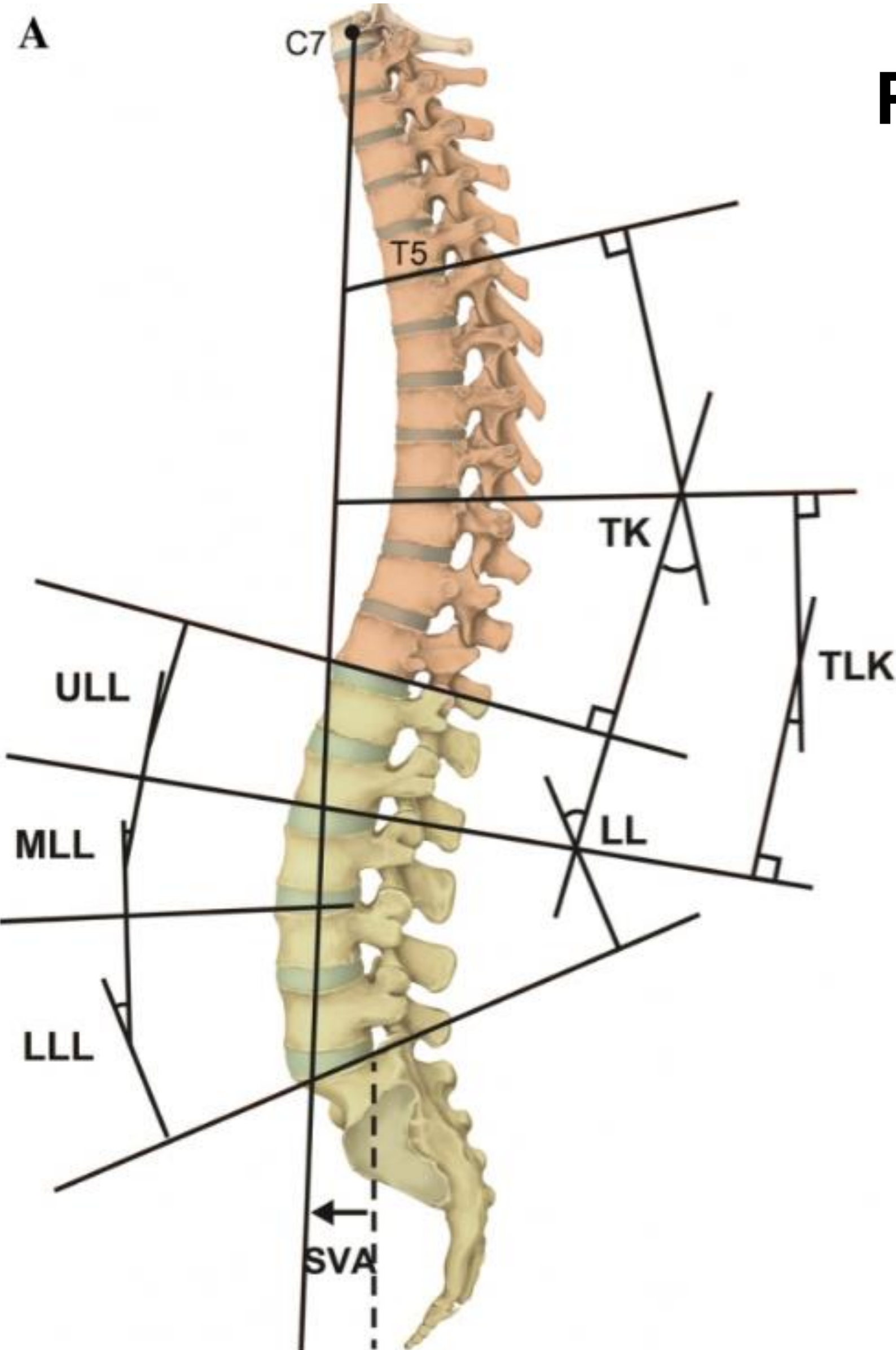
Full Endoscopic SS

Intersomatische Fusie - Schroeven

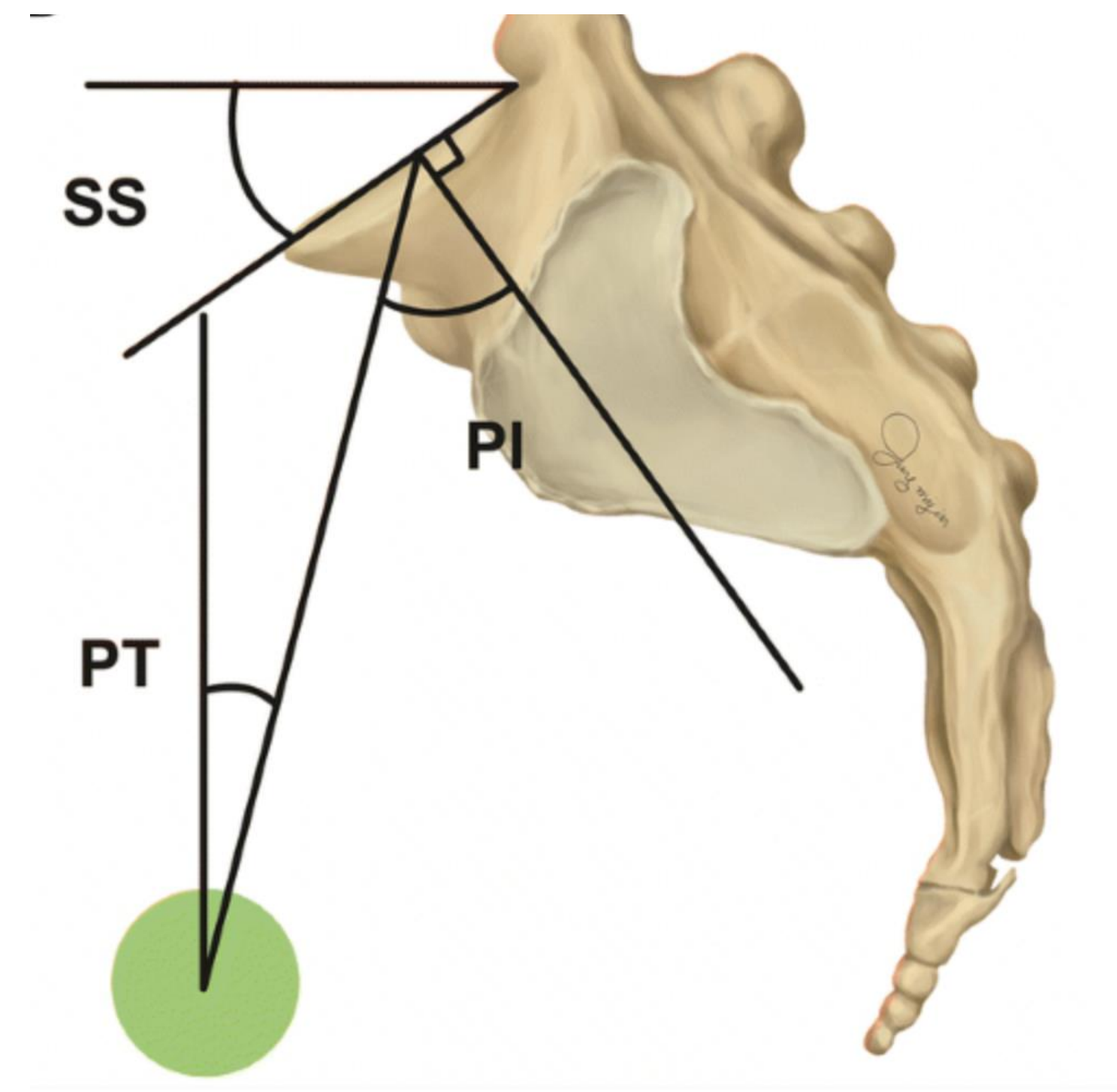
- **Deformiteit**
- **Instabiliteit:**
 - Klinisch
 - Radiologisch
 - Flexie- Extensieopnames, dynamische MR
 - $> 15^\circ$ angulatie
 - $> 3\text{mm}$ shift
- **Fusie Degeneratief lijden**
 - > 6 maanden conservatief en duidelijke etiologie !
 - Cave Evidentie
 - **Cave herstel Sagittale balans !!!**



The four types of the Roussouly sagittal classification. The shape of lumbar lordosis depends on sacral slope (SS) orientation. Types 1 and 2 have $SS < 35^\circ$, type 3 has $35^\circ < SS < 45^\circ$, and type 4 has $SS > 45^\circ$. Generally, the PI is low in types 1 and 2 and high in type 3. Note the location of the apex of the lumbar lordosis. In type 1, it is in the center of the L5 vertebral body; in type 2, it is at the base of the L4 vertebral body; in type 3, it is in the center of the L4 vertebral body; and in type 4 it is in the center of the L4 vertebral body or higher

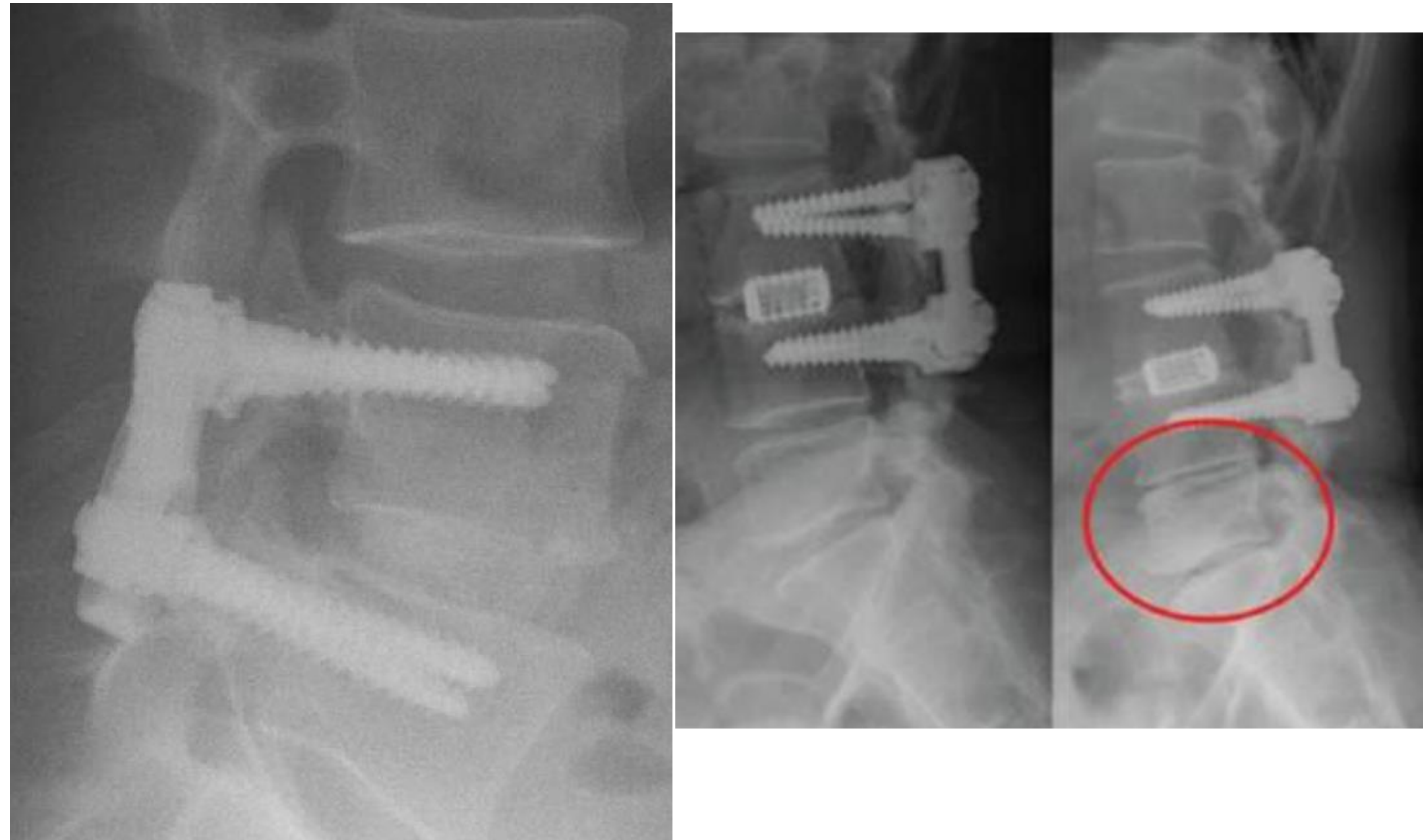


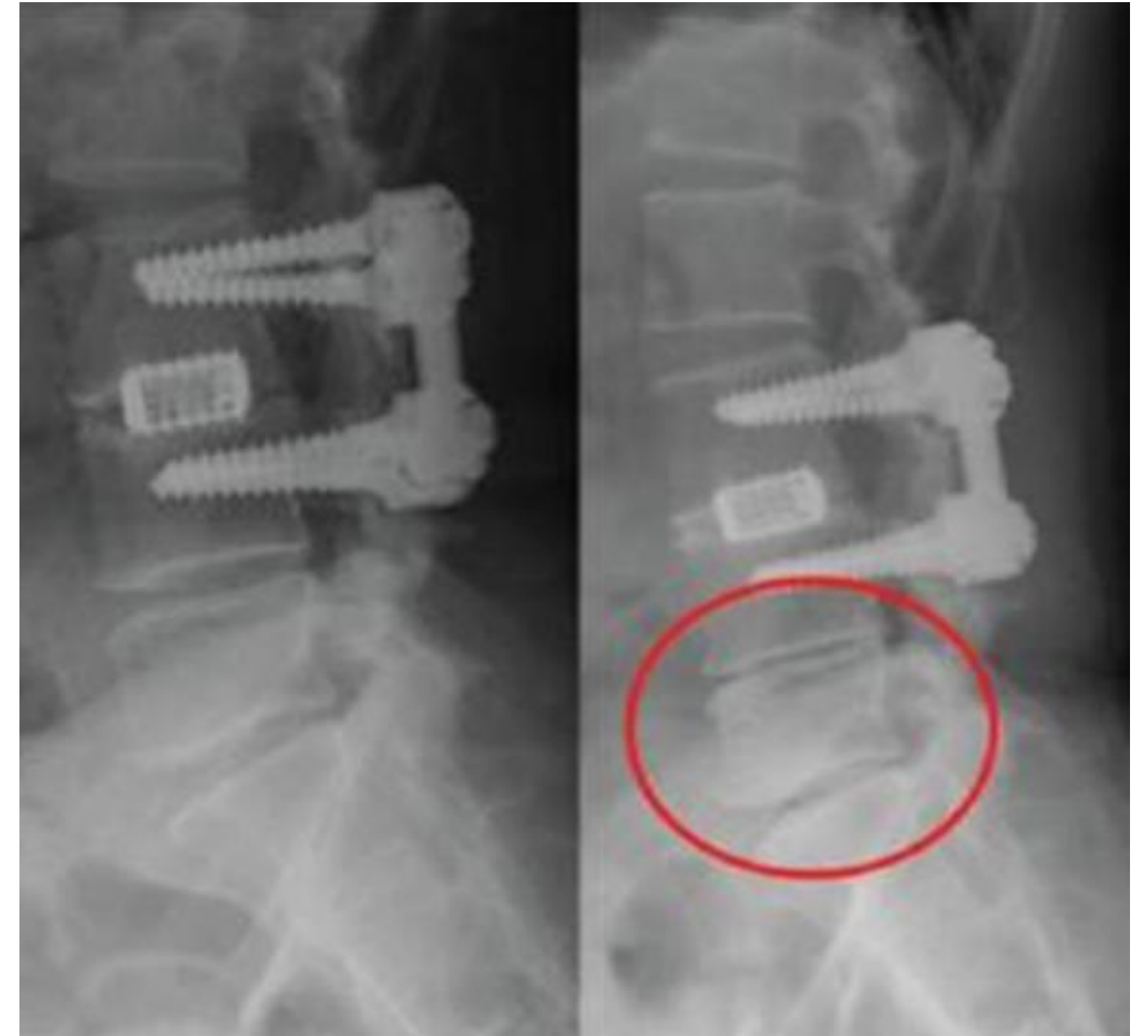
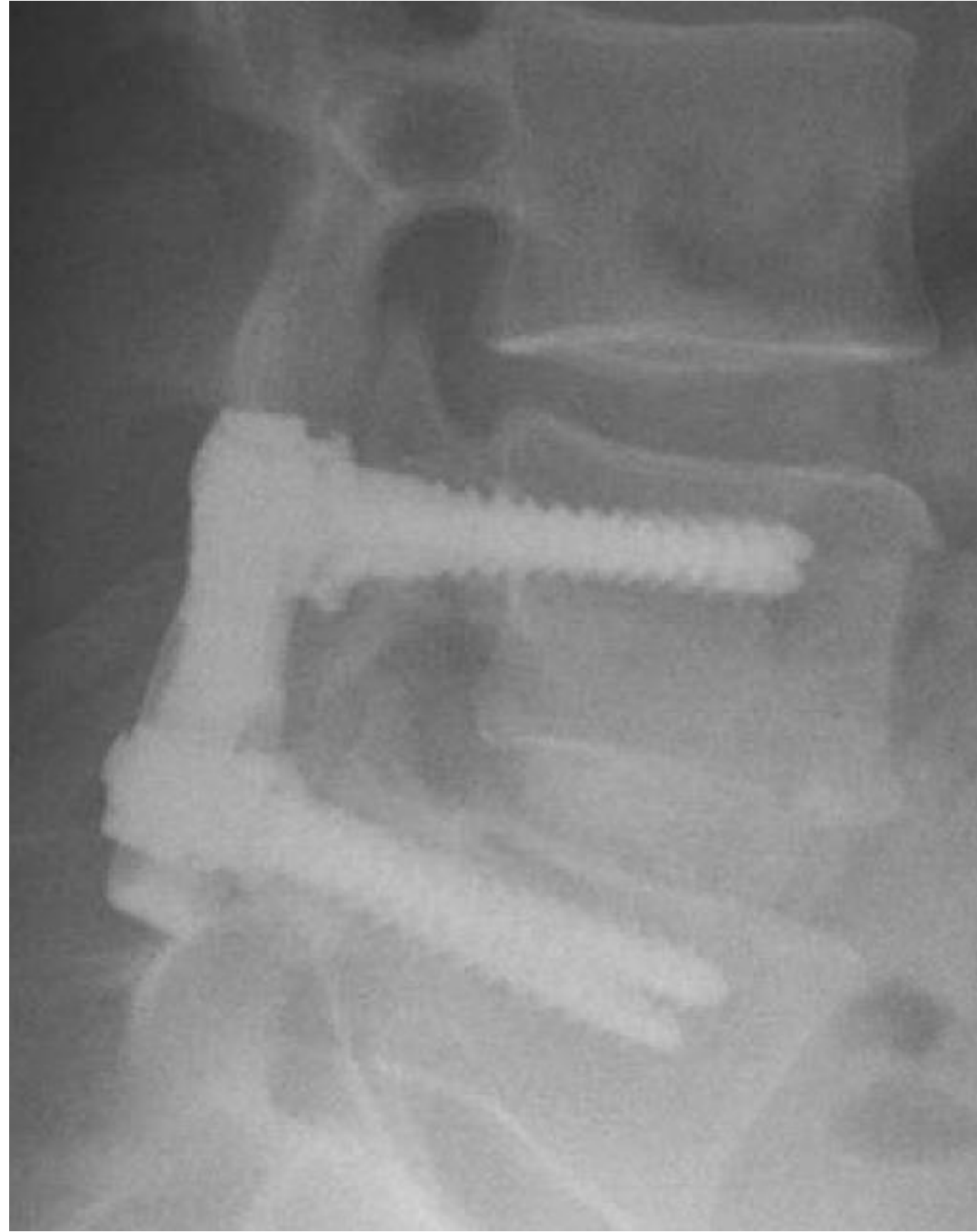
$$PI = PT + SS$$



Lumbale Lordose

- $LL = \frac{1}{2} PI + 28^\circ$





- Fusie
 - RALIF, 360°, TLIF, PLIF, XLIF
 - Again Sagittal balance
 - Mono segmentair > goede indicatie > hoge SF 36
- Motion preservation > ASD
 - Dynesys
 - Interspineuze spacers
 - Prothese

Disc arthroplasty

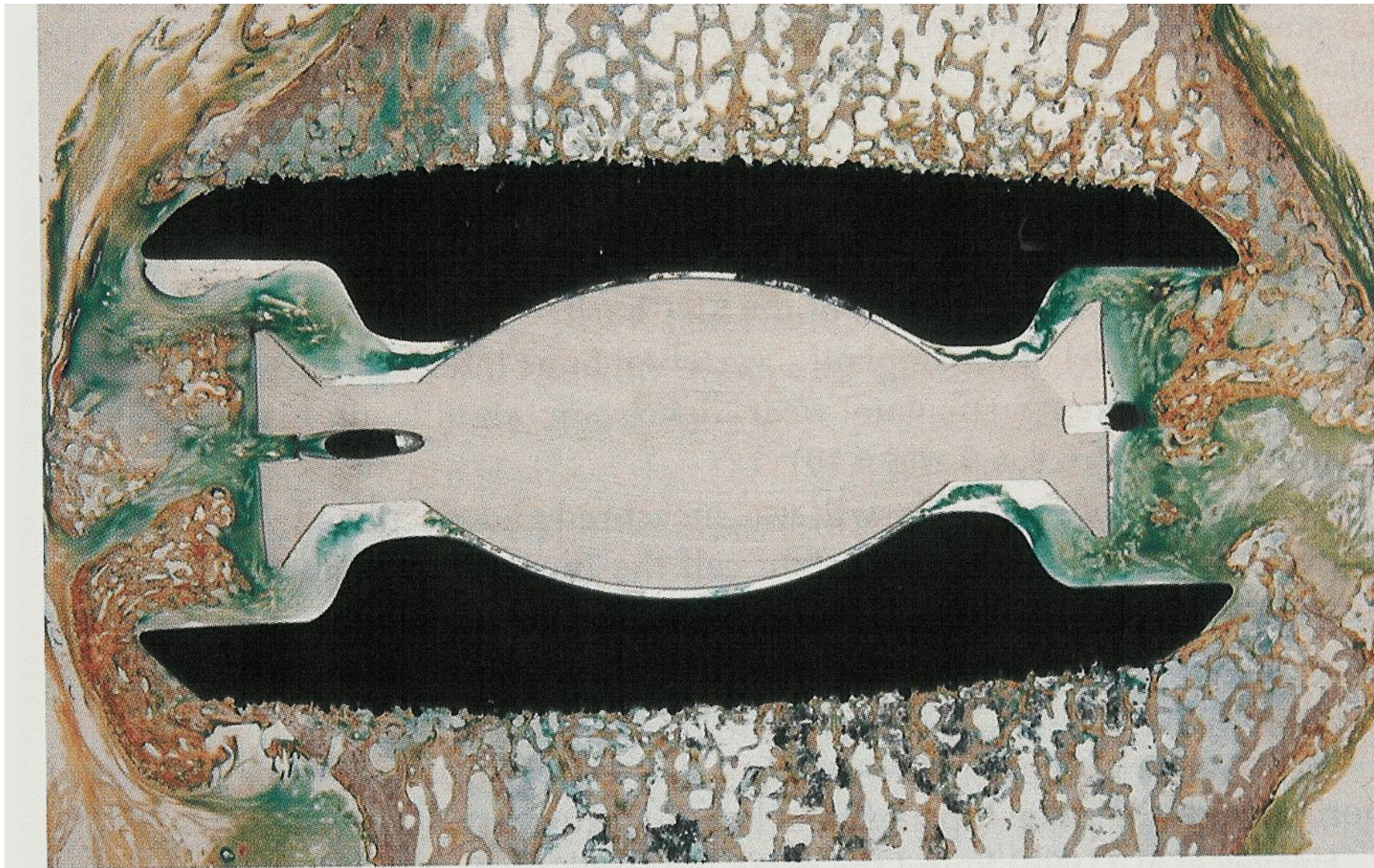
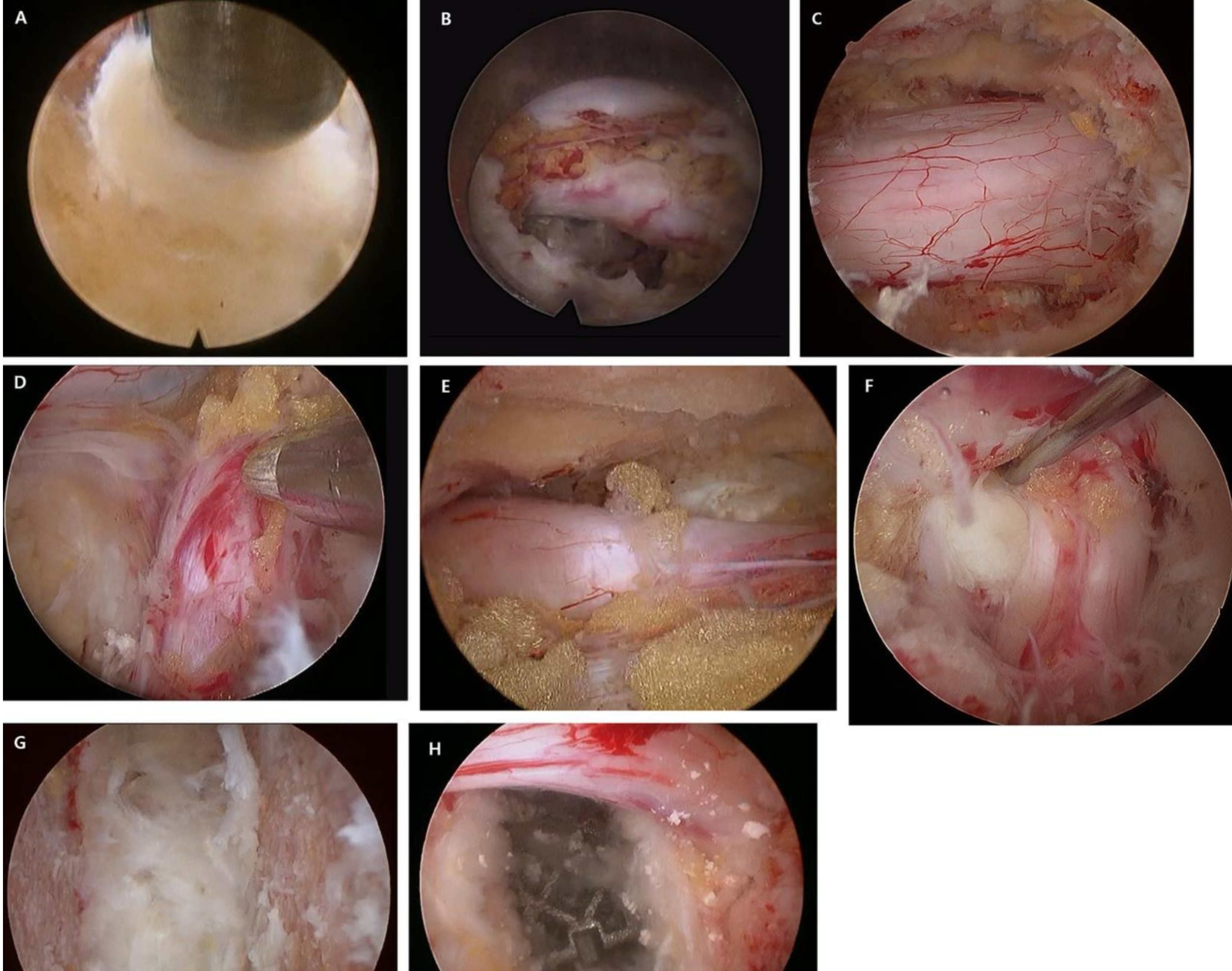


Figure 6.7. A coronal histologic section of the SB III Charité prosthesis. Excellent ingrowth is seen between the coated endplates and the L5 and L6 vertebral bodies at 6 months post-operatively



3/12/2023

Various techniques of endoscopic spine surgery. (A) Transforaminal endoscopic lumbar discectomy. (B) Interlaminar lumbar endoscopic discectomy. (C) Interlaminar central lumbar decompression. (D) Paraspinal foraminal lumbar decompression. (E) Interlaminar contralateral lateral recess decompression. (F) Posterior cervical foraminotomy and discectomy. (G, H) Endoscopic lumbar interbody fusion (fusion bed preparation and cage insertion).

ORTHO.GENT

ORTHOPEDIE & TRAUMATOLOGIE



Decompression with or without Fusion in Degenerative Lumbar Spondylolisthesis

I.M. Austevoll, E. Hermansen, M.W. Fagerland, K. Storheim, J.I. Brox, T. Solberg, F. Rekeland, E. Franssen, C. Weber, H. Brisby, O. Grundnes, K.R.H. Algaard, T. Böker, H. Banitalebi, K. Indrekvam, and C. Hellum, for the NORDSTEN-DS Investigators*

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Spine Surgery Factors

If the surgical method used is not appropriate to address a patient's pain, **they will likely have a higher risk of back surgery failure.**



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ORTHO.GENT

ORTHOPEDIE & TRAUMATOLOGIE

hartelijk dank