Rachis dégénératif
Pathologie discale protrusive
Canal étroit

F. Lecouvet, X. Banse, V. Perlepe,
T. Kirchgesner, S. Acid
J. Malghem, B. Vande Berg

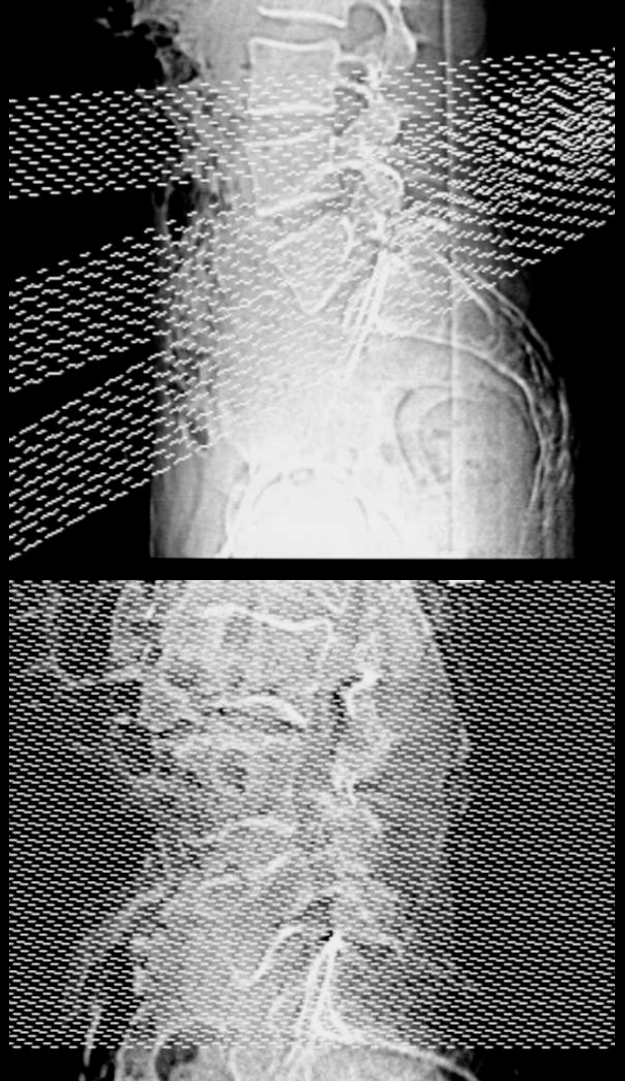
Cliniques universitaires
SAINT-LUC
UCL BRUXELLES

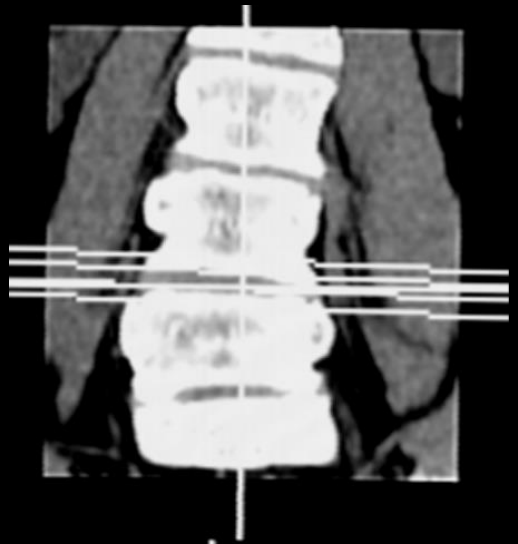
Contenu

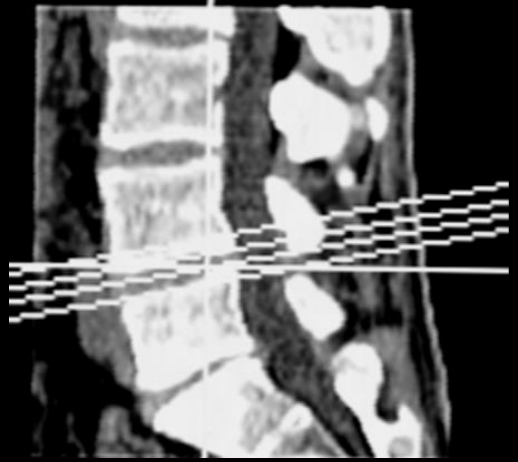
- Technique
- Bases théoriques
- Exemples

Scanner ou TDM

- Pas mort
- Vive la spire
- ~~Contraste iodé~~



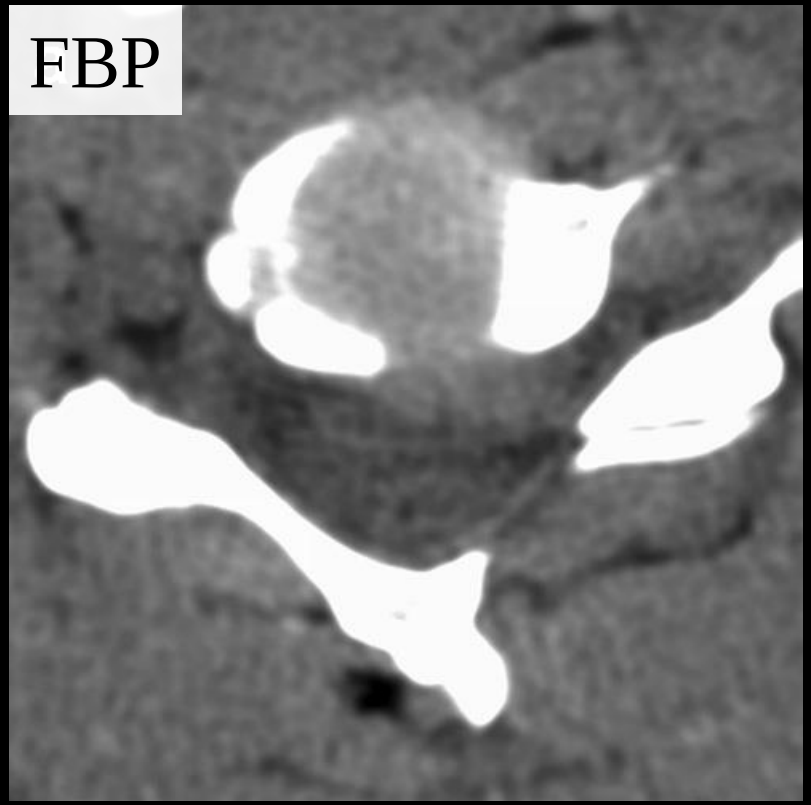



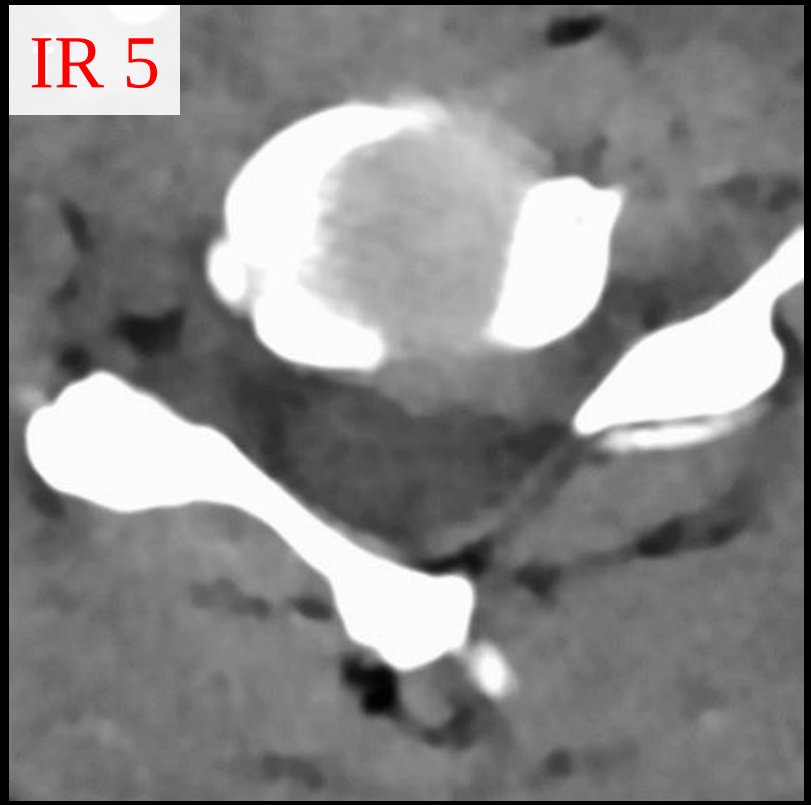

Séméiologie TDM

- Débord 60-100 UH
- Contraste : - bon avec graisse
  - faible avec plexus / sac

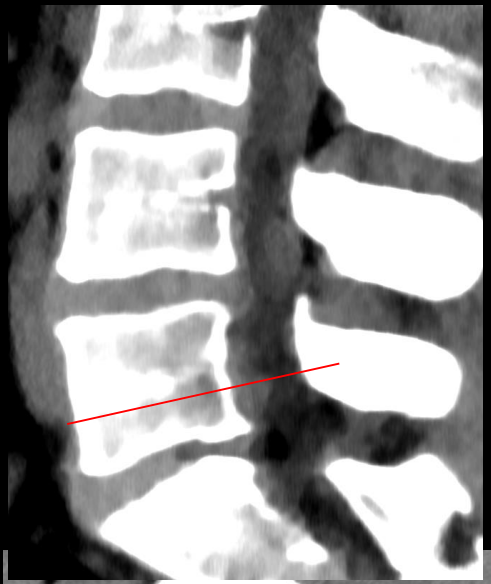
Evolution doses et qualité



Rétroprojection filtrée



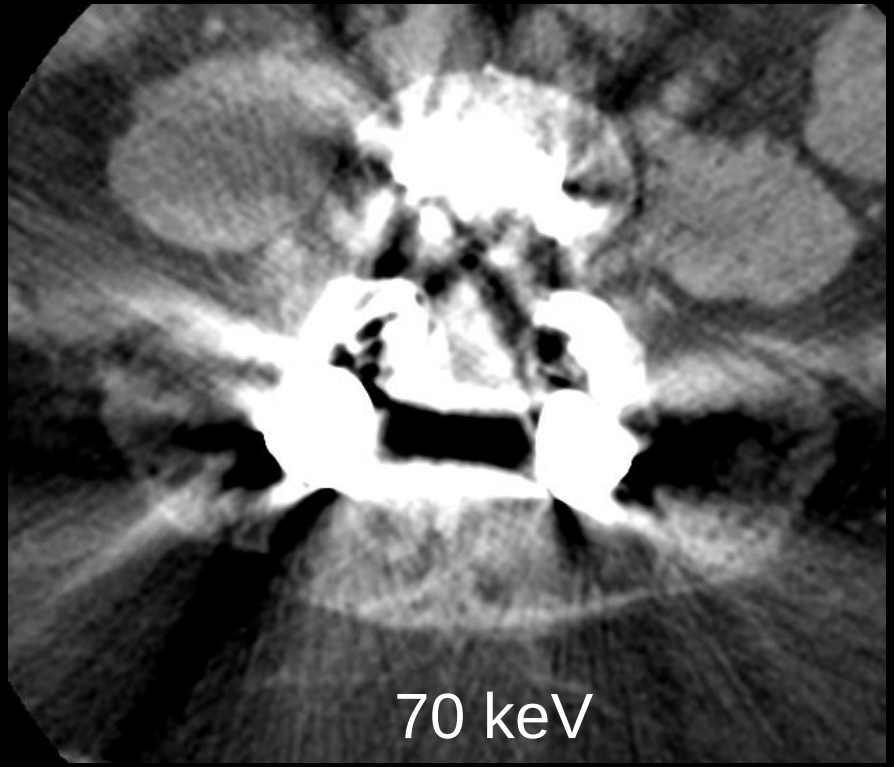
Reconstructions itératives



17/12

04/01

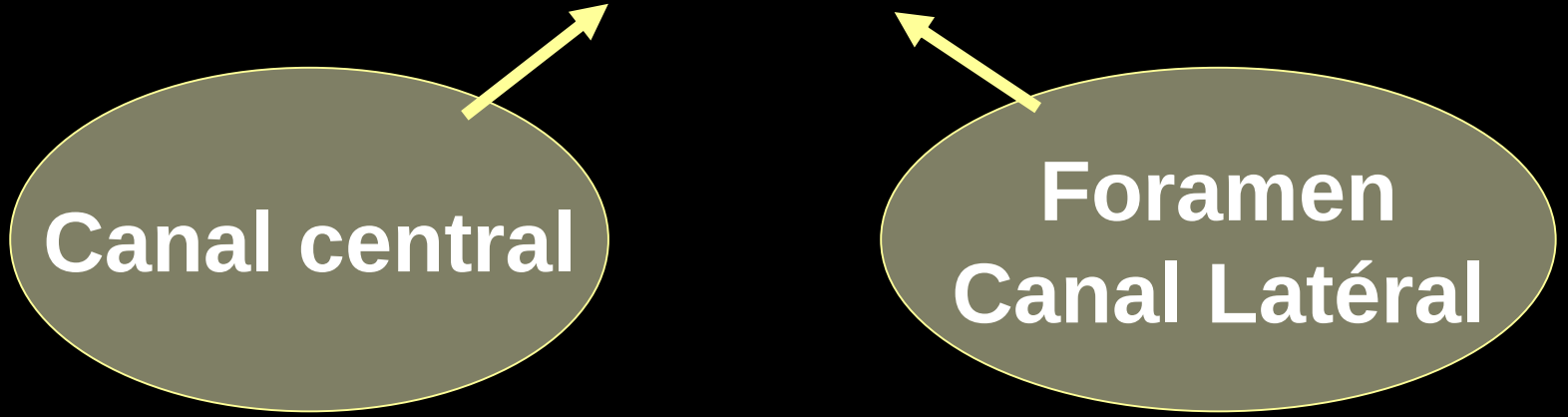
Evolution qualité



Intérêt scanner double énergie en mode monochromatique

IRM

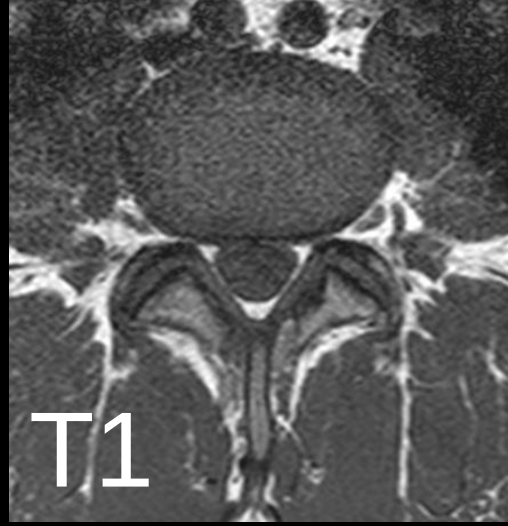
- Sagittal T_1, T_2
- et transverse T_2 (et T1)



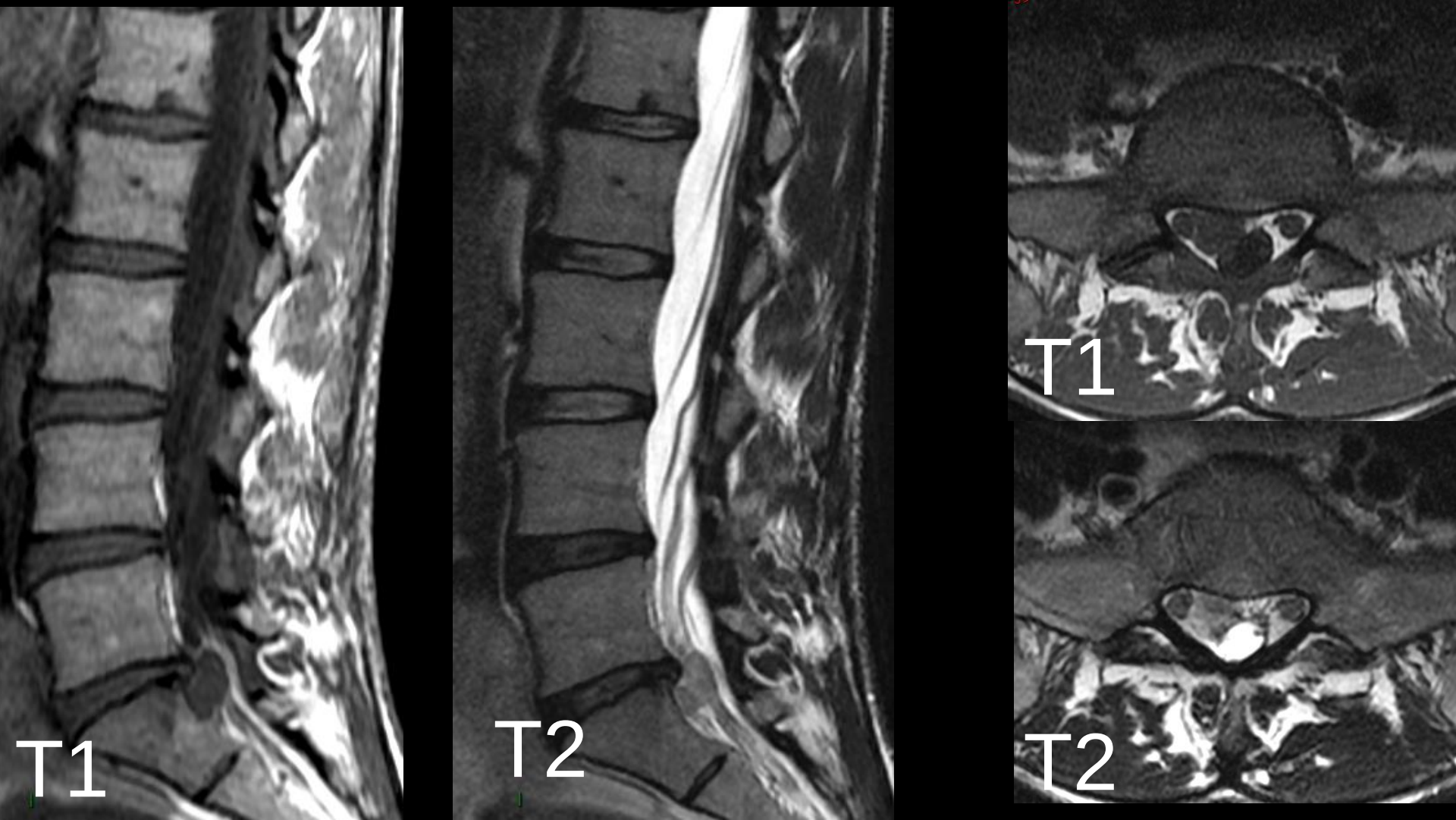
- Coronales STIR ?
- 3DT2 ?
- T2 DIXON !


T1

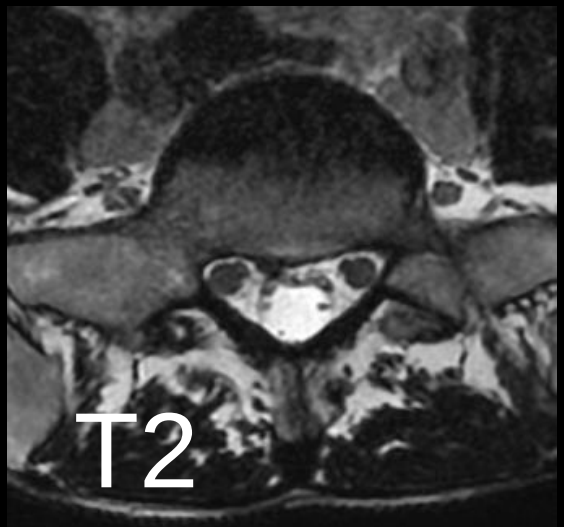

T2


T1


T2

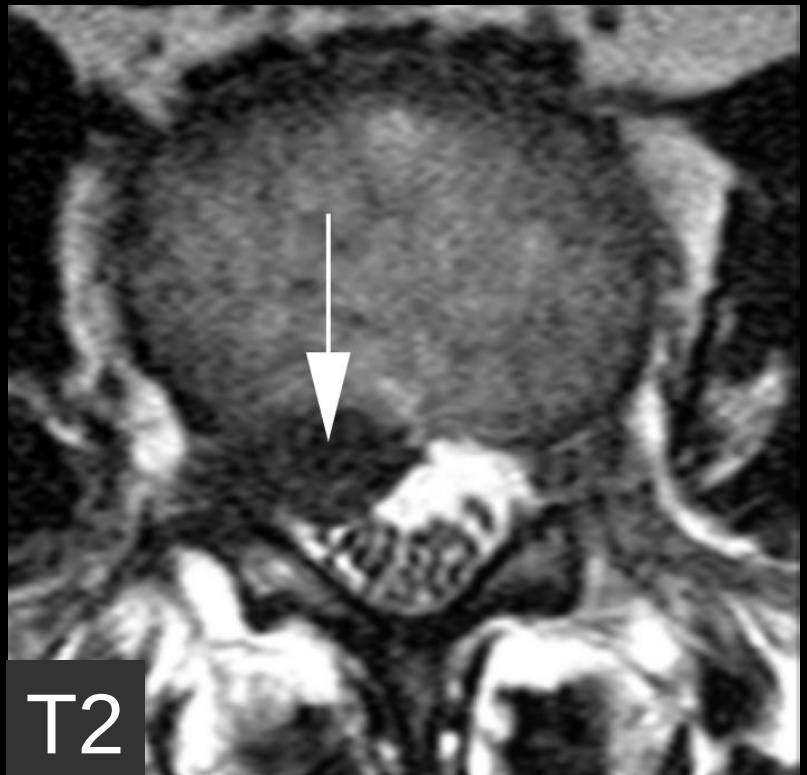

T1
T2
T1
T2

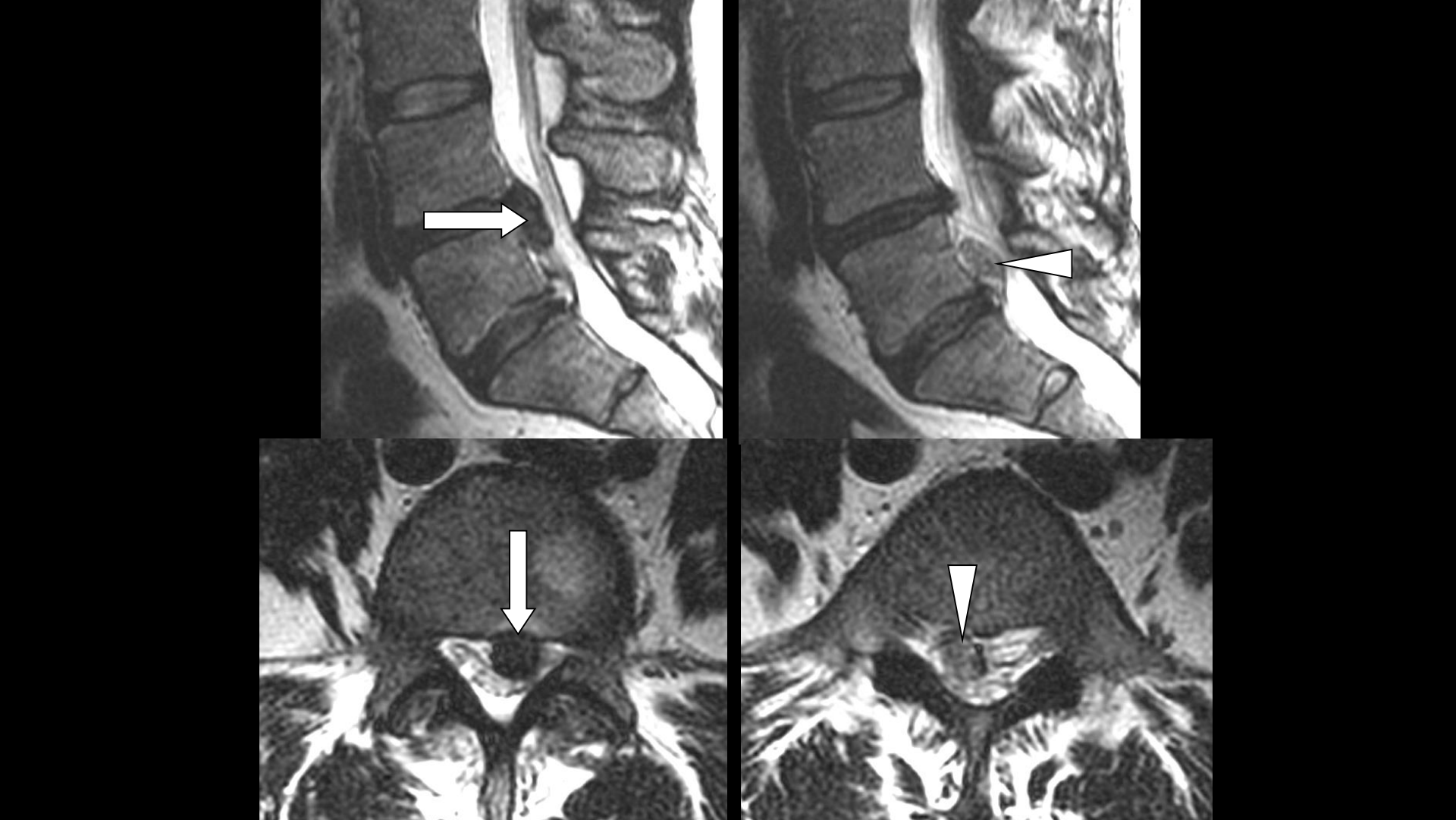
Histoire naturelle



Séméiologie IRM

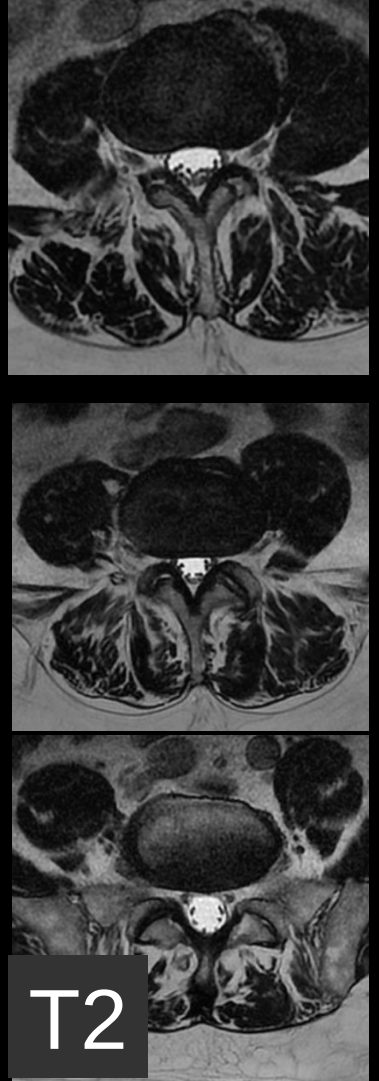
Signal variable



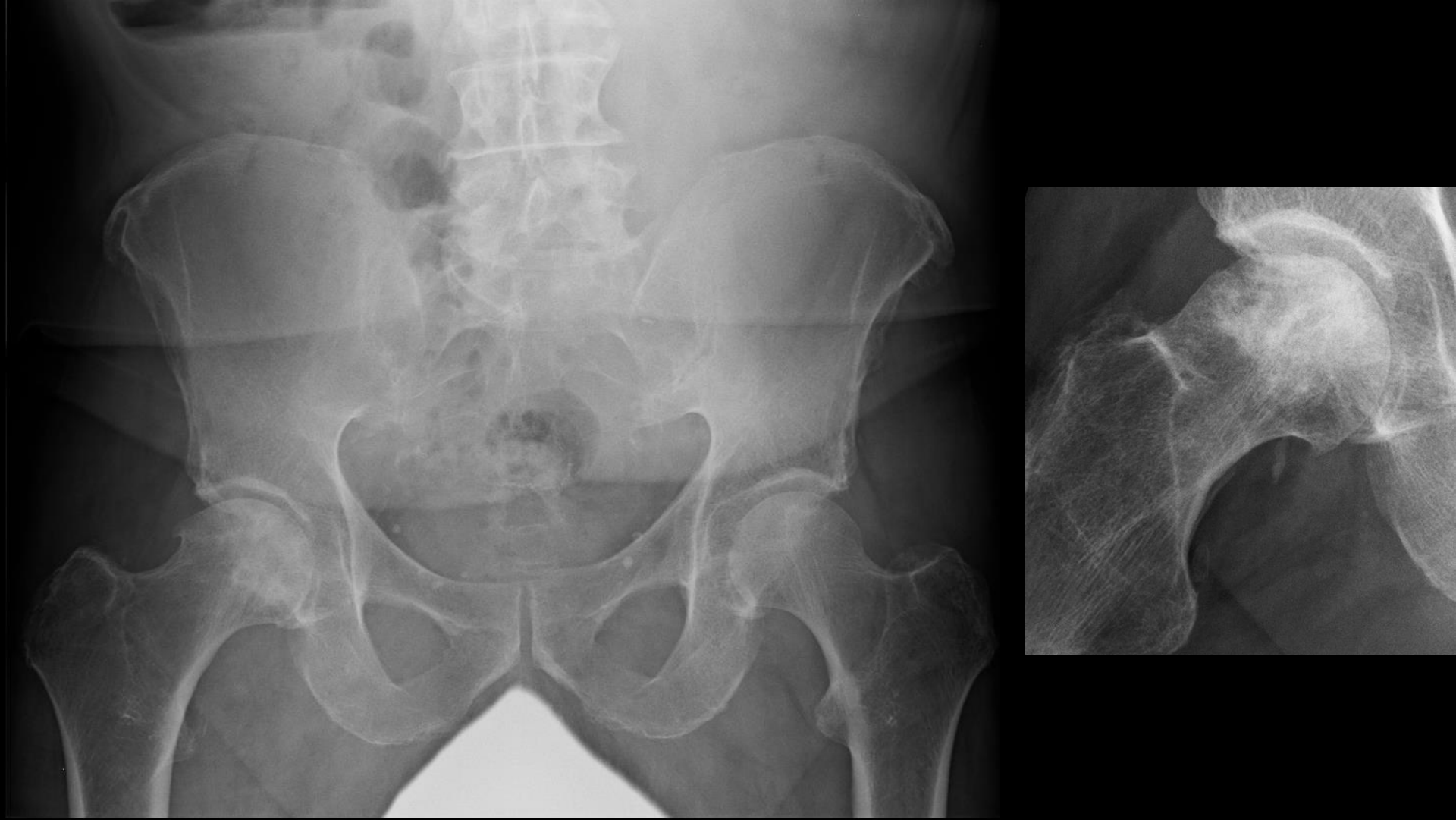



T1


T2


T2


STIR



Effectiveness of a Rapid Lumbar Spine MRI Protocol Using 3D T2-Weighted SPACE Imaging Versus a Standard Protocol for Evaluation of Degenerative Changes of the Lumbar Spine

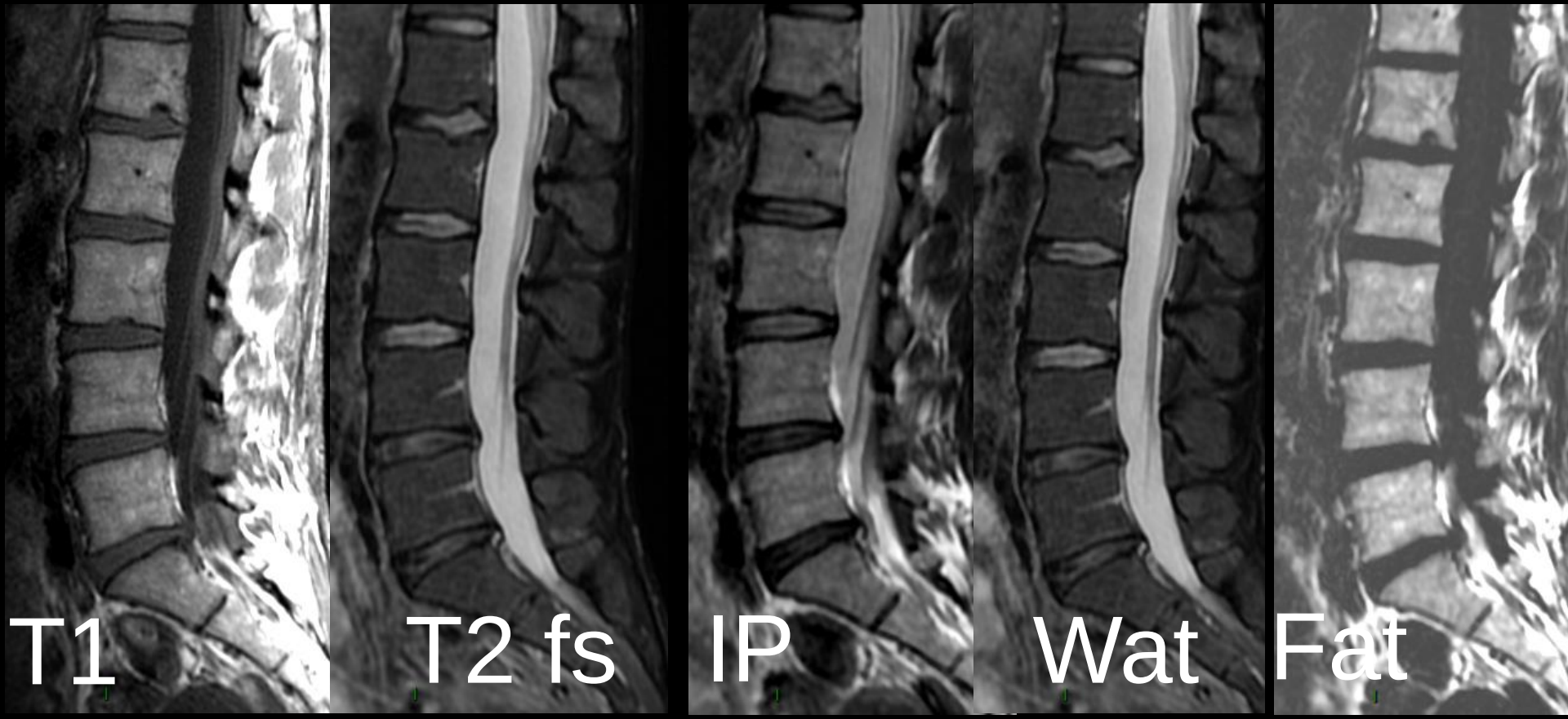
Anousheh Sayah[1]
Ann K. Jay
Jacob S. Toaff
Erini V. Makariou
Frank Berkowitz

OBJECTIVE. Reducing lumbar spine MRI scanning time while retaining diagnostic accuracy can benefit patients and reduce health care costs. This study compares the effectiveness of a rapid lumbar MRI protocol using 3D T2-weighted sampling perfection with application-optimized contrast with different flip-angle evolutions (SPACE) sequences with a standard MRI protocol for evaluation of lumbar spondylosis.

MATERIALS AND METHODS. Two hundred fifty consecutive unenhanced lumbar MRI examinations performed at 1.5 T were retrospectively reviewed. Full, rapid, and complete versions of each examination were interpreted for spondylotic changes at each lumbar level, including herniations and neural compromise. The full examination consisted of sagittal T1-weighted, T2-weighted turbo spin-echo (TSE), and STIR sequences; and axial T1- and T2-weighted TSE sequences (time, 18 minutes 40 seconds). The rapid examination consisted of sagittal T1- and T2-weighted SPACE sequences, with axial SPACE reformations (time, 8 minutes 46 seconds). The complete examination consisted of the full examination plus the


3D TSE T2

T2 Dixon

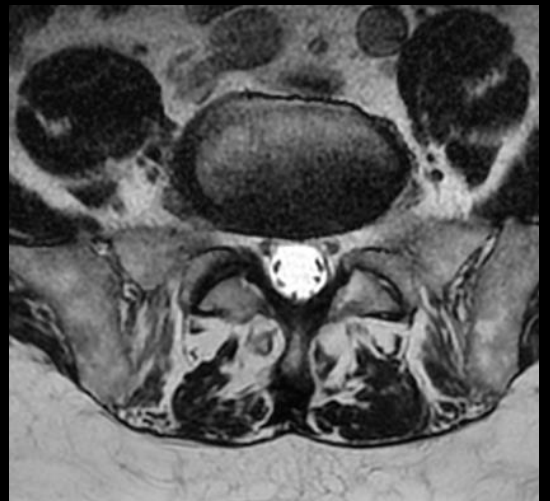


Débord discal

- Global = “bombement”
- Focal = “hernie”
  - protrusion
  - extrusion
  - fragment discal exclu

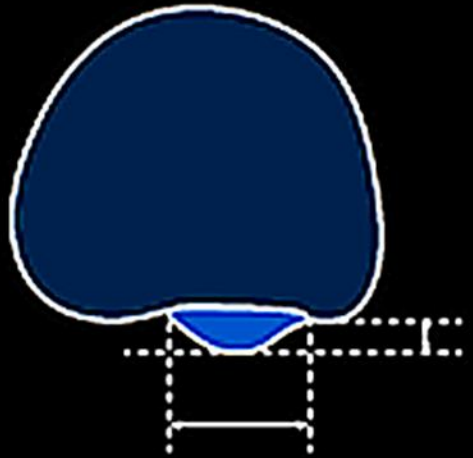
Normal

Bombement

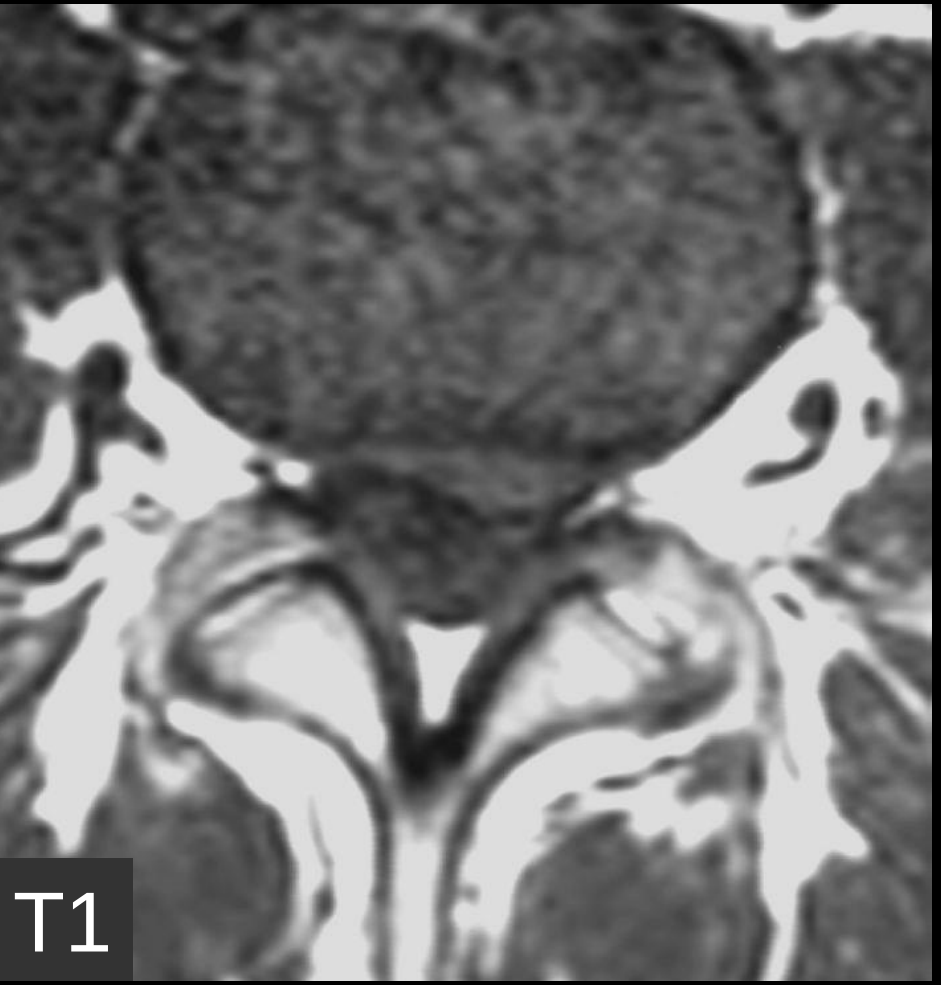


PROTRUSION

ET



T2


T1

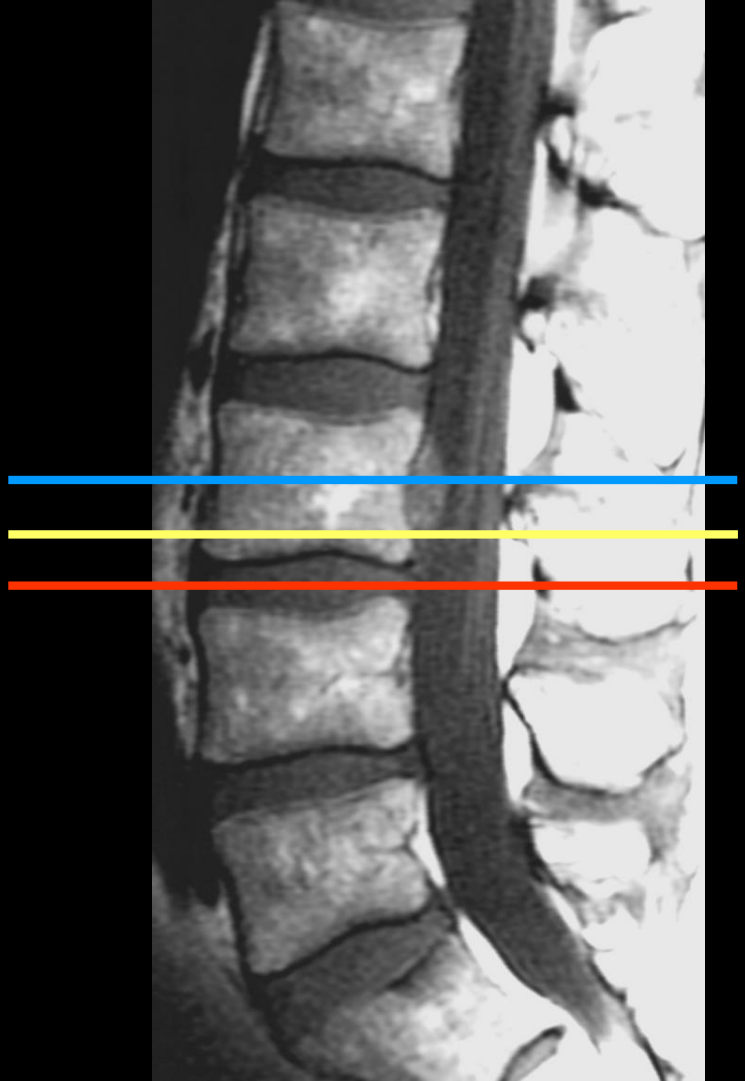
EXTRUSION

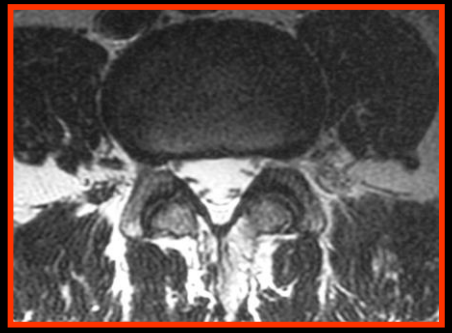
OU

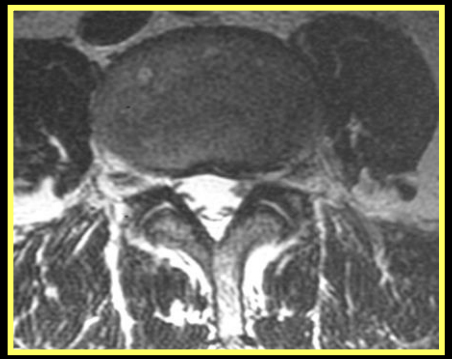
T2

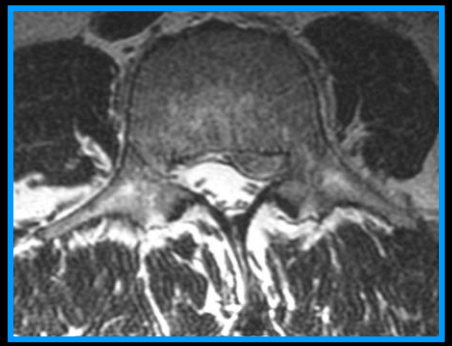

T2

FRAGMENT EXCLU









4 topographies axiales

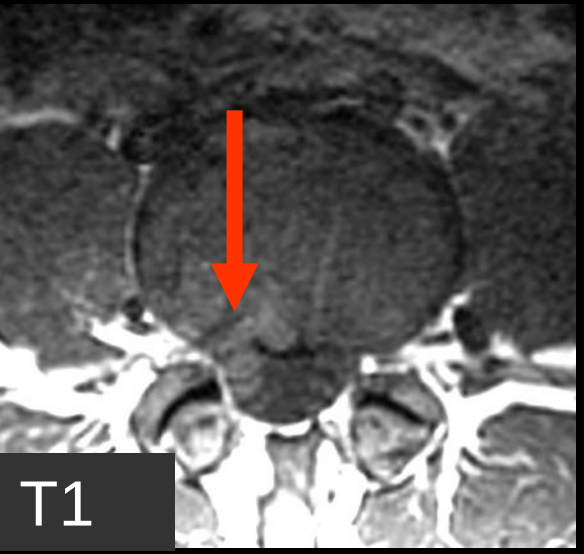
Médian

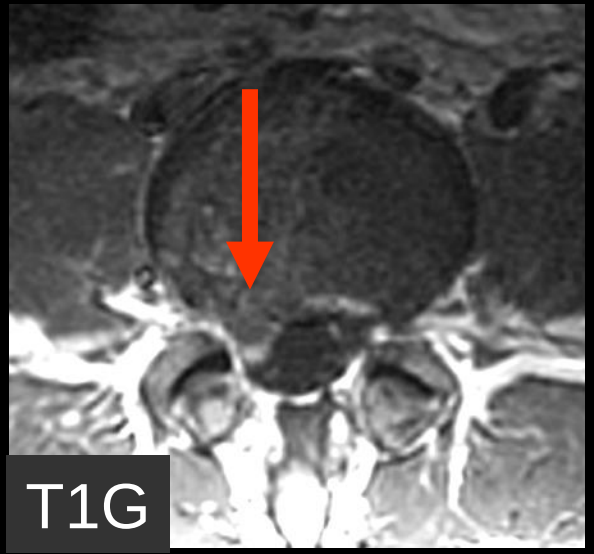
Postéro-latéral

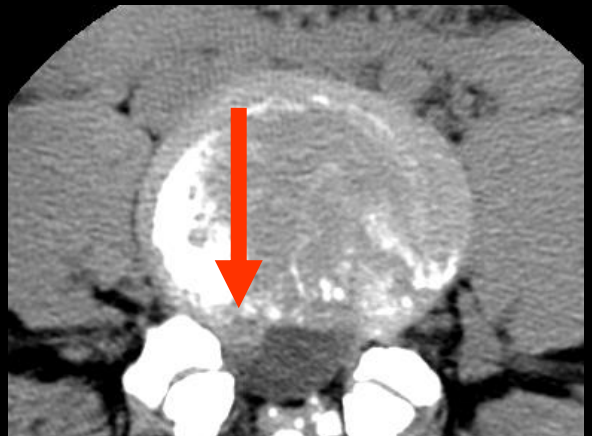
Foraminal

Post-foraminal

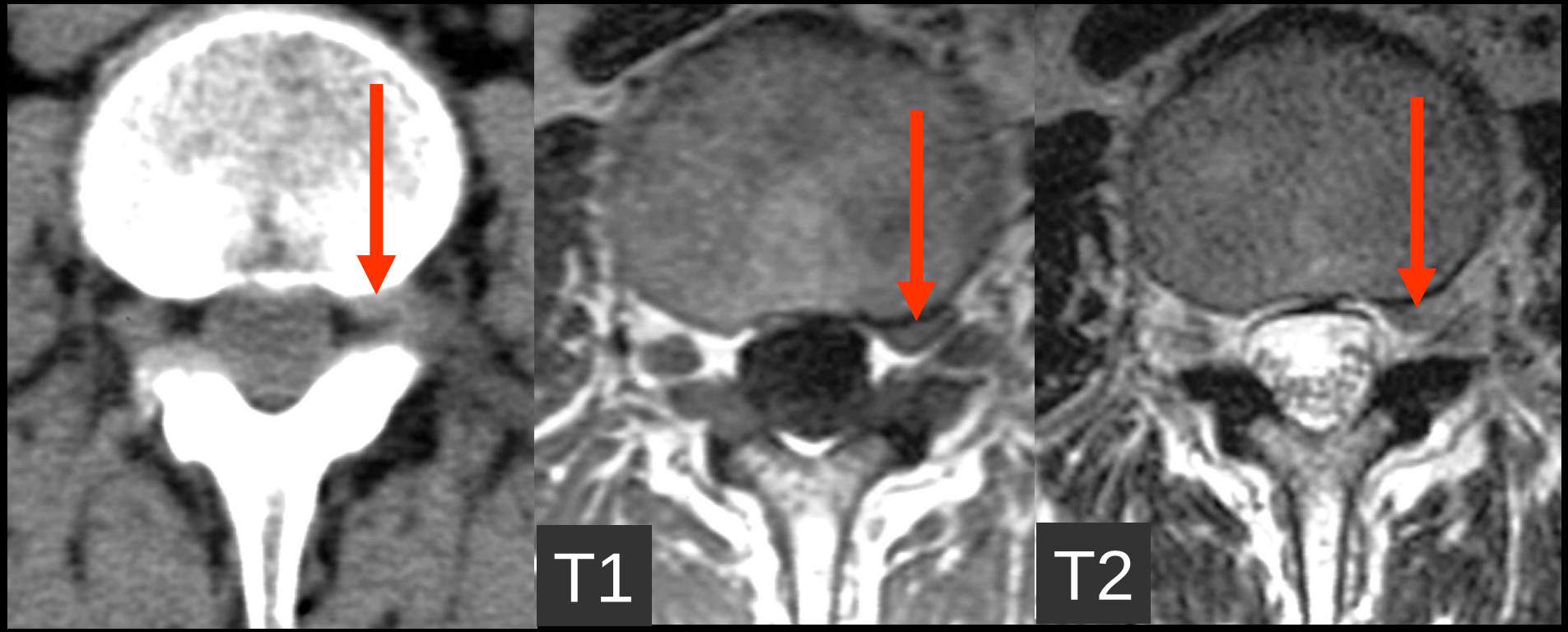
Post-lat.



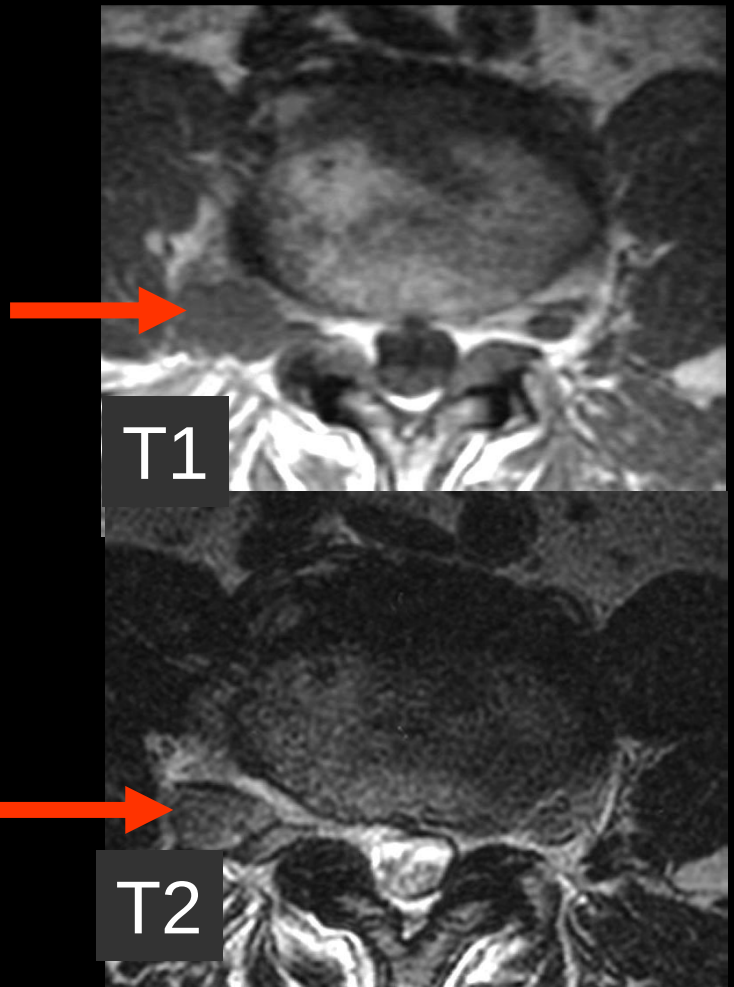


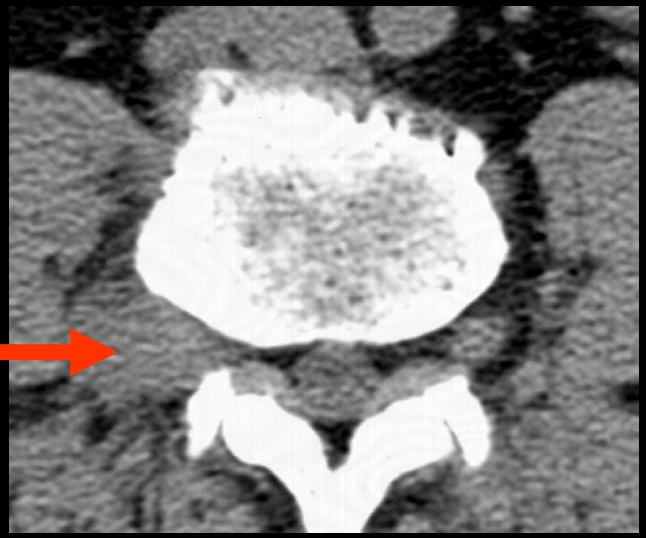


Foraminal



Post-foraminal



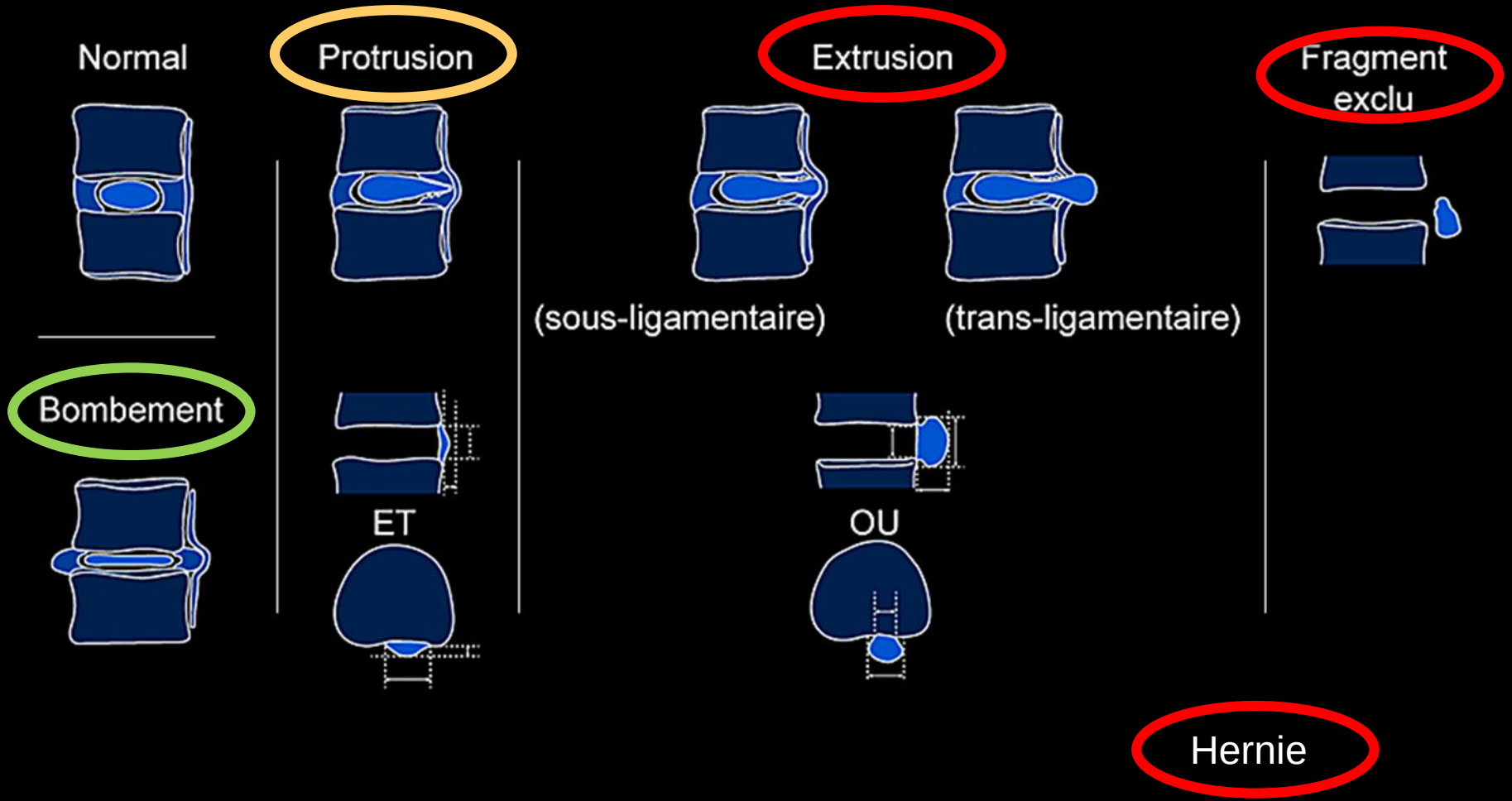


Trajet crânio-caudal

Horizontal

Ascendant

Descendant

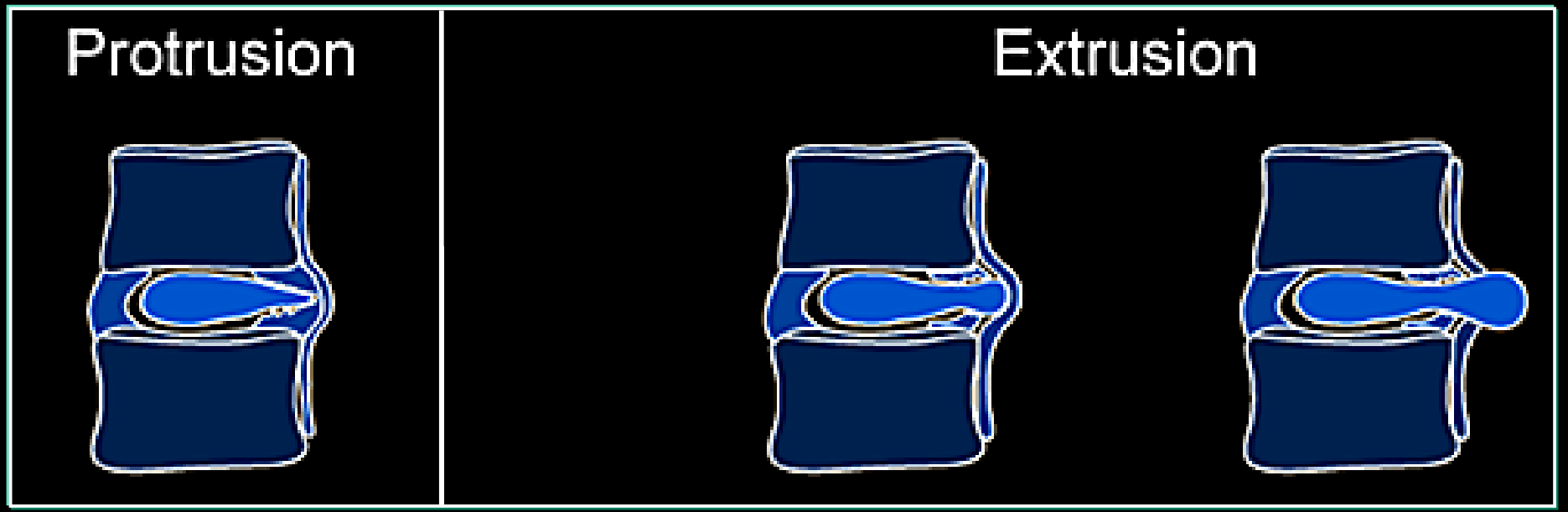

Normal
Protrusion
Extrusion
Fragment exclu
(sous-ligamentaire)
(trans-ligamentaire)
Bombement
ET
OU
Hernie

Population asymptomatique

	Jensen	Malghem
• Bombement	52%	43%
• Protrusion	27%	17%
• Extrusion	1%	0%

Jensen MC, et al. MRI of the lumbar spine in people without back pain. NEJM 1994;331:69-73
Malghem J, et al. IRM de rachis lombaires asymptomatiques. Etude du GETROA. In: Le Rachis Lombaire dégénératif. Getroa Opus XXV. Sauramps,1998.

Signification



Vieillissement

- Pincement
- Déshydratation
- Fissure annulus
- Moelle osseuse juxta-discale

- AIAP


T1
T2

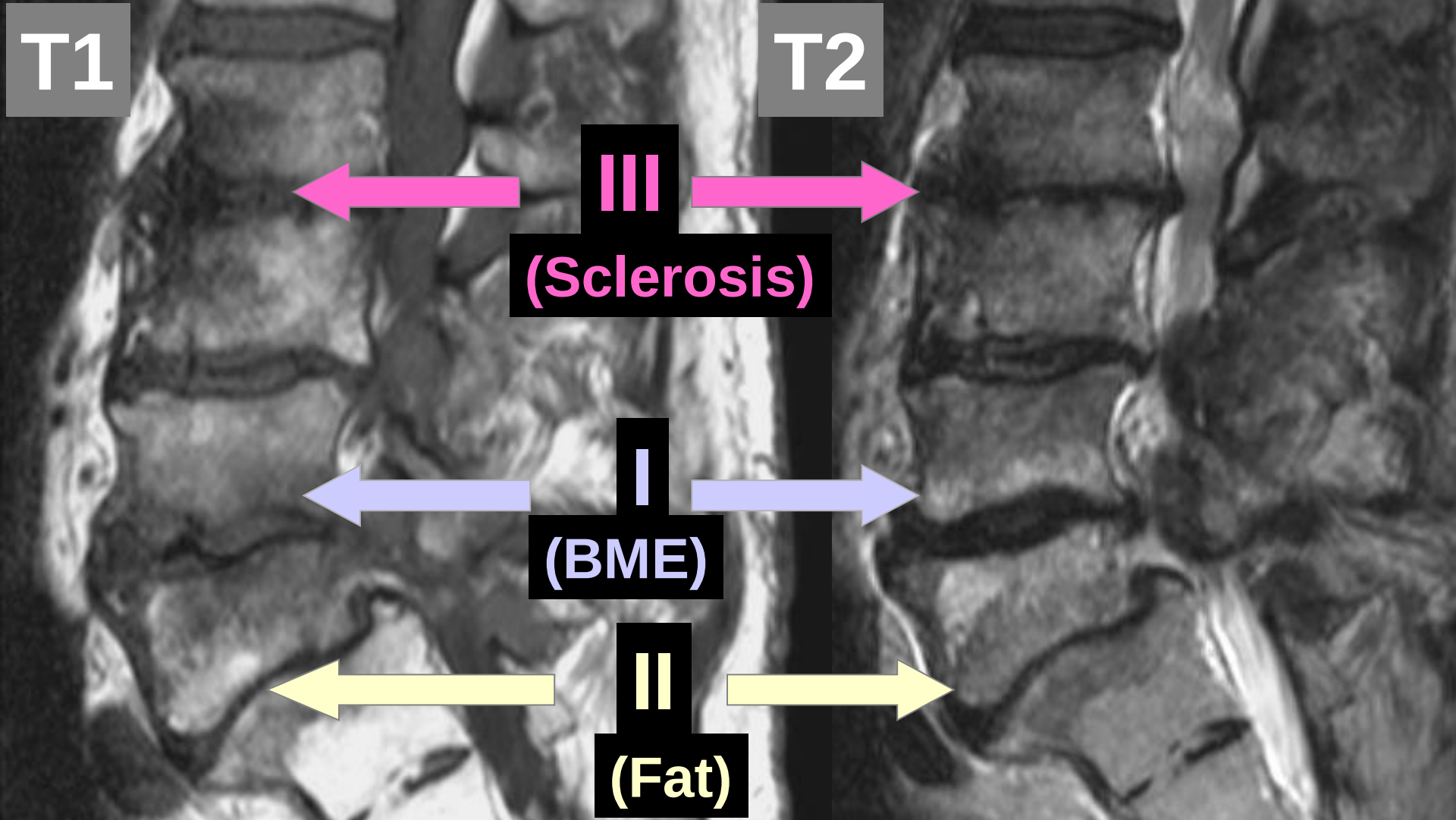
« MODIC 1 »

State of the Art

Michael T. Modic, MD • Thomas J. Masaryk, MD • Jeffrey S. Ross, MD • John R. Carter, MD

Radiology 1988; 168:177–186

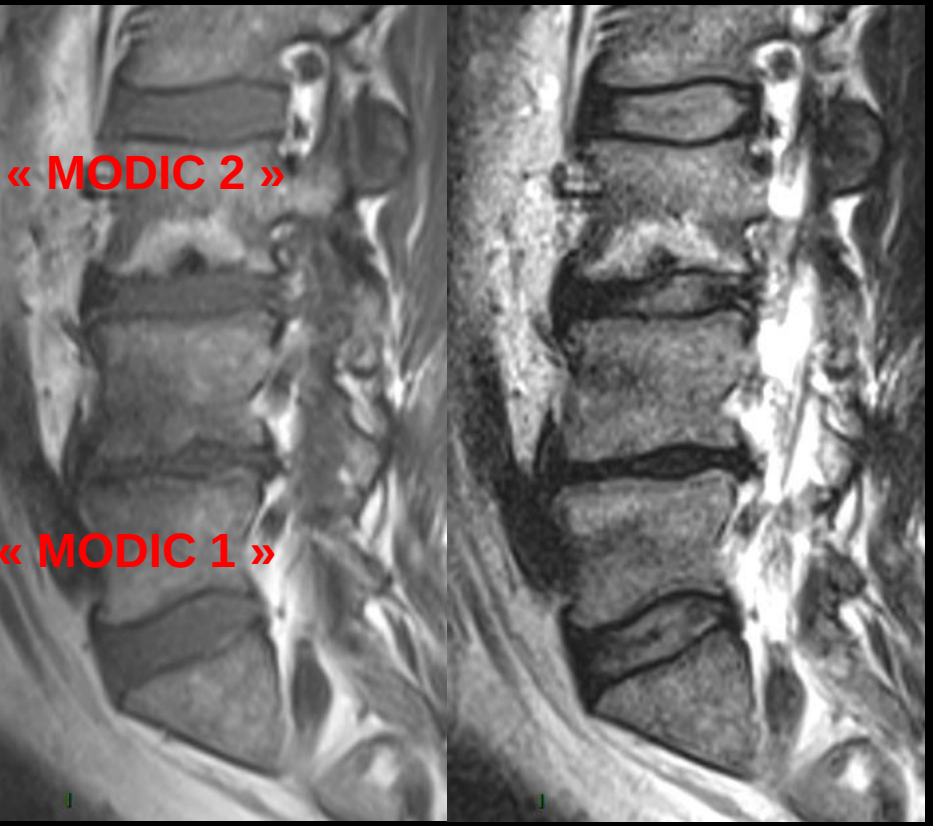
Imaging of Degenerative Disk Disease[1]

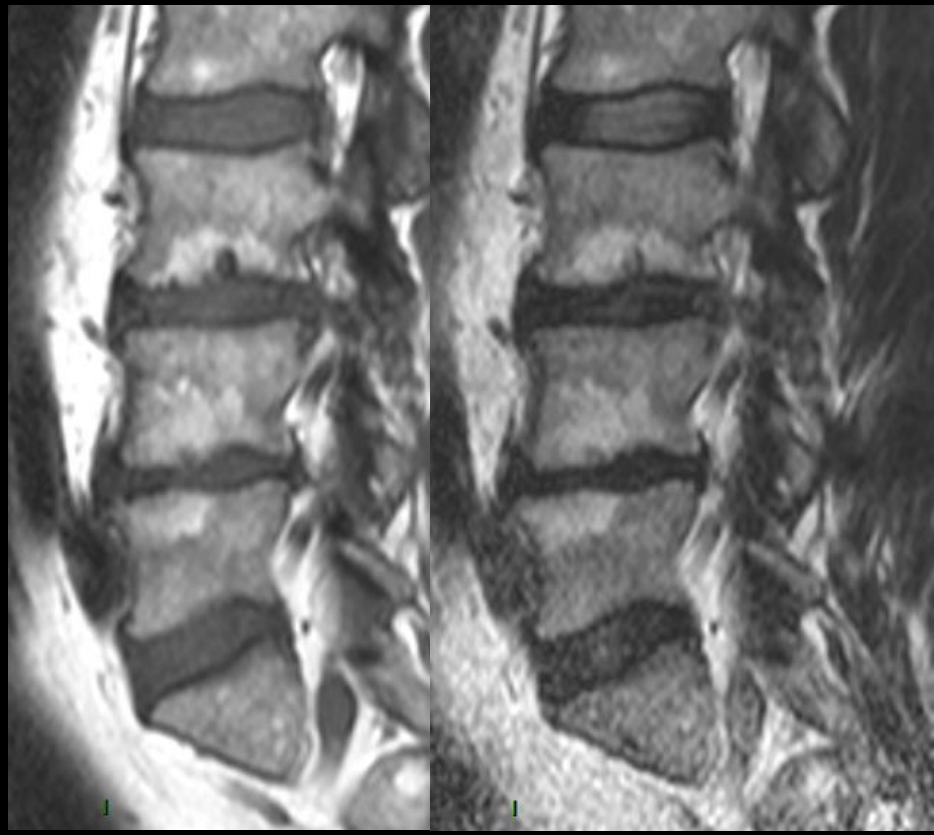

T1
T2
III
(Sclerosis)
I
(BME)
II
(Fat)

+ 1 an

« MODIC 2 »

« MODIC 1 »





DEGENERATIVE LUMBAR DISC DISEASE

AN MRI STUDY OF 74 PATIENTS WITH LOW BACK PAIN

T. TOYONE, K. TAKAHASHI, H. KITAHARA, M. YAMAGATA, M. MURAKAMI, H. MORIYA

From Chiba University, Japan

We carried out MRI studies of 74 patients with end-plate and vertebral bone-marrow changes associated with degenerative lumbar disc disease. Abnormalities were classified into type A, with decreased signal intensities, and type B, with increased signal intensities on T1-weighted spin-echo images.

Twenty-seven (73%) of the 37 patients with type-A changes had low back pain, in contrast to only four (11%) of the 37 patients with type-B changes. Lateral flexion-extension radiographs showed hypermobility in 26 patients (70%) with type-A changes, and in only six (16%) with type-B changes. Type-A changes correlated with segmental hypermobility and low back pain, while type-B changes were more common in patients with stable degenerative disc disease.

spin-echo images and increased signal intensity on the T2-weighted images, subsequently changed to type 2, with increased signal intensity on T1-weighted images and isointense or slightly increased signal intensity on T2-weighted images. Lang et al (1990) studied 33 patients after lumbar fusion and found high signal intensities on T1-weighted images in the 16 patients with a solid fusion. Neither the mechanism nor the clinical significance, however, was established.

We have used MRI to investigate the clinical significance of the changes in the vertebral bone marrow in degenerative disc disease.

PATIENTS AND METHODS

Dominik Weishaupt, MD
Marco Zanetti, MD
Juerg Hodler, MD
Norbert Boos, MD

Index terms:
Spine, 33.77
Spine, abnormalities, 33.77, 33.781, 33.783
Spine, arthritis, 33.77
Spine, facet joints, 334.77
Spine, intervertebral disks, 33.783, 336.77
Spine, MR, 33.121411

Radiology 1998; 209:661–666

[1] From the Departments of Diagnostic Radiology (D.W., M.Z., J.H.) and Orthopedic Surgery (N.B.), Orthopedic University Clinic Balgrist, Forchstrasse 340, CH-8008 Zurich, Switzerland. Received February 20, 1998; revision requested April 27; revision received May 26; accepted July 20. **Address reprint requests to** J.H.

MR Imaging of the Lumbar Spine: Prevalence of Intervertebral Disk Extrusion and Sequestration, Nerve Root Compression, End Plate Abnormalities, and Osteoarthritis of the Facet Joints in Asymptomatic Volunteers[1]

PURPOSE: To identify the magnetic resonance (MR) abnormalities of the lumbar spine that have a low prevalence in asymptomatic patients and thus determine the findings that are predictive of low back pain in symptomatic patients.

MATERIALS AND METHODS: Sagittal T1-weighted and sagittal and axial T2-weighted MR images were obtained in 60 asymptomatic volunteers aged 20–50 years. The MR images were evaluated with regard to intervertebral disk abnormalities, end plate abnormalities, and osteoarthritis of the facet joints by two musculoskeletal radiologists independently.

RESULTS: Disk bulging or disk protrusion was found in 42 (14%) and 48 (16%) of the intervertebral spaces in 37 (62%) and 40 (67%) subjects, respectively. High-signal-intensity zones were found commonly (in 23 [7.7%] and 25 [8.3%] of the intervertebral spaces in 19 (32%) and 20 (33%) subjects, respectively). Disk extrusions were less common (in 11 [3.7%] and 11 [3.7%] of the intervertebral spaces in 11 (18%) and 11 (18%) subjects, respectively). There were no disk sequestrations. A nerve root compression in a single intervertebral space was diagnosed by one reader. End plate abnormalities were found in two (0.7%) and six (1.9%) of the intervertebral spaces in two (3%) and six (10%) subjects, respectively. No severe osteoarthritis was diagnosed by either reader.

Tadeusz W. Stadnik, MD
Roland R. Lee, MD
Hugo L. Coen, MD
Erik C. Neirynck, MD
Therese S. Buisseret, MD
Michel J. C. Osteaux, MD

Index terms:
Gadolinium
Magnetic resonance (MR), contrast enhancement, 336.12143
Spine, intervertebral disks, 336.783
Spine, MR, 336.121411, 336.12143

Radiology 1998; 206:49–55

Abbreviations:
LBP = low back pain
SE = spin echo

[1] From the Department of Radiology and Medical Imaging, University Hospital V.U.B., Laarbeeklaan 101, 1090 Brussels, Belgium (T.W.S., H.L.C., E.C.N., T.S.B., M.J.C.O.); and the Department of Radiology, Neuroradiology Division, The Johns Hopkins Hospital, Baltimore, Md (R.R.L). From the 1996 RSNA scientific assembly. Received May 22, 1997; revision re-

Annular Tears and Disk Herniation: Prevalence and Contrast Enhancement on MR Images in the Absence of Low Back Pain or Sciatica[1]

PURPOSE: To evaluate the prevalence and radiologic findings of annular tear (especially of contrast material enhancement), bulging disk, and disk herniation on T2-weighted and gadolinium-enhanced T1-weighted magnetic resonance (MR) images in people without low back pain (LBP) or sciatica.

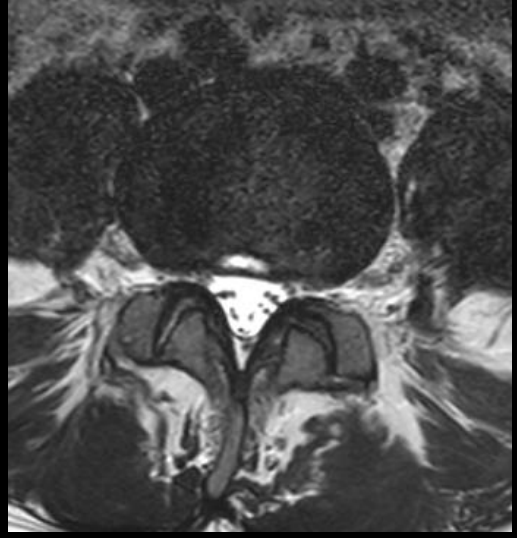
MATERIALS AND METHODS: Thirty-six volunteers without LBP and/or sciatica (18 with no symptoms in their lifetime and 18 who were pain free for at least 6 months) were examined with sagittal and axial T2-weighted fast spin-echo (SE) and sagittal gadolinium-enhanced T1-weighted fast SE imaging. The prevalence and MR findings of bulging disk, focal protrusion, extrusion, and nonenhancing or enhancing annular tears were assessed.

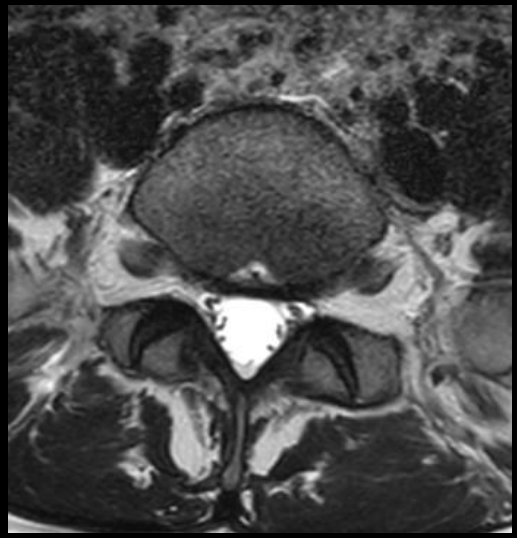
RESULTS: The prevalence of bulging disk and focal disk protrusion was 81% (29 volunteers) and 33% (12 volunteers), respectively. There were no extrusions. Twenty-eight annular tears were found in 20 patients (56%); 27 tears (96%) also showed contrast enhancement.

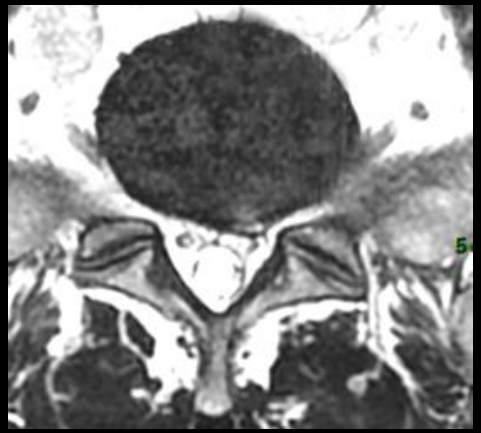
Fissure

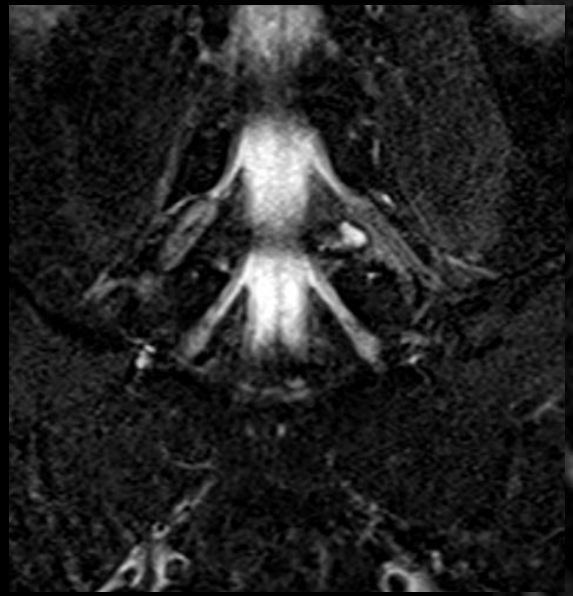
Annulus

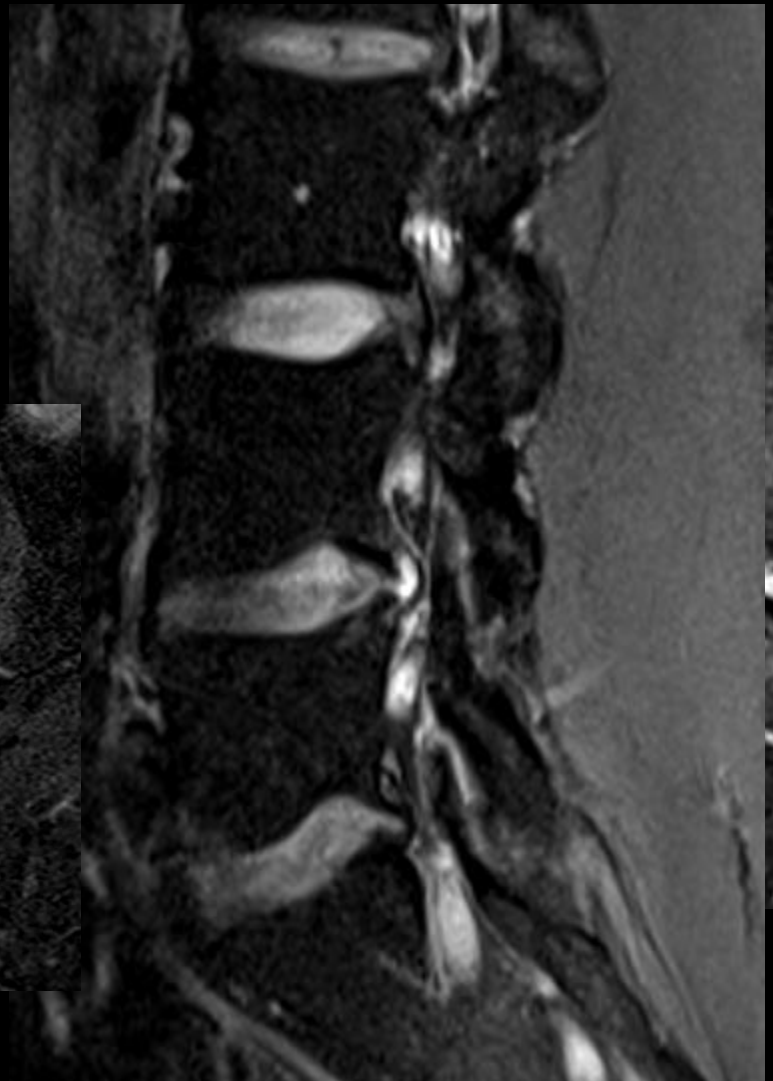
"HIZ"



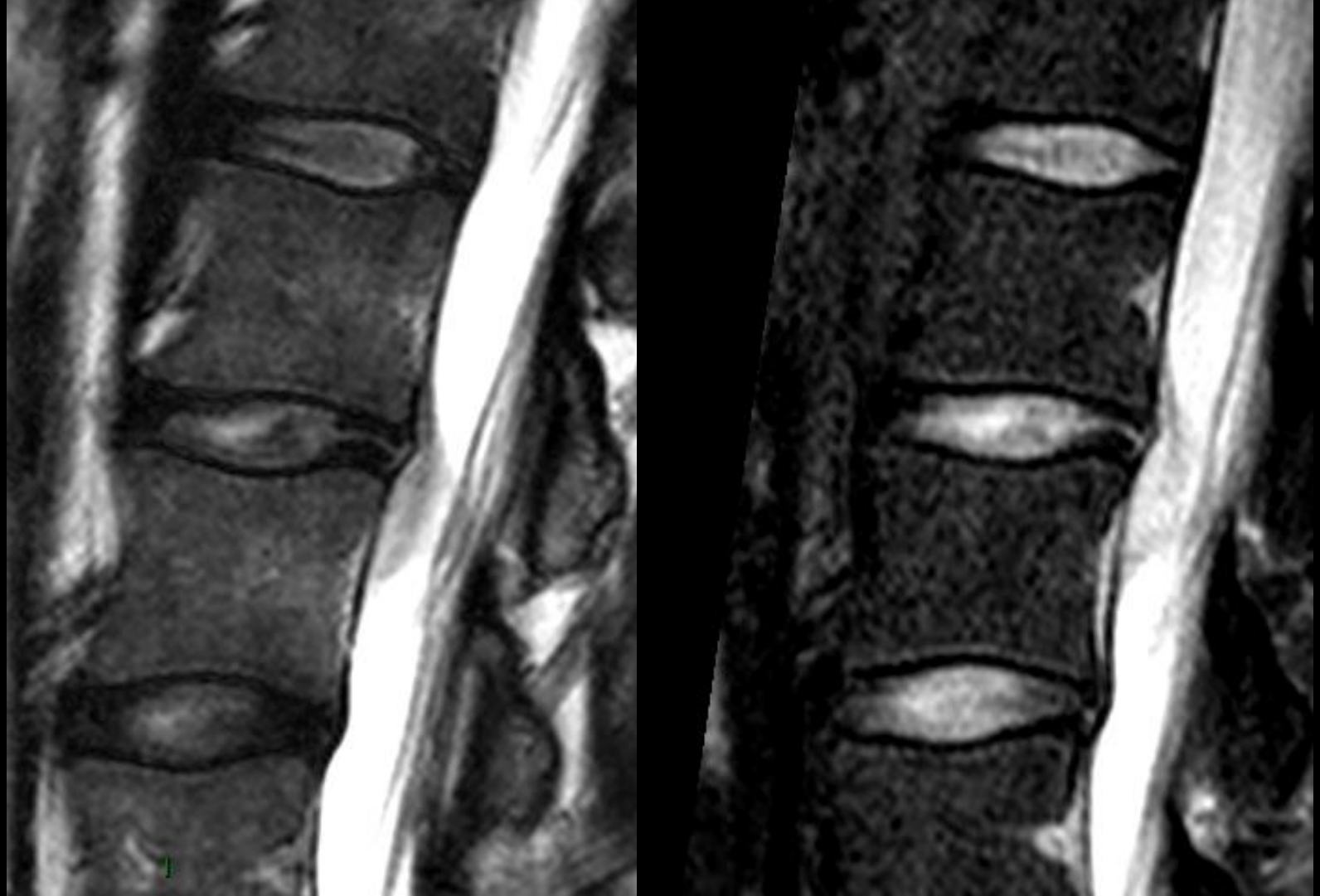









3 c



Painful Lumbar Disk Derangement: Relevance of Endplate Abnormalities at MR Imaging

Weishaupt D, et al Radiology 2001

Abstract

PURPOSE: To investigate the predictive value of MRI of abnormalities of the lumbar intervertebral disks, particularly with adjacent endplate changes, to predict symptomatic disk derangement, with discography as the standard.

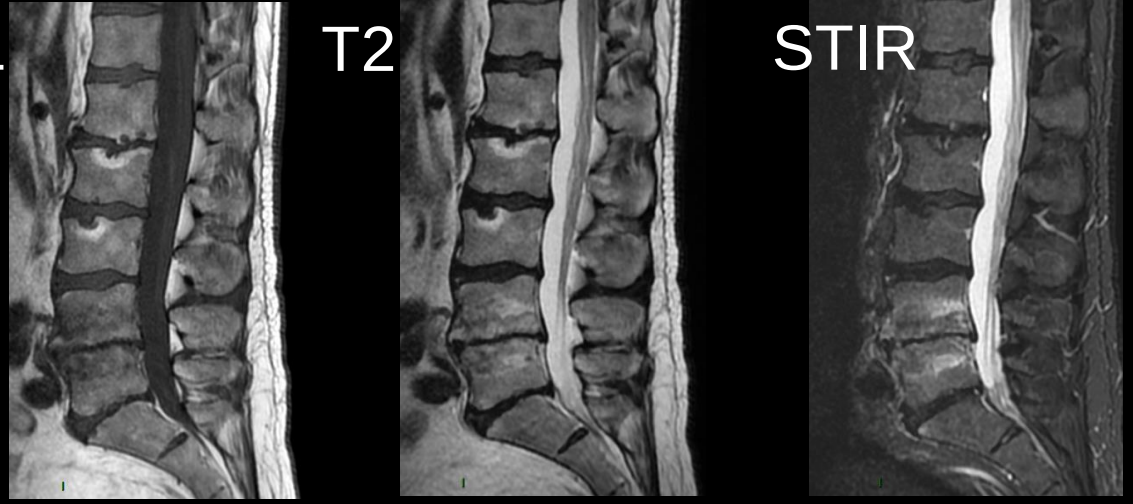
MATERIALS AND METHODS: Fifty patients aged 28–50 years with chronic low back pain and without radicular leg pain underwent prospective clinical examination and sagittal T1- and T2-weighted and transverse T2-weighted MR imaging. Subsequently, patients underwent lumbar discography with a pain provocation test (116 disks). MR images were evaluated for disk degeneration, a high-signal-intensity zone, and endplate abnormalities. Results of pain provocation at discography were rated independently of the image findings as concordant or as nonconcordant or painless. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to assess the clinical relevance of MR abnormalities.

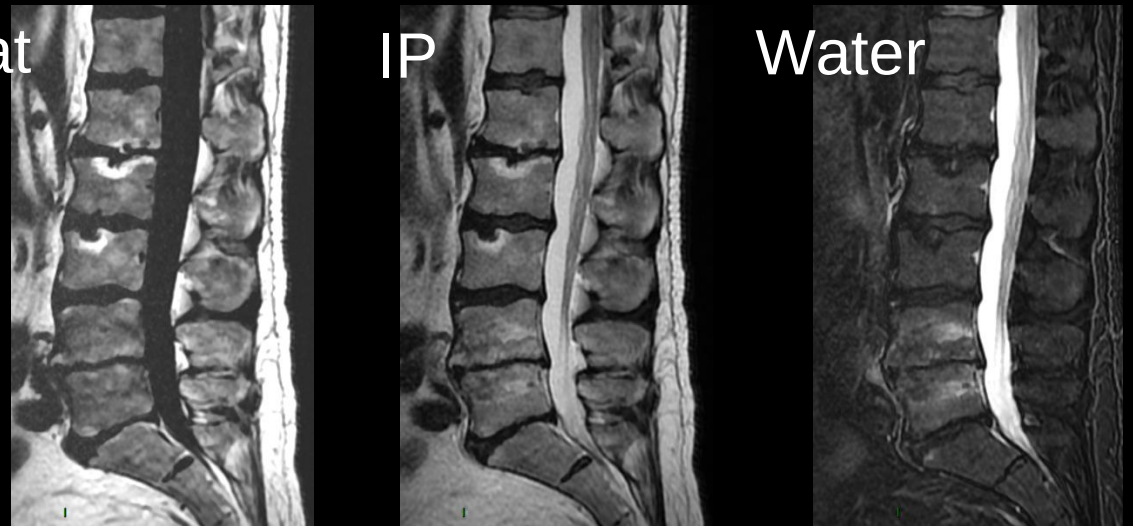
RESULTS: Normal disks on MR images were generally not painful at provocative discography (NPV, 98%). Disk degeneration (sensitivity, 98%; specificity, 59%; PPV, 63%) and a high-signal-intensity zone (sensitivity, 27%; specificity, 85%; PPV, 56%) were not helpful in the identification of symptomatic disk derangement. When only moderate and severe type I and type II endplate abnormalities were considered abnormal, all injected disks caused concordant pain with provocation (sensitivity, 38%; specificity, 100%; PPV, 100%).

CONCLUSION: Moderate and severe endplate abnormalities appear be useful in the prediction of painful disk derangement in patients with symptomatic low back pain.

Classique

Dixon T2





MRI of non-specific low back pain and/or lumbar radiculopathy: do we need T1 when using a sagittal T2-weighted Dixon sequence?

Fabio Zanchi[1] · Raphaël Richard[2] · Mahmoud Hussami[1,2] · Arnaud Monier[1] · Jean-François Knebel[3,4] · Patrick Omoumi[1]

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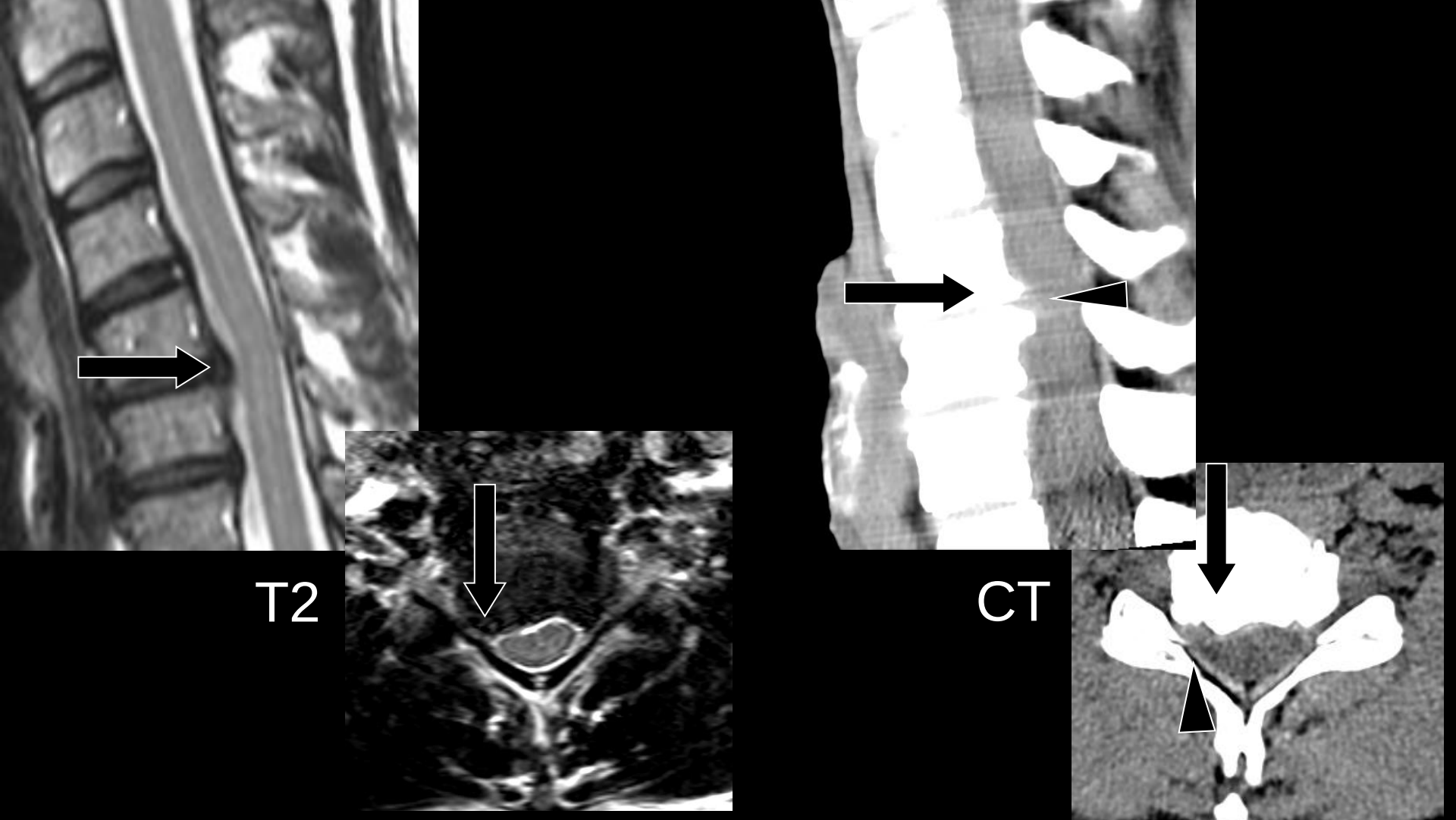
Abstract

Objective To show that for the MRI workup of non-specific low back pain and/or lumbar radiculopathy, the acquisition of T1-weighted sequences in the sagittal plane could be waived when using an FSE T2-weighted Dixon sequence.

Materials and methods Three musculoskeletal radiologists retrospectively reviewed fifty lumbar spine MRI examinations performed for non-specific low back pain and/or lumbar radiculopathy. Two protocols were separately analyzed in the sagittal plane: a standard protocol (T1-weighted, in-phase, and water-only images of an FSE T2-weighted Dixon sequence) and a simplified protocol (fat-only, in-phase, and water-only images of an FSE T2-weighted Dixon sequence). Eight items usually assessed on T1-weighted sequences were analyzed for each of the vertebrae ($n = 250$), vertebral endplates ($n = 500$), vertebral corners ($n = 1000$), foramina ($n = 500$), lamina ($n = 500$), and facet joints ($n = 500$). Interchangeability of these protocols was

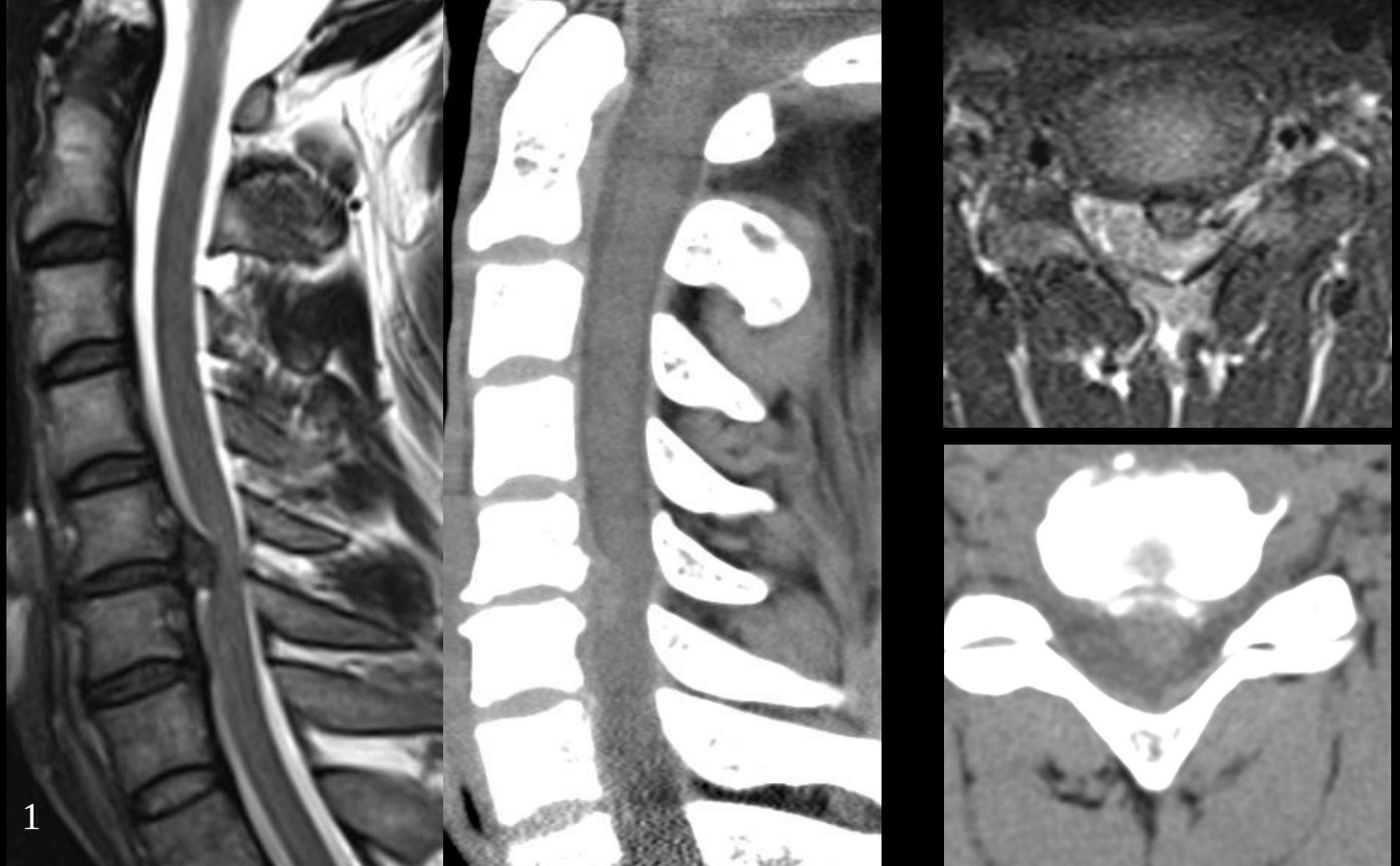
Particularités cervicales

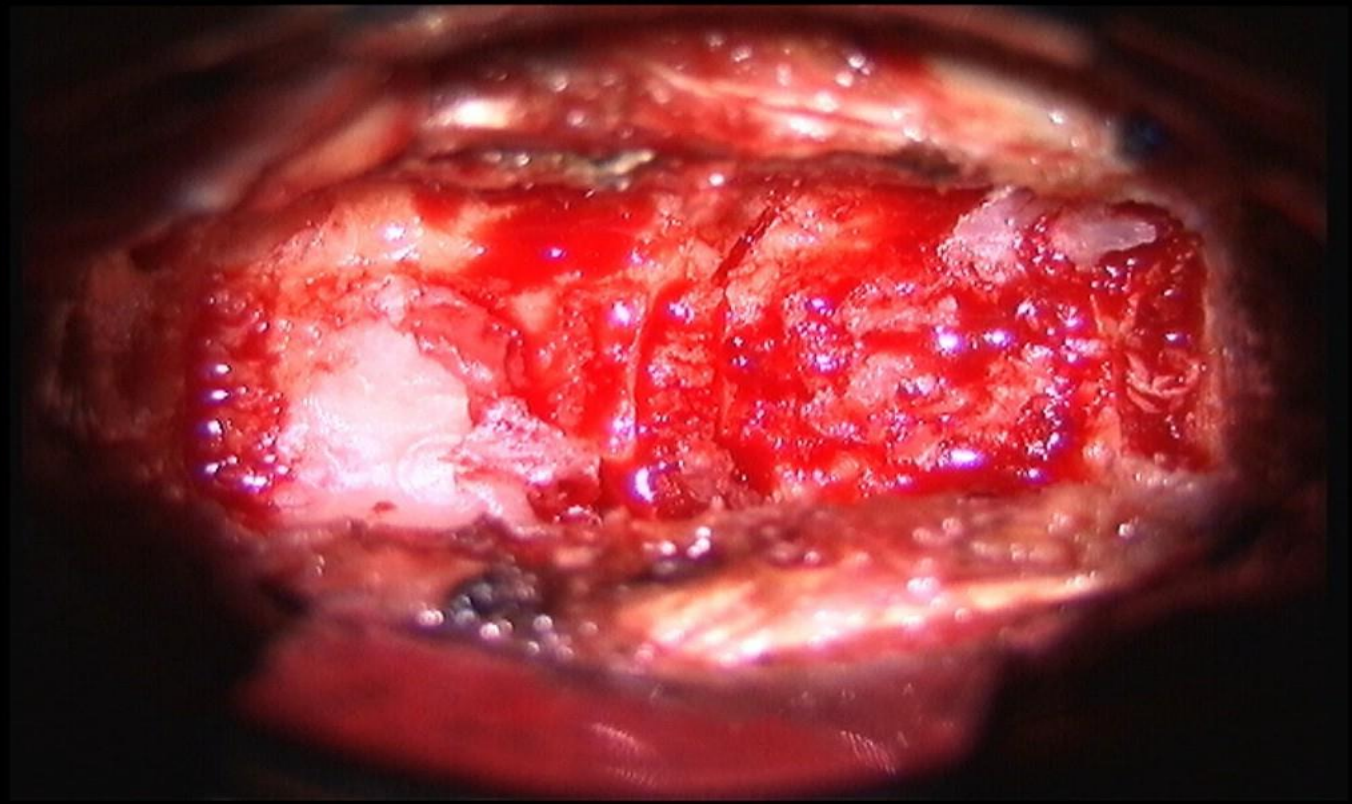
- Moelle épinière
- Foramens
- Mou ou dur ?
- CCE

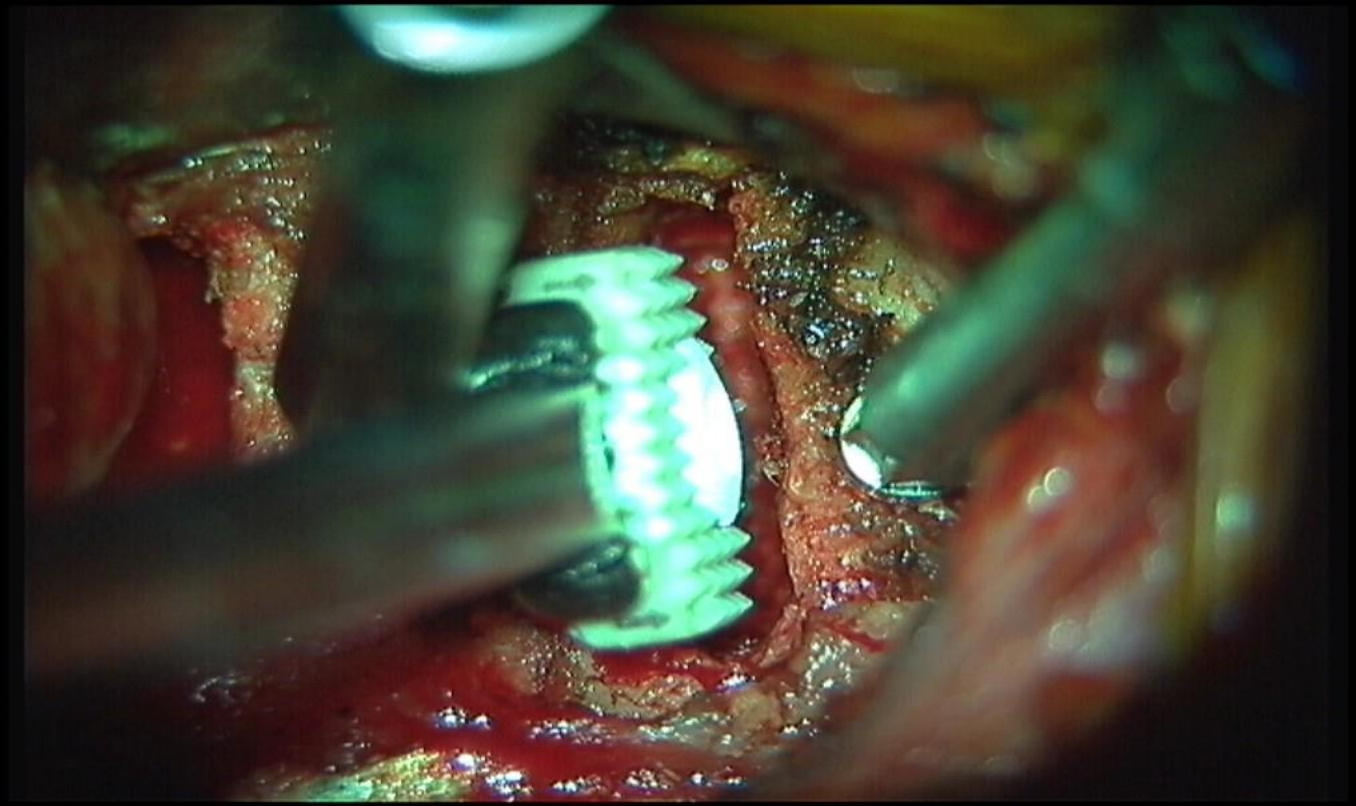

T2
CT

1

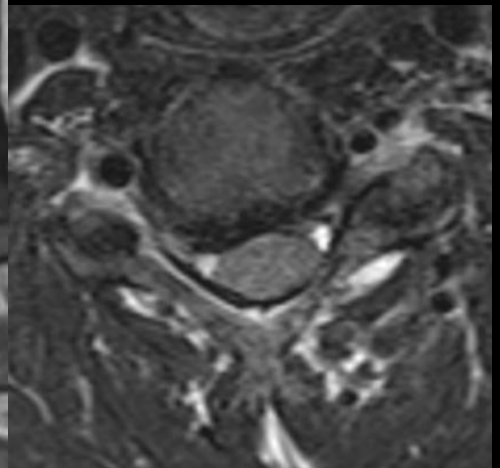
2

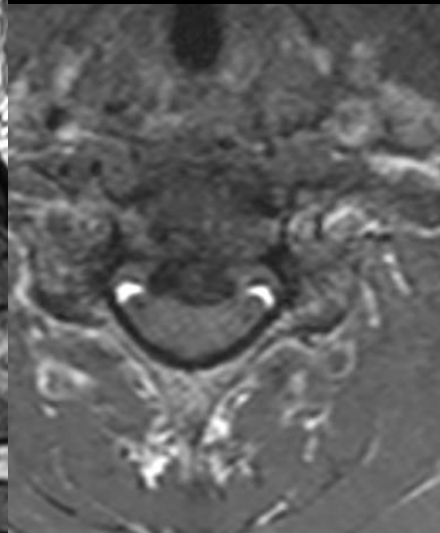

1



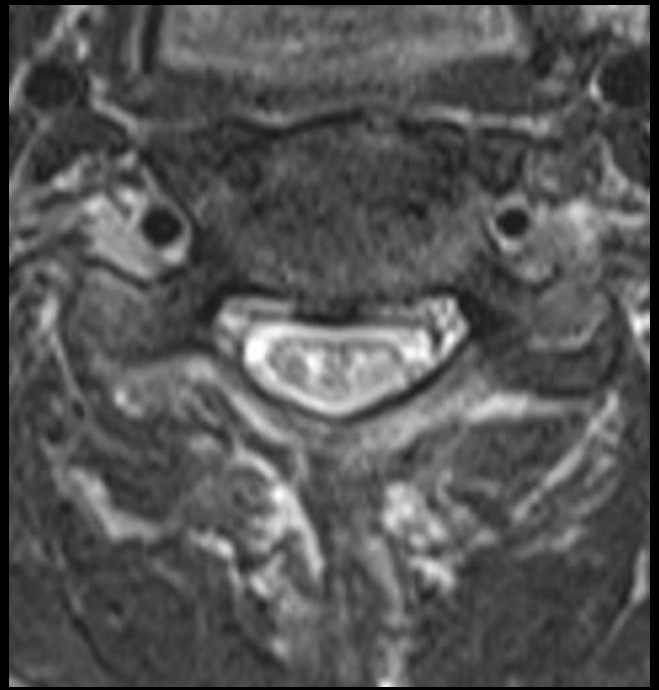


Sévérité



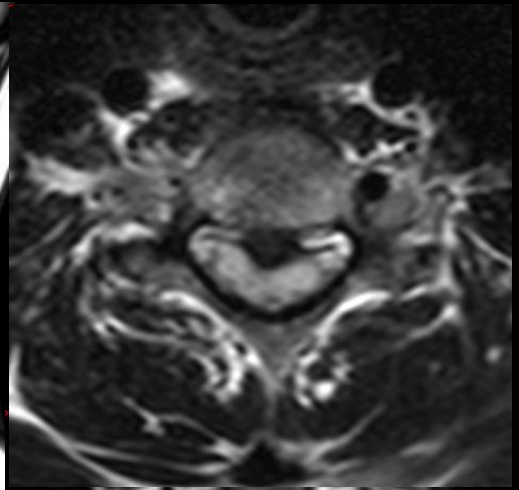


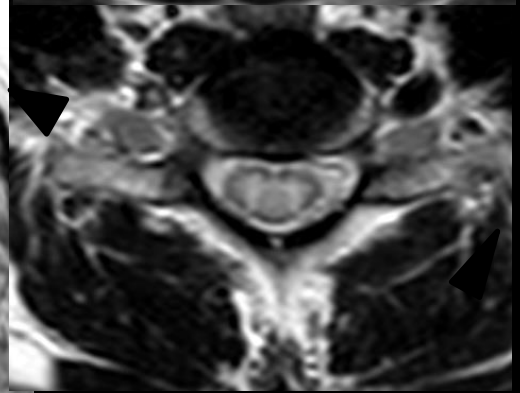

5 cm
C 602
L 1047



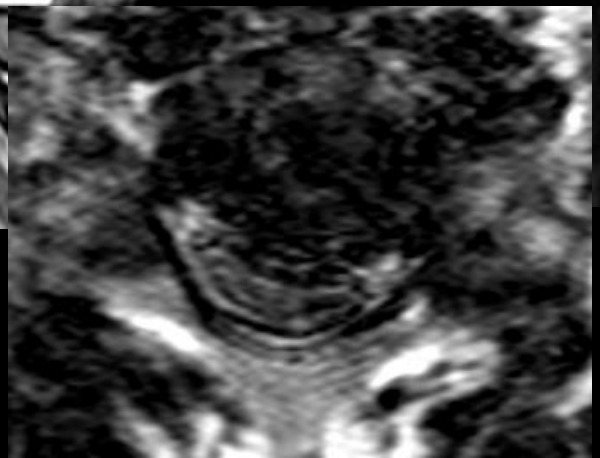
Myélopathie

POST OP





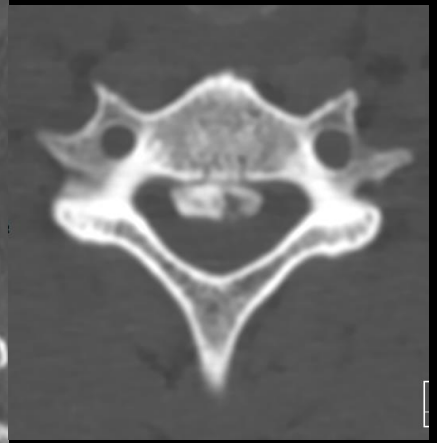

REVERSIBLE

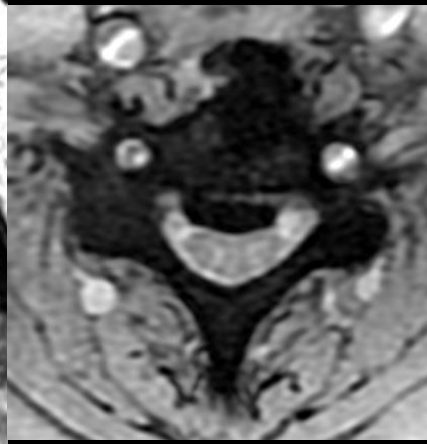


IRREVERSIBLE

CAS PARTICULIER

POST OP

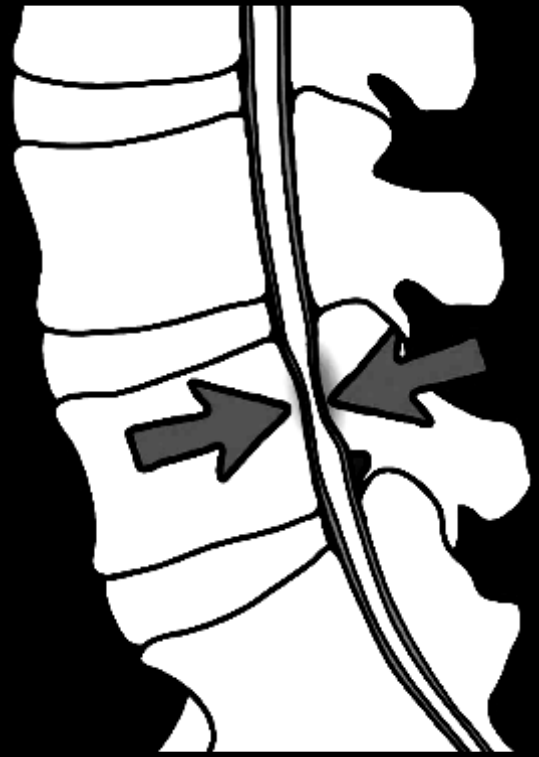





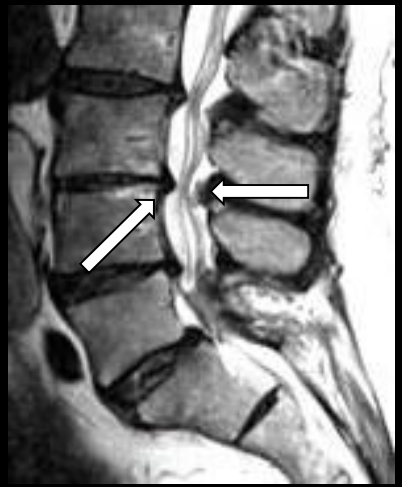
Canal étroit

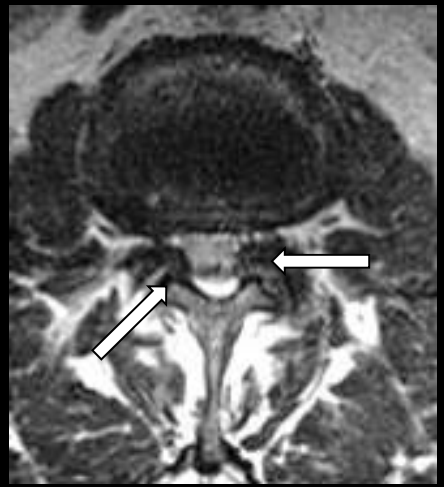
- Causes habituelles
- Causes moins habituelles

  - Mêmes symptomes (claudic. neurogène)
  - Mêmes outils diagnostiques (MRI > CT)
  - Mêmes mesures

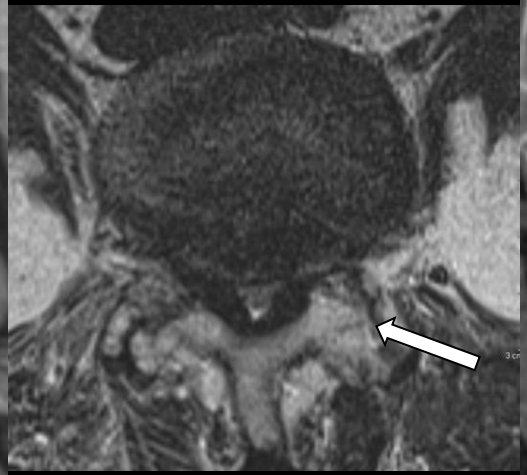


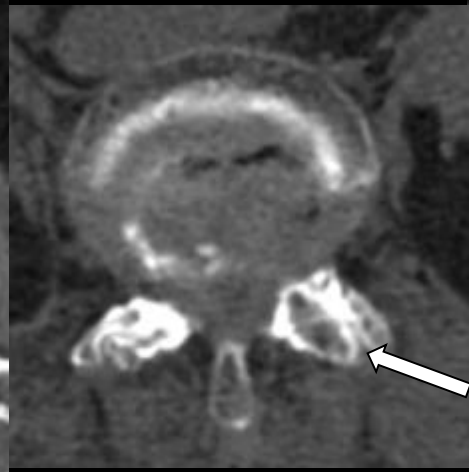
Common : disc & ligament bulge

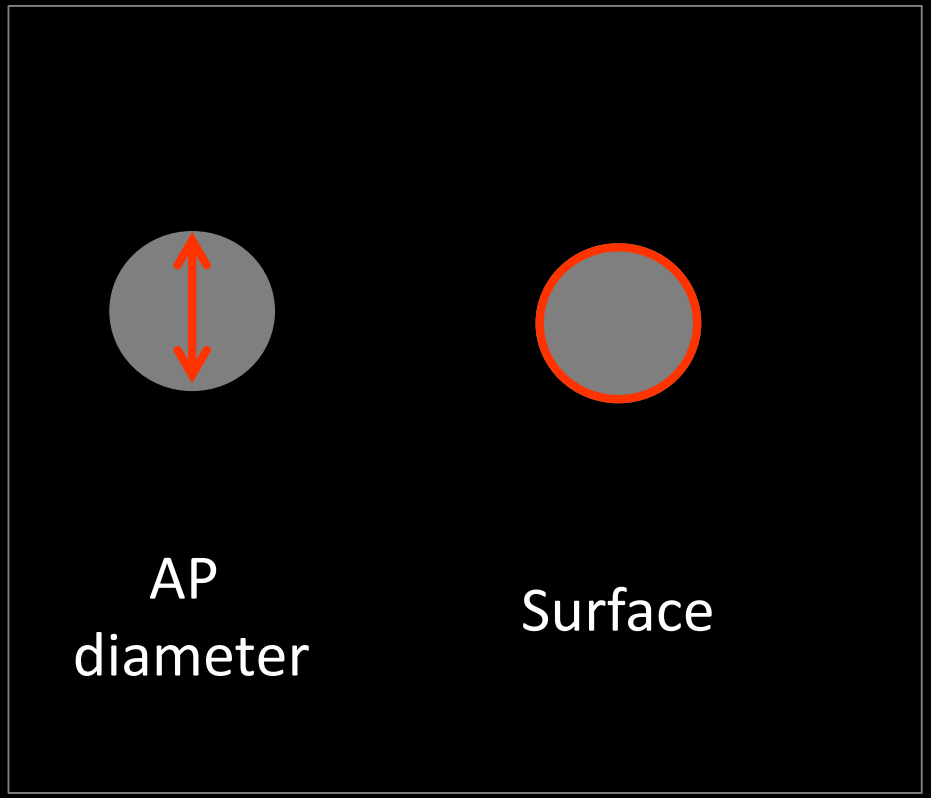


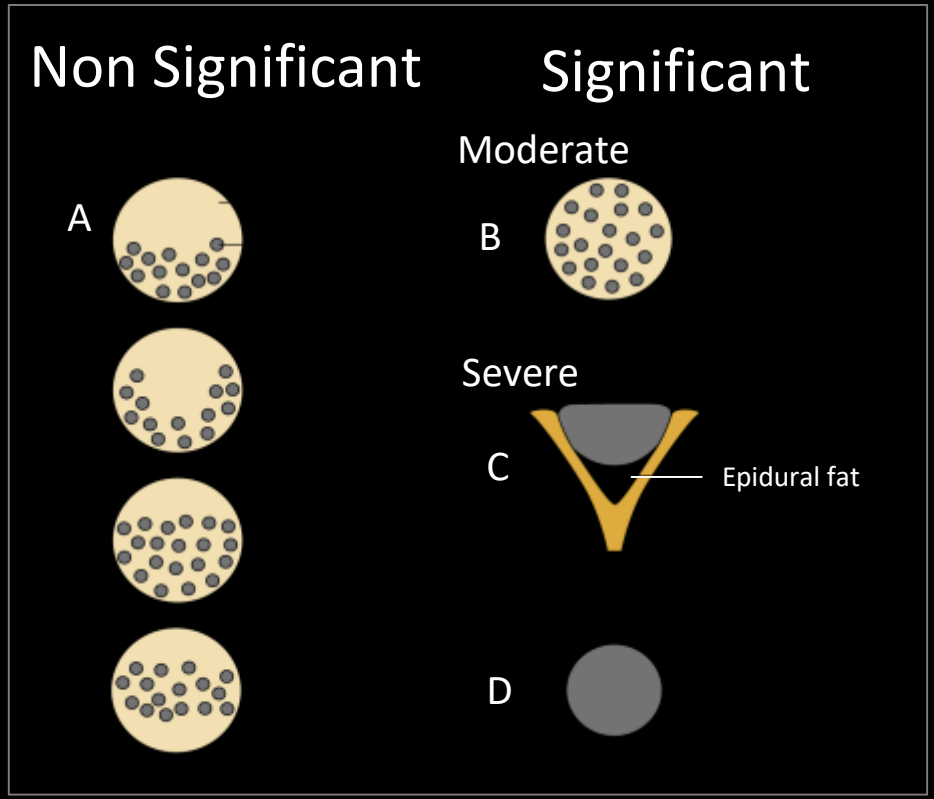


Common : facet OA & listhesis







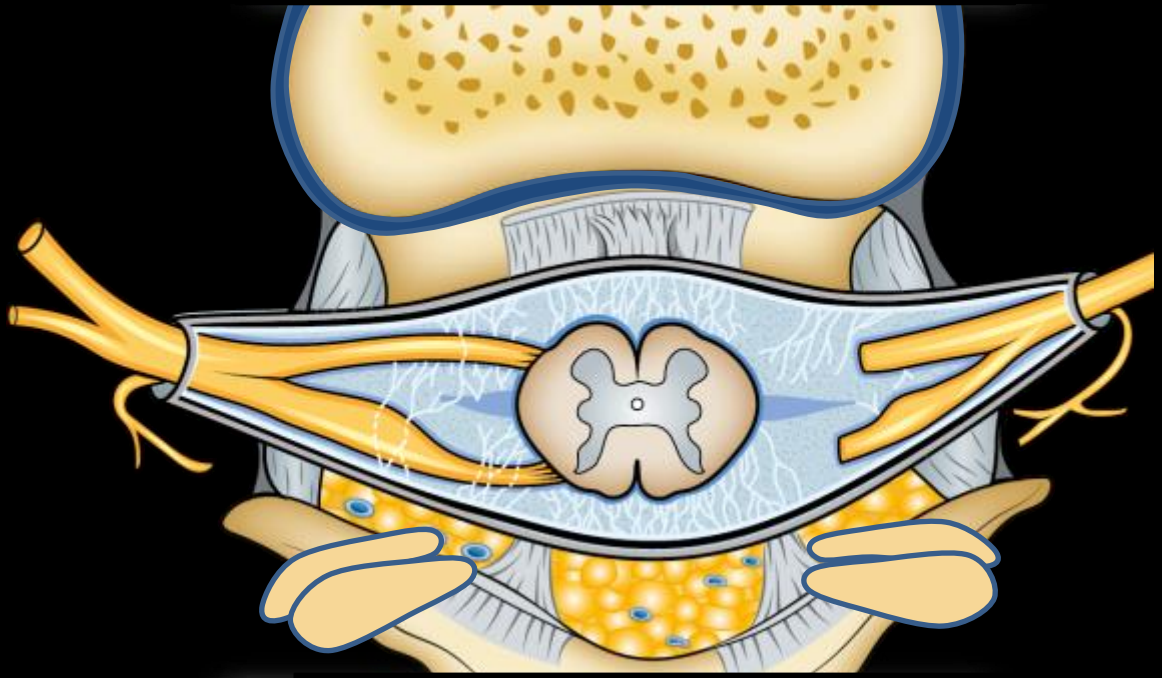


Quantitative measurements of the spinal cord and canal by MRI and myelography.
Ros L, et al. Eur Radiol 1998

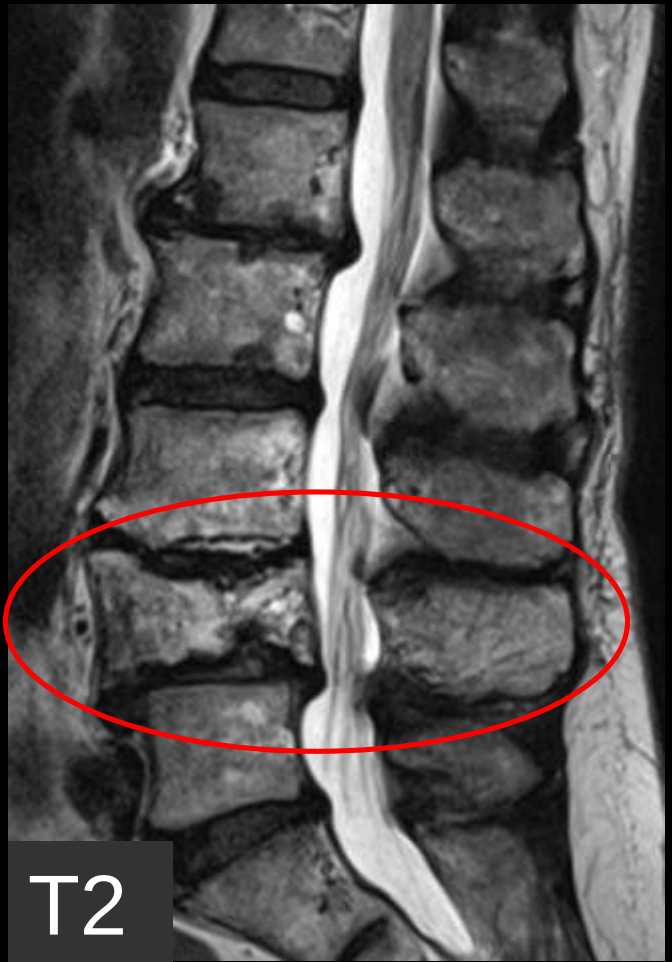
Qualitative grading of severity of lumbar spinal stenosis based on morphology of the dural sac on MRI.
Schizas C, et al. Spine 2010

Less common causes

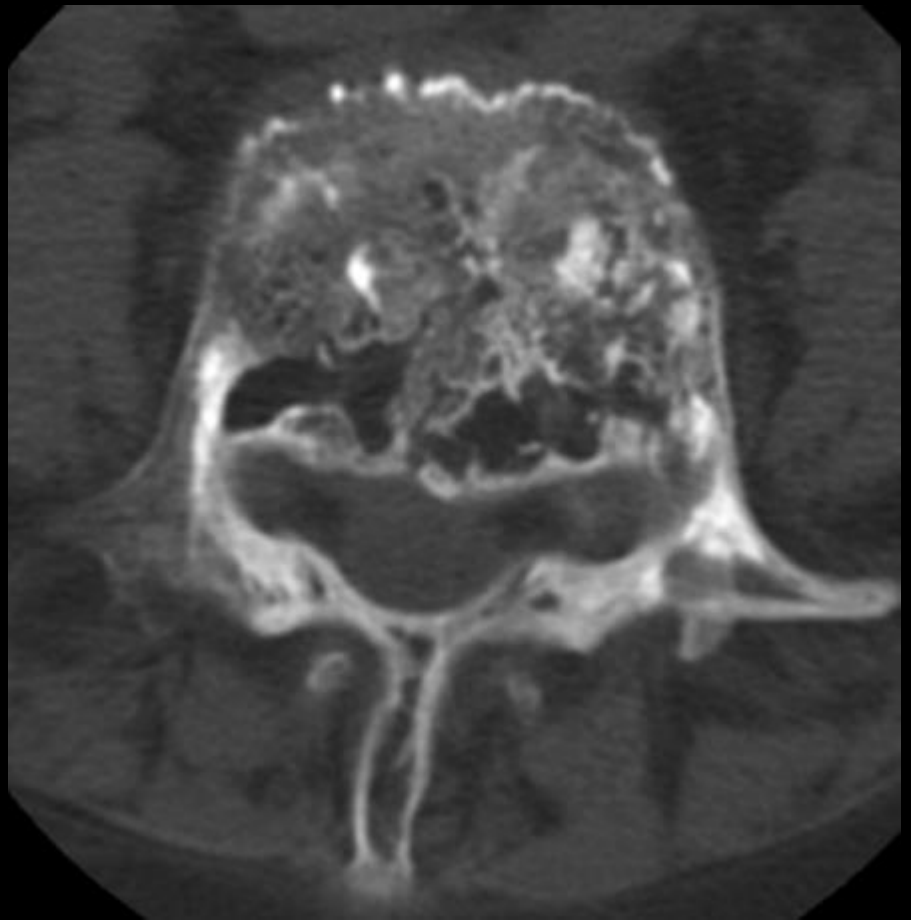
- Bone
- Disco-vertebral
- Epidural
- Facet joints
- Ligaments



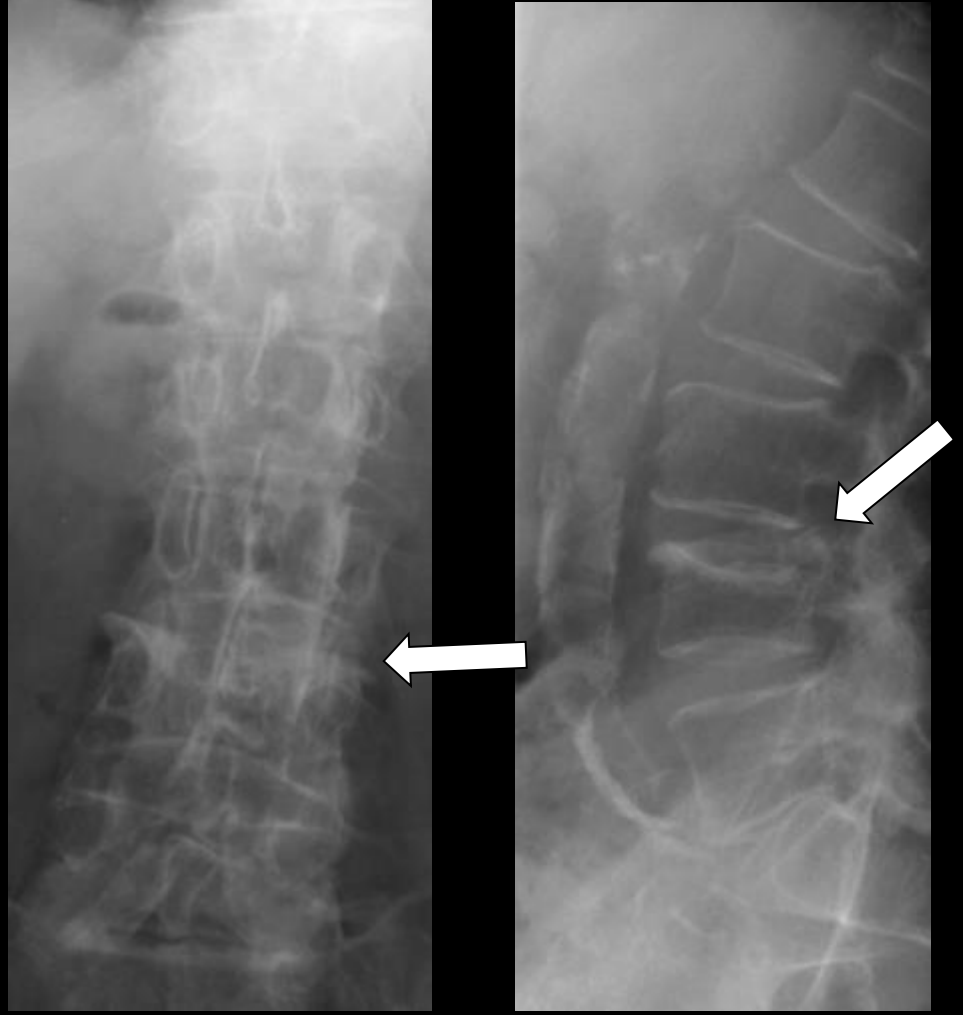
Os (1) : Paget



Bone

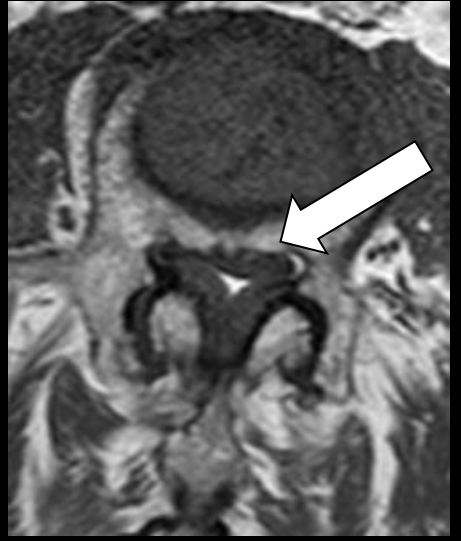


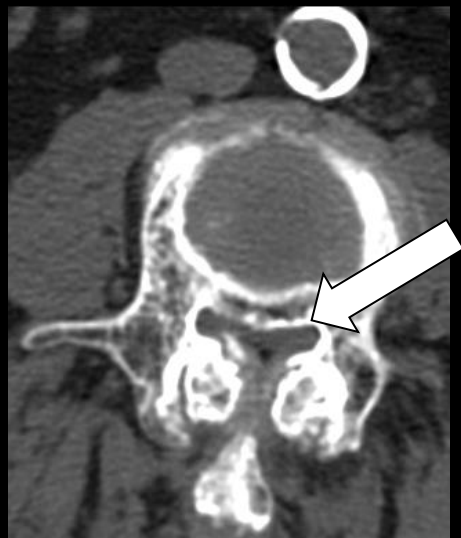
Os (2)



Lumbar stenosis with osteoporotic compression fracture and neurogenic claudication. Sills AK. J Spinal Disord. 1993

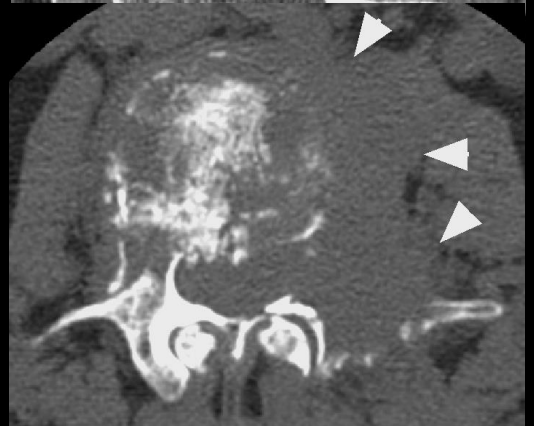
Os (2) : VCF (B)





Bone

Os (3) Tassements malins

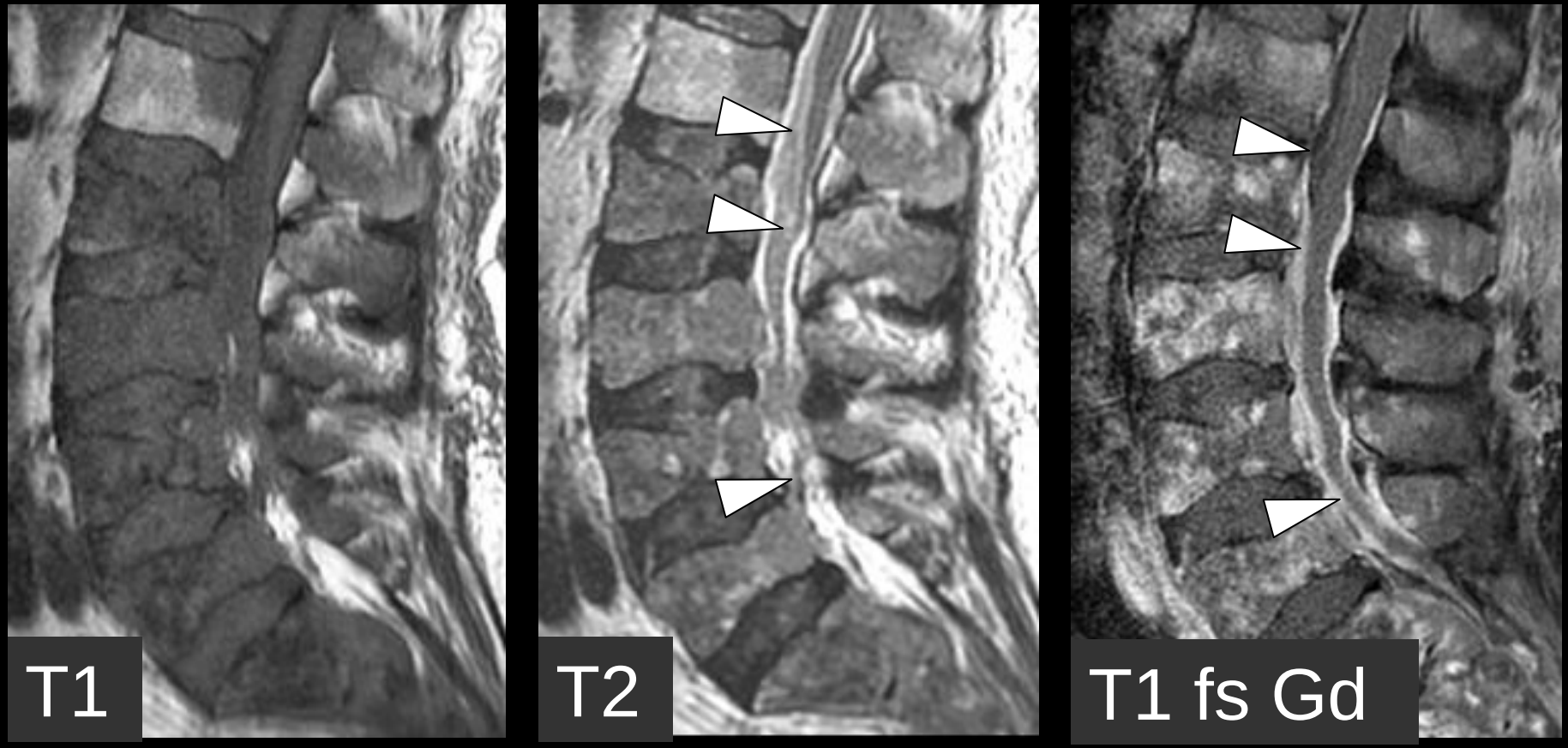


T1

T2

T1gd

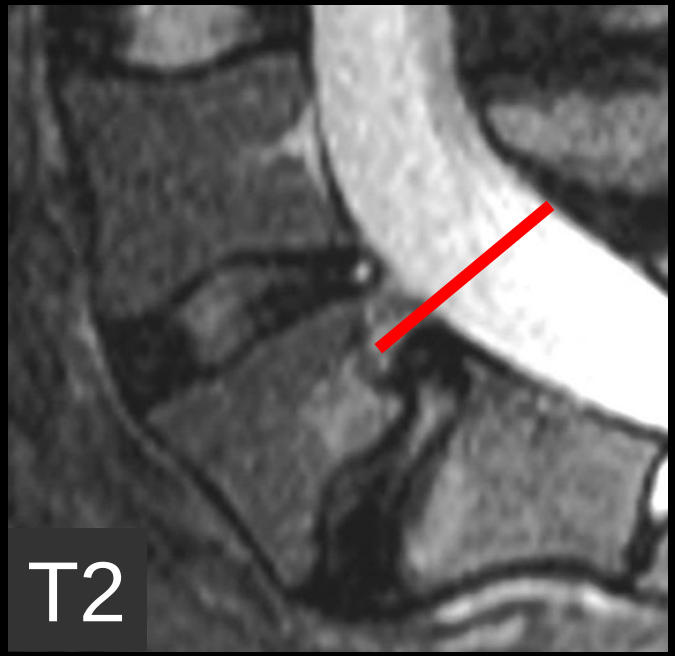
Os (3) : Carcinomatose épidurale



Neurogenic claudication due to narrowing of the lumbar canal by extradural metastatic tumor. Martin NA, Neurosurgery 1981

Os (4)

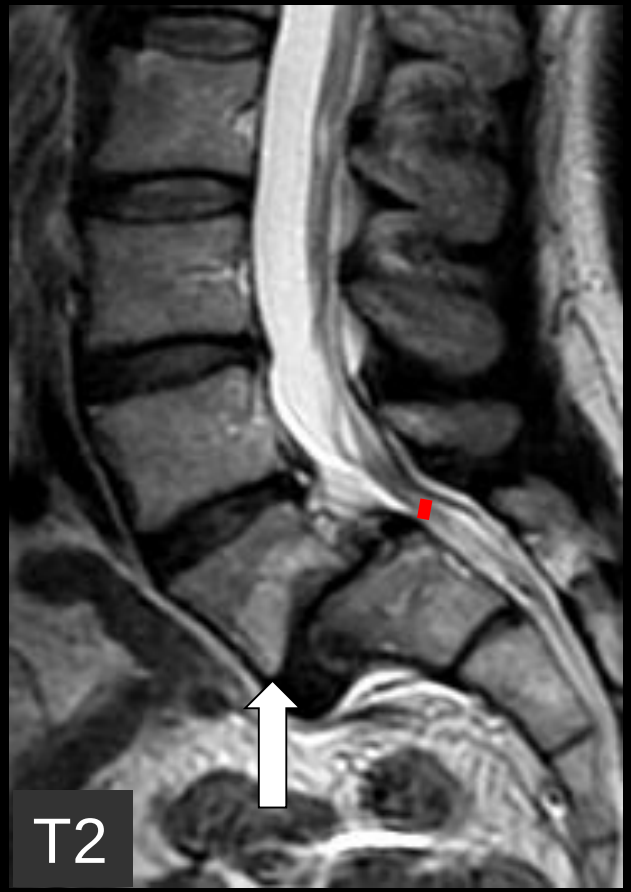
Spondylolyse



« Usual » spondylolytic (isthmic) spondylolisthesis

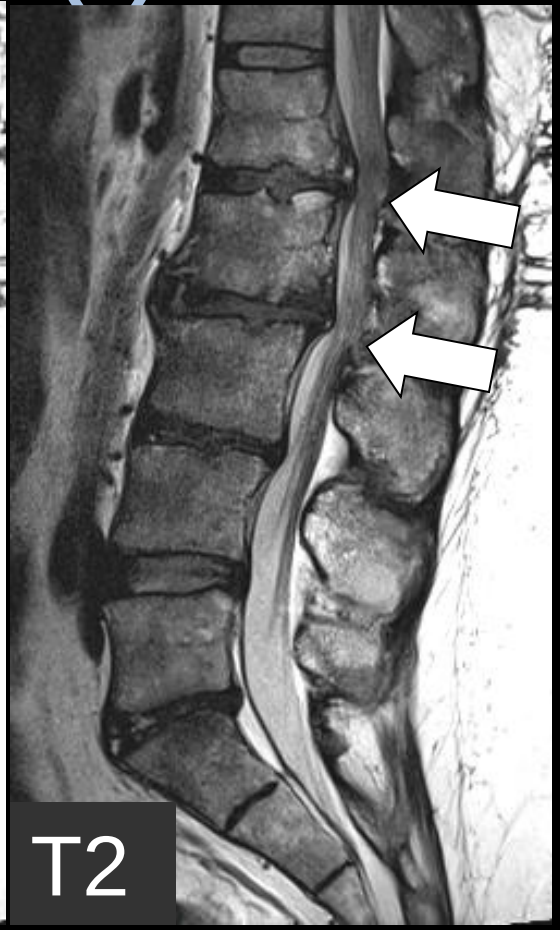
Surgical treatment of high-grade lumbosacral spondylolisthesis in childhood, adolescent and young adult Vialle R, et al. Eur Spine J. 2006

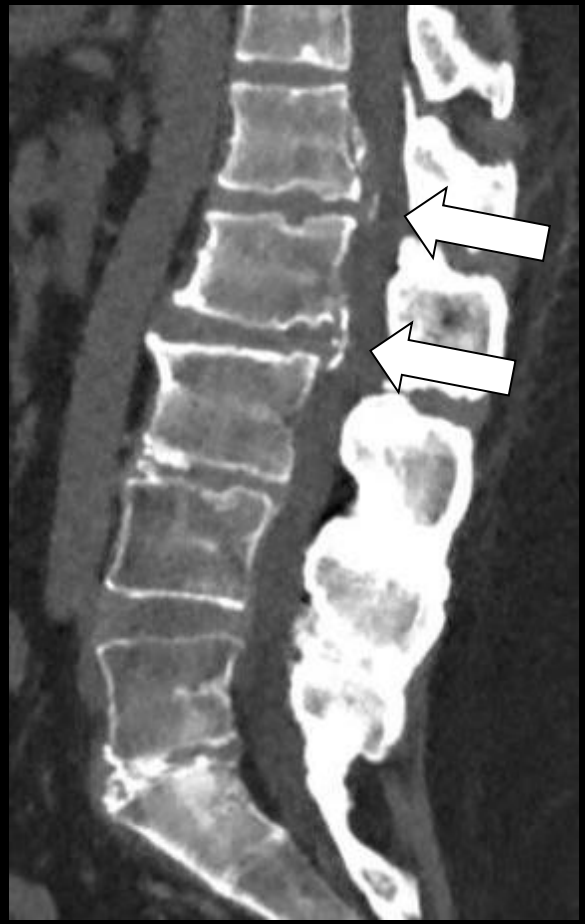
Os (4) High-grade (isthmic) spondylolisthesis



Surgical treatment of high-grade lumbosacral spondylolisthesis in childhood, adolescent and young adult Vialle R, et al. Eur Spine J. 2006

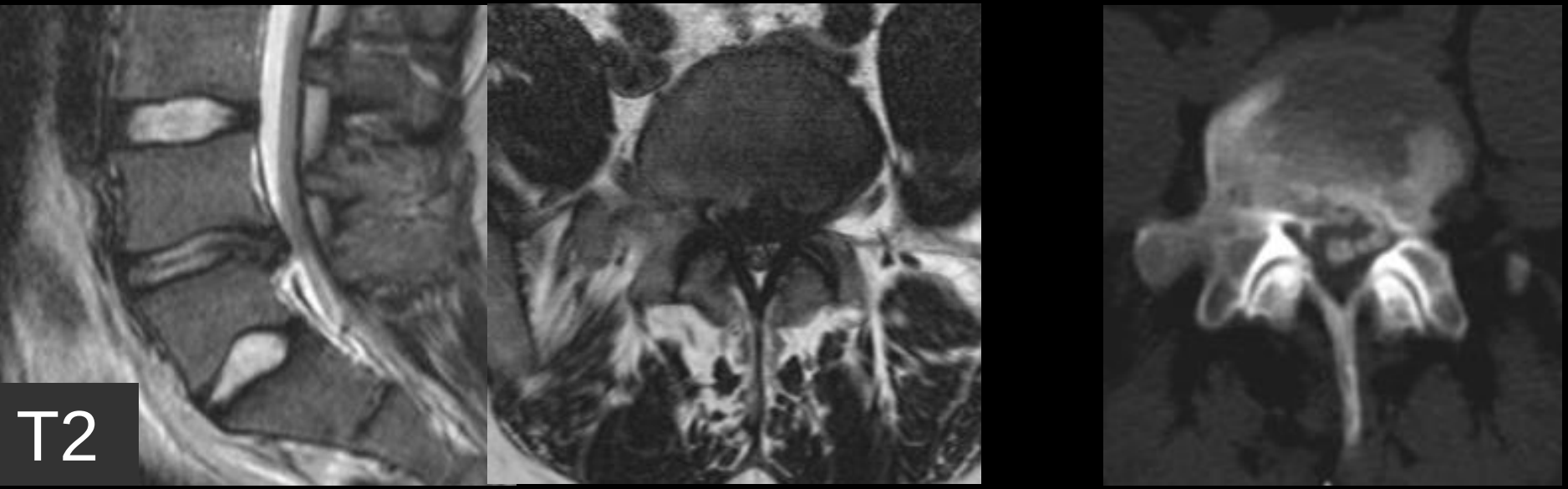
Disco-vertebral (5) : Scheuermann





Tallroth K, Spinal stenosis subsequent to juvenile lumbar osteochondrosis. Skeletal Radiol. 1990

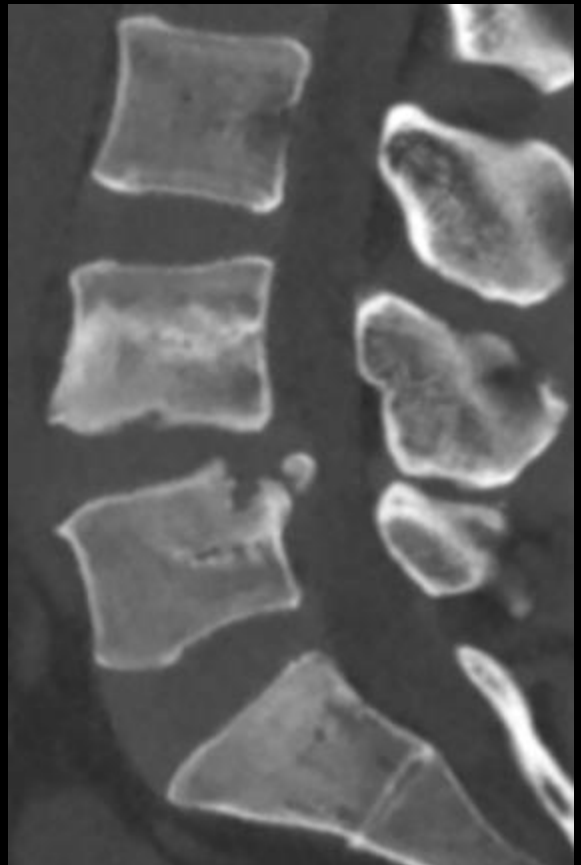
Disco-vertebral (6)



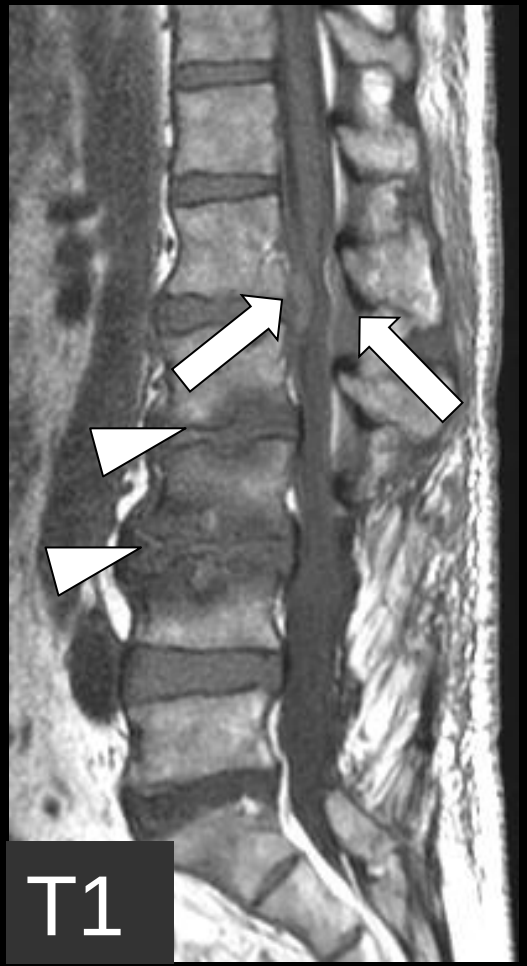
Wu X. et al. A review of current treatment of lumbar posterior ring apophysis fracture with lumbar disc herniation Eur Spine J 2013

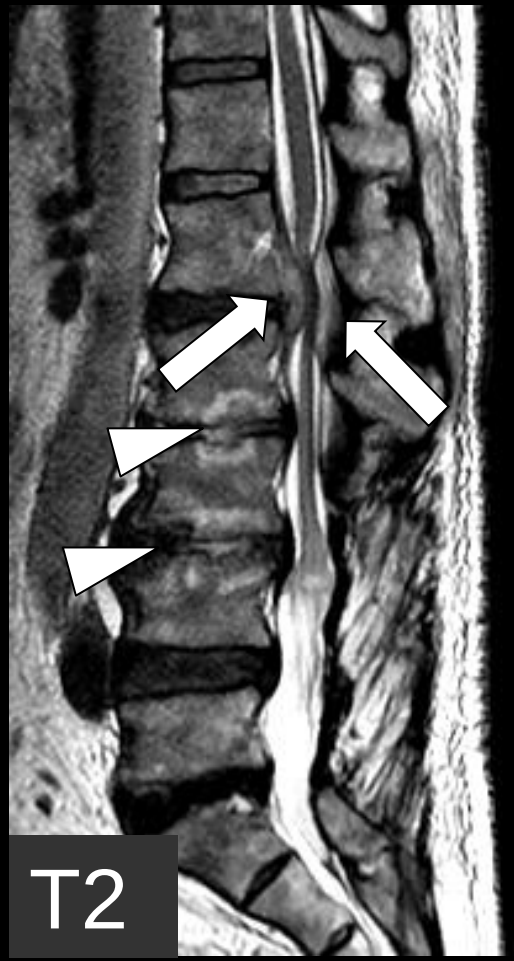
(synonyms: avulsed vertebral rim apophysis, limbus vertebral fracture, lumbar posterior marginal node, slipped vertebral epiphysis)

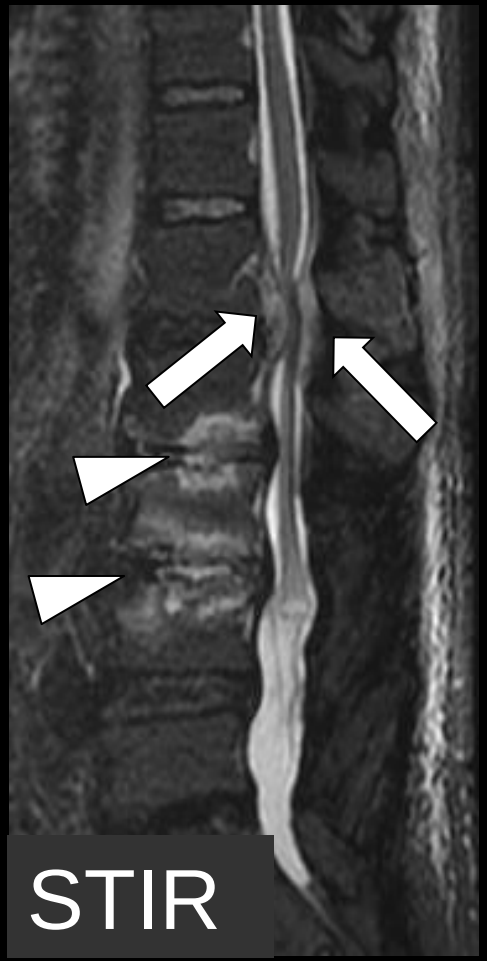
Disco-vertebral causes



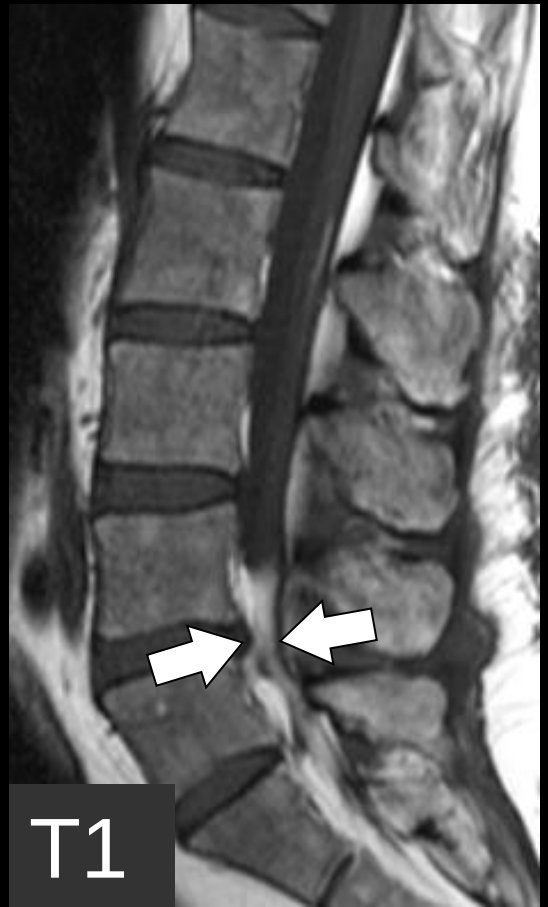
Disco-vertebral (7) : TBC + abcès épidural

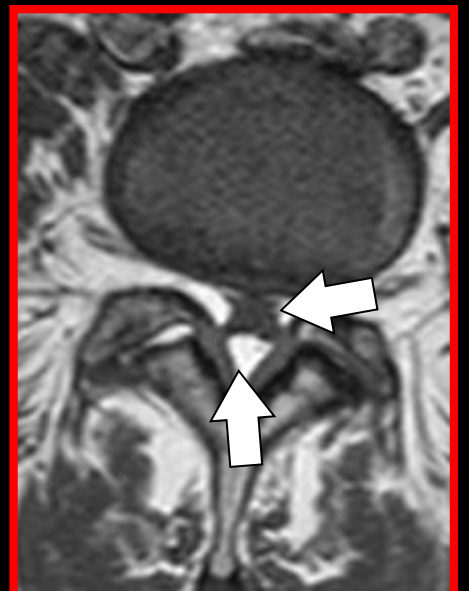






Causes épidurales



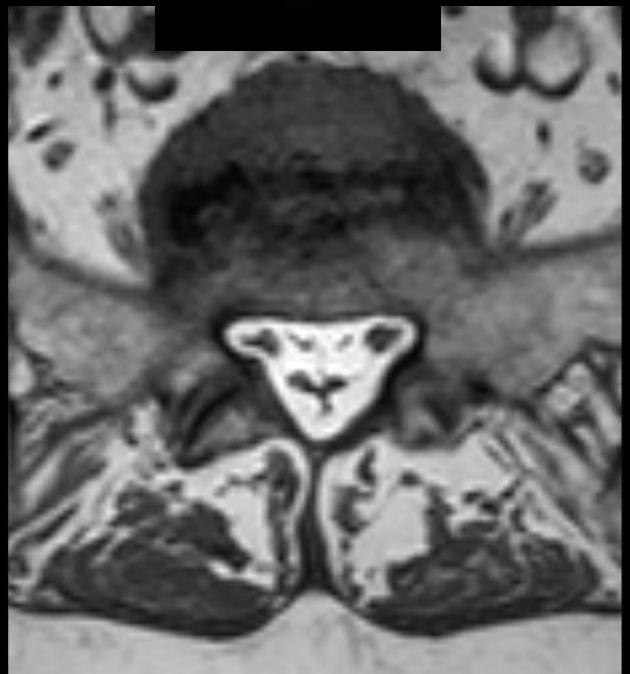


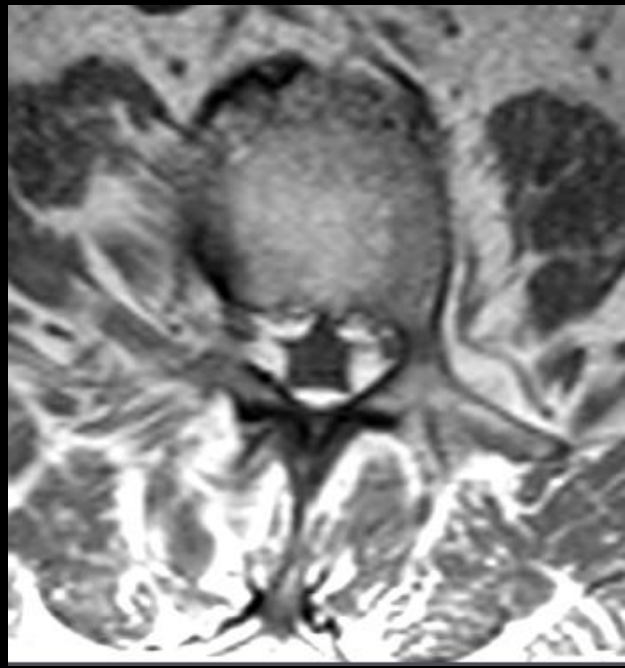

T1

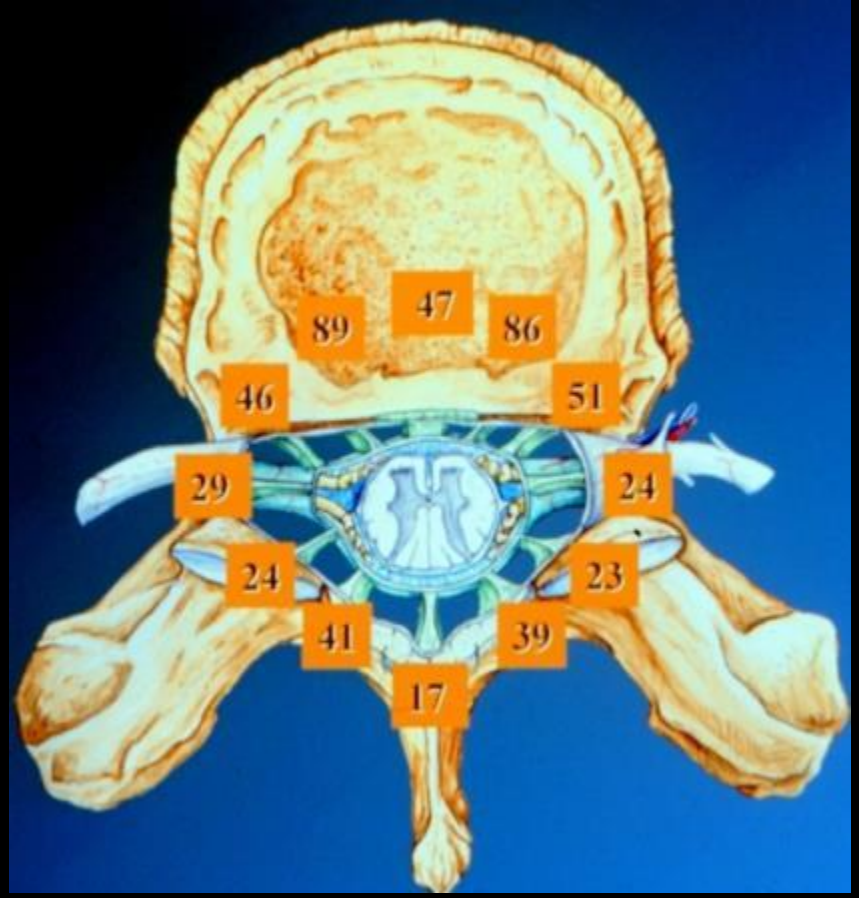

T2

?

Epidural (8) : Lipomatose



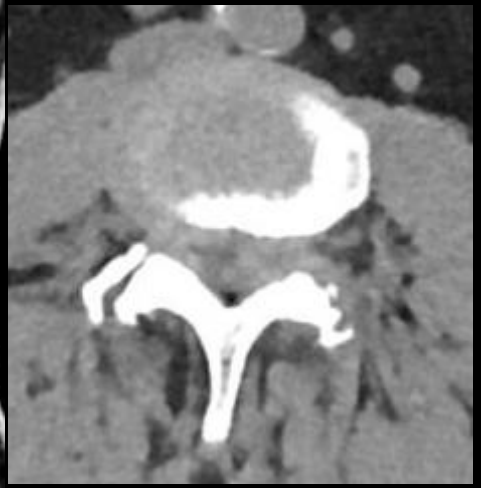




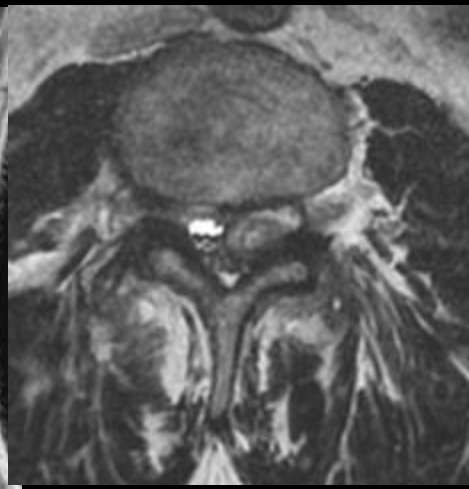
Geers C, Lecouvet FE, et al Polygonal deformation of the dural sac in lumbar epidural lipomatosis: anatomic explanation by the presence of meningovertebral ligaments. AJNR 2003


D

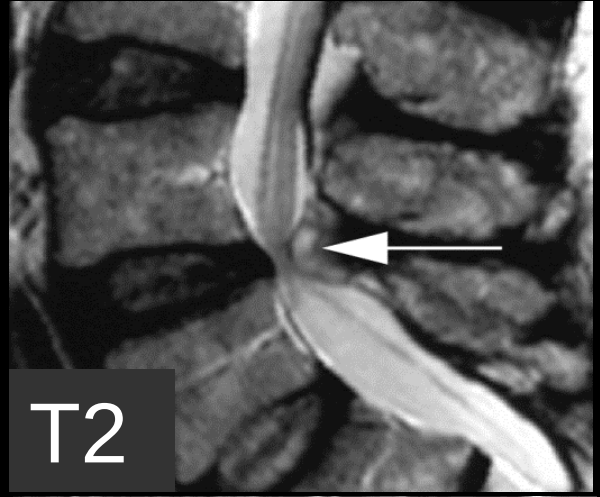
Kystes AIA (9)

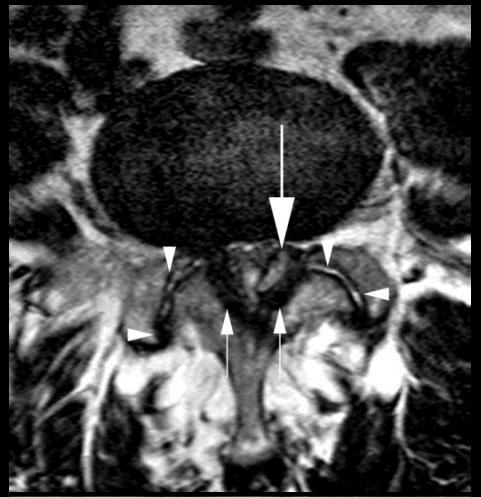


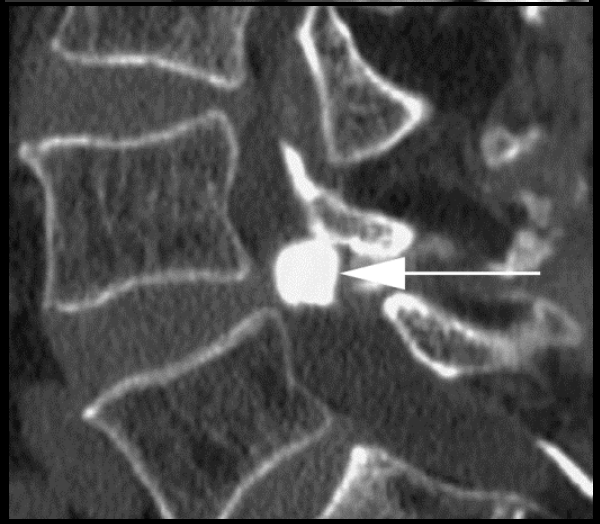
Not always
evident on CT….

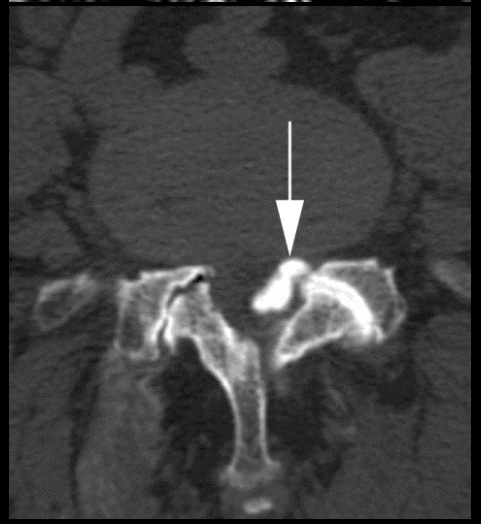


Kystes AIA (9)





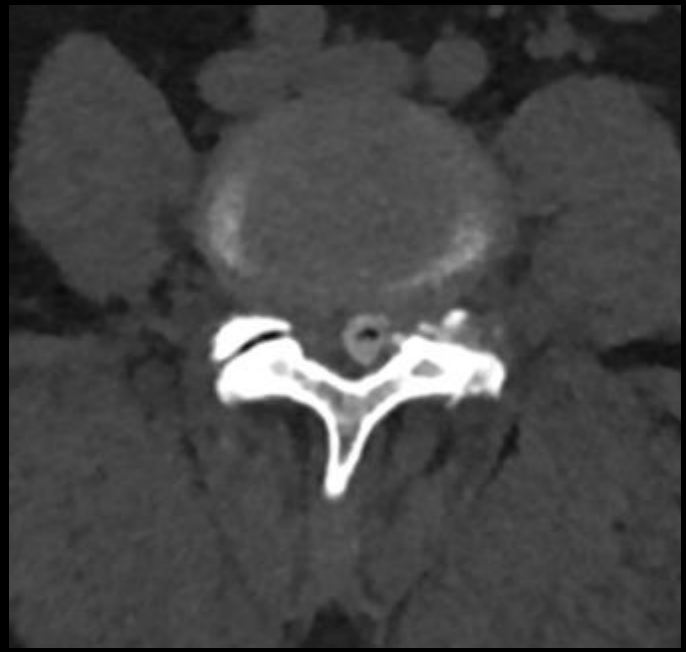




Epstein. Lumbar synovial cysts:review of diagnosis, surgical management, and outcome assessment. J Spinal Disord. 2004

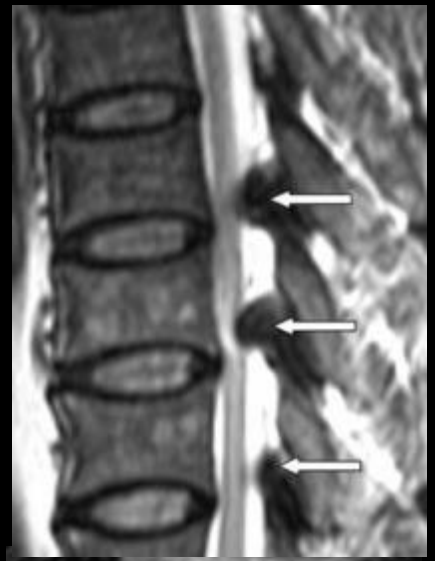
Kystes AIA: variantes

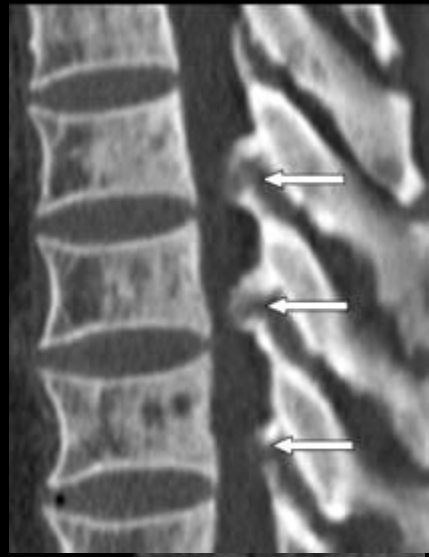
Kystes AIA: variantes



Ligaments (10)

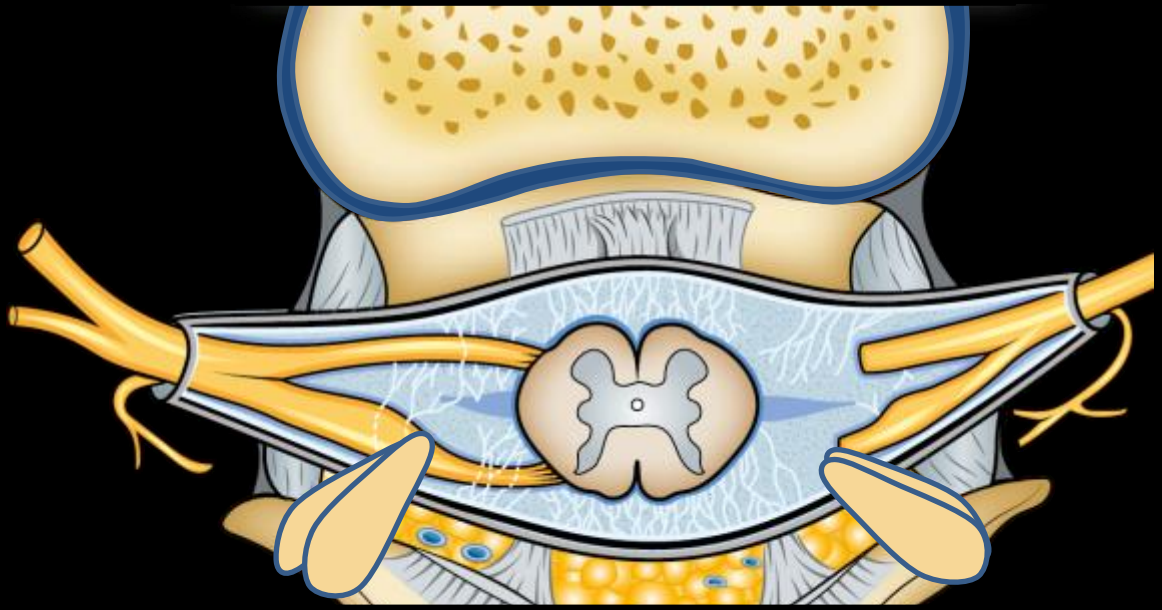
Hypophosphatemic
vitamin D-resistant rickets
with symptomatic ossification
of the ligamentum flavum





Causes moins habituelles

- Os
- Disco-vertébral
- Epidural
- Facettes
- Ligaments



Rachis dégénératif
Pathologie discale protrusive
Canal étroit

F. Lecouvet, X. Banse, V. Perlepe,
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