



Reunión Anual
SOCIEDAD ESPAÑOLA DE
NEURORRADIOLOGÍA

SAN SEBASTIÁN

7 - 9 de noviembre de 2024



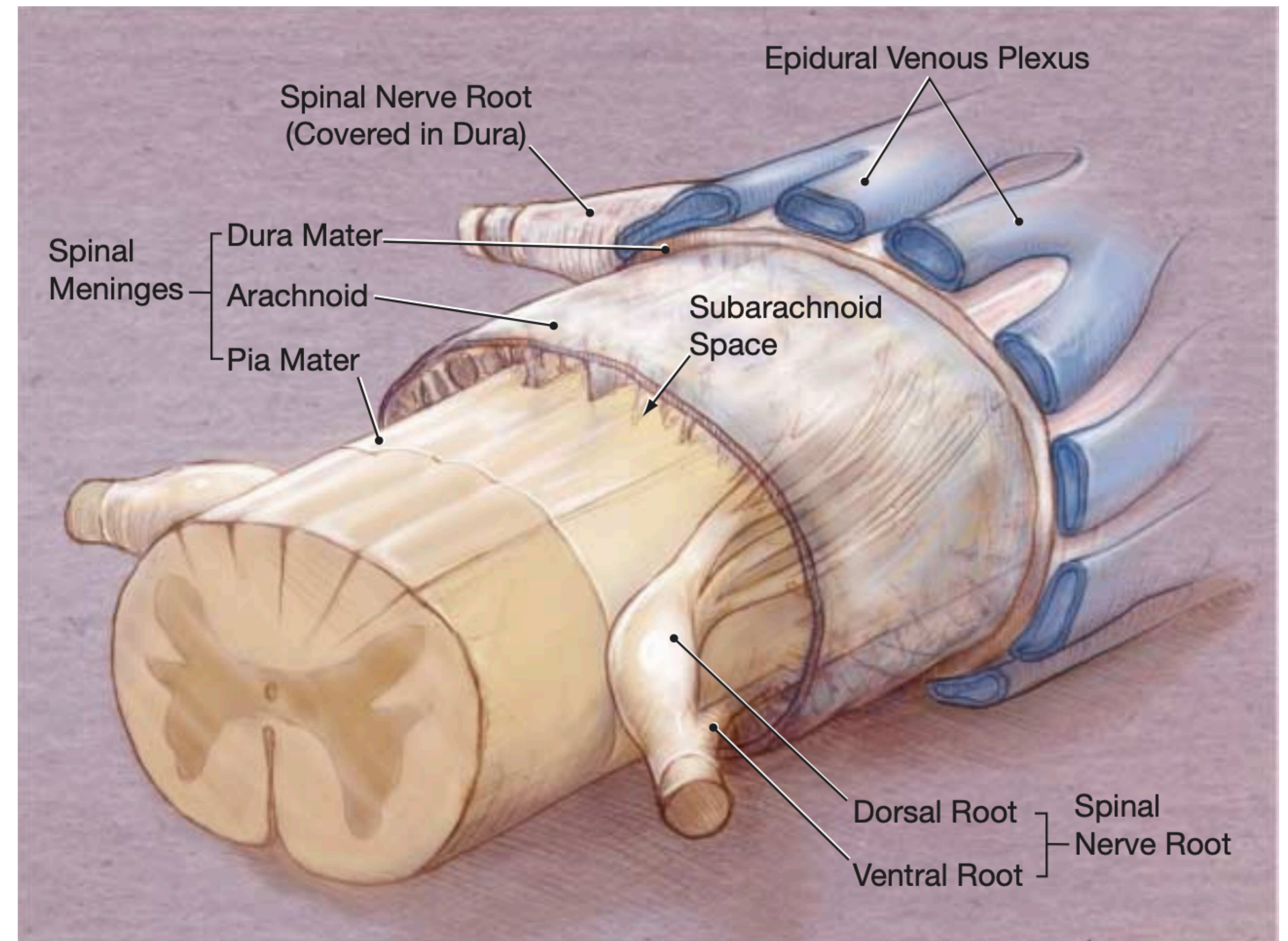
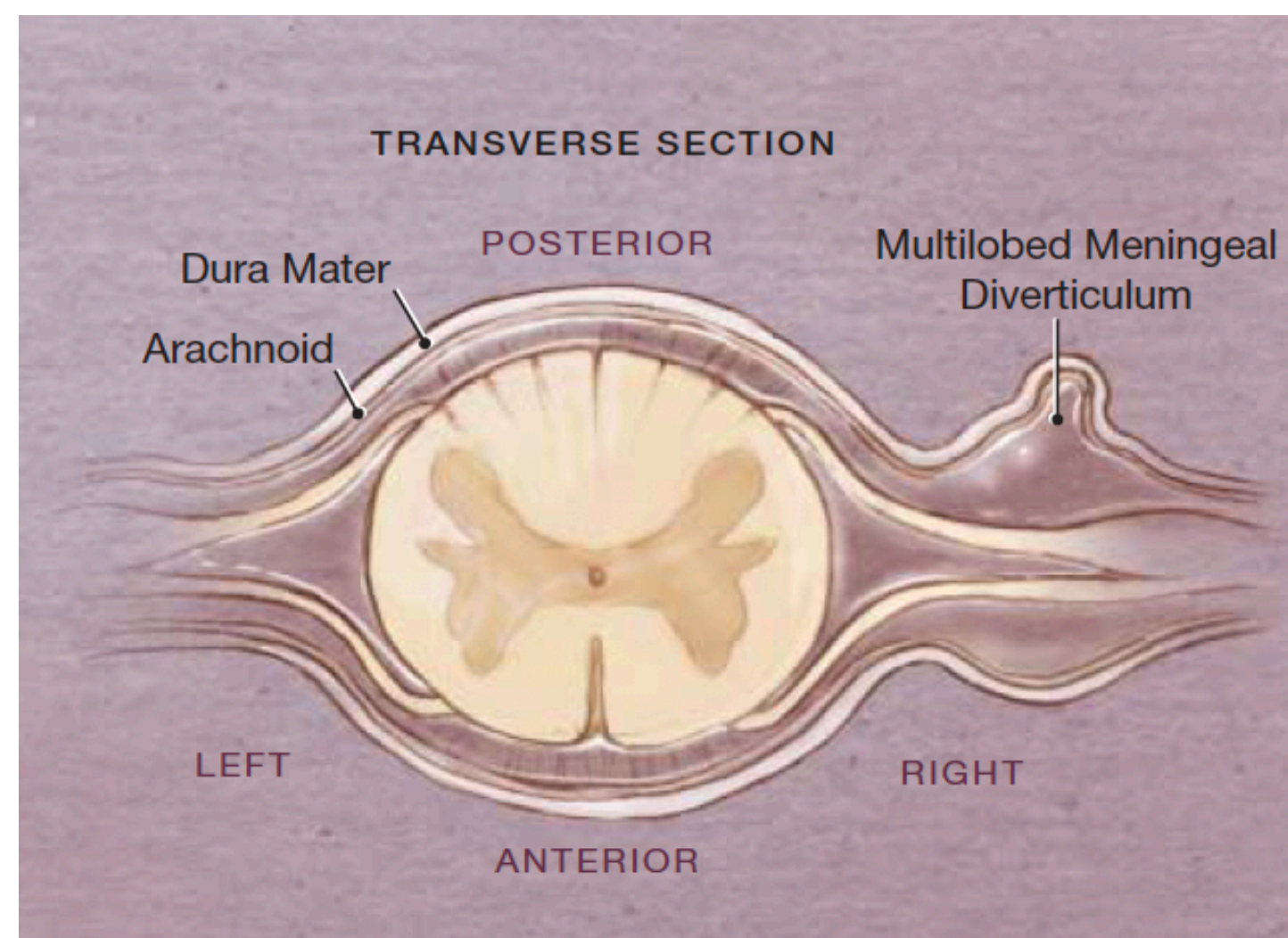
AVANCES EN MÉTODOS DE IMAGEN PARA LA EVALUACIÓN Y MANEJO DE FÍSTULAS DE LÍQUIDO CEFALORRAQUÍDEO

KIKO PADILLA
NRVI
H.R.U. de Málaga



SÍNDROME DE HIPOTENSIÓN INTRACRENAL ESPONTÁNEA (SHIE) EPIDEMIOLOGÍA

- 30-50 AÑOS
- MUJERES 60 %
- 5/100.000 Hab. aprox. (??)
- Factores riesgo: degeneración osteoarticular espinal, alteraciones tejido conectivo (60% ptes), traumatismos



Neuroradiology (2023) 65:233–243
https://doi.org/10.1007/s00234-022-03079-5

REVIEW

Spontaneous intracranial hypotension: updates from diagnosis to treatment

Paul J. Farnsworth¹ · Ajay A. Madhavan¹ · Jared T. Verdoorn¹ · Darya P. Shlapak¹ · Derek R. Johnson^{1,2} · Jeremy K. Cutsforth-Gregory² · Waleed Brinjikji^{1,3} · Vance T. Lehman¹

Received: 14 September 2022 / Accepted: 26 October 2022 / Published online: 7 November 2022
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Neurology®

CSF–venous fistula in spontaneous intracranial hypotension
Wouter I. Schievink, Franklin G. Moser and M. Marcel Maya
Neurology 2014;83:472–473 Published Online before print June 20, 2014
DOI 10.1212/WNL.0000000000000639

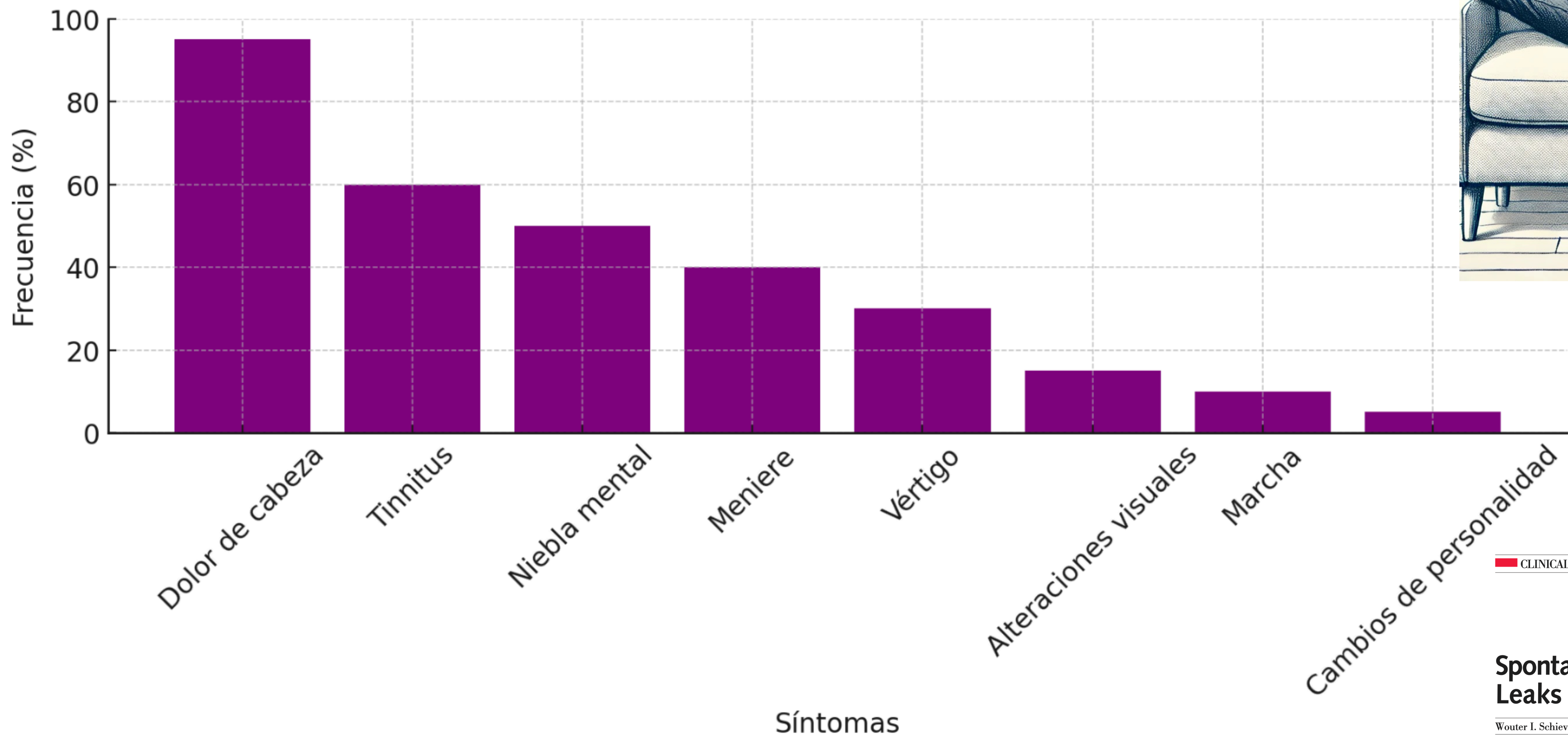
CLINICAL REVIEW

CLINICIAN'S CORNER

Spontaneous Spinal Cerebrospinal Fluid Leaks and Intracranial Hypotension

Wouter I. Schievink, MD

SÍNTOMAS

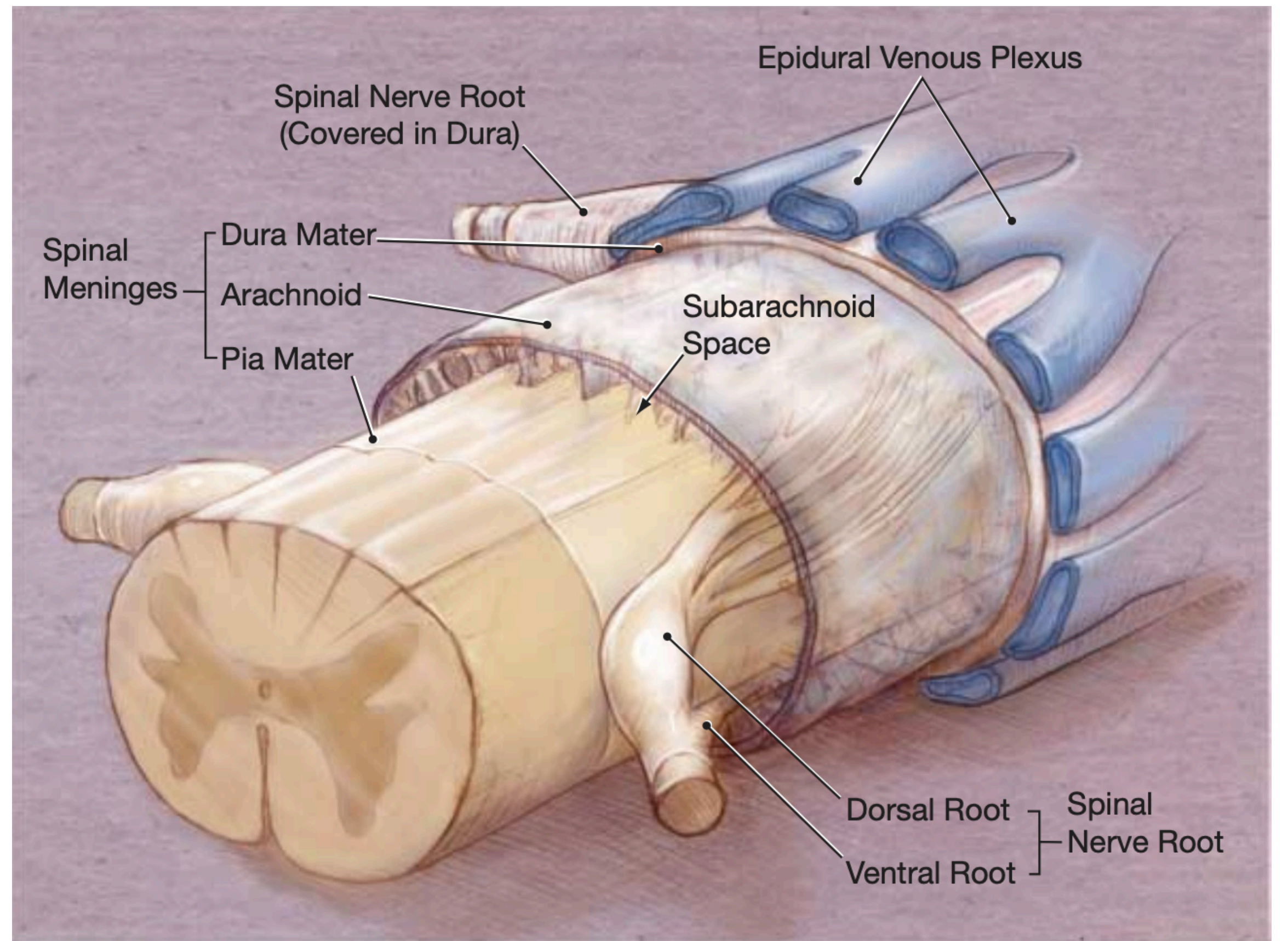
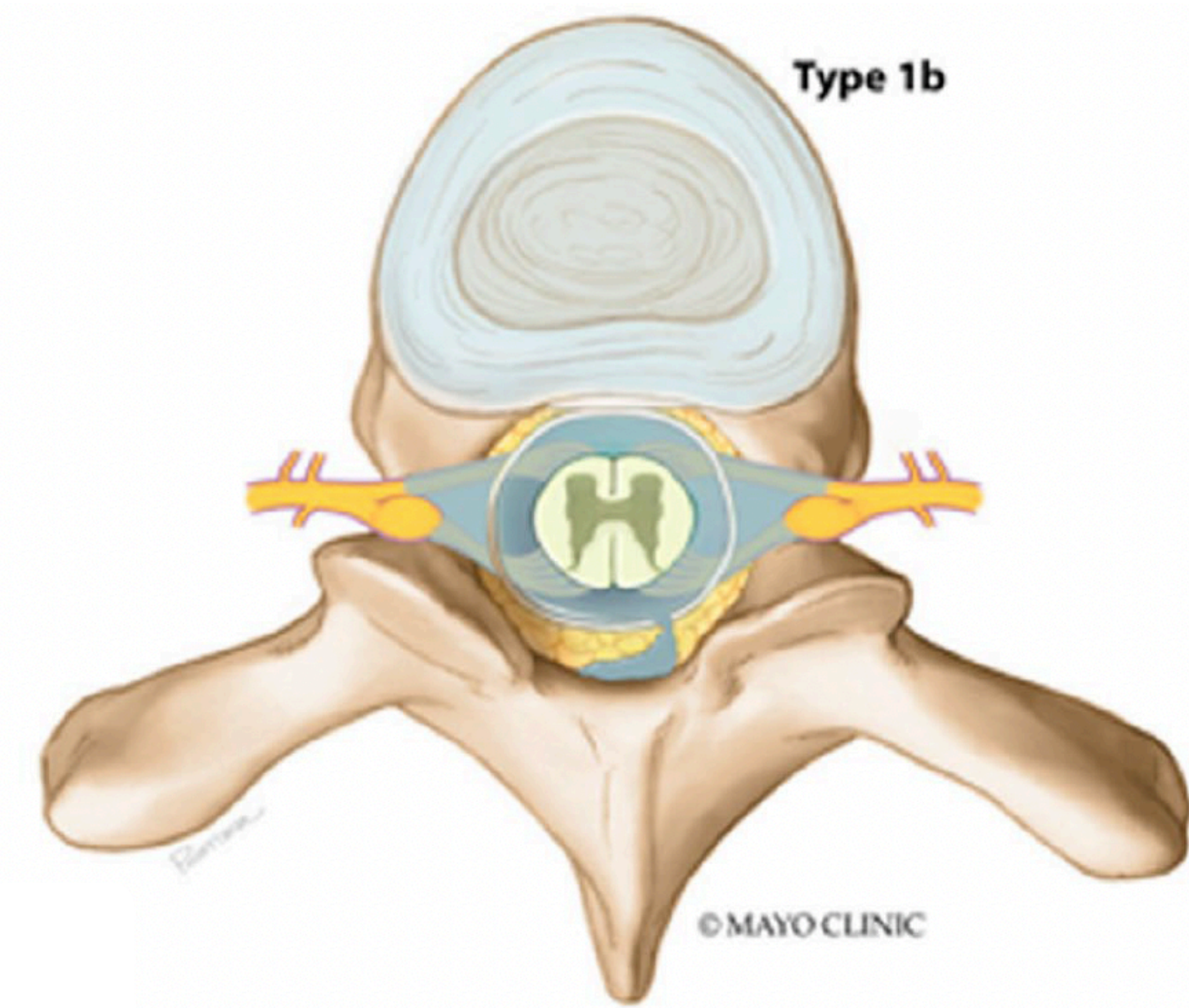
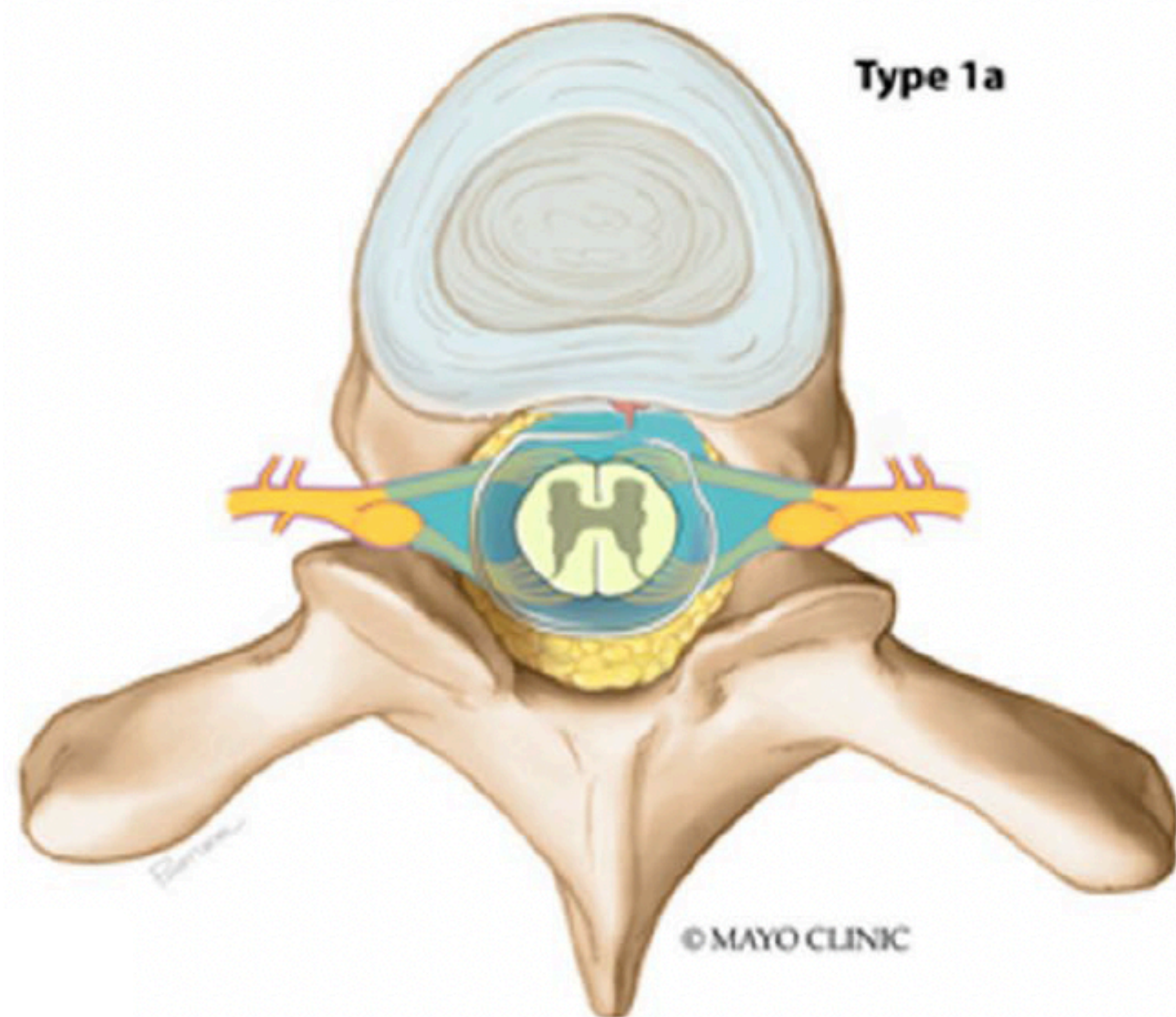


CLINICAL REVIEW

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Wouter I. Schievink, MD



TIPOS / CAUSAS

- DESGARROS DURALES ESPINALES (VENTRALES O DORSALES / DIVERTÍCULOS MENÍNGEOS RADICULARES)

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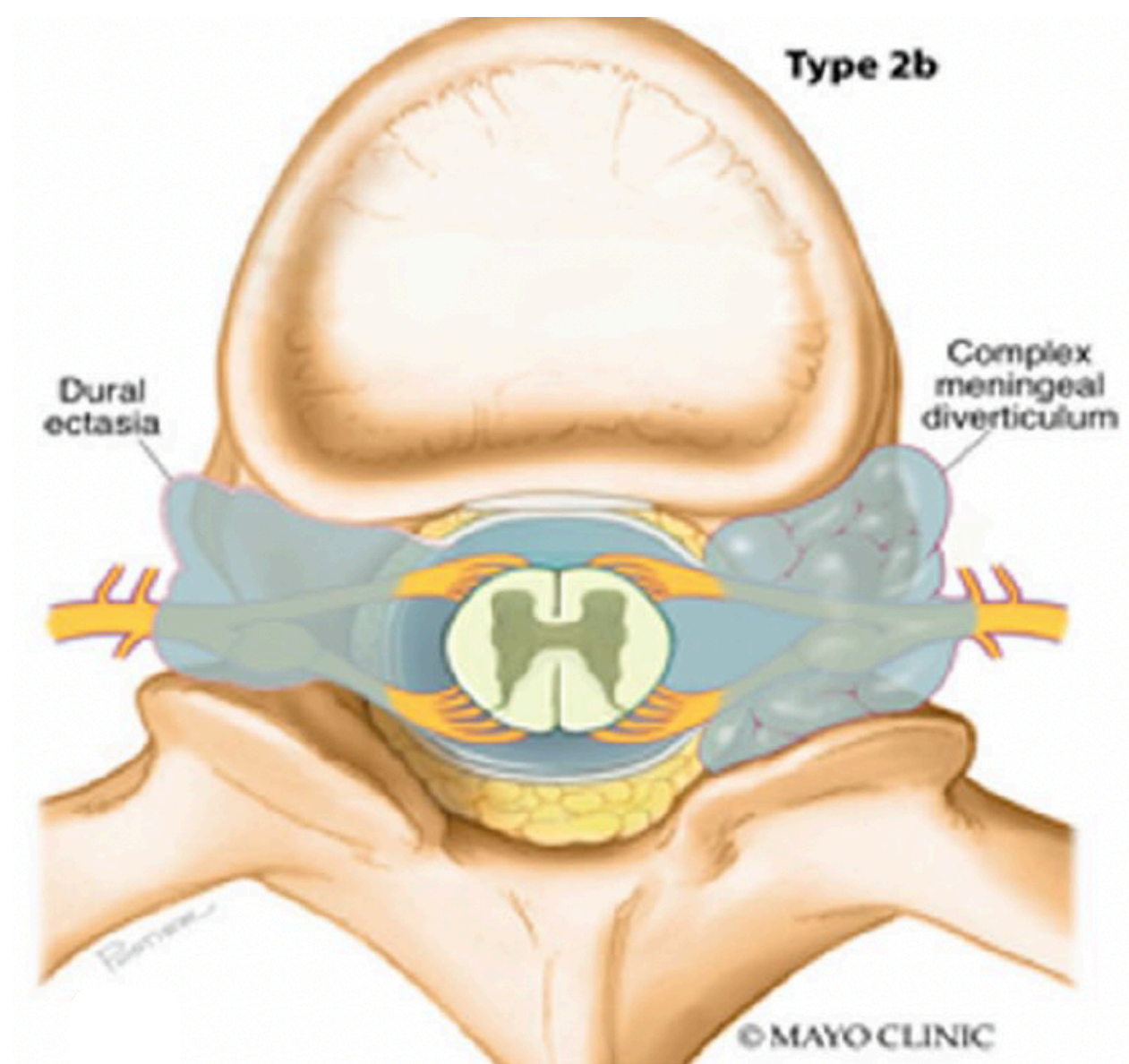
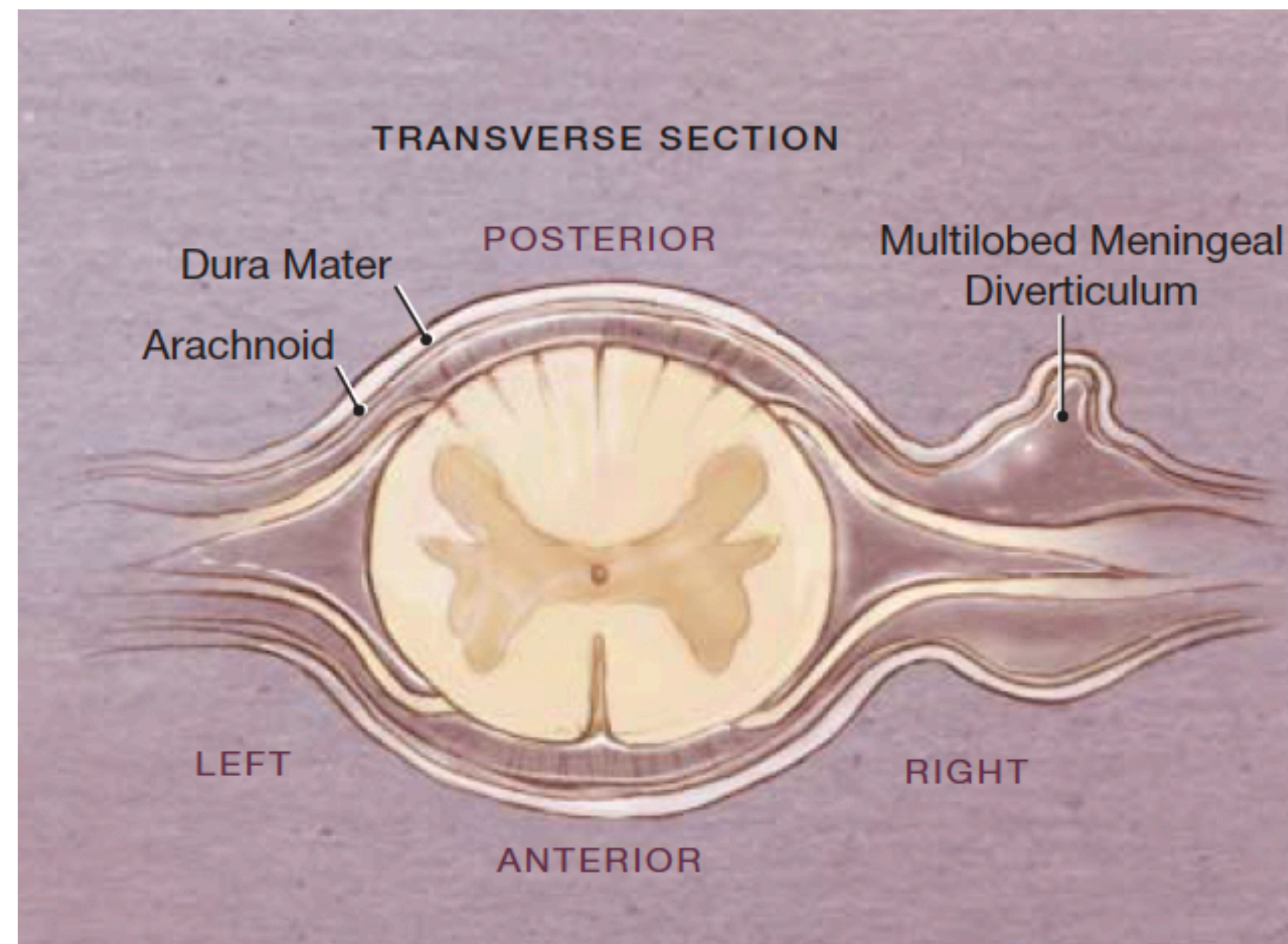
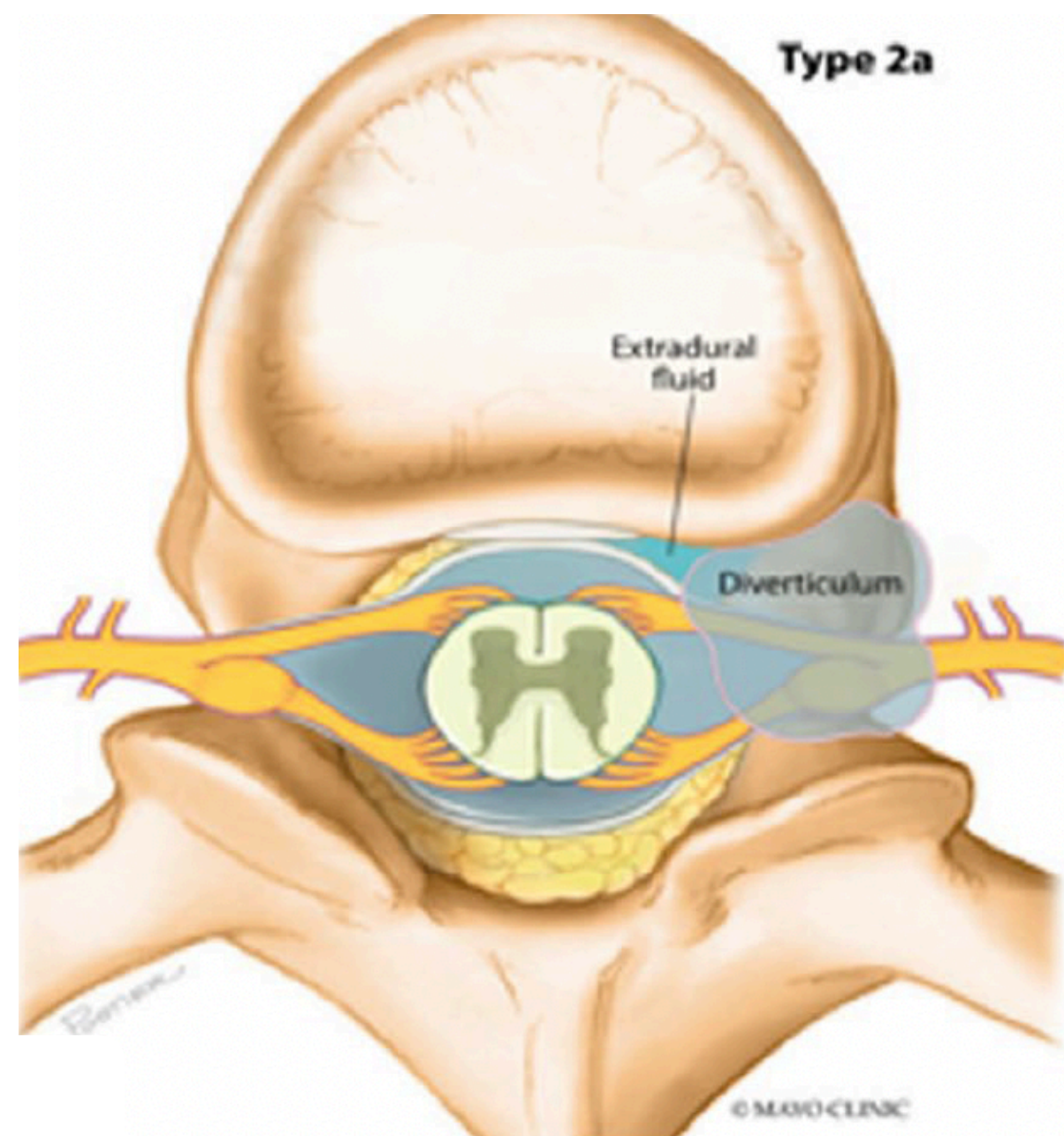
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Wouter I. Schievink, MD



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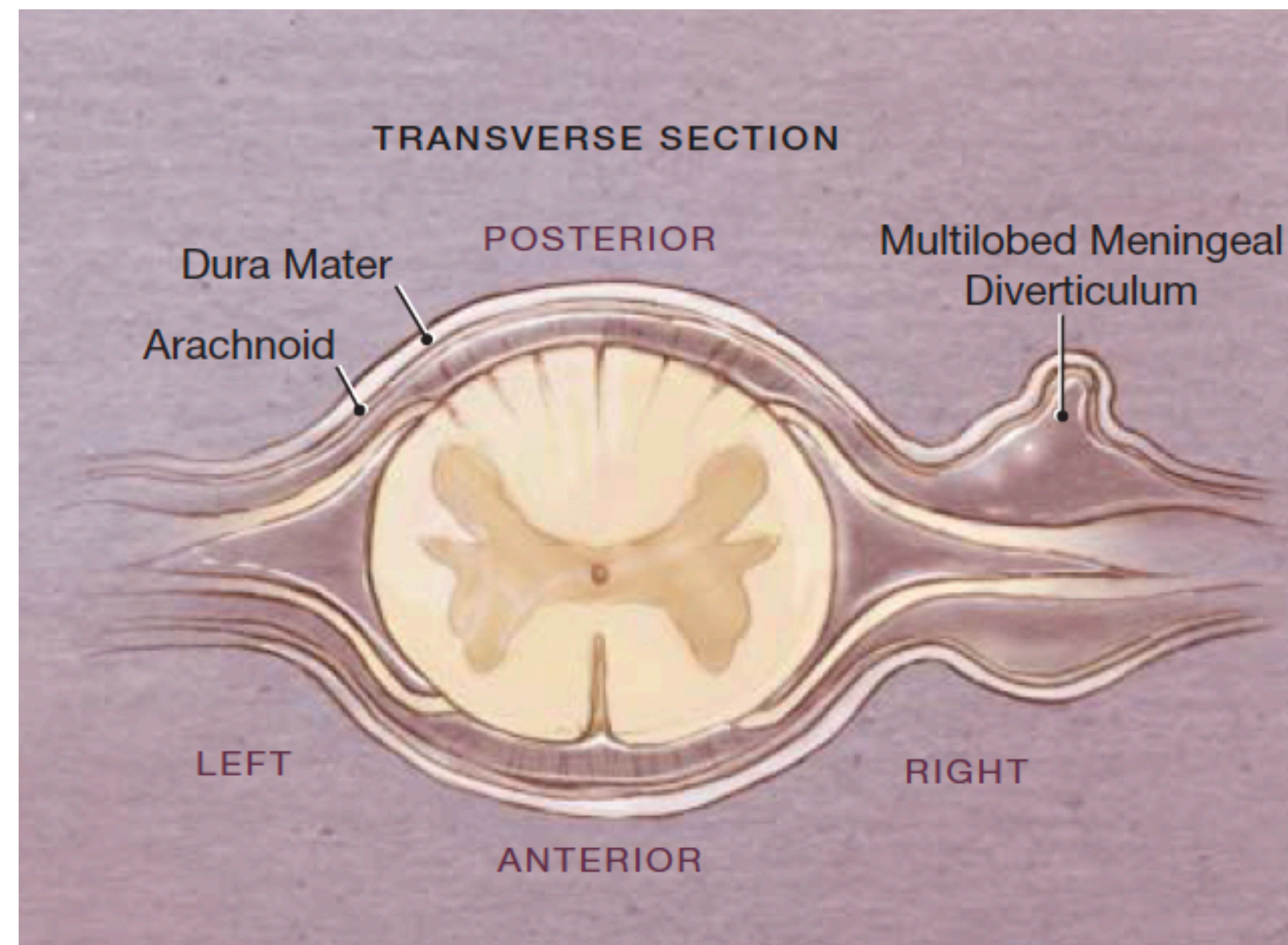
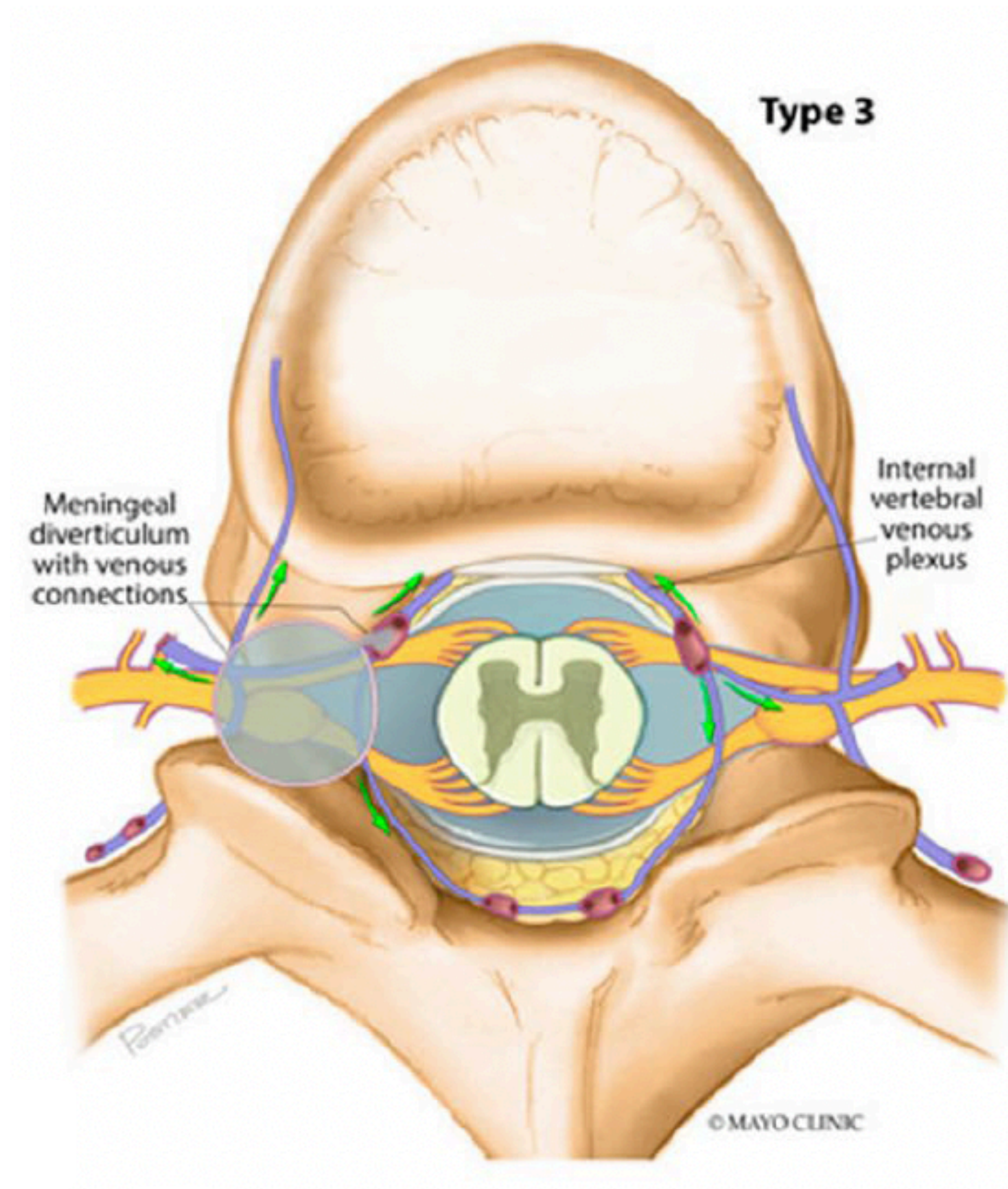
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Wouter I. Schievink, MD



TIPOS / CAUSAS

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- FISTULAS VENOSAS LCR

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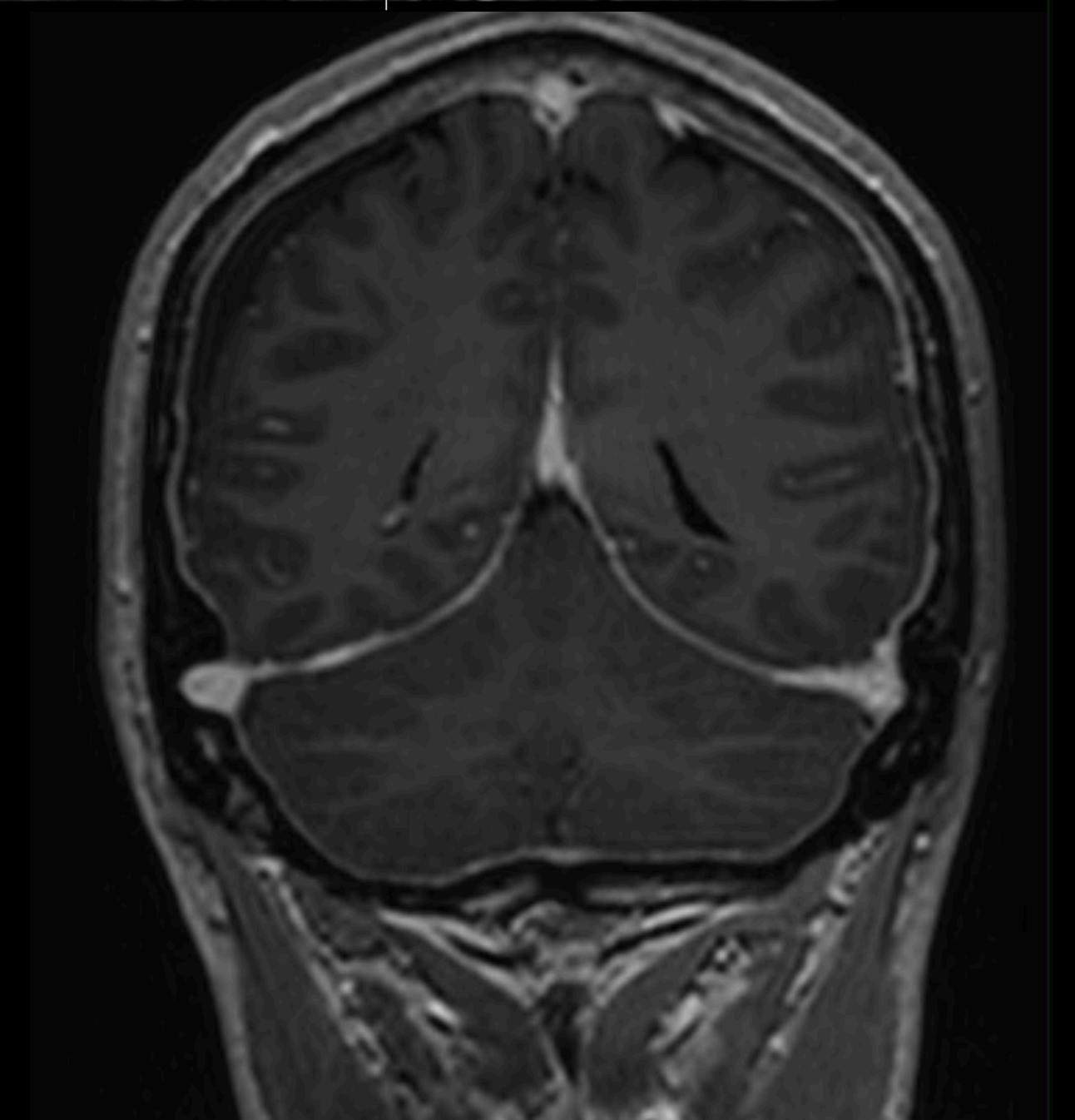
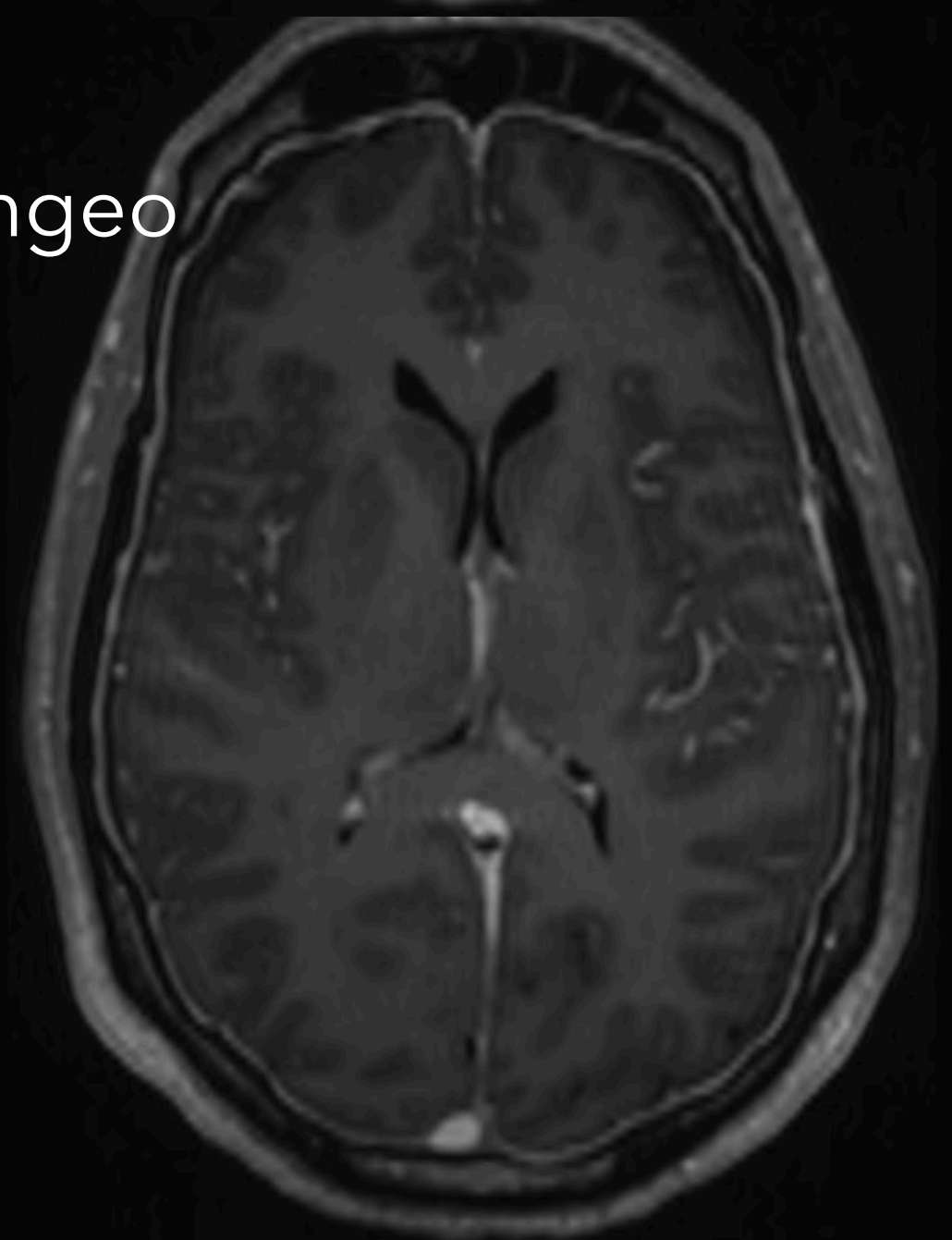
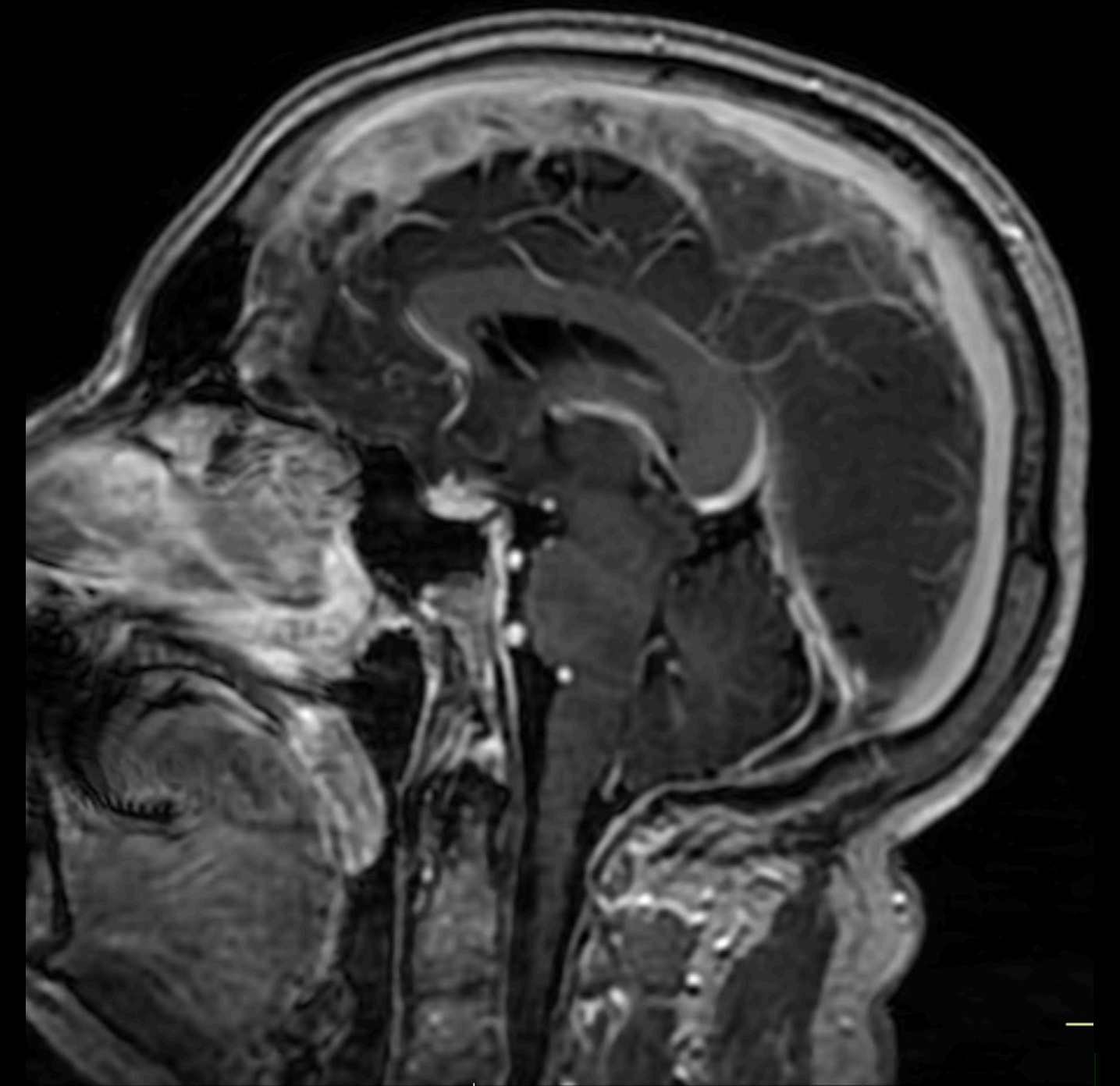
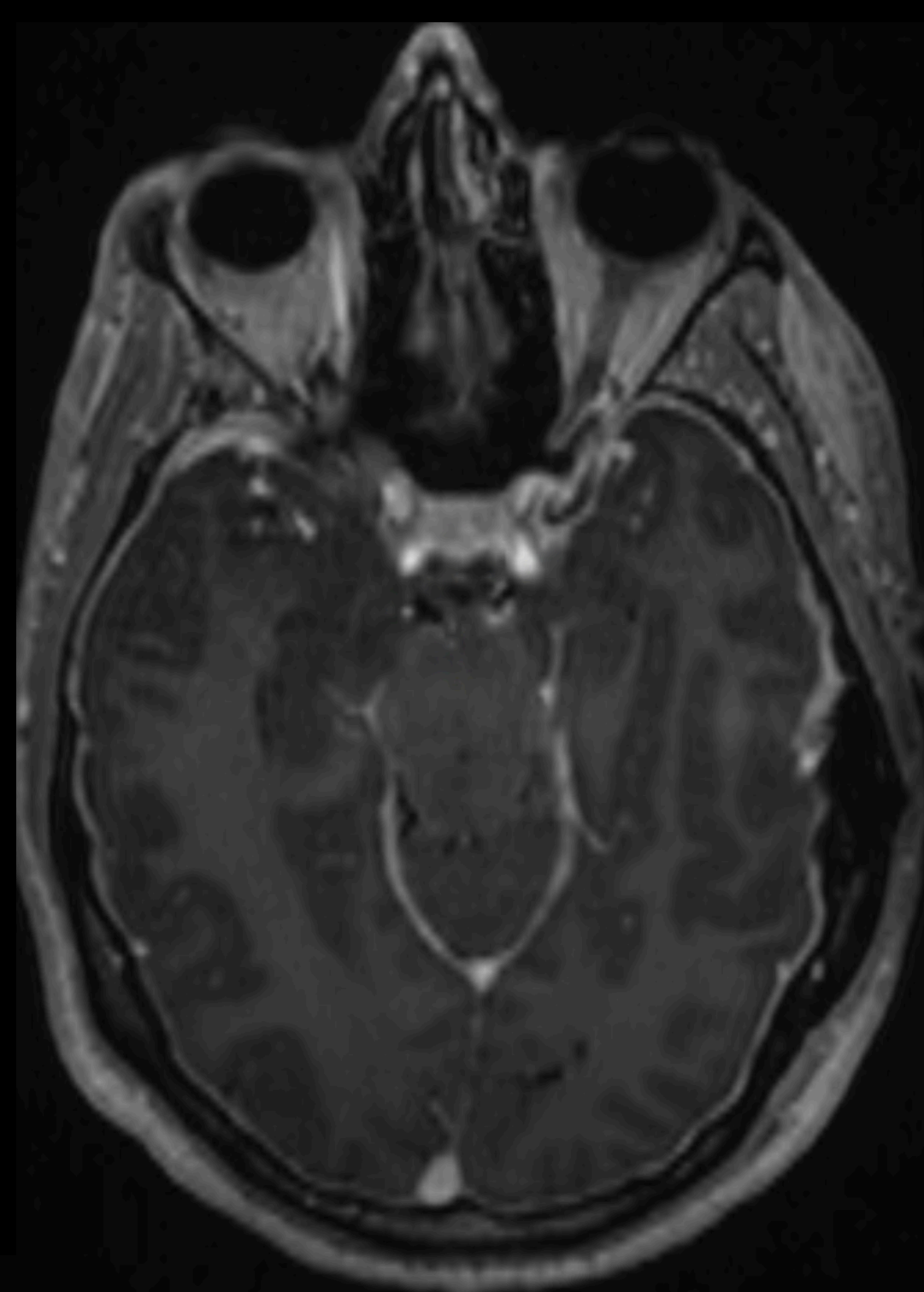
Wouter I. Schievink, MD

Context Spontaneous intracranial hypotension is caused by spontaneous spinal ce-

* Hombre 45 años
* Cefalea con patrón
ortostático claro después
de infección por covid

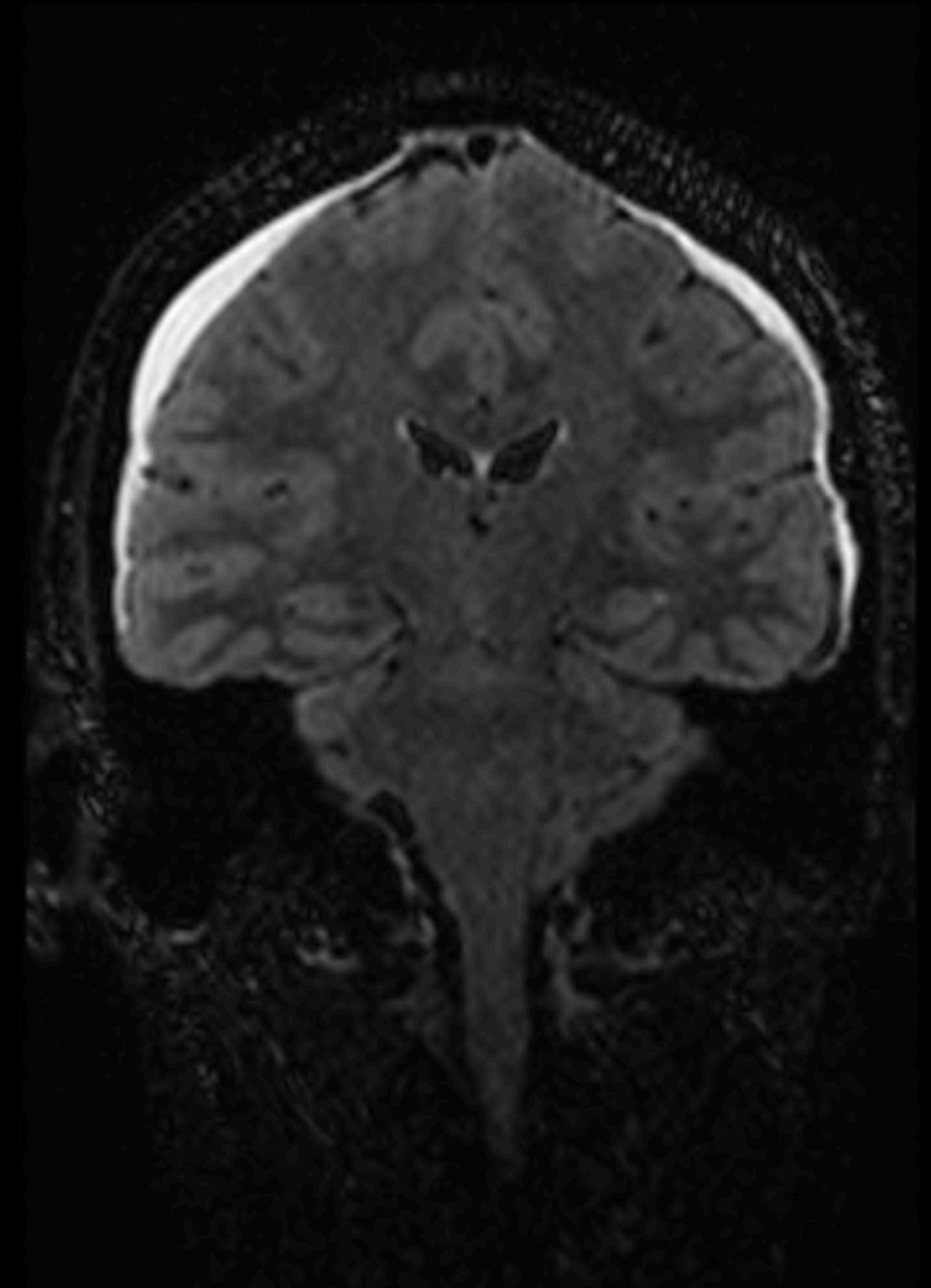
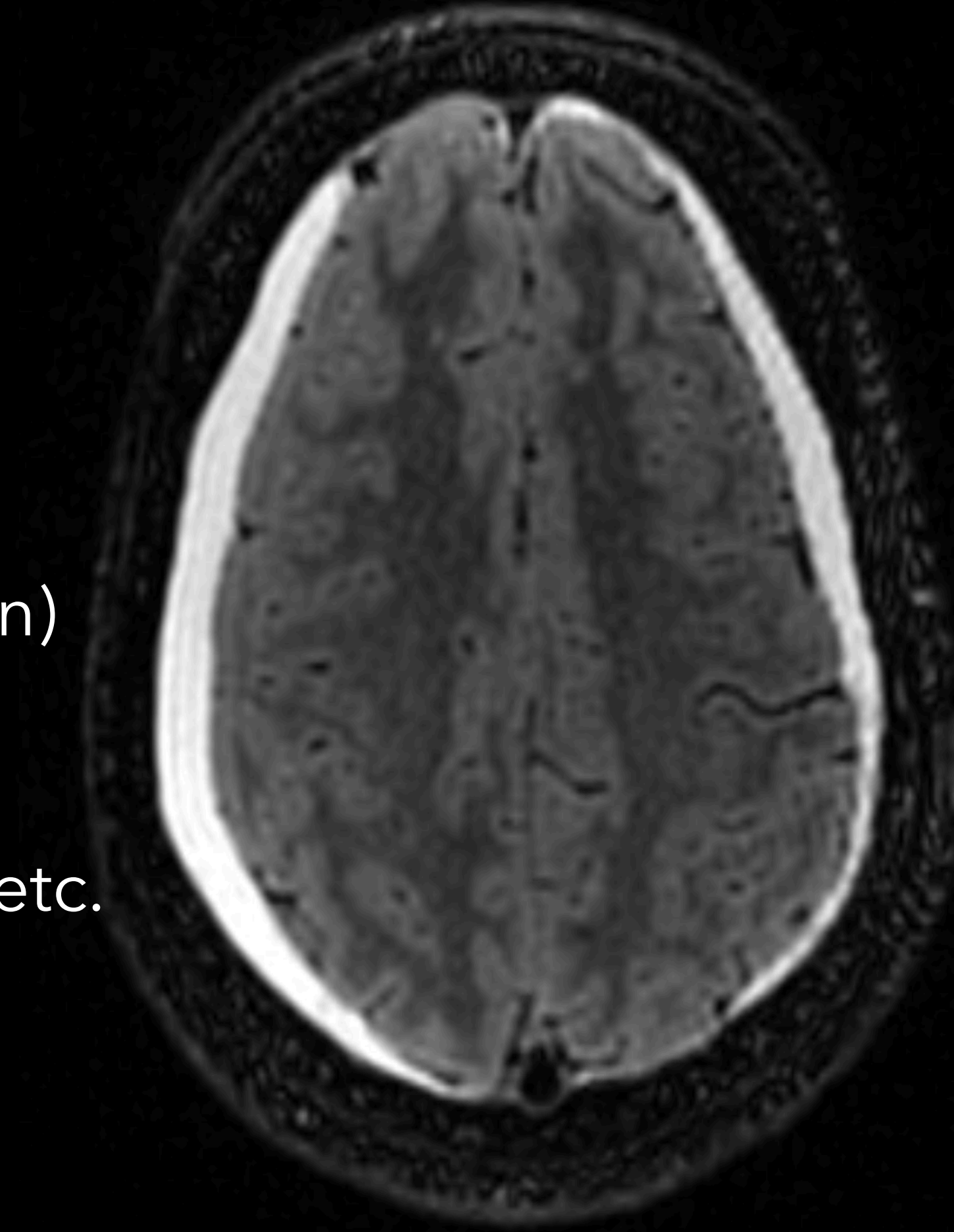
HALLAZGOS RM

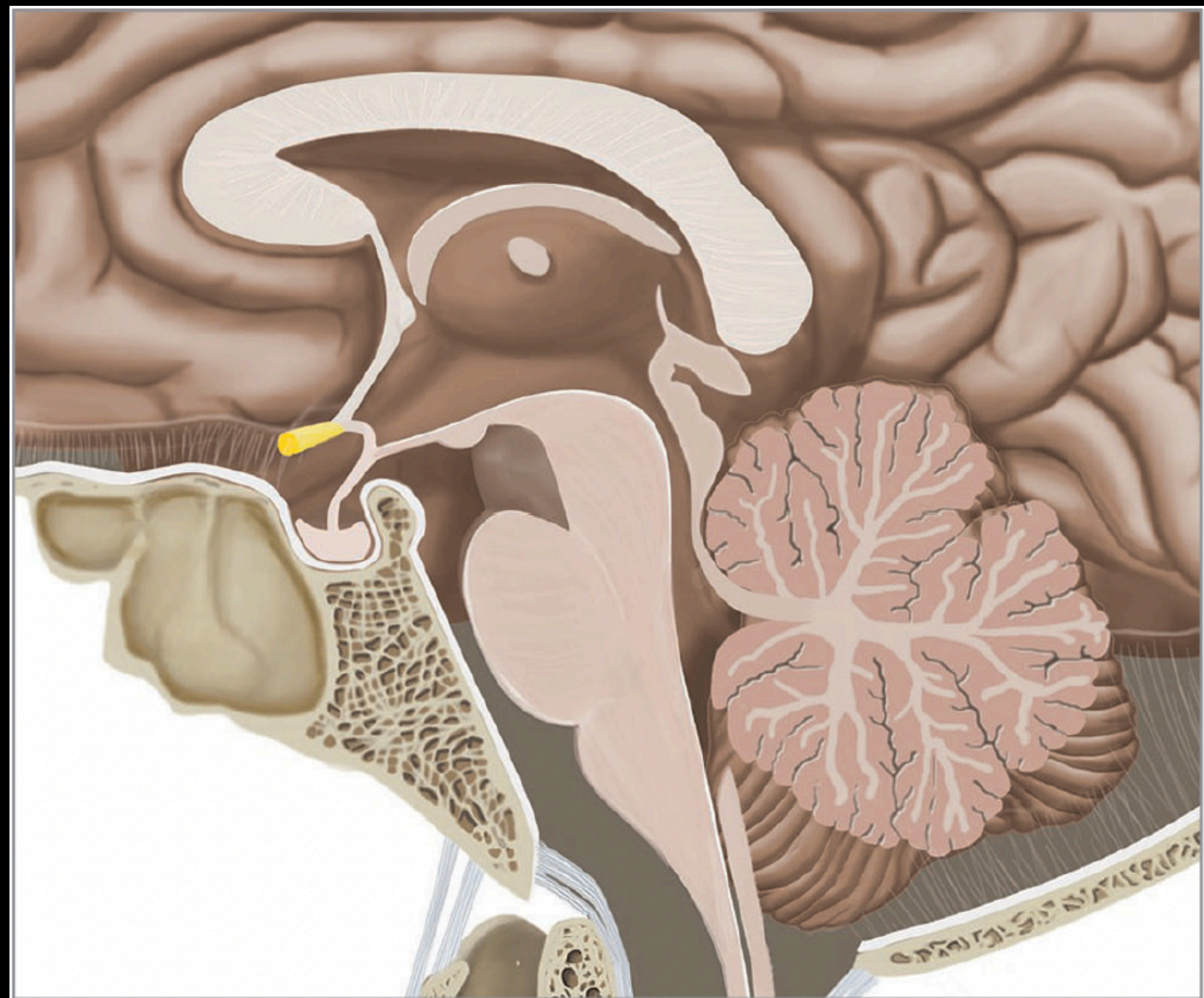
- Hipertintensidad y engrosamiento paquimeníngeo
- Engrosamiento / Congestion senos dures
- Pérdida de altura de cisterna supraselar
- Colapso de ventrículos laterales



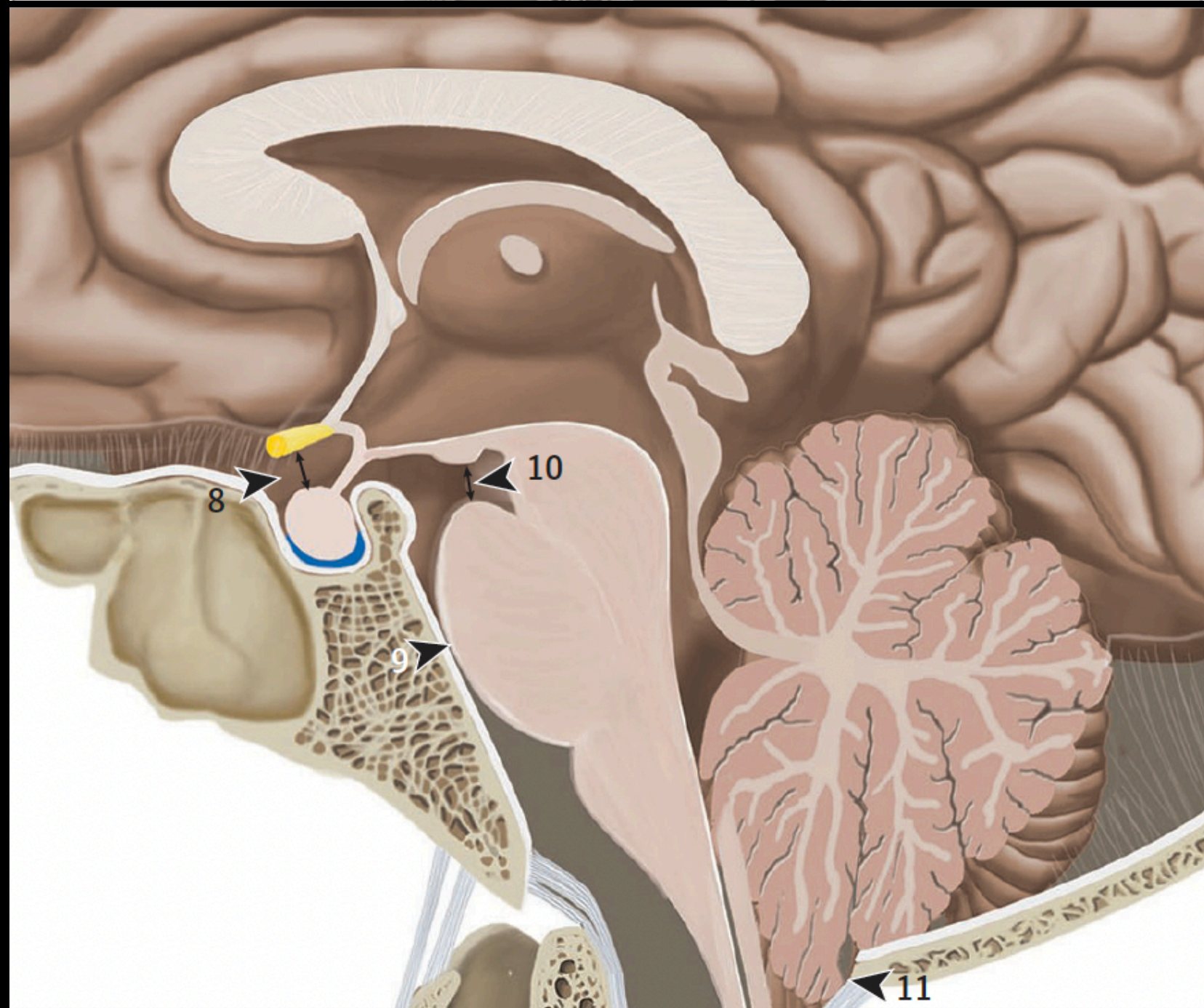
HALLAZGOS RM

- Hematomas subdurales / Higromas
- Hiperostosis craneal (larga evolución)
- Otros... (congestión/convexidad hipofisaria, siderosis superficial FP) etc.





Normal



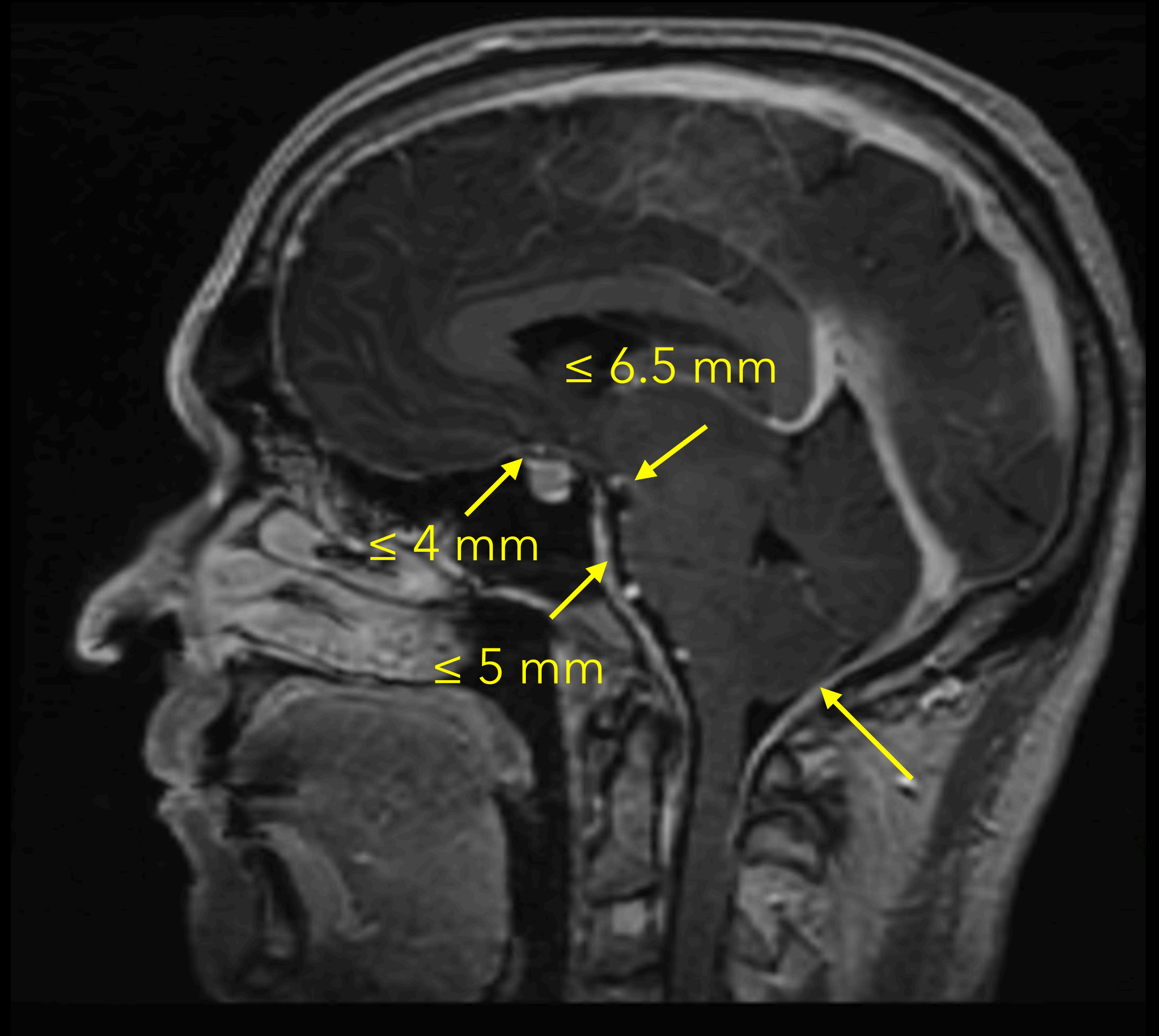
HIE

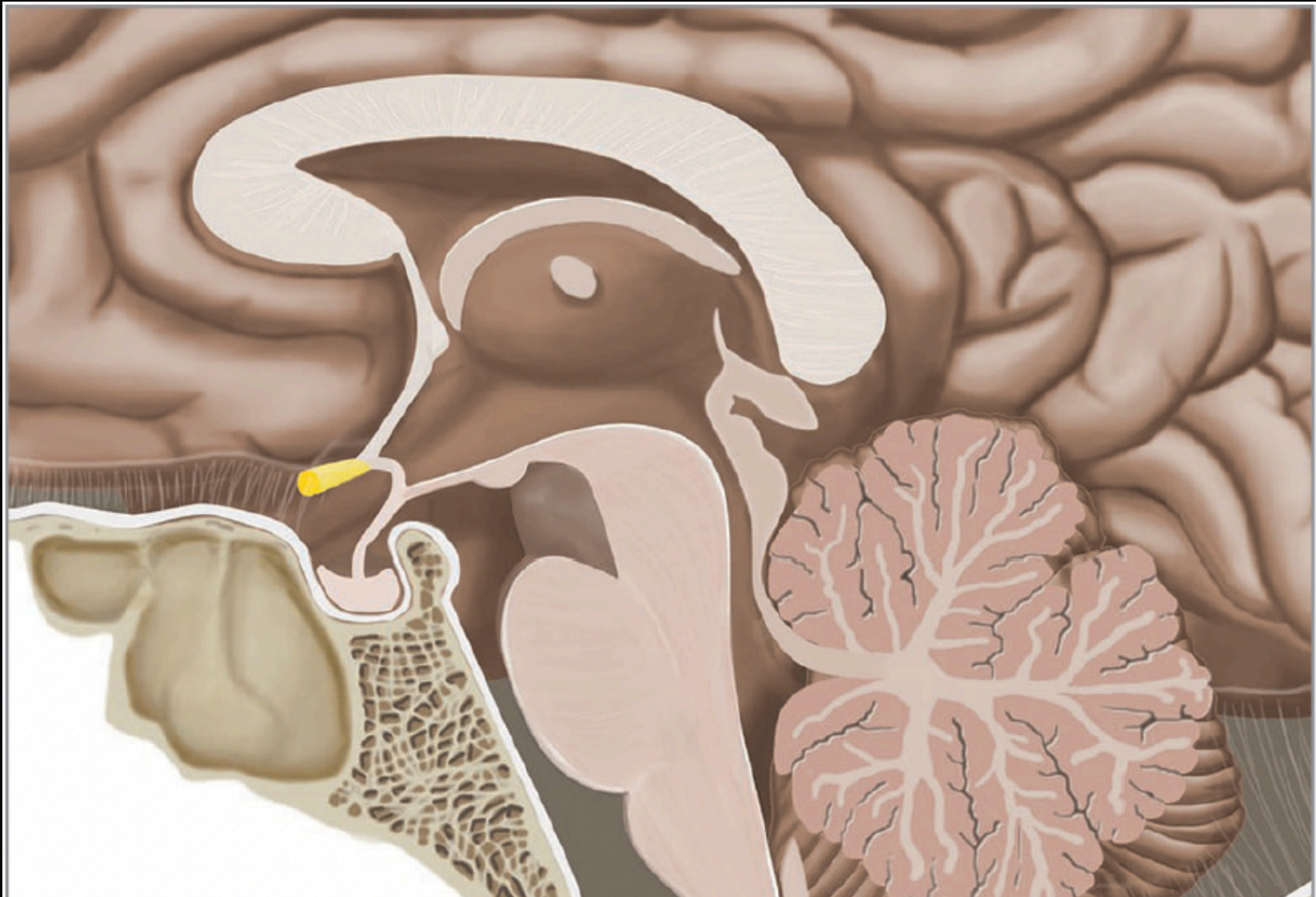
"BERN SCORE"

JAMA Neurology | Original Investigation

Assessing Spinal Cerebrospinal Fluid Leaks in Spontaneous Intracranial Hypotension With a Scoring System Based on Brain Magnetic Resonance Imaging Findings

Tomas Dobrocky, MD; Lorenz Grunder, MD; Philippe S. Breiding, MD; Mattia Branca, MSc; Andreas Limacher, PhD; Pascal J. Mosimann, MD; Pasquale Mordasini, MSc; Felix Zibold, MD; Levin Haeni, MD; Christopher M. Jesse, MD; Christian Fung, MD; Andreas Raabe, MD; Christian T. Ulrich, MD; Jan Gralla, MSc; Jürgen Beck, MD; Eike I. Piechowiak, MD

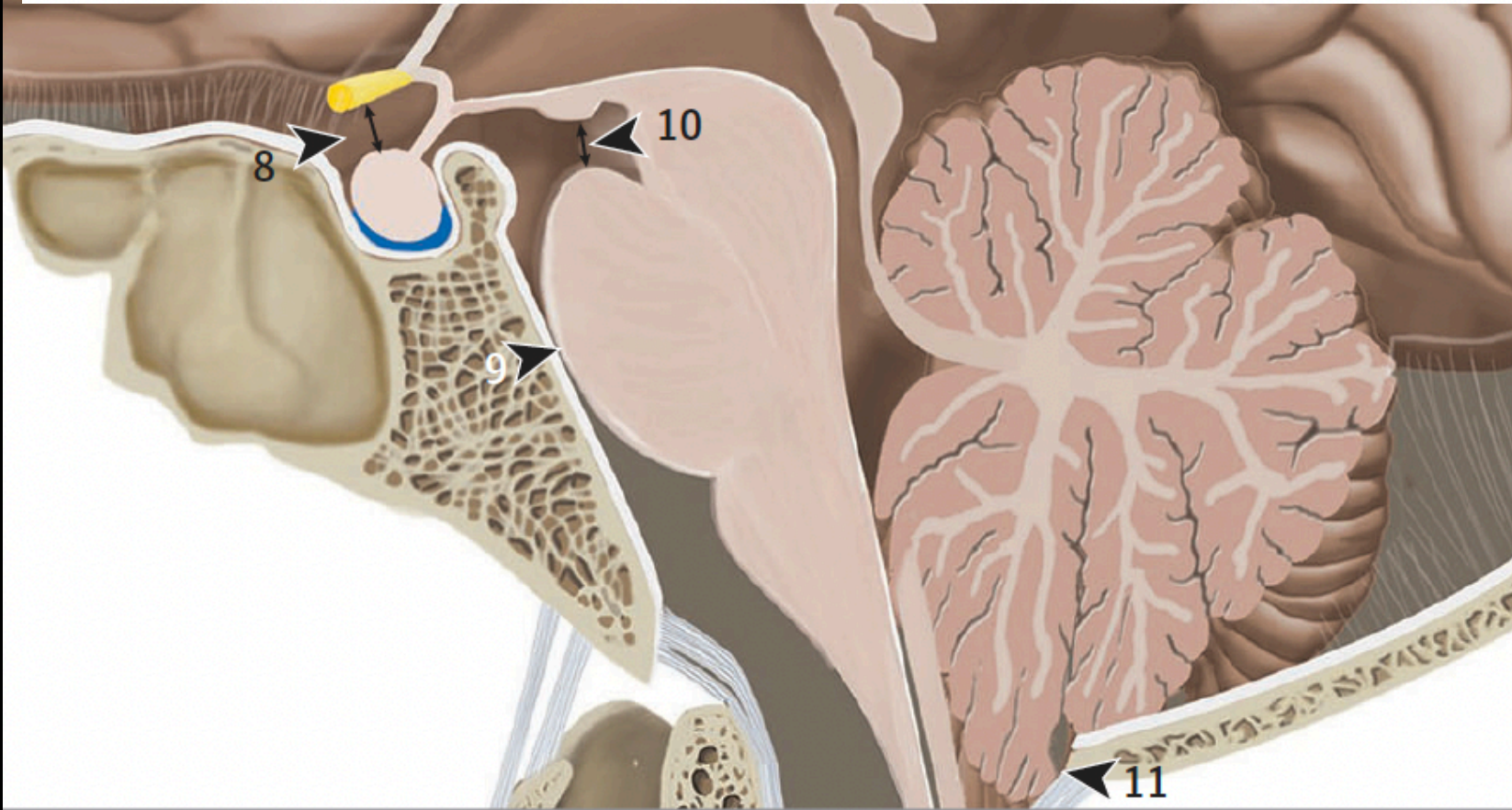




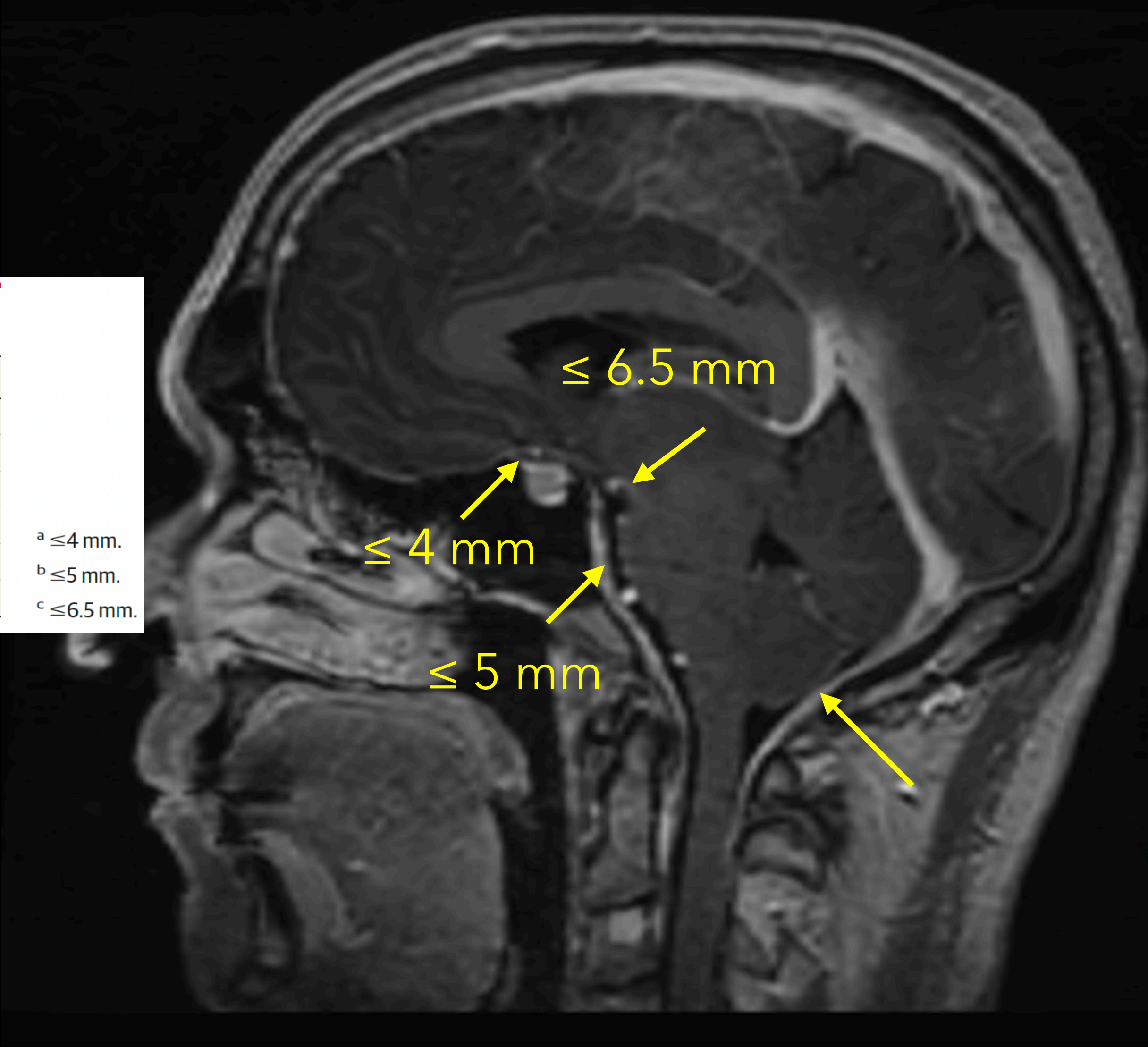
Normal

Table 2. Six Imaging Signs With Good Discriminative Power and Interrater Agreement That Were Included in the Final Diagnostic Score and Assigned Score Points

Characteristic	Coefficient (95% CI)	Odds Ratio (95% CI)	P Value	Score Points
Engorgement venous sinus	2.95 (1.18-4.72)	19.12 (3.26-112.30)	.001	2
Pachymeningeal enhancement	4.04 (2.50-5.59)	57.01 (12.18-266.78)	<.001	2
Subdural fluid collection	1.54 (-0.10 to 3.17)	4.65 (0.90-23.92)	.07	1
Suprasellar cistern ^a	3.48 (2.36-4.60)	32.32 (10.55-99.02)	<.001	2
Prepontine cistern ^b	1.47 (0.41-2.52)	4.34 (1.51-12.47)	.007	1
Mamillopontine distance ^c	1.13 (0.07-2.19)	3.08 (1.07-8.90)	.04	1

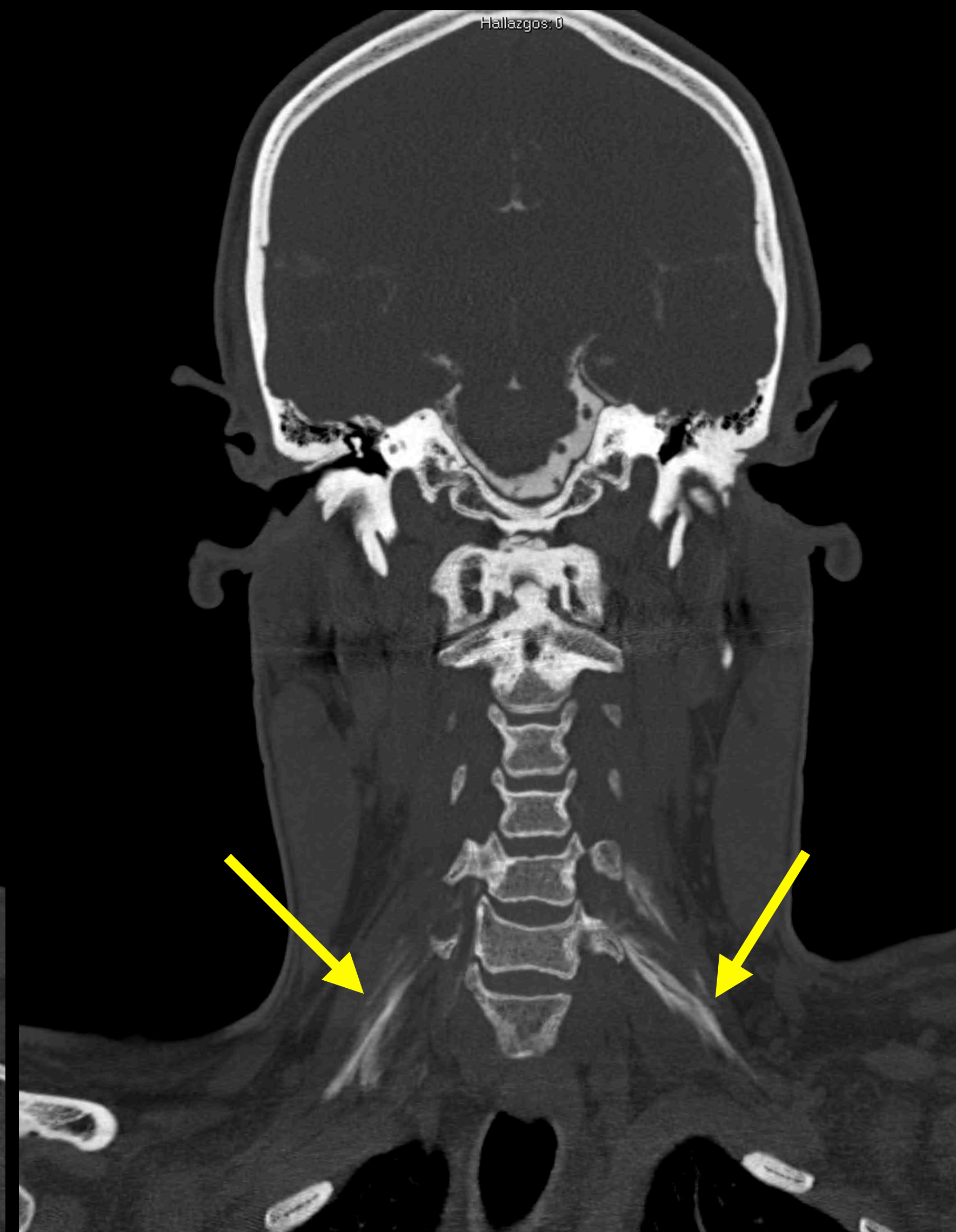


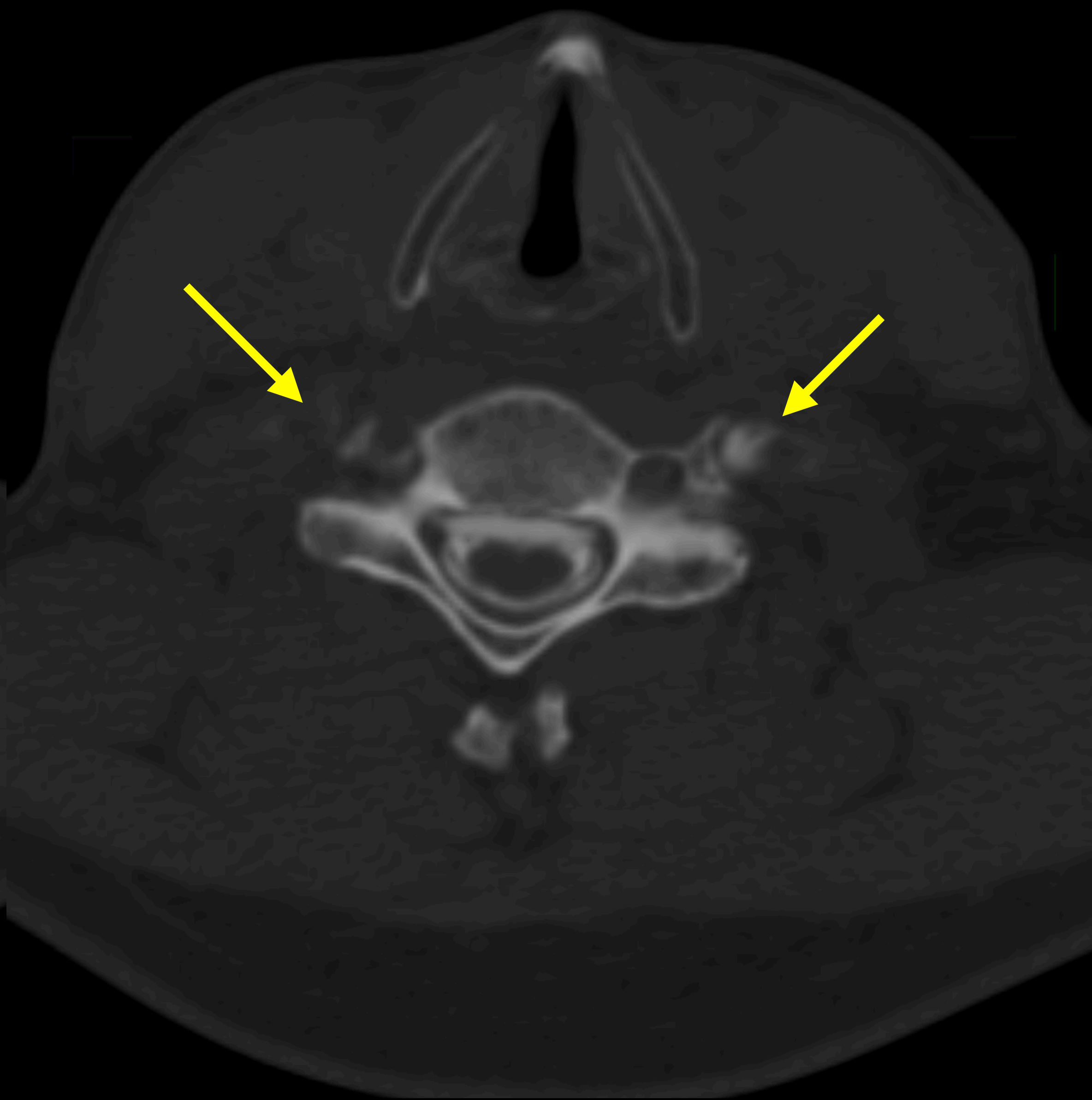
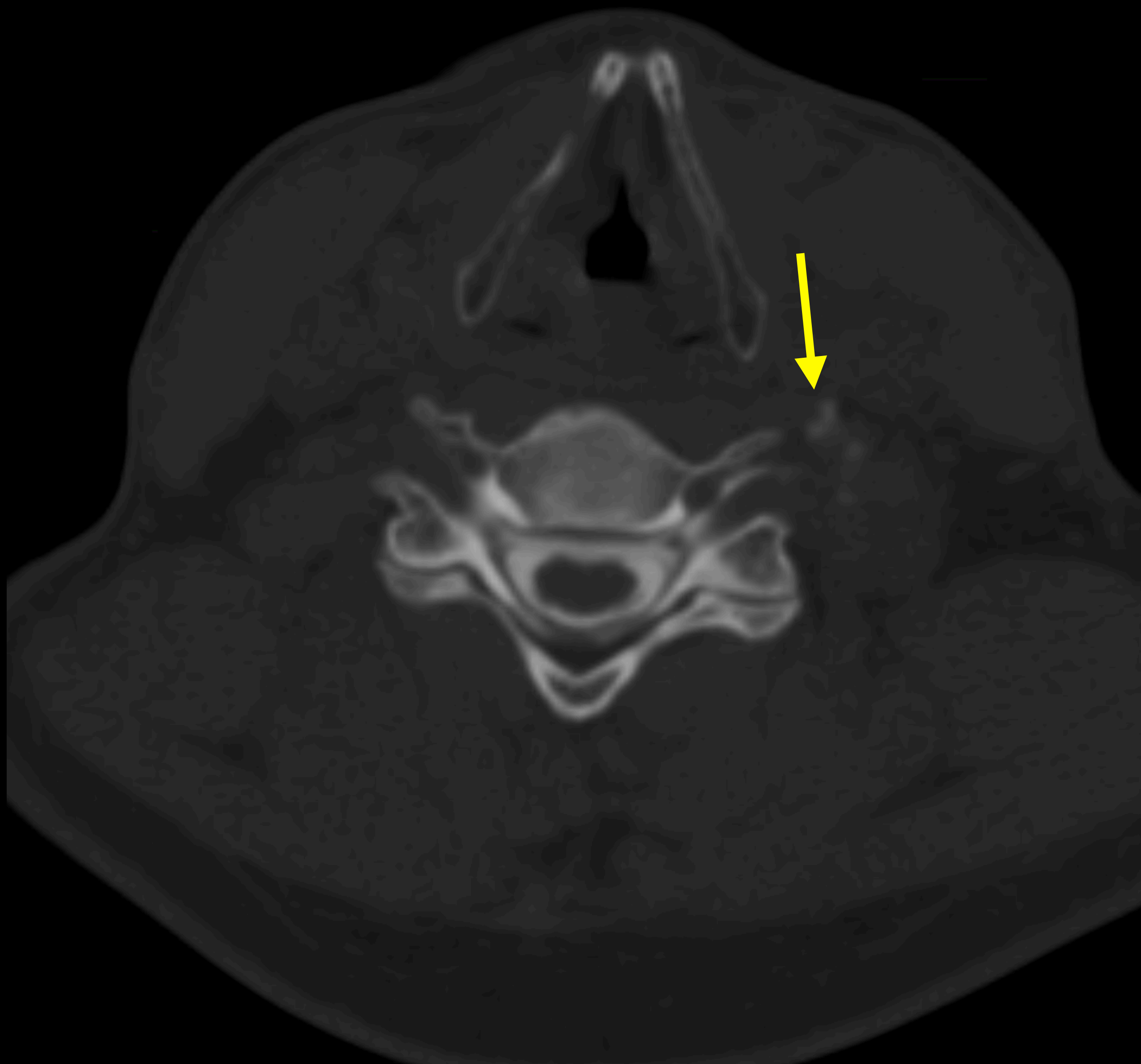
HIE



* Hombre 45 años

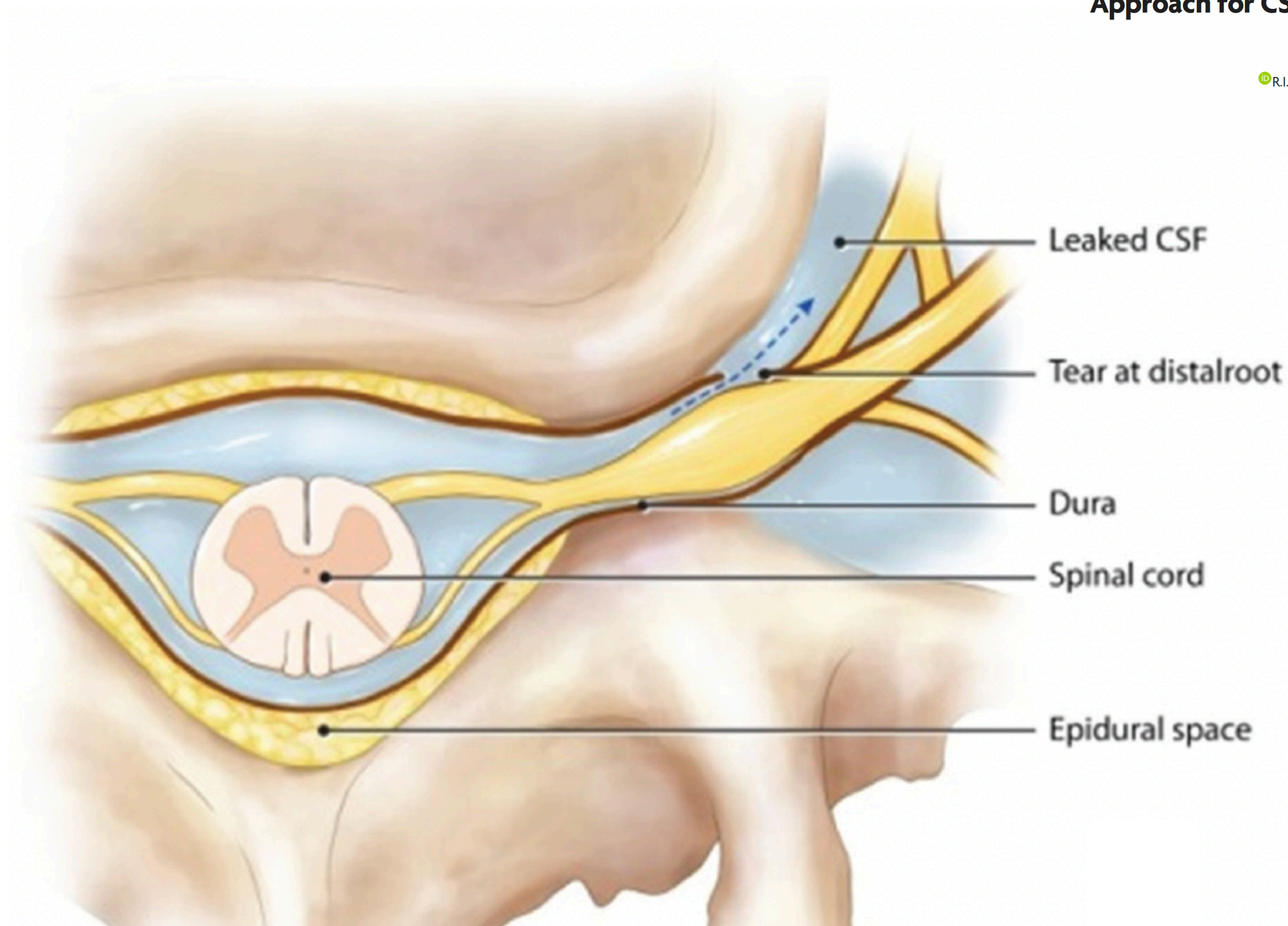
* Antecedente de cefaleas leves que empeoran de forma súbita y con patrón ortostático claro después de infección por covid





Spontaneous Intracranial Hypotension: A Systematic Imaging Approach for CSF Leak Localization and Management Based on MRI and Digital Subtraction Myelography

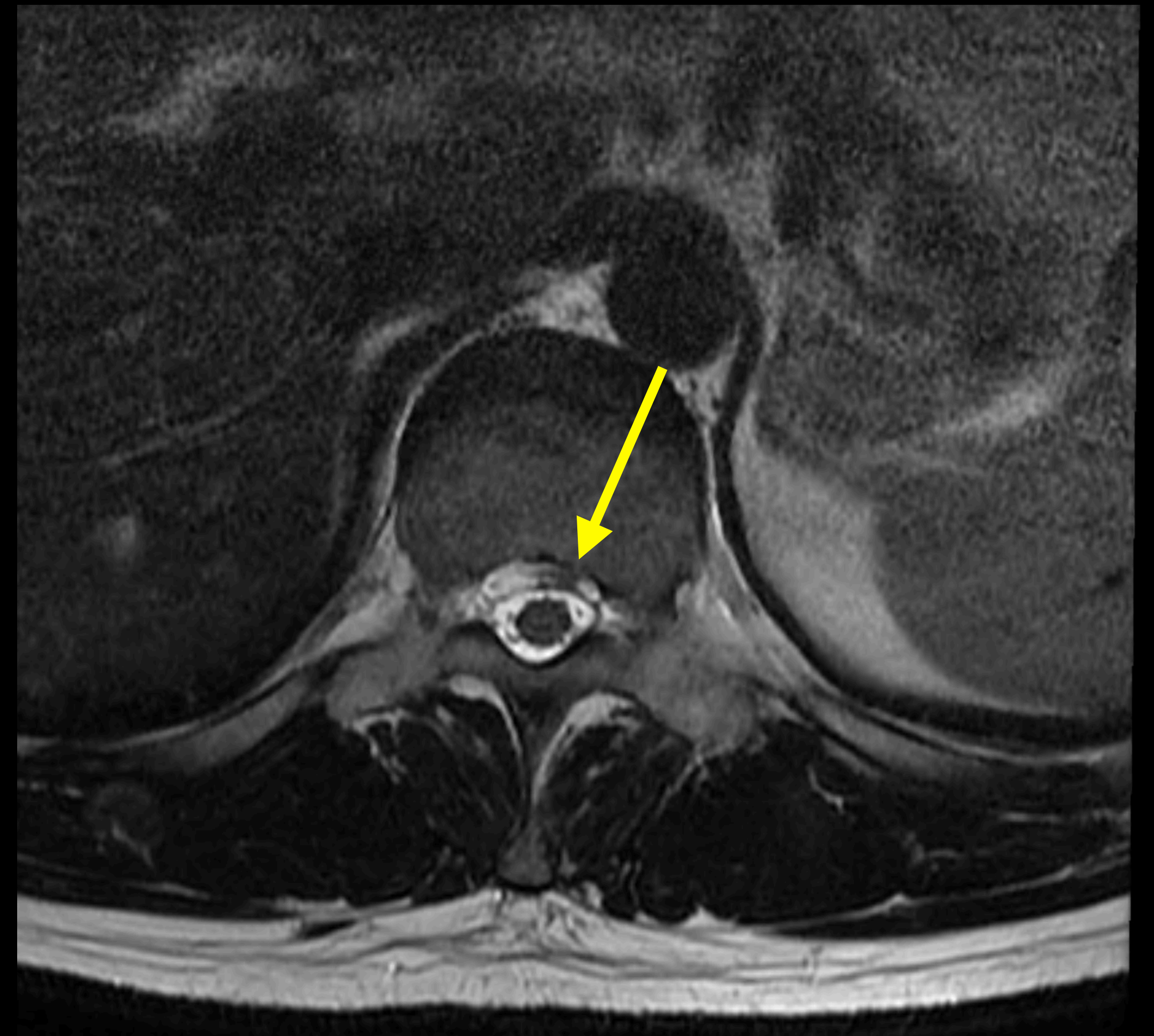
^{ID}R.I. Farb, ^{ID}P.J. Nicholson, ^{ID}P.W. Peng, ^{ID}E.M. Massicotte, ^{ID}C. Lay, ^{ID}T. Krings, and ^{ID}K.G. terBrugge

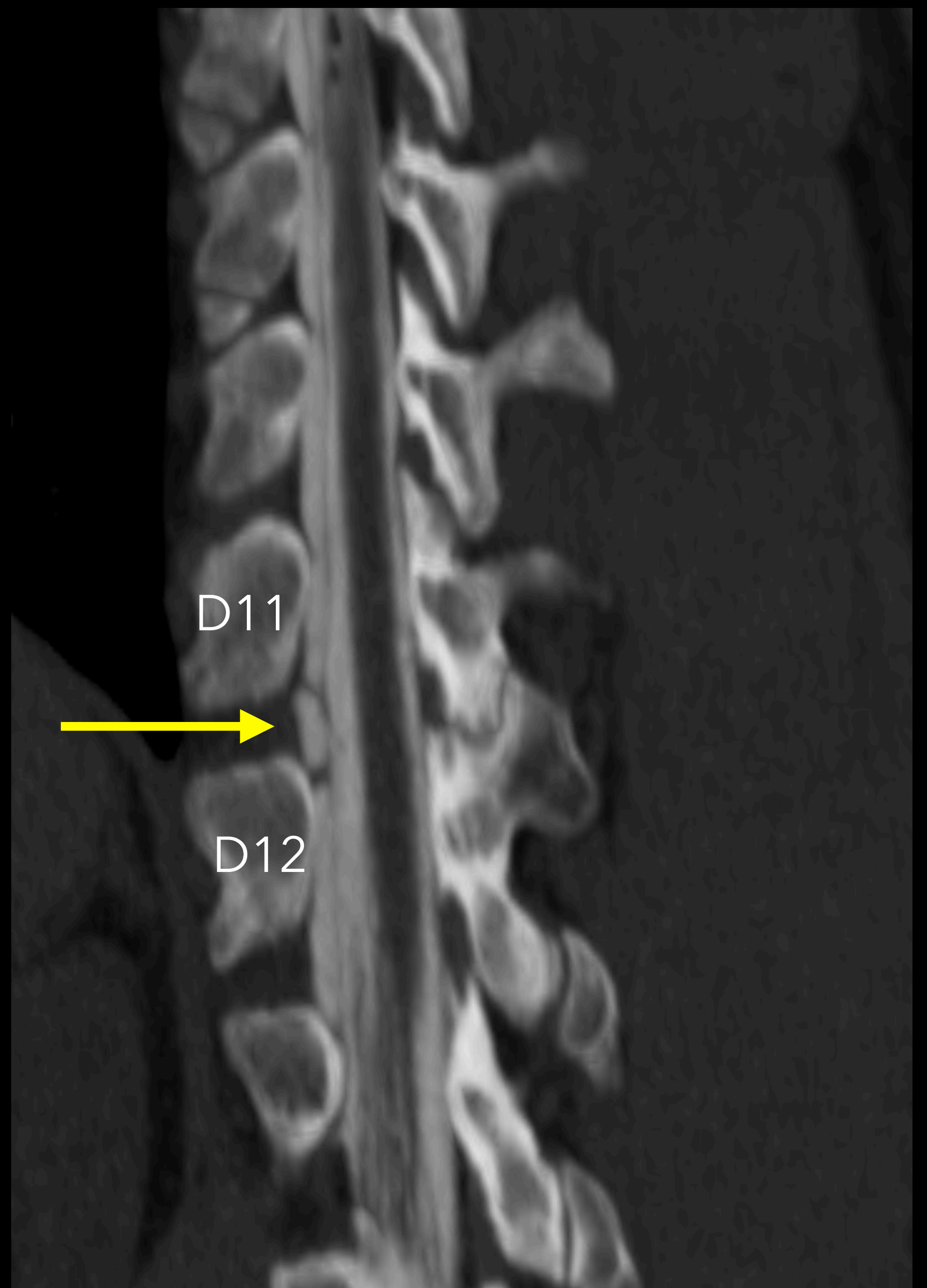
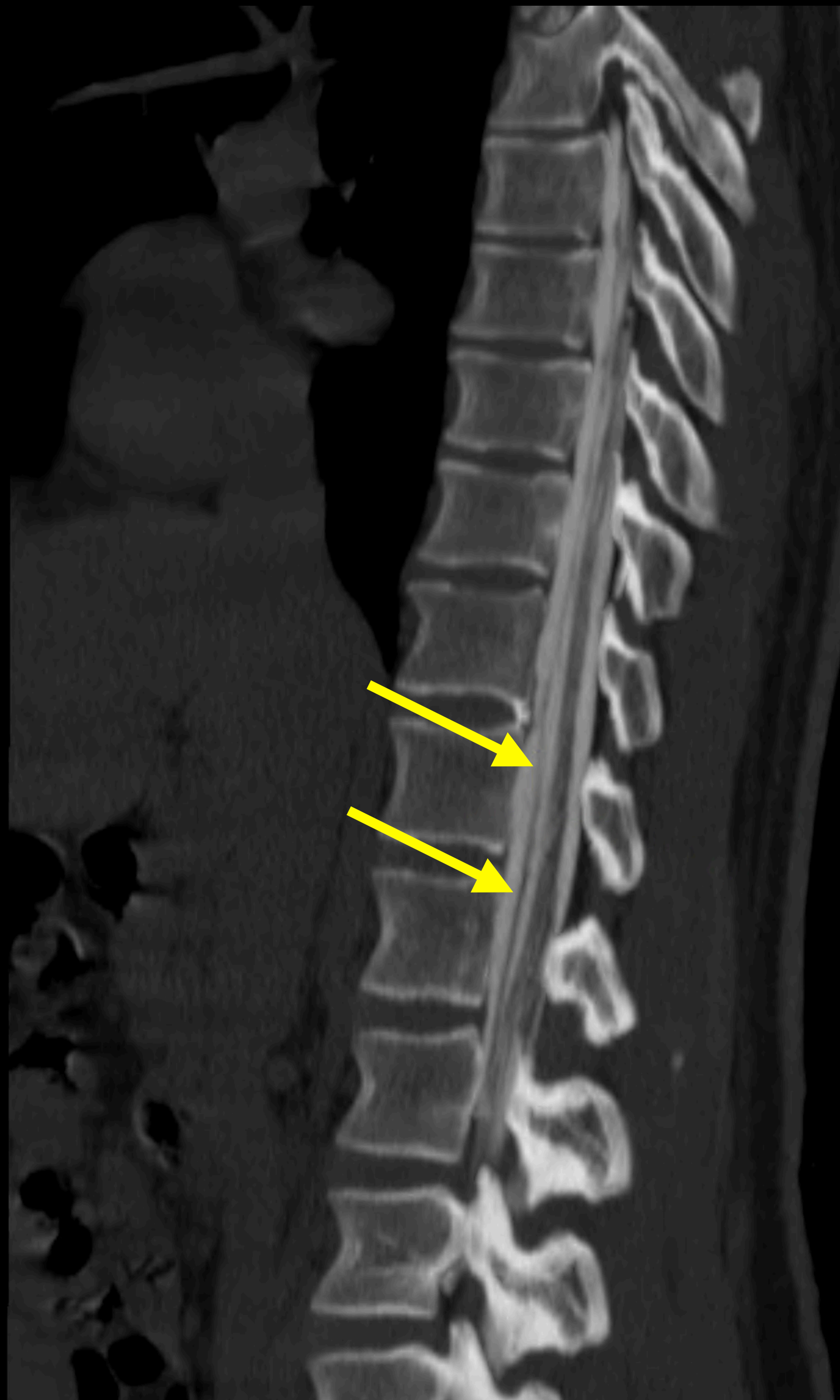


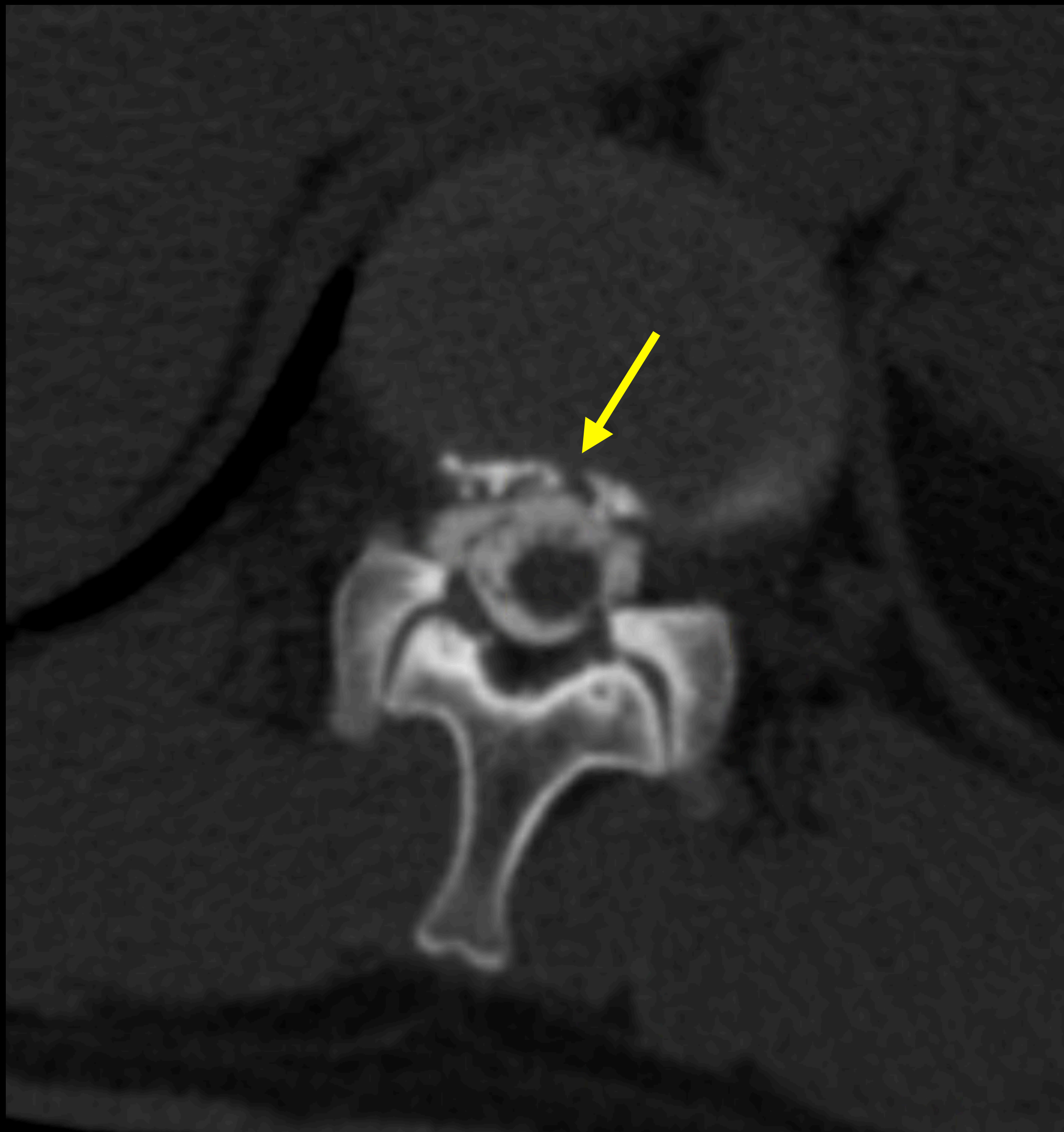


* Hombre 35 años. Jardinero

* Dolor dorsal. Evolución a Cefalea
ortostática

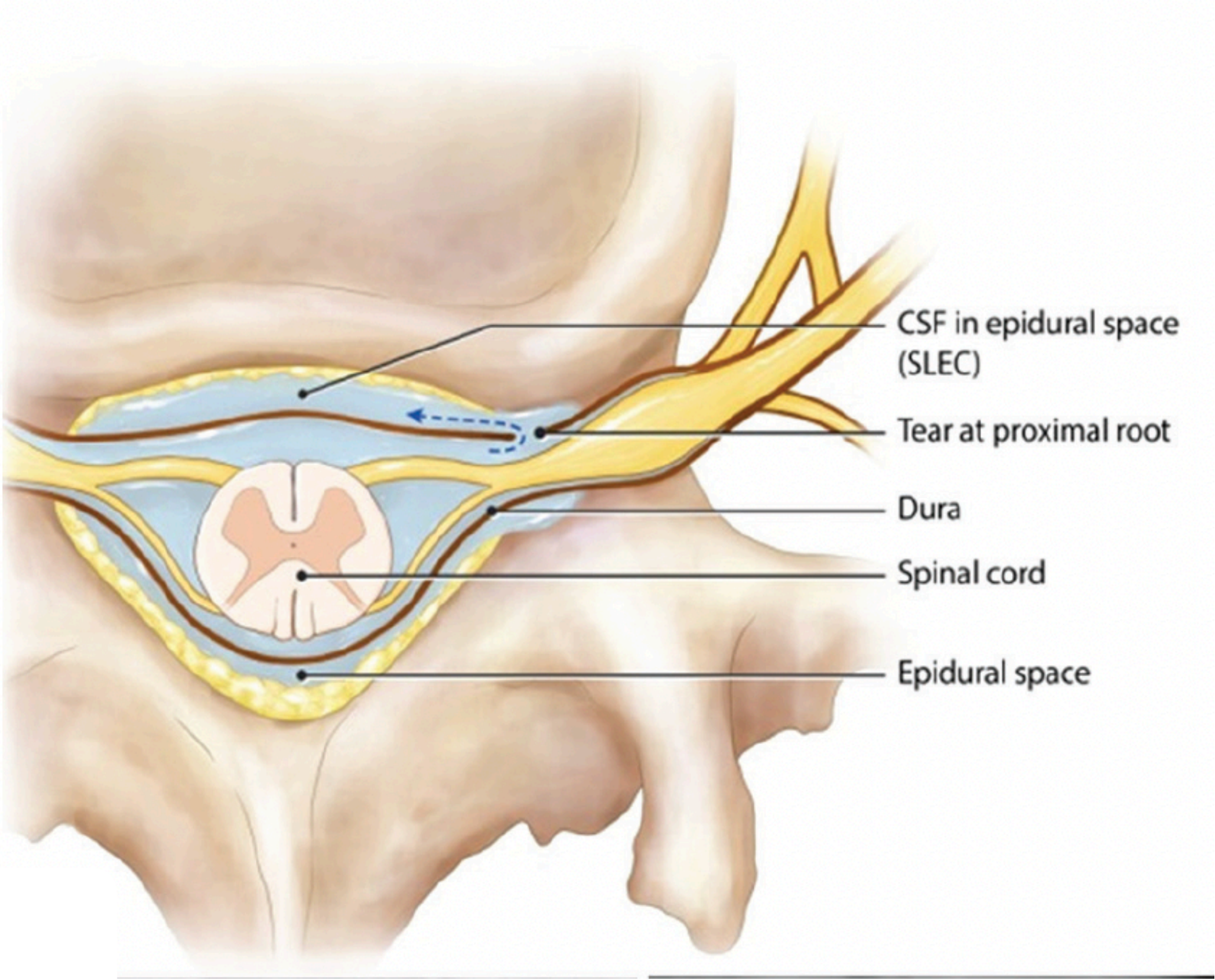
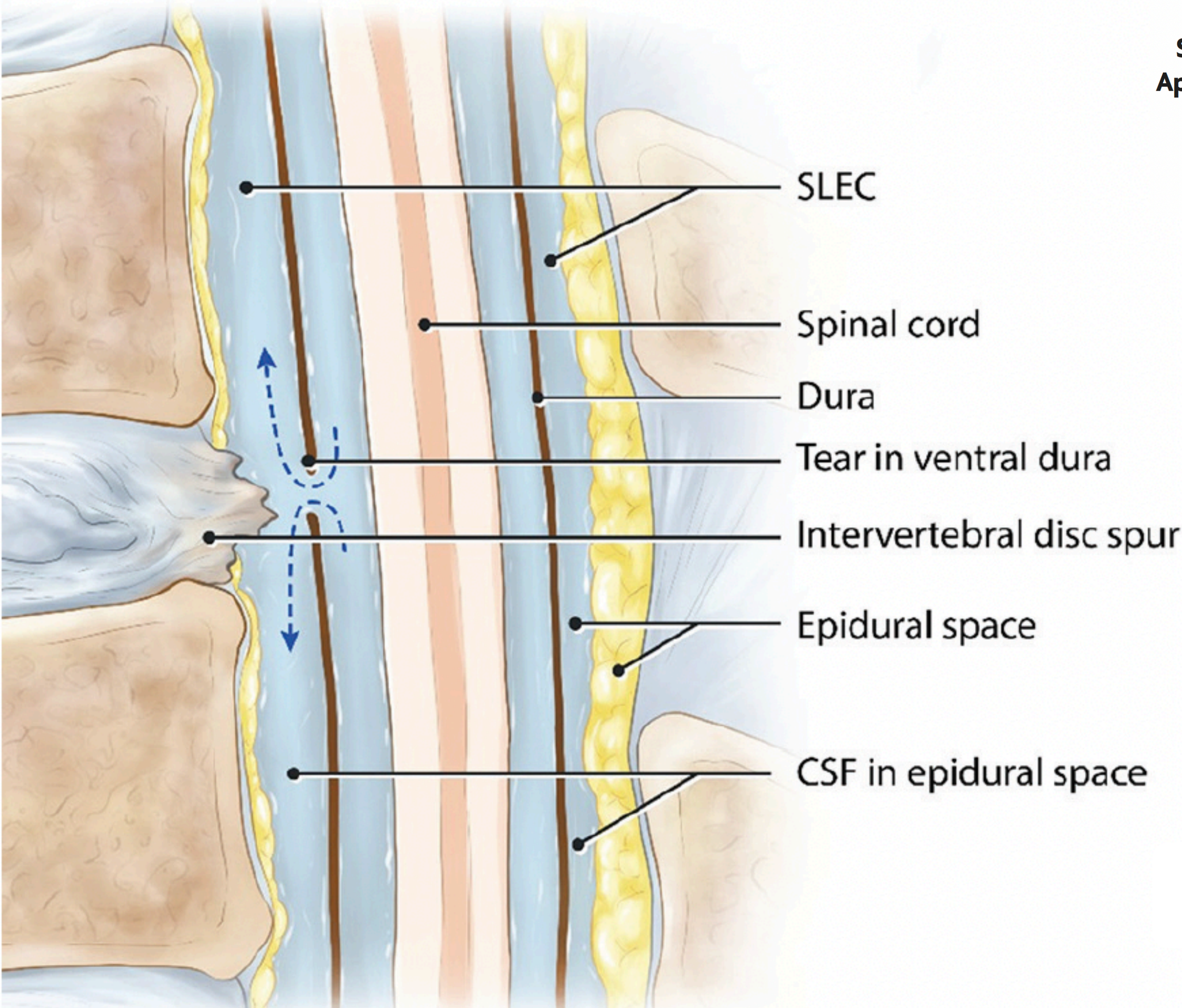






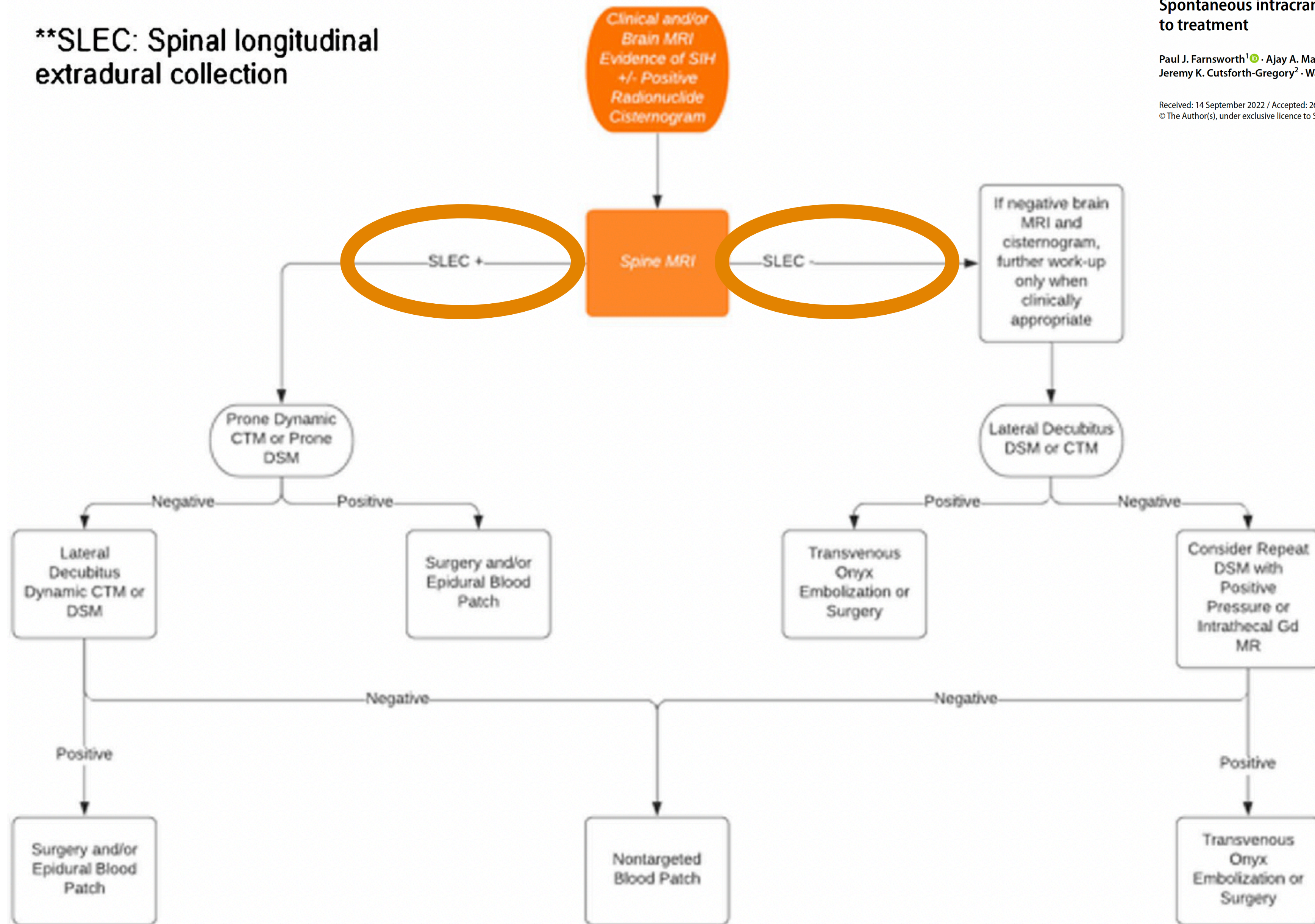
Spontaneous Intracranial Hypotension: A Systematic Imaging Approach for CSF Leak Localization and Management Based on MRI and Digital Subtraction Myelography

R.I. Farb, P.J. Nicholson, P.W. Peng, E.M. Massicotte, C. Lay, T. Krings, and K.G. terBrugge



ALGORITMO DIAGNÓSTICO

****SLEC: Spinal longitudinal extradural collection**



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FIG. 1. Frequency of CSF-venous fistulas according to spinal level. The view is from the back as it is on DSM, and the right side is on the right. Figure is available in color online only.

MIELOGRAFÍA CON CT Y RM

- Localización de la fuga con RM con gadolinio (FUERA DE FICHA TECNICA) con P positiva: 14 %
- Hiperdensidad de vena paraespinal con CT: 7 %

Clin Neuroradiol
<https://doi.org/10.1007/s00062-021-01060-y>

ORIGINAL ARTICLE



Diagnostic Yield of Intrathecal Gadolinium MR Myelography for CSF Leak Localization

Ajay A. Madhavan¹ · Carrie M. Carr¹ · John C. Benson¹ · Waleed Brinjikji¹ · Felix E. Diehn¹ · Dong Kun Kim¹ · Vance T. Lehman¹ · Greta B. Liebo¹ · Pearse P. Morris¹ · Darya P. Shlapak¹ · Jared T. Verdoorn¹ · Jonathan M. Morris¹

Received: 27 February 2021 / Accepted: 23 June 2021
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Protocolo habitual: 0,5 ml
Magnevist + 12-15 ml iohexol
180 (MRM + CTM + repetición)

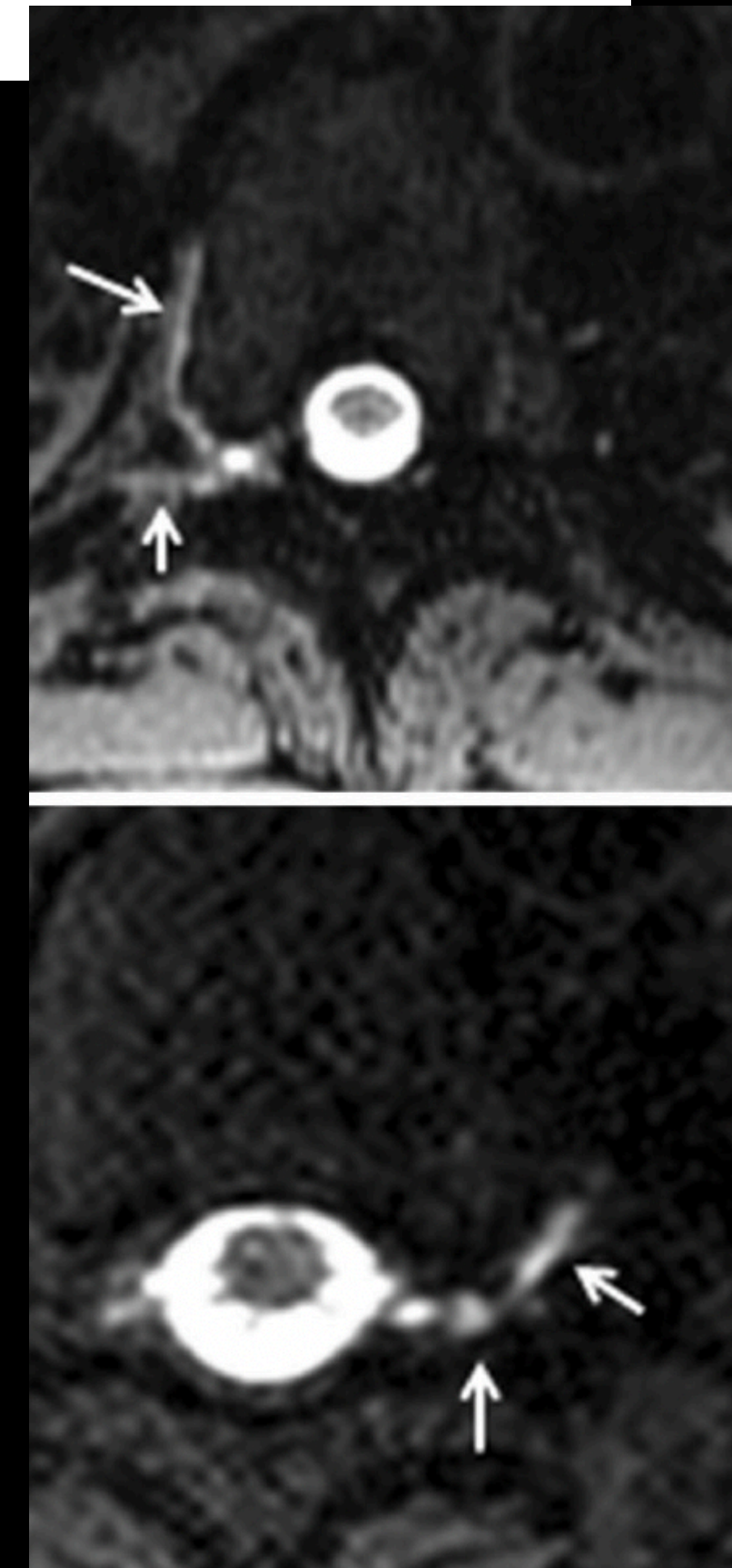
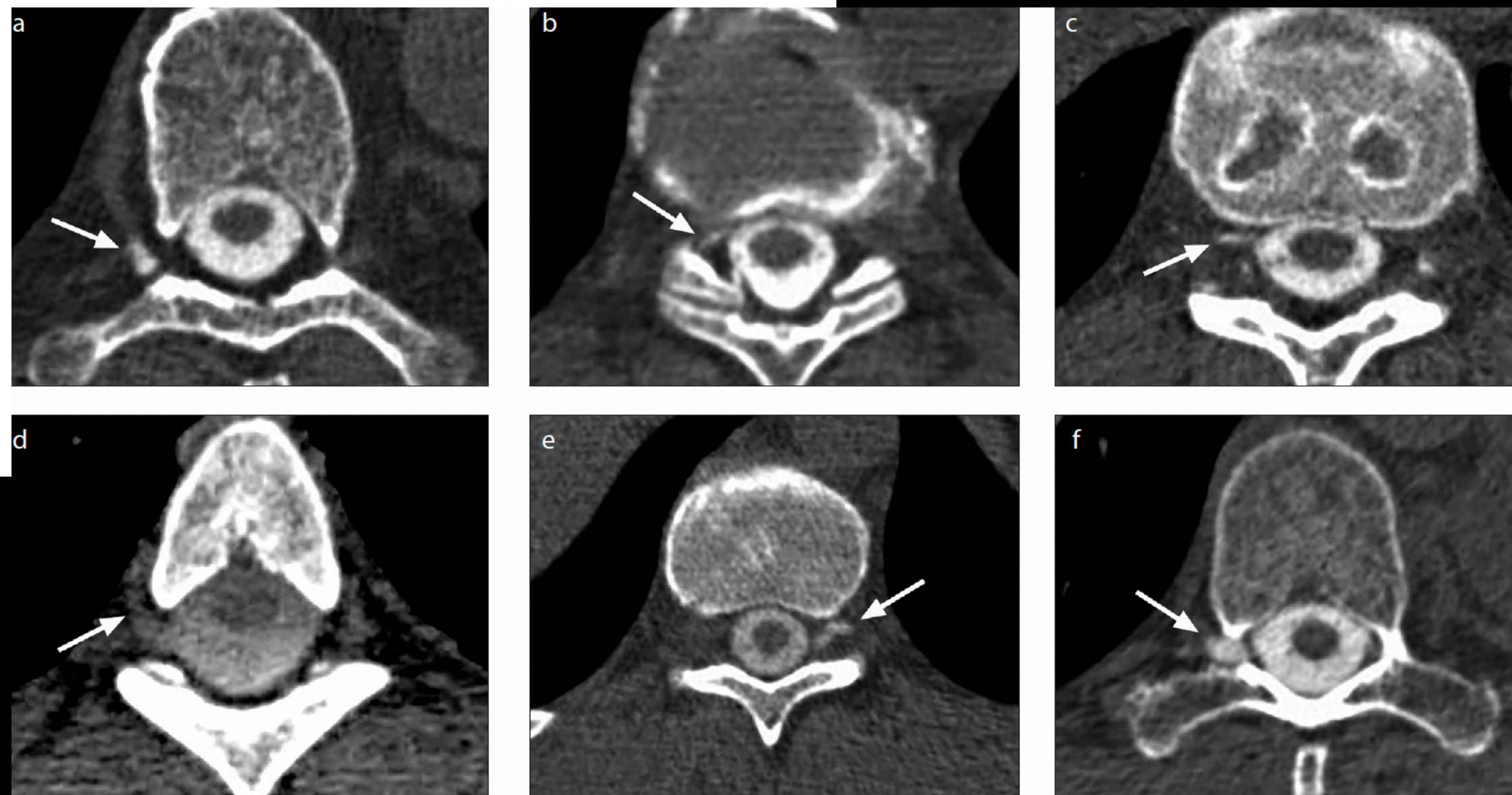
DIR

Diagn Interv Radiol 2018; 24: 54–59
© Turkish Society of Radiology 2018

NEURORADIOLOGY
ORIGINAL ARTICLE

Prevalence of hyperdense paraspinal vein sign in patients with spontaneous intracranial hypotension without dural CSF leak on standard CT myelography

Michael S. Clark¹ ·
Felix E. Diehn¹ ·
Jared T. Verdoorn¹ ·
Vance T. Lehman¹ ·
Greta B. Liebo¹ ·
Jonathan M. Morris¹ ·
Kent R. Thielen¹ ·
John T. Wald¹ ·
Neeraj Kumar¹ ·
Patrick H. Luetmer¹

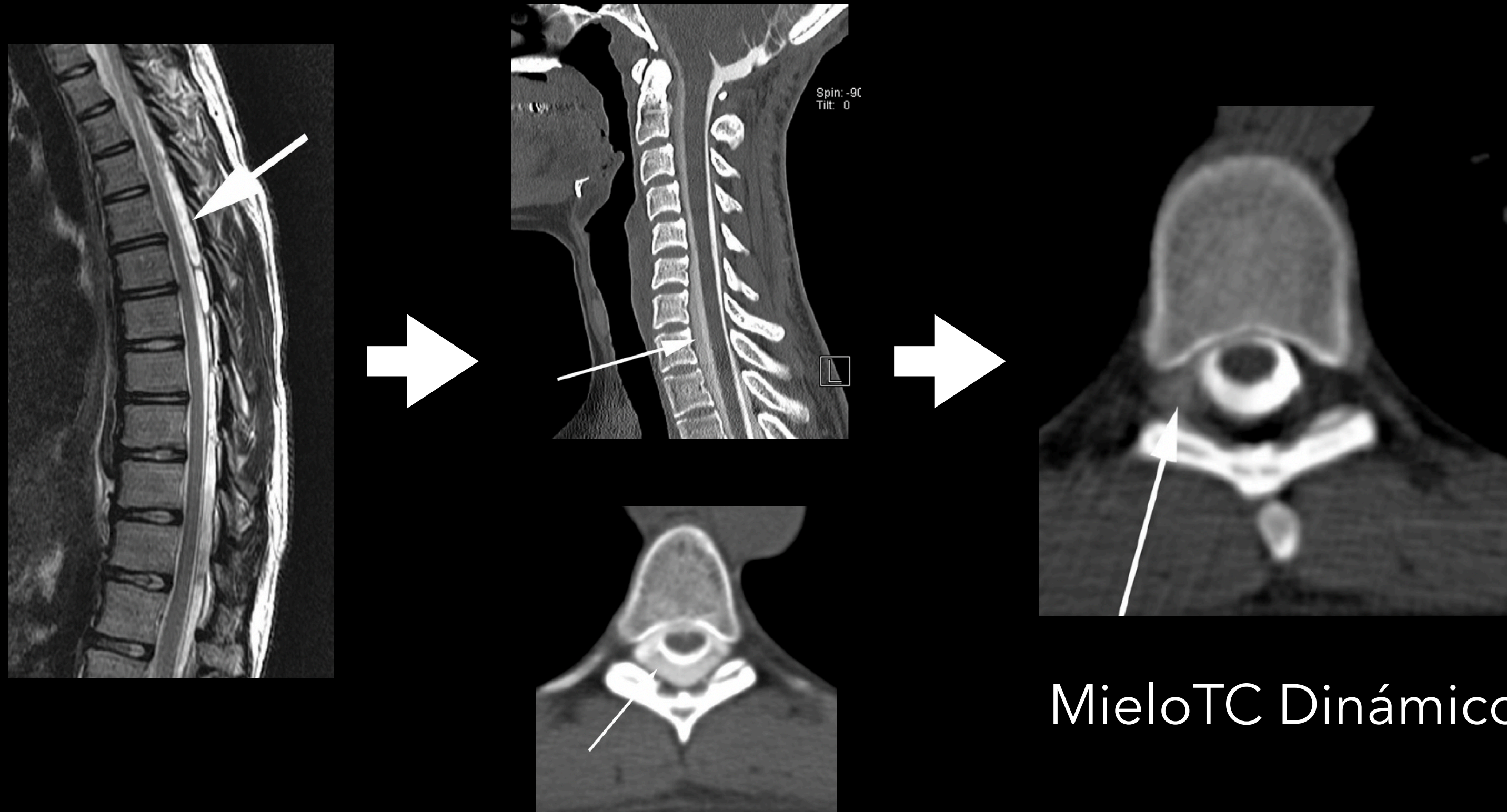


MIELOGRAFÍA CON CT DINÁMICO

AJNR

**When Should I Do Dynamic CT
Myelography? Predicting Fast Spinal CSF
Leaks in Patients with Spontaneous
Intracranial Hypotension**

P.H. Luetmer, K.M. Schwartz, L.J. Eckel, C.H. Hunt, R.E.
Carter and F.E. Diehn



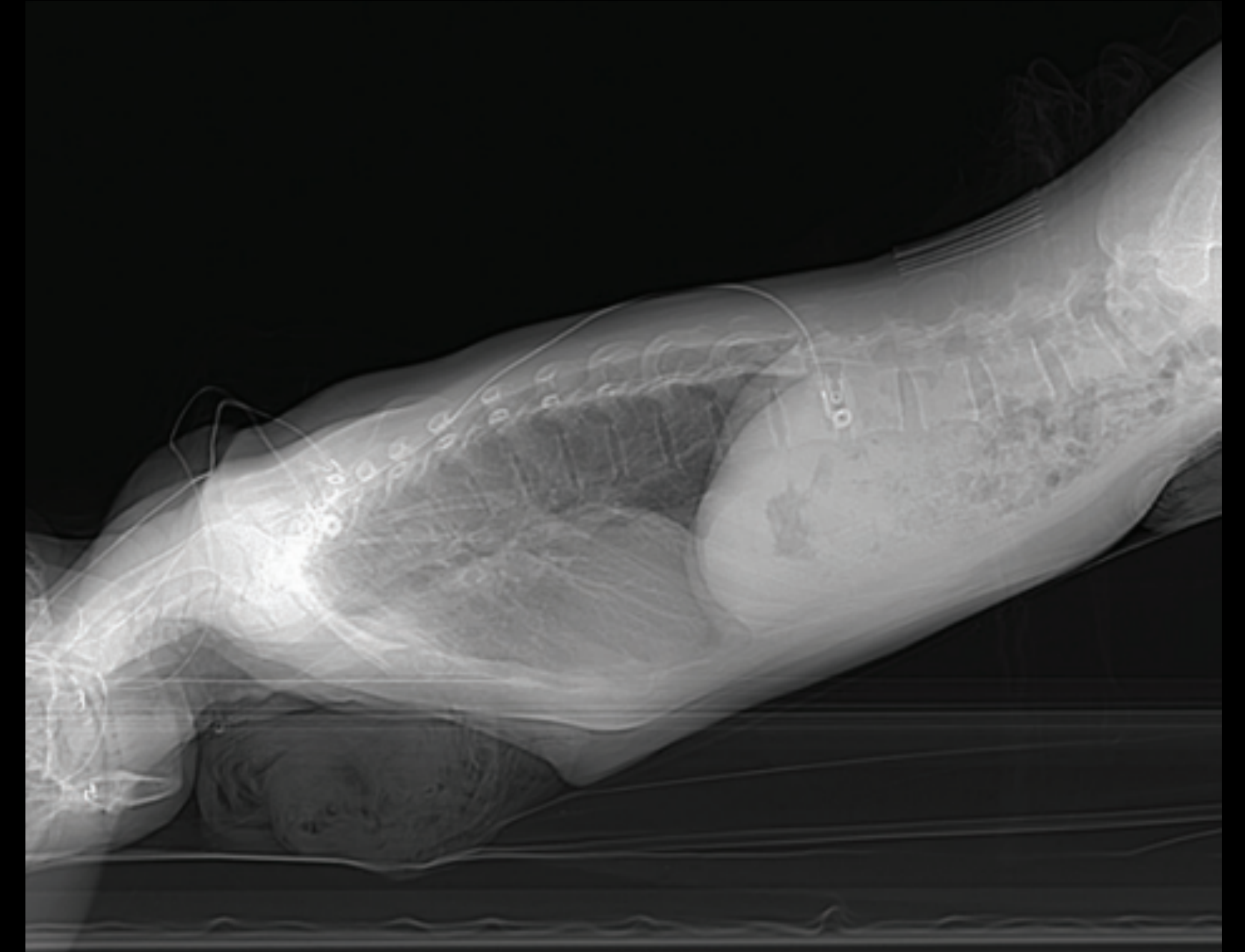
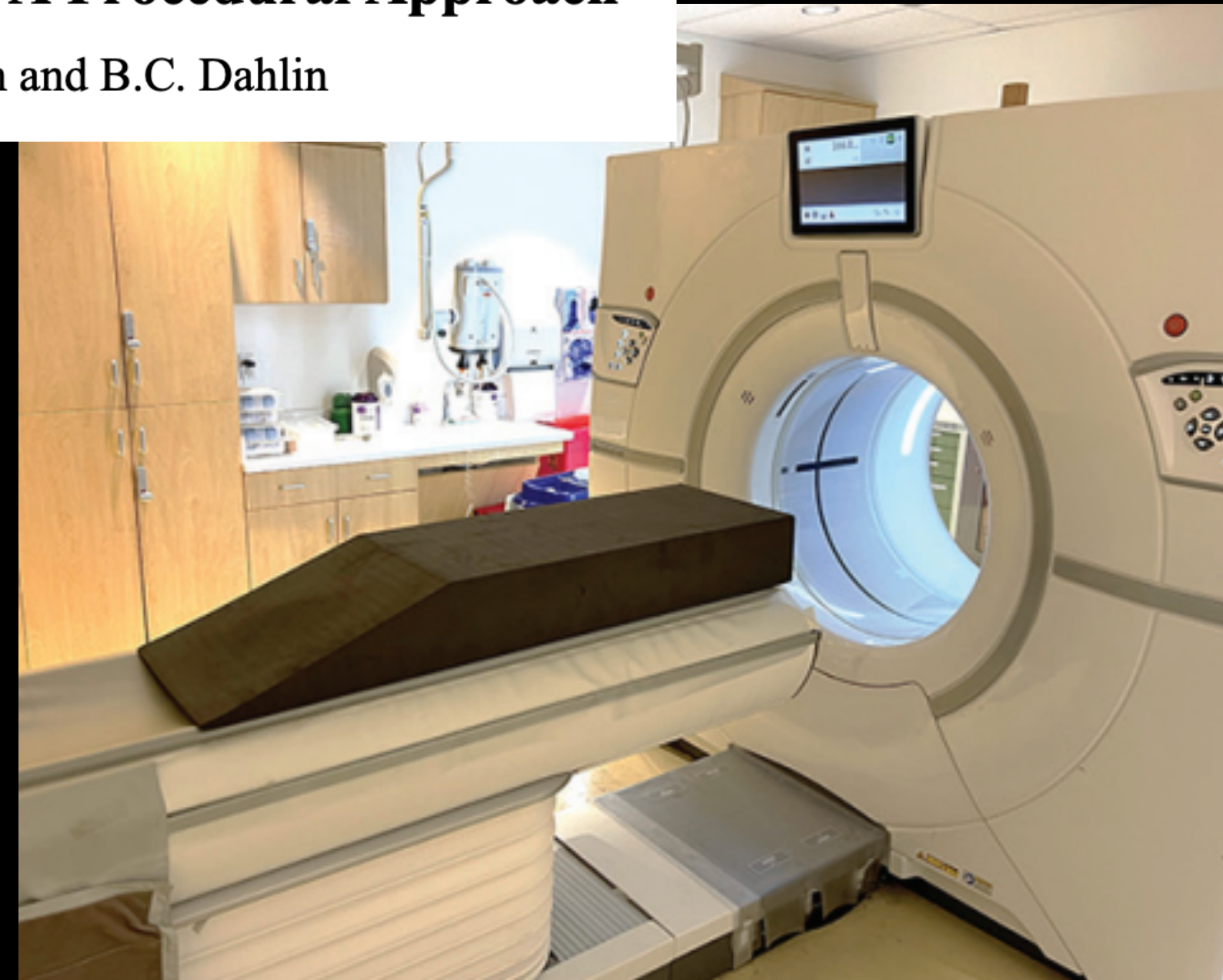
- NO correlación RM cráneo-fugas alto flujo (20% pacientes con HIE)
- Colección extradural en RM columna → Mielo TC dinámico
- Reducido beneficio en adquisiciones tardías (3-4 horas)

MieloTC Dinámico

AJNR

Modified Dynamic CT Myelography for Type 1 and 2 CSF Leaks: A Procedural Approach

M.D. Mamlouk, P.Y. Shen and B.C. Dahlin

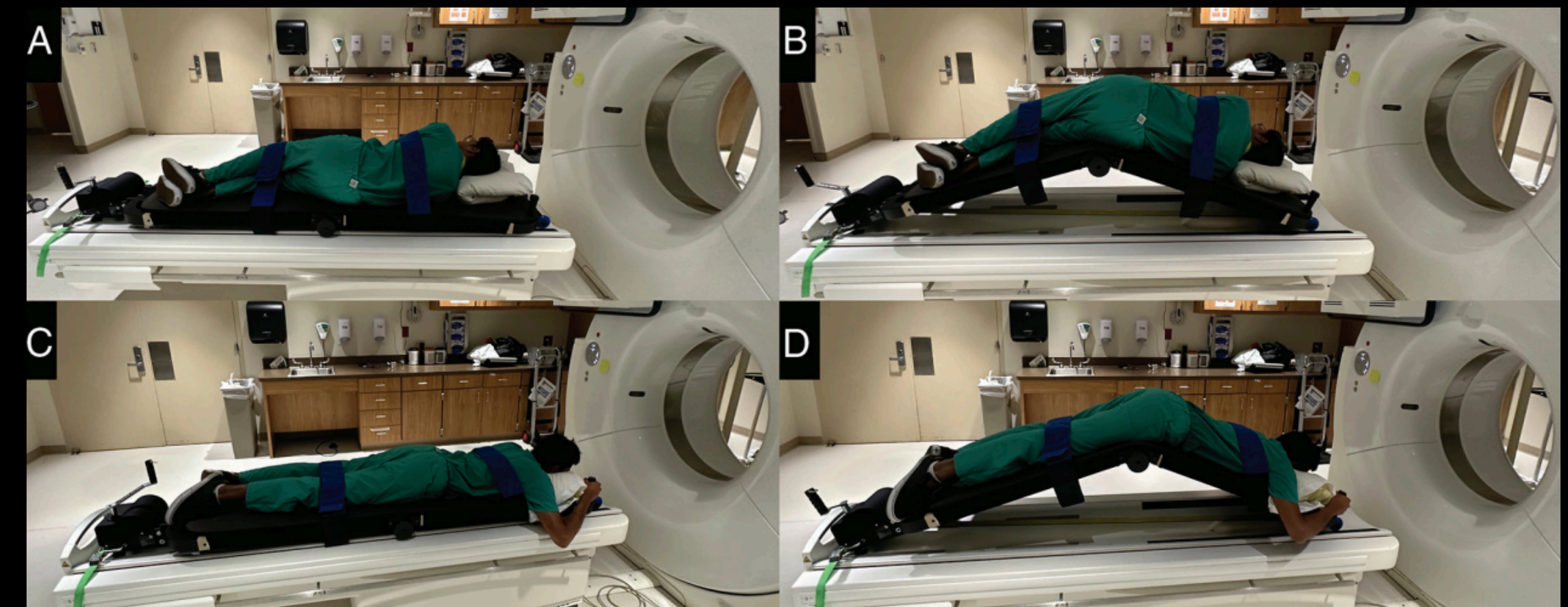
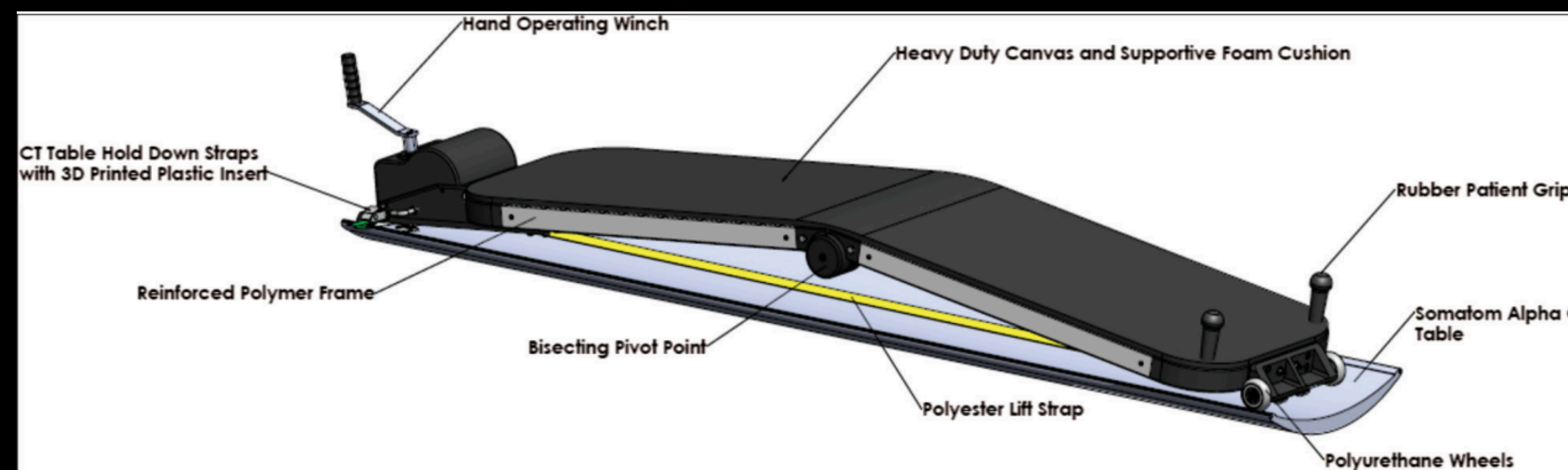


AJNR

A Novel Patient-Positioning Device for Dynamic CT Myelography

Andrew L. Callen, Rich Wojcik and Michael Bojanowski

AJNR Am J Neuroradiol 2023, 44 (11) 1352-1355



CISTERNOGRAFÍA CON GAMMAGRAFÍA / PET CON RADIOISÓTOPOS

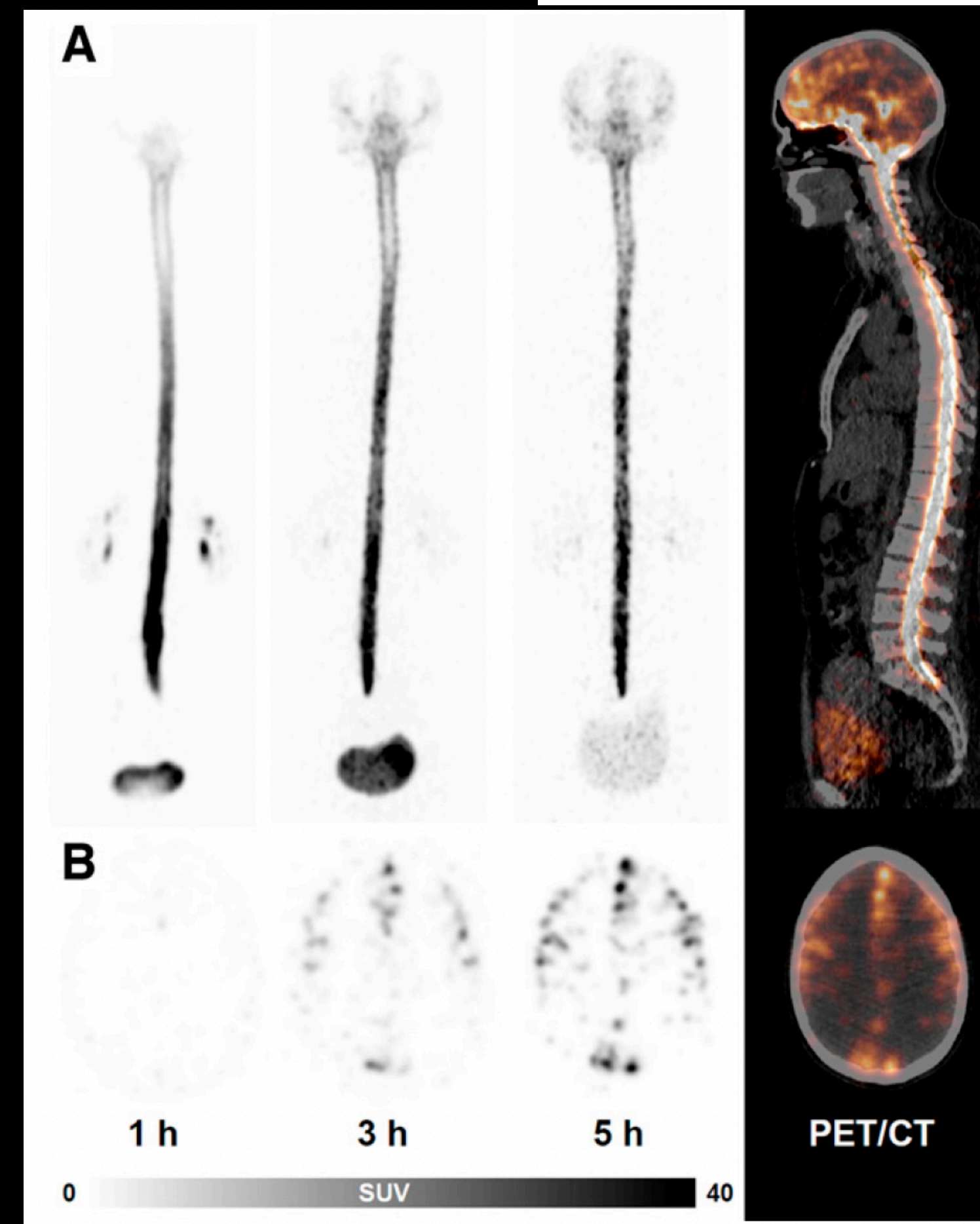
- Acúmulo en sector espinal y extensión incompleta del radiosótomo en convexidades cerebrales en 5 h. → Sospecha HIE
- Acumulos extratecales no asociado a localización de fugas
- Posible papel en selección de pacientes

⁶⁸Ga-DOTA PET for Diagnosis of Spinal Cerebrospinal Fluid Leaks

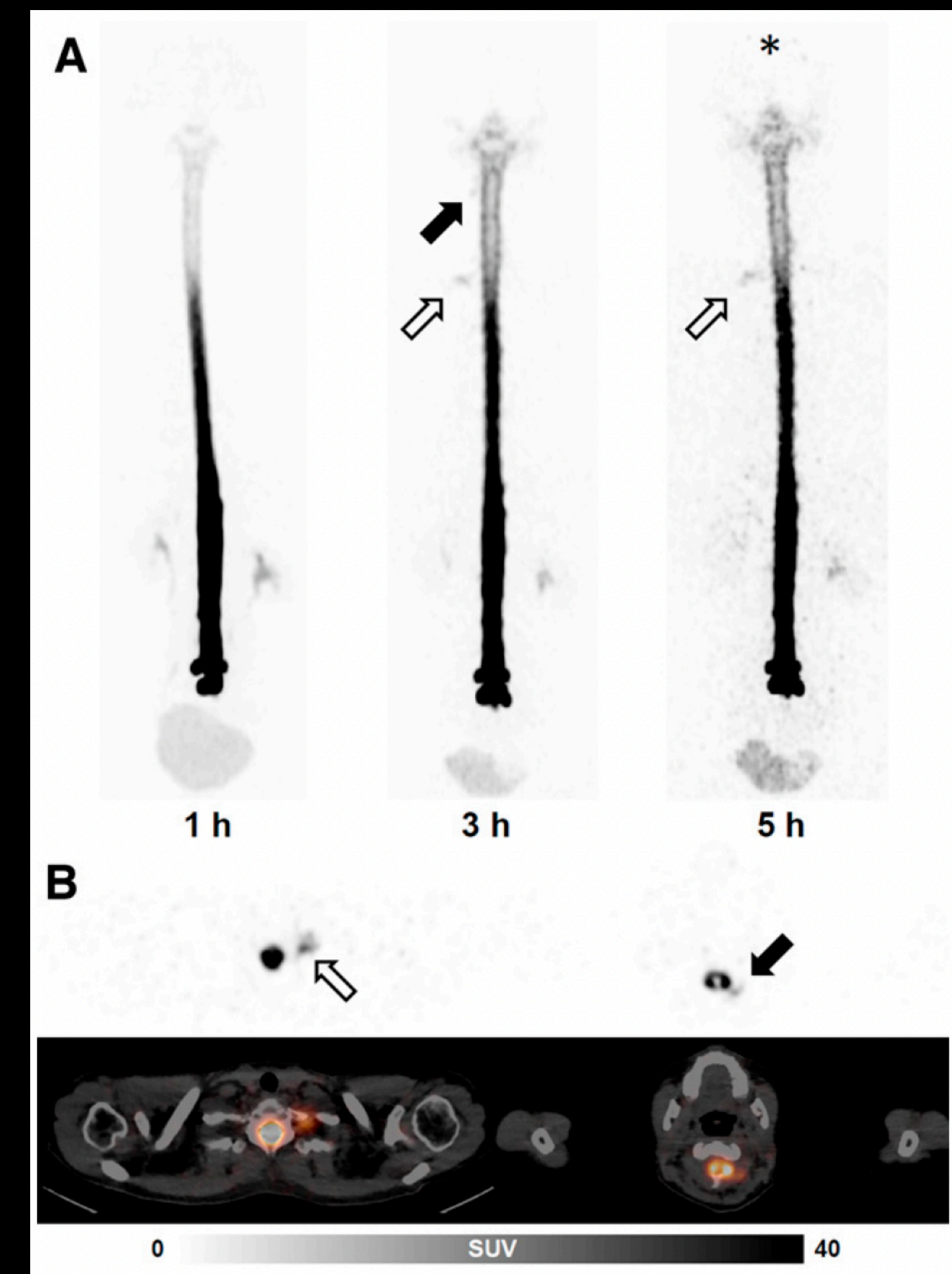
Petros Evangelou¹, Mohamed Aymen Omrane², Johannes Thurow², Michael Mix², Christian Fung¹, Niklas Lützen³, Ganna Blazhenets², Horst Urbach³, Jürgen Beck^{*1}, and Philipp T. Meyer^{*2}

¹Department of Neurosurgery, Medical Center, Faculty of Medicine, University of Freiburg, Freiburg, Germany; ²Department of Nuclear Medicine, Medical Center, Faculty of Medicine, University of Freiburg, Freiburg, Germany; and ³Department of Neuroradiology, Medical Center, Faculty of Medicine, University of Freiburg, Freiburg, Germany

J Nucl Med 2023; 64:430–436



NORMAL



FV LCR

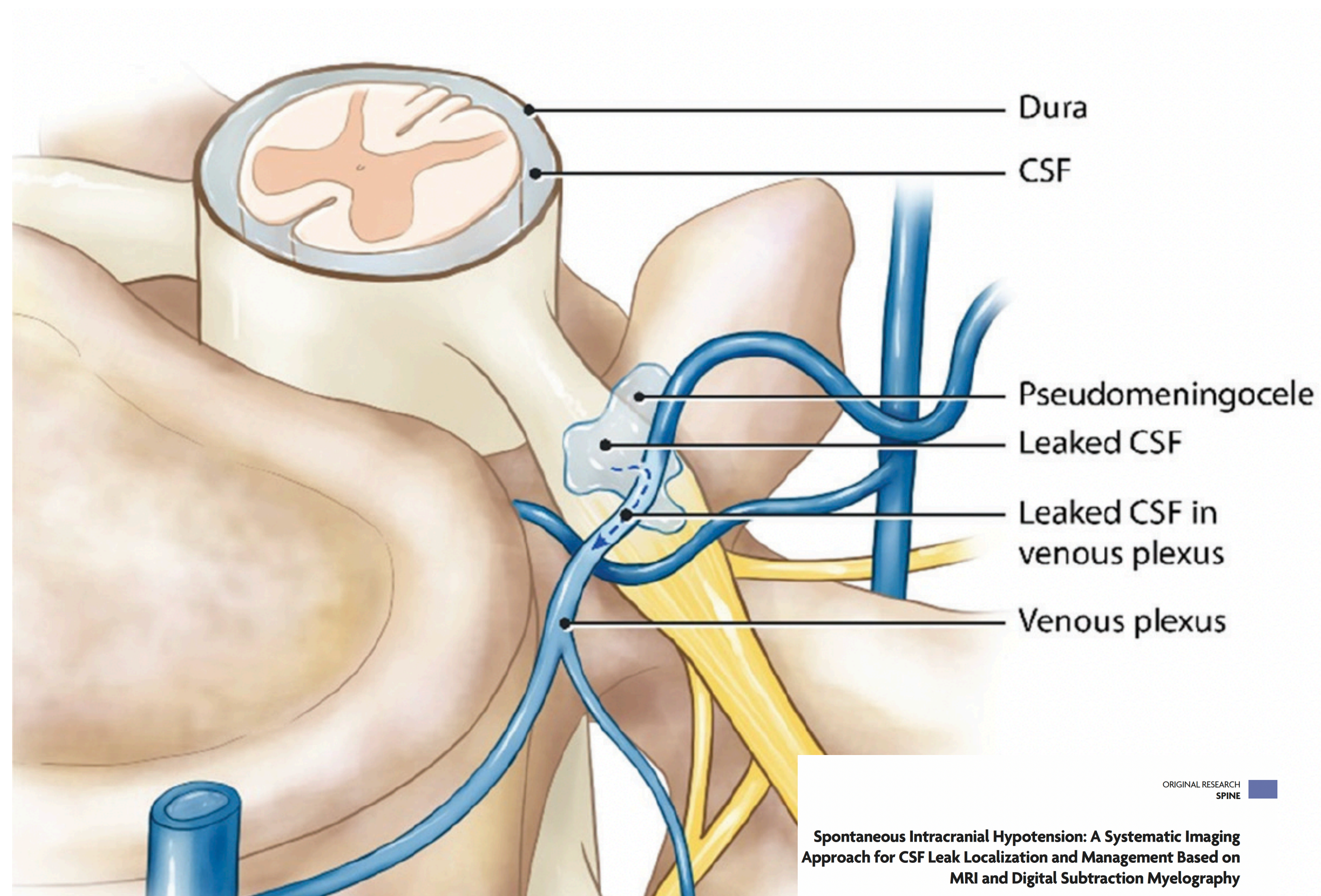
SÍNDROME DE HIPOTENSIÓN ESPONTÁNEA DE LCR EN RELACIÓN CON FISTULA VENOSA DE LÍQUIDO CEFALORRAQUÍDEO (FVLCCR)

- Bajo flujo
- Mielografía por sustracción digital

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ORIGINAL RESEARCH
SPINE

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R.I. Farb, P.J. Nicholson, P.W. Peng, E.M. Massicotte, C. Lay, T. Krings, and K.G. terBrugge

Caso FV LCR (2019)

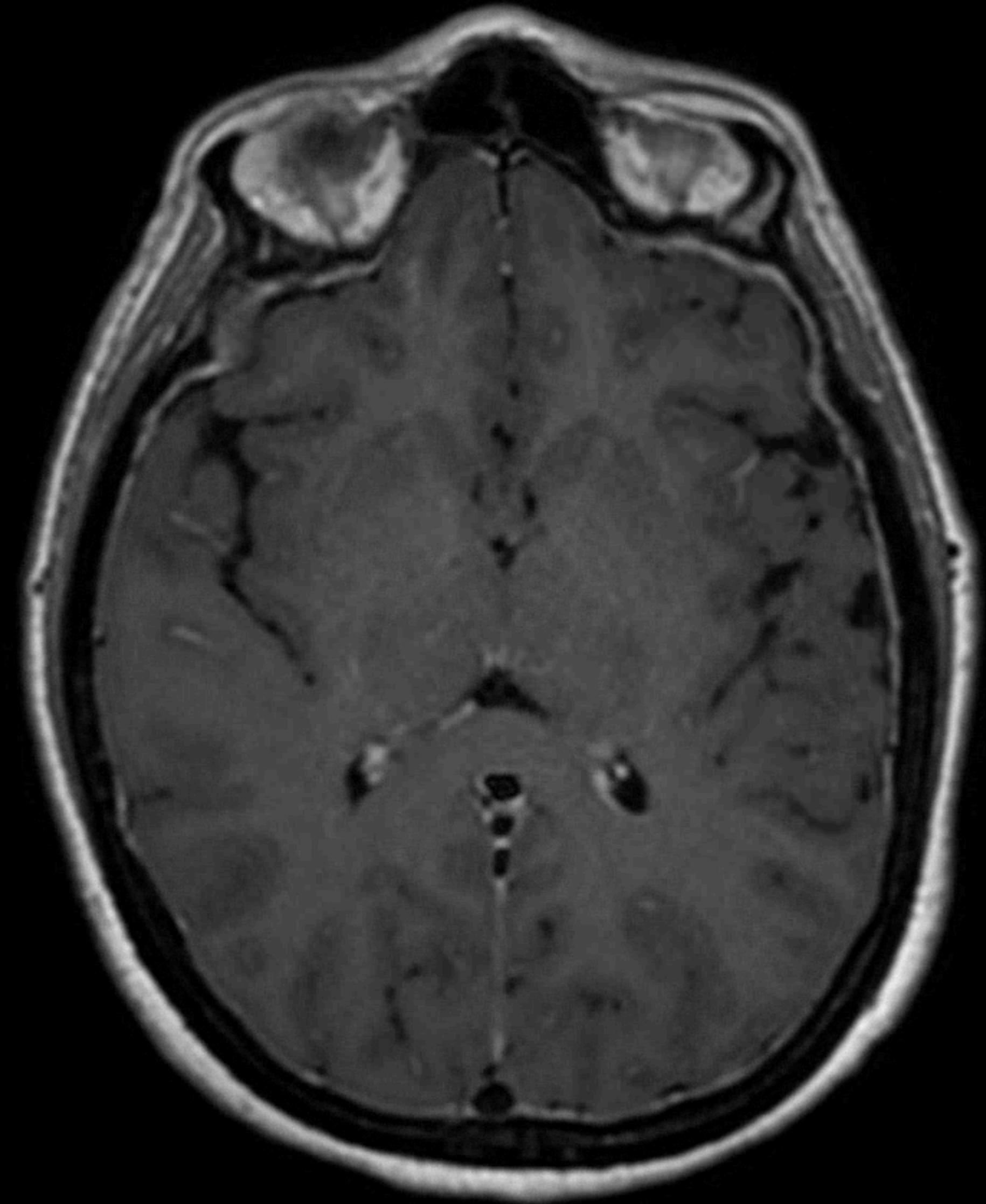
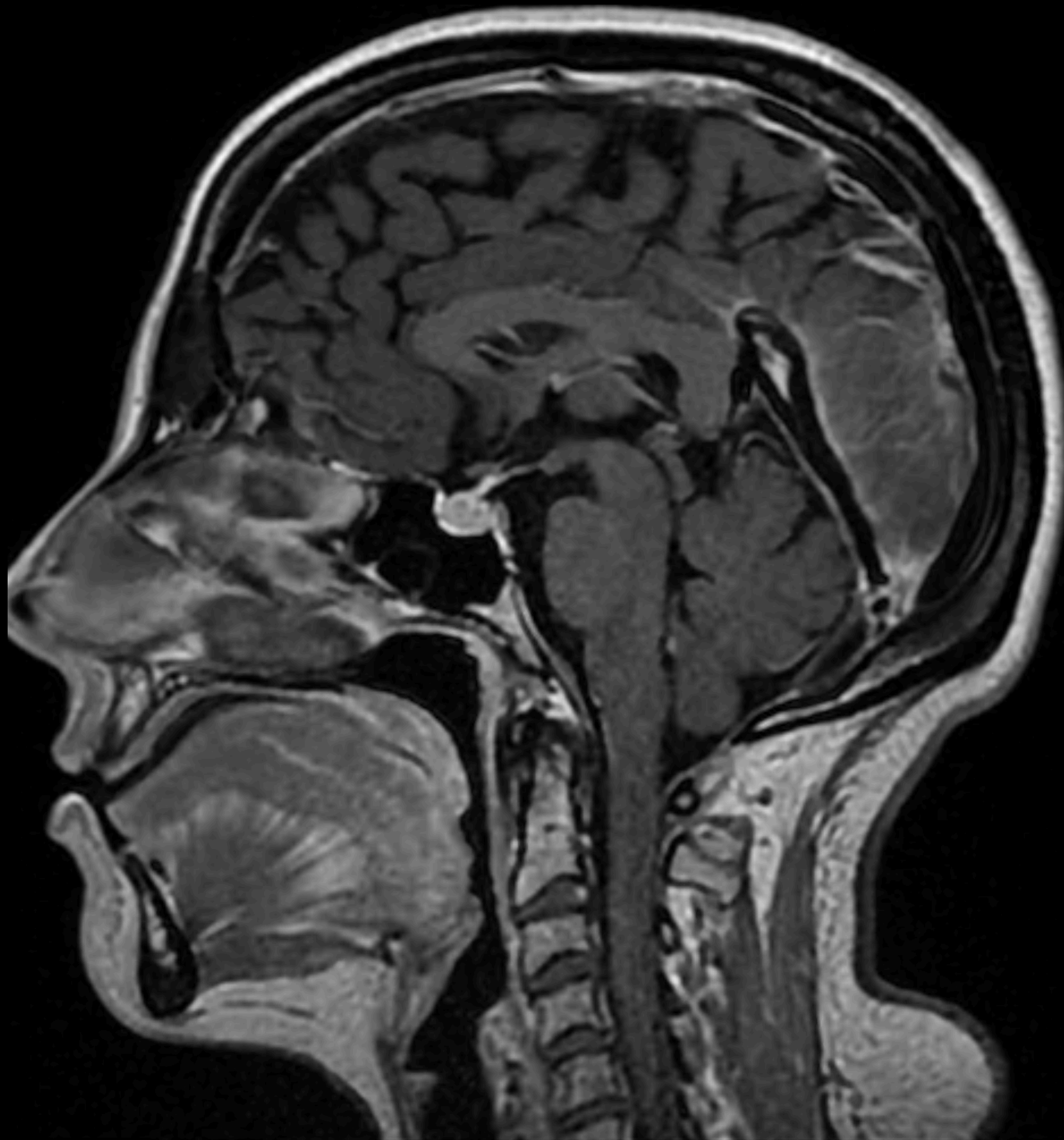
- * Mujer de 45 años. NAMC.
- * 13/09/2019: 10 minutos tras levantarse cefalea pulsátil de máxima intensidad. Náuseas y vómitos que no ceden a tratamiento médico.
- * No déficit en la exploración neurológica.
- * Refiere 3/4 episodios al mes de cefaleas pulsátiles fronto-orbitarias de hasta un día de duración. Patrón ortostático. Se iniciaron tras el nacimiento de su hijo (parto natural).



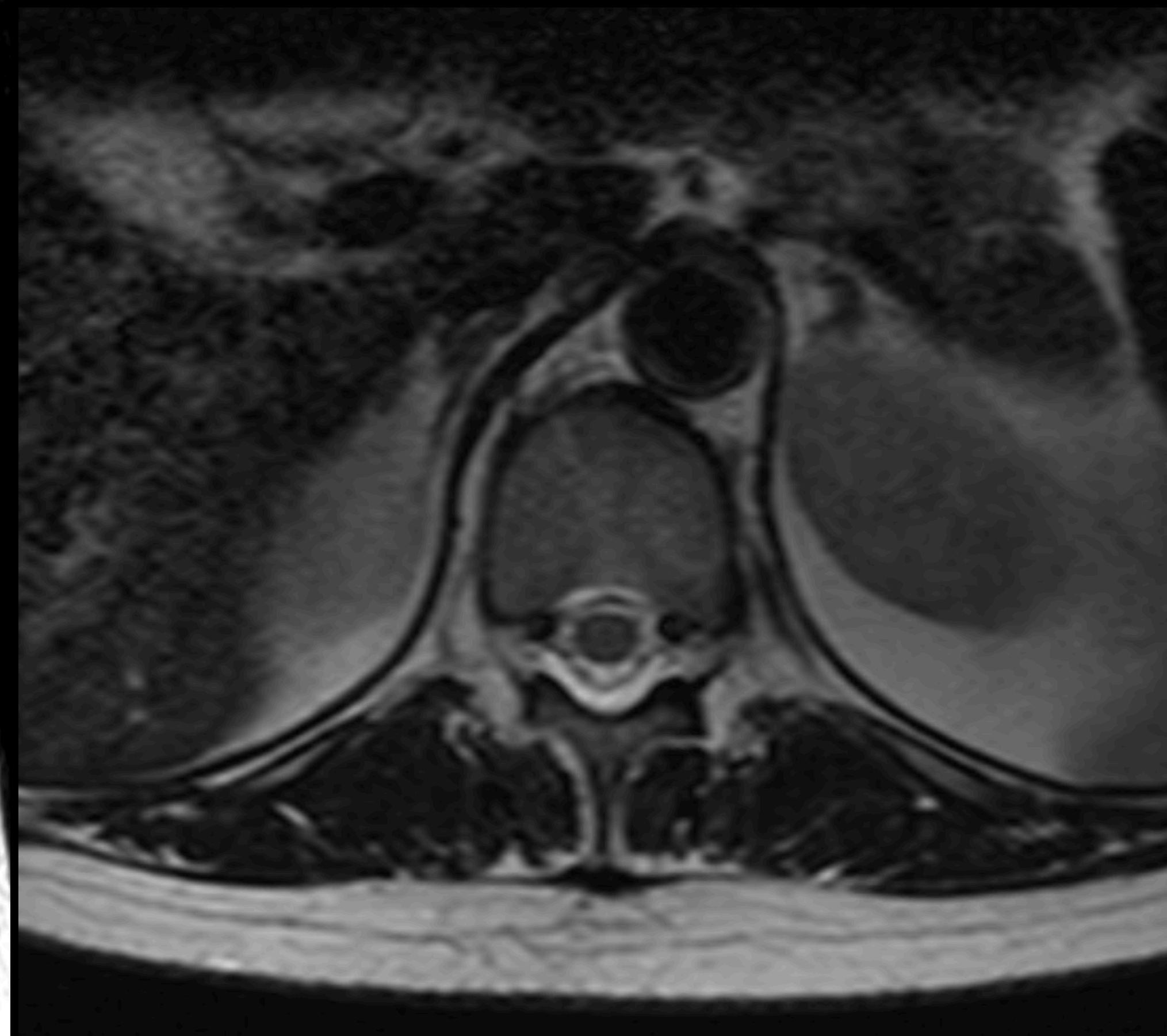
Juicio clínico:

Cefalea holocraneal en paciente migrañosa sin focalidad ni signos meníngicos

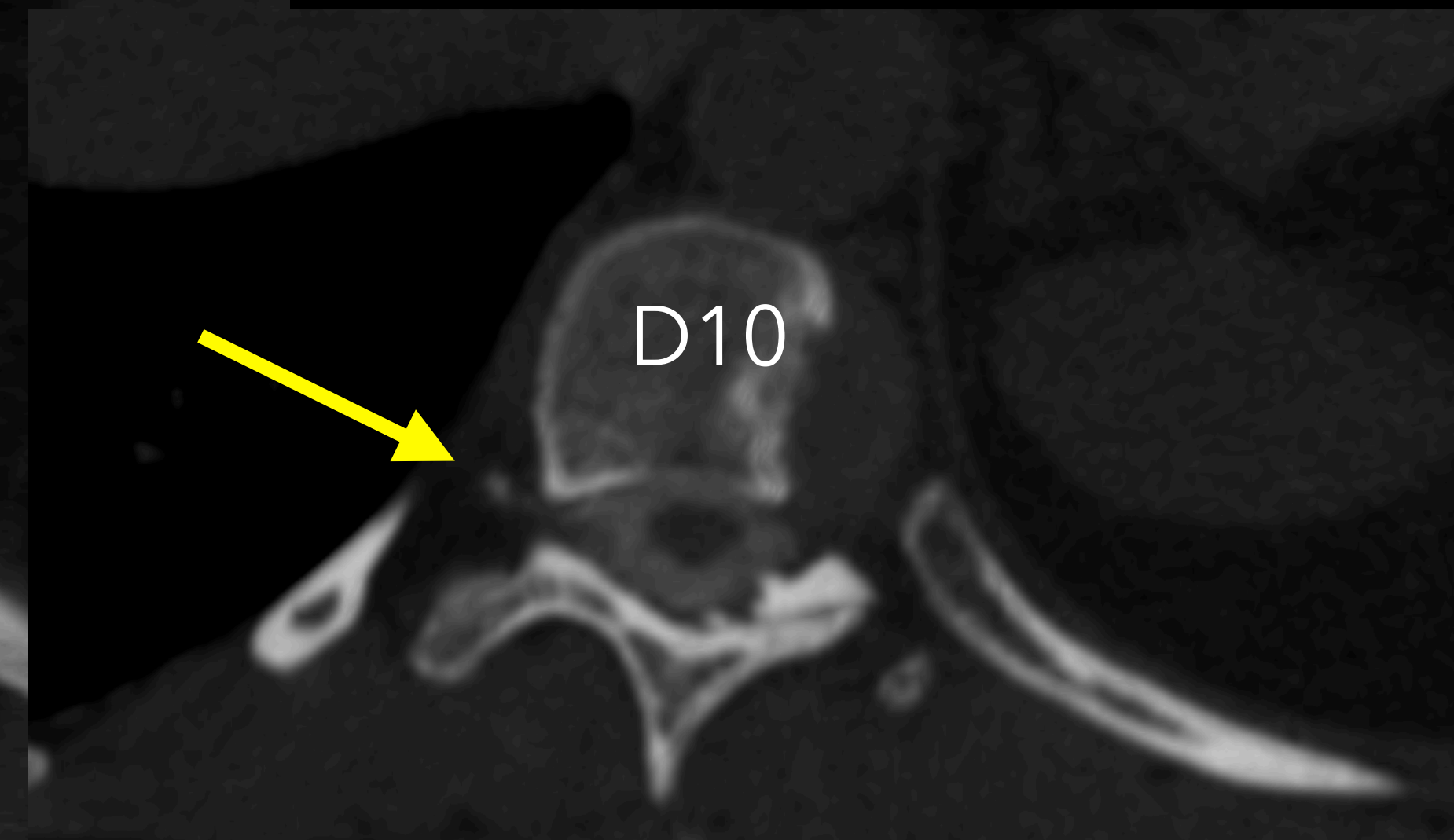
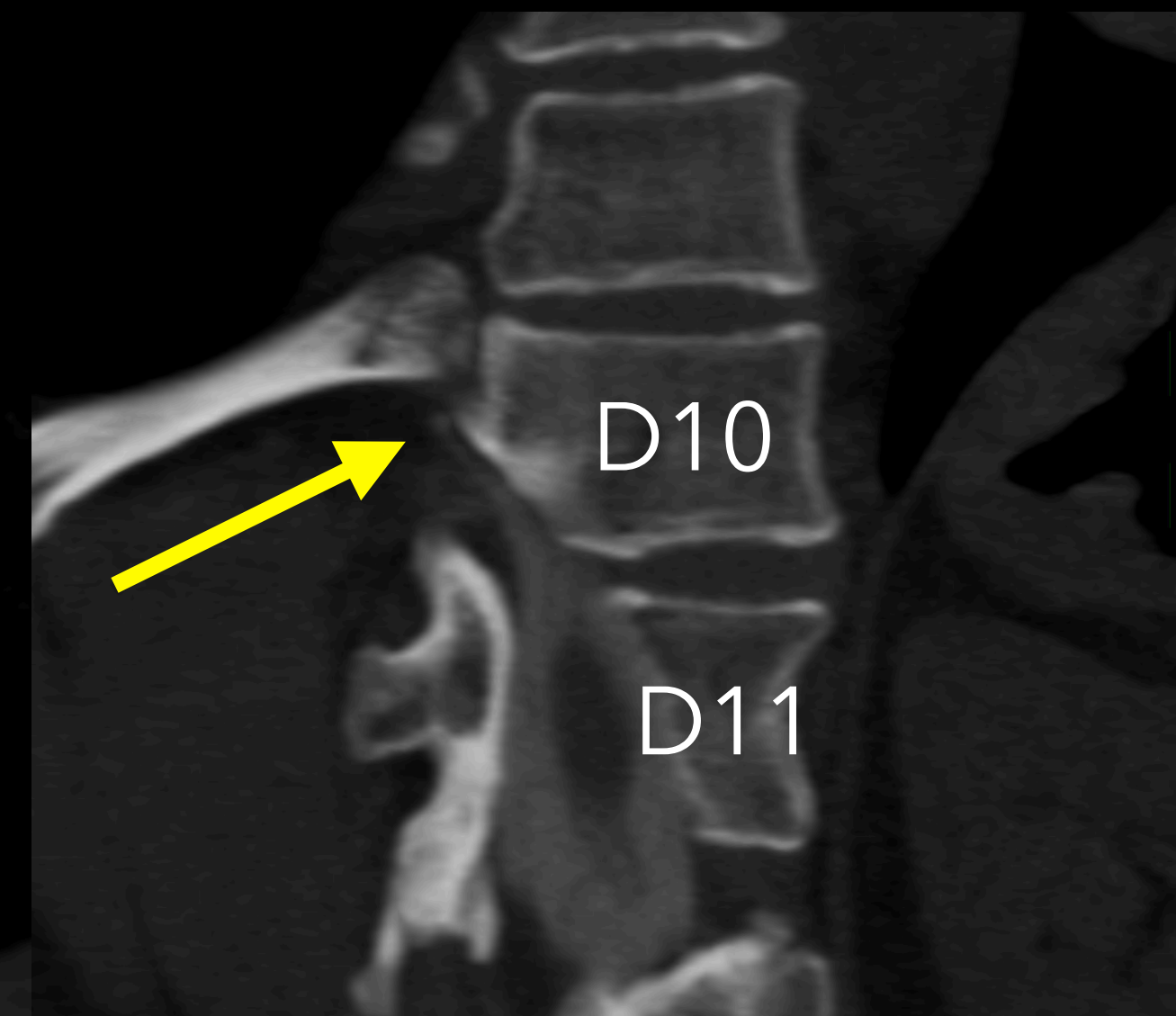
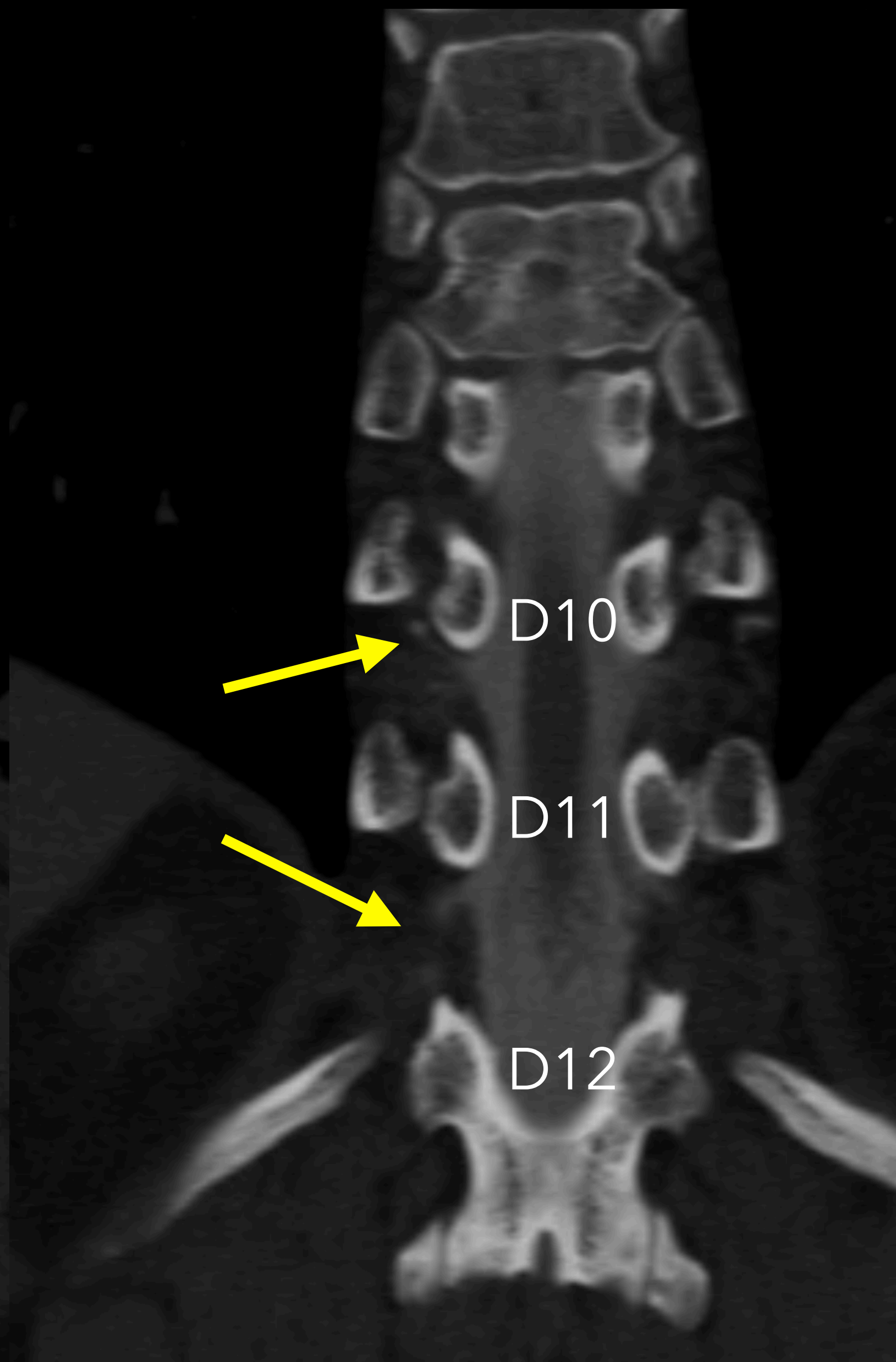
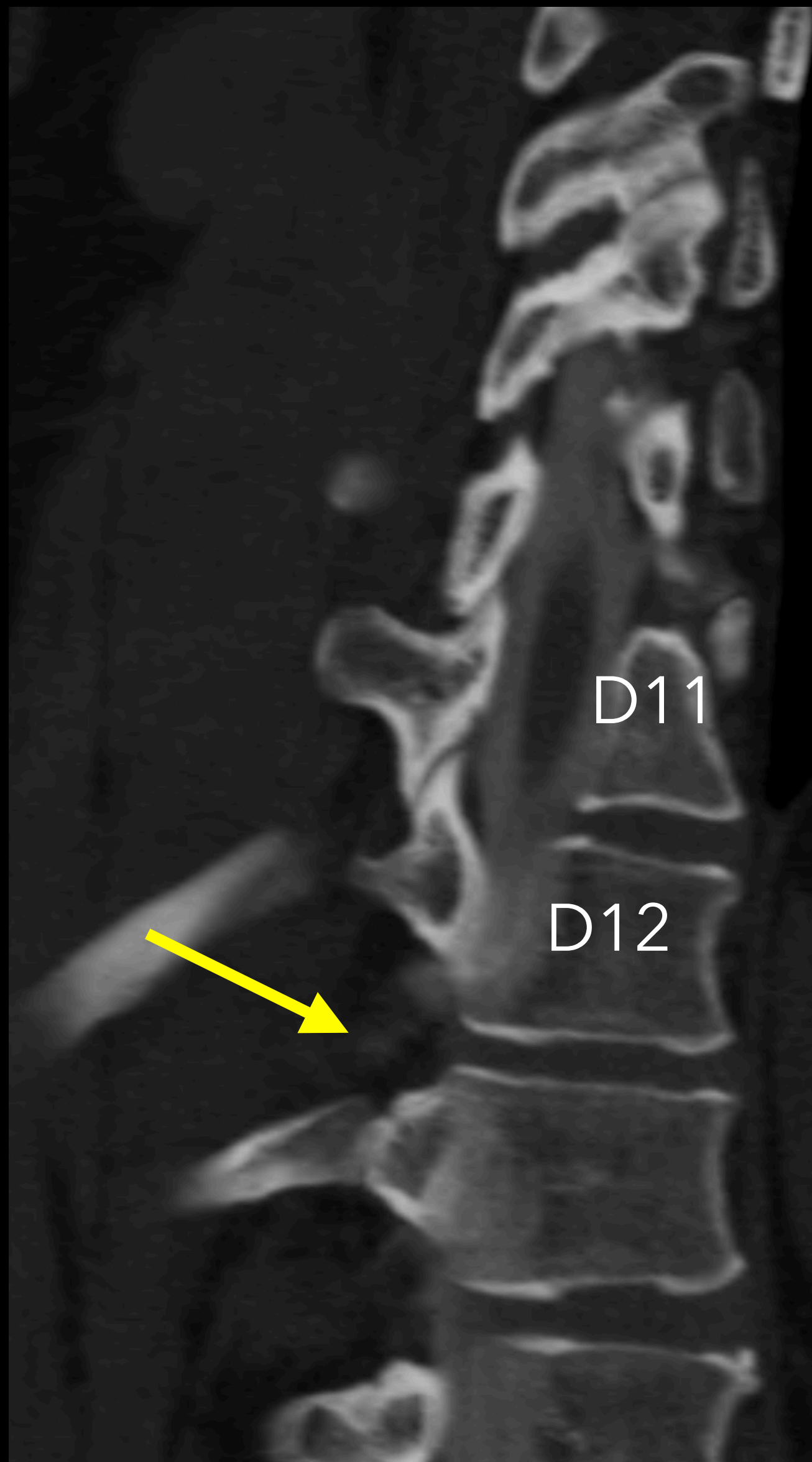
- Vuelve a consultar varias veces. Eventualmente ingreso para estudio. RM de cráneo



- RM de columna completa. Fractura previa T12. No se observan colecciones LCR

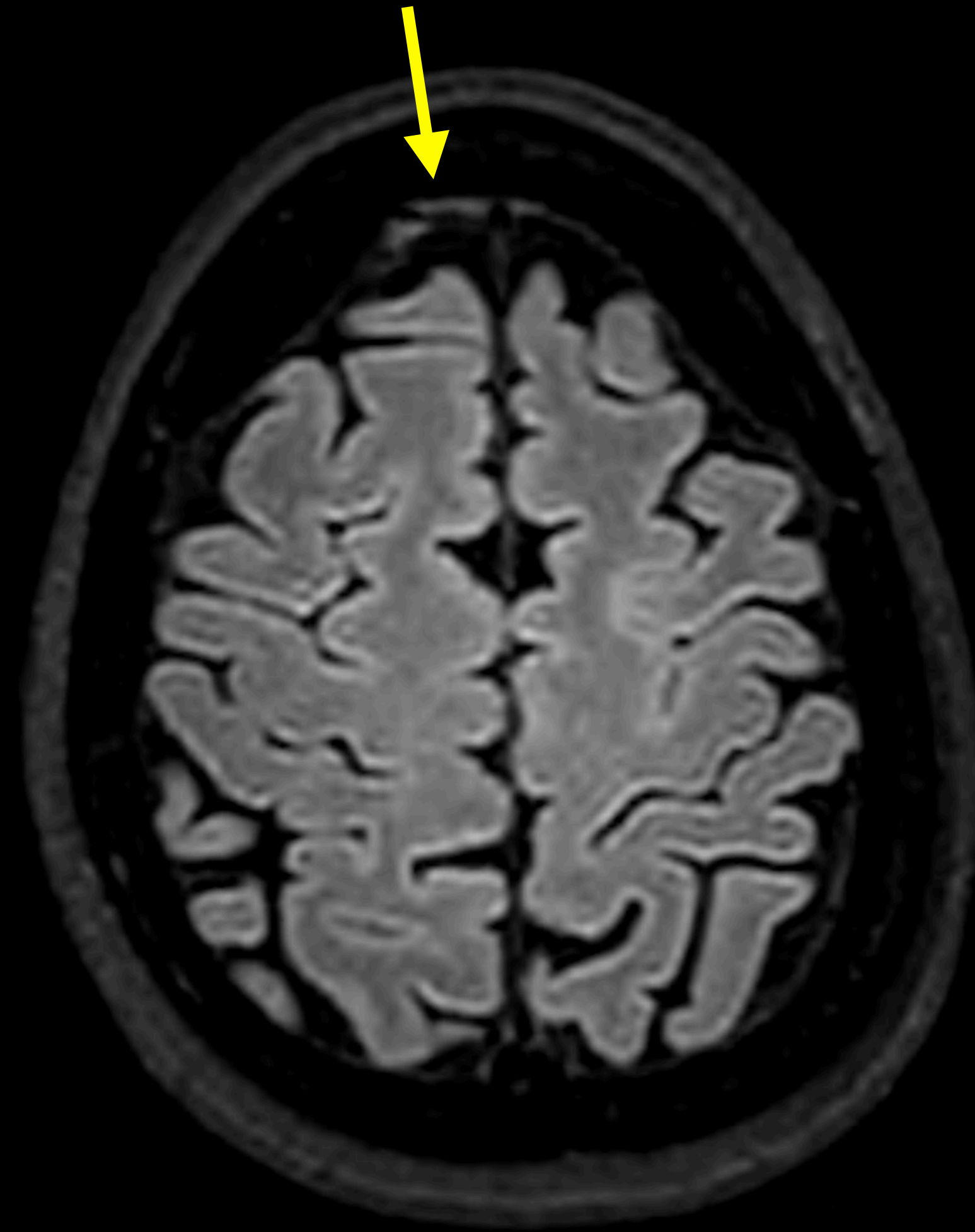


- Mielo TC convencional Oct. 2019

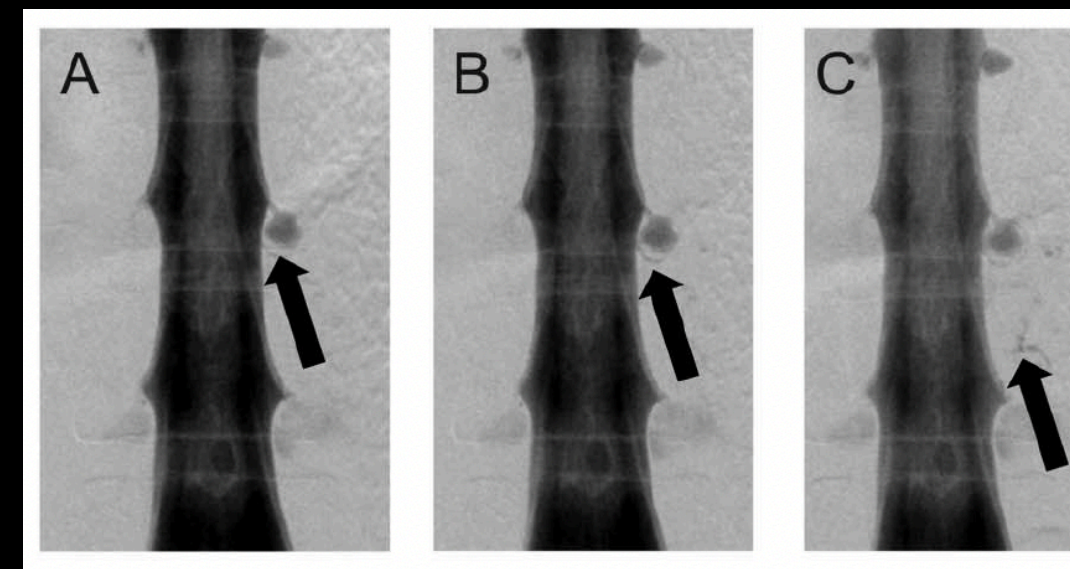


- Junio 2024: persisten hallazgos RM y cefalea ortostática. Leve mejoría temporal tras varios parches hemáticos

[28/06/2024 12:42:30]
Actual
1,48
DFOV 59,4 x 26,2 cm
MPR 1,18 mm



Mielografía con Substracción Digital (MSD)



Neurology®

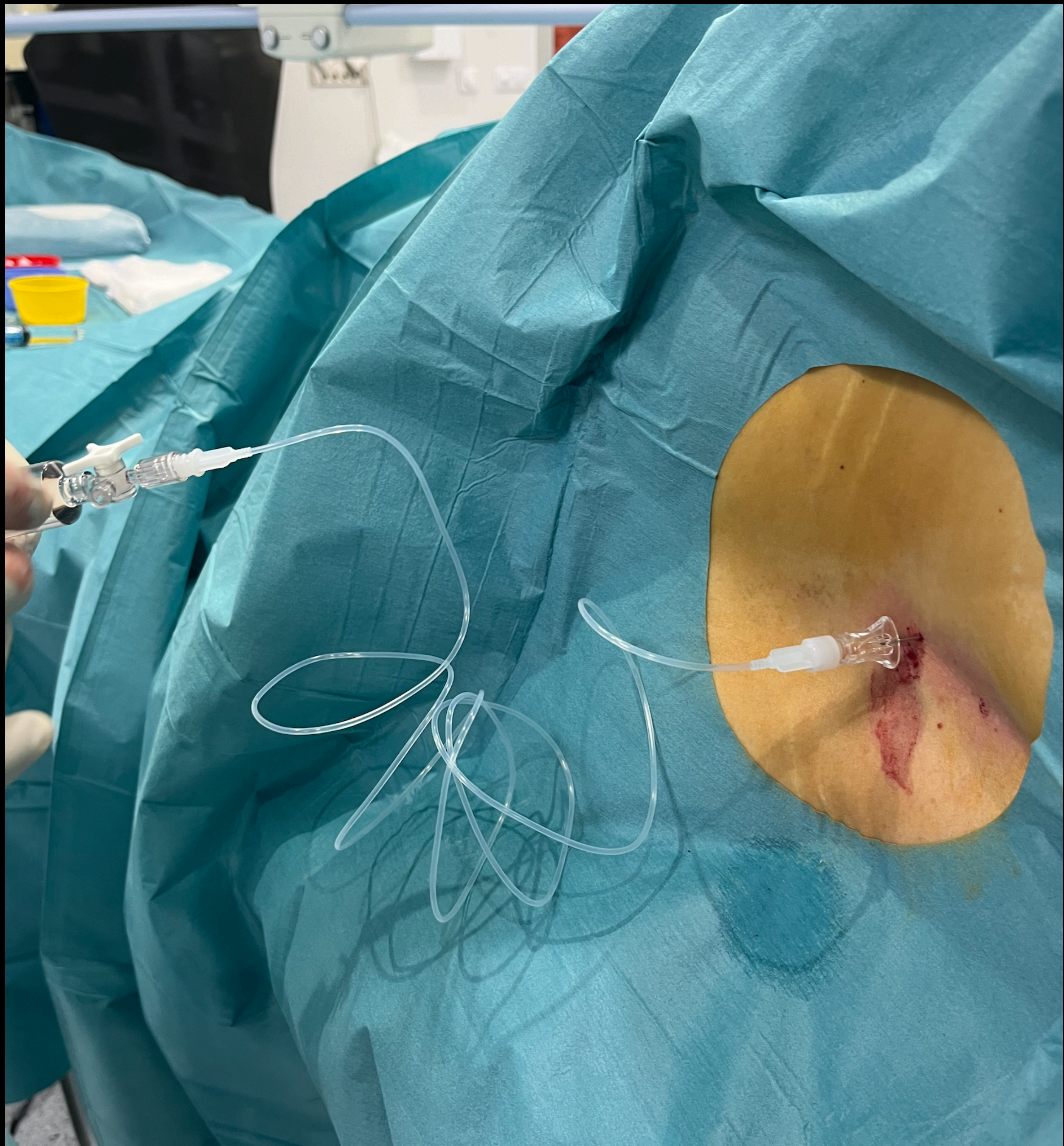
CSF-venous fistula in spontaneous intracranial hypotension

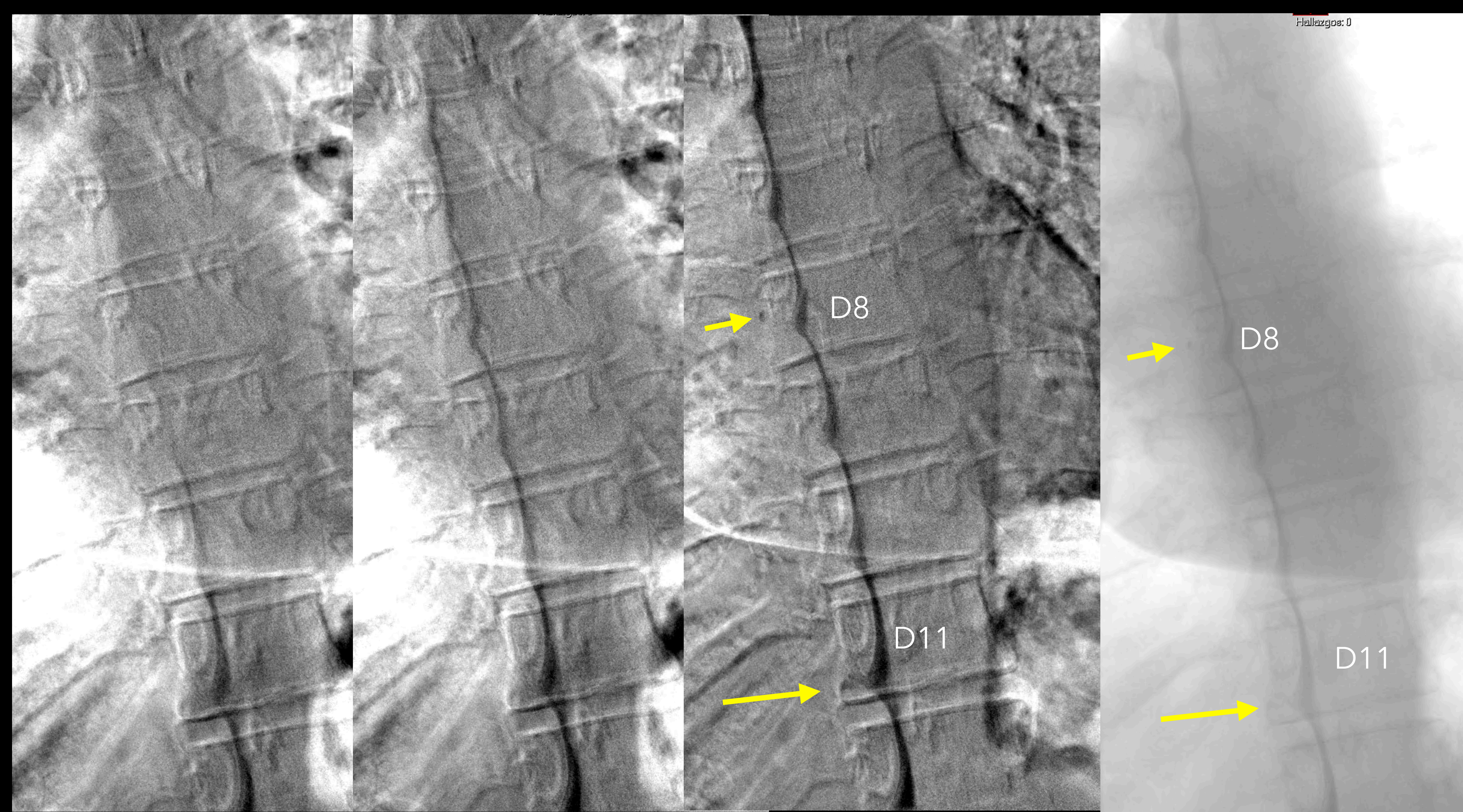
Wouter I. Schievink, Franklin G. Moser and M. Marcel Maya
Neurology 2014;83:472-473 Published Online before print June 20, 2014
DOI 10.1212/WNL.0000000000000639

This information is current as of June 20, 2014

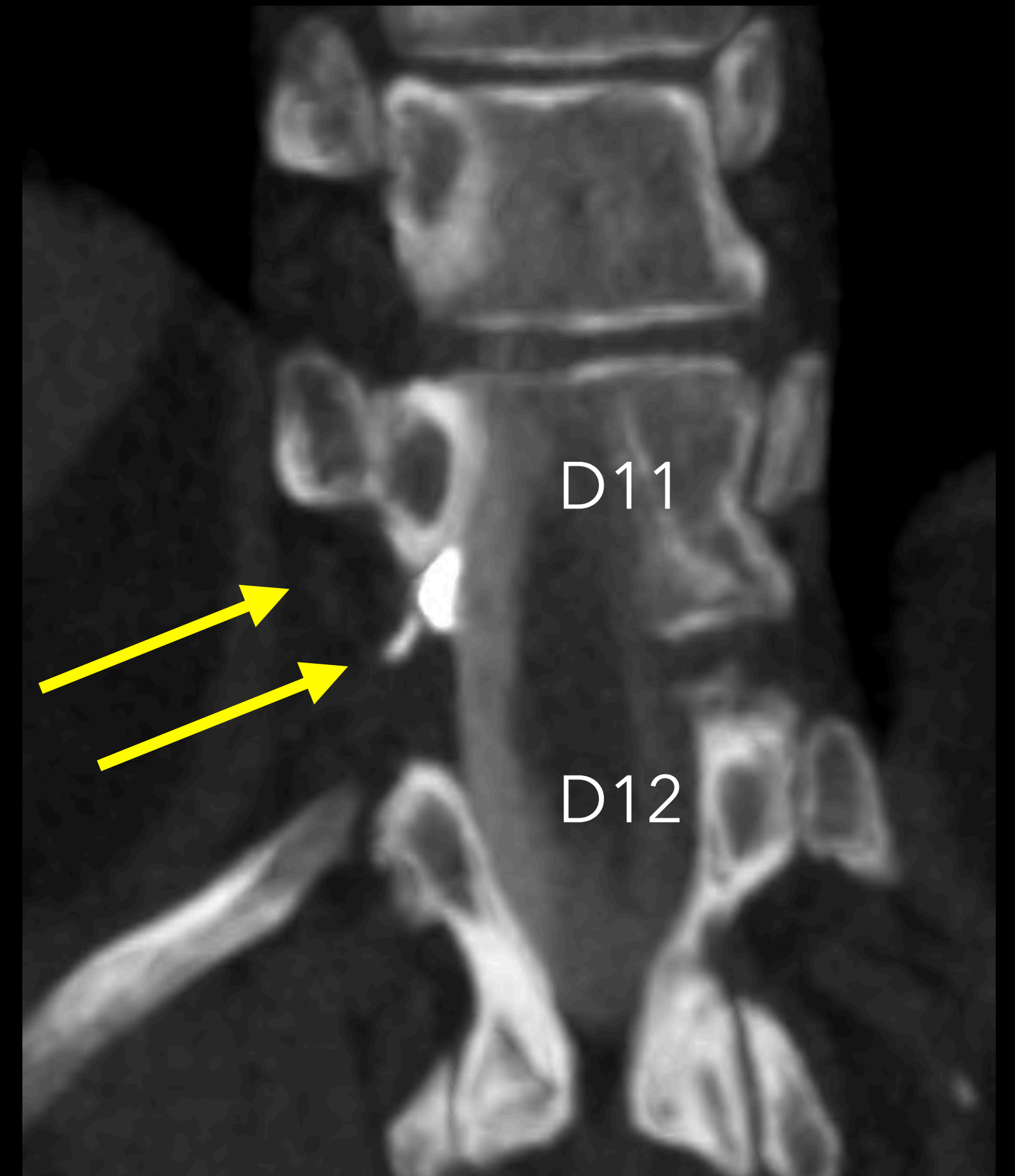
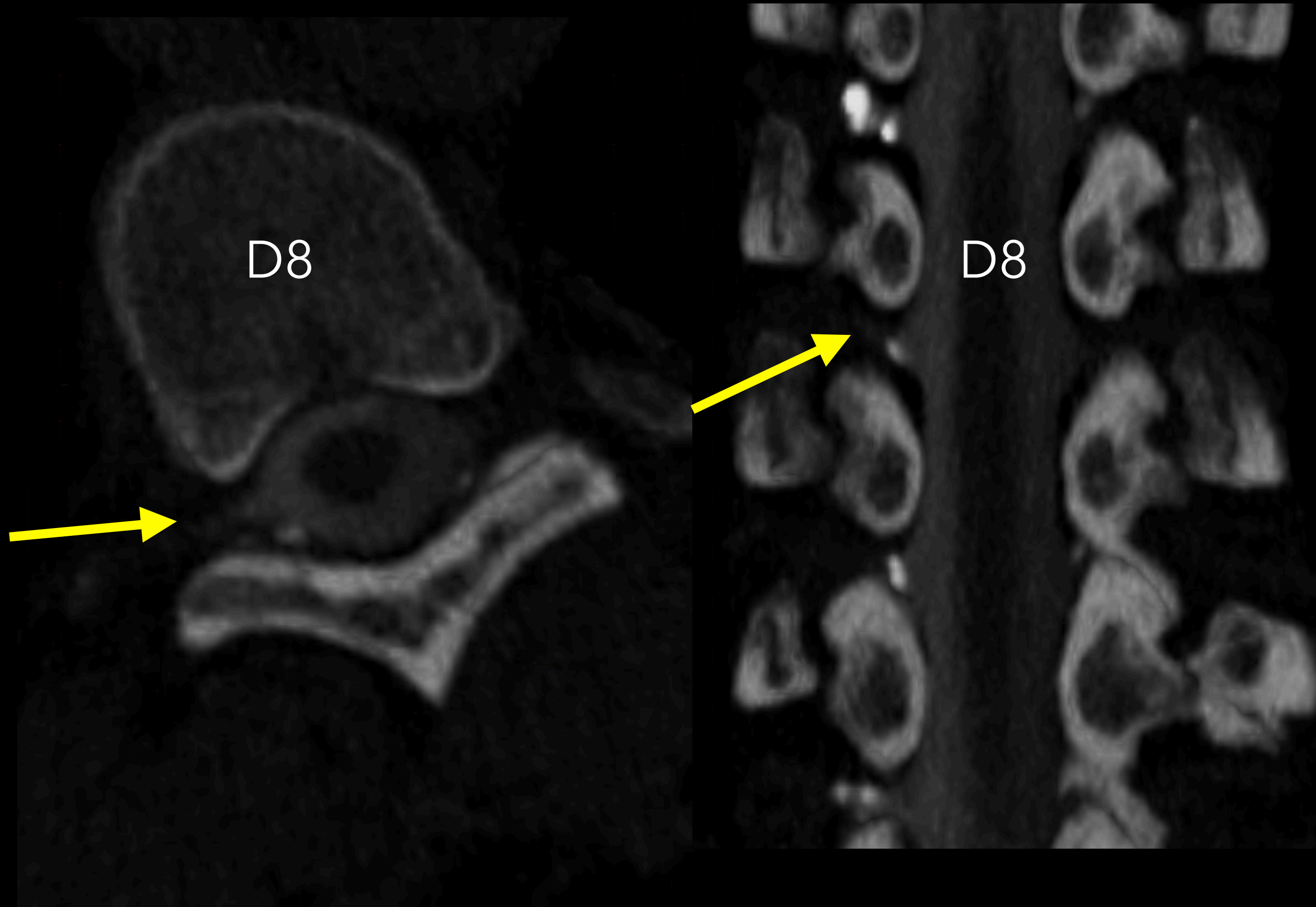
- Decubito Lateral (+/- Anest. Gen.)
- Inyección 1-2 cuerpos x seg.
- 10° - 15° de inclinación
- C.Iodado 300
- Procedimiento en 2 días
- Técnica / Cooperación del paciente fundamentales
- Punción intratecal (20 G)



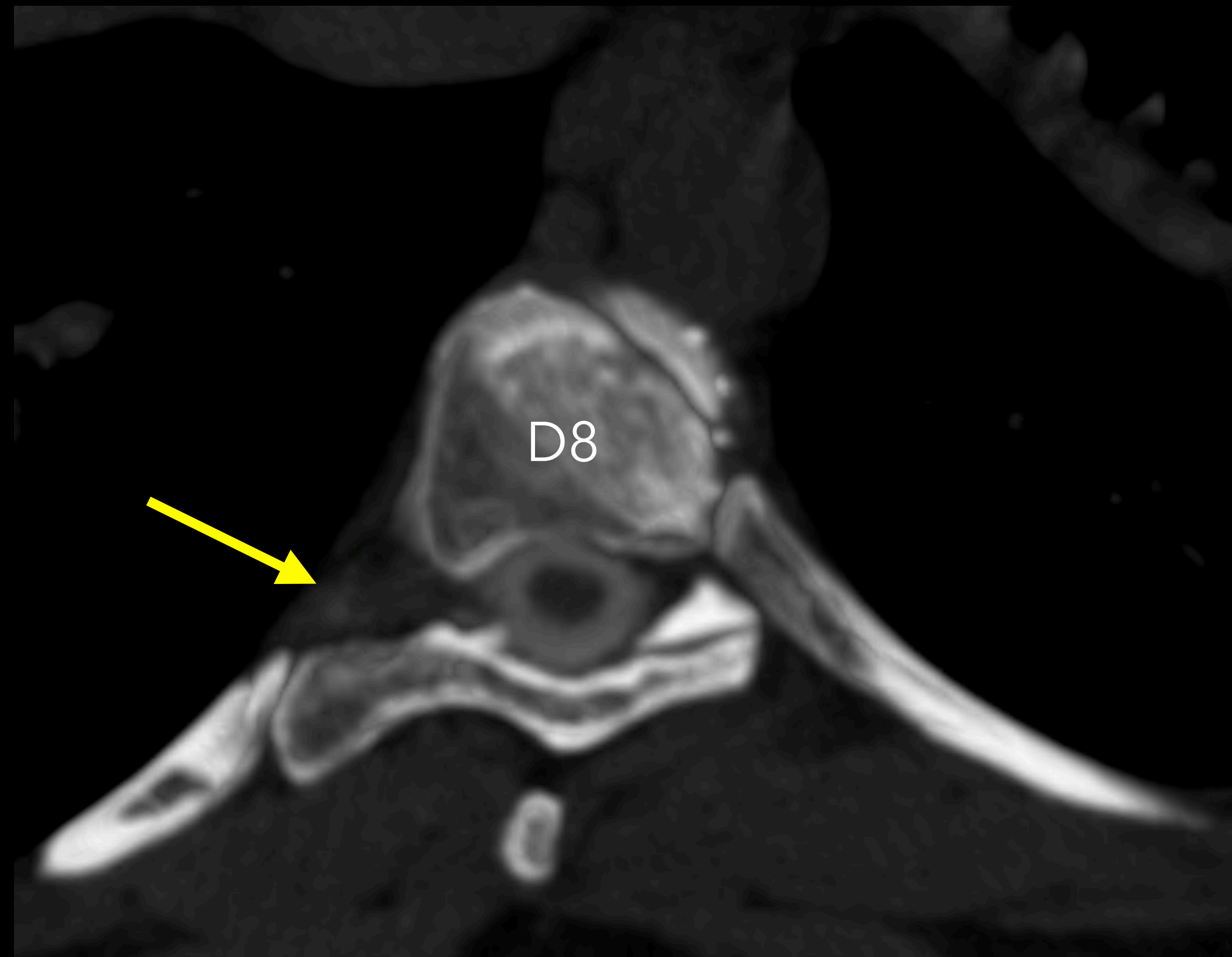
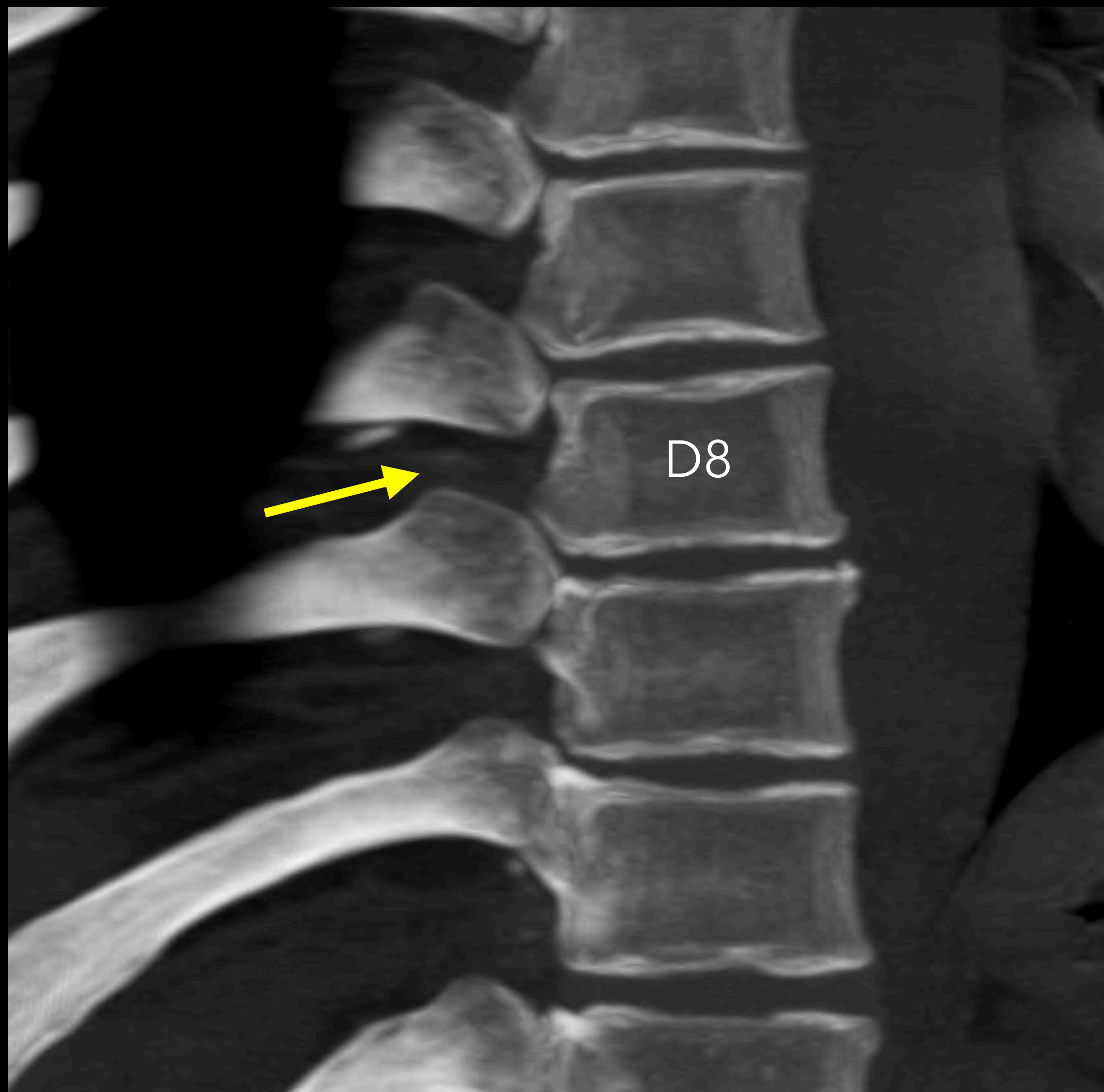




- TC POST Mielografía por S.D. (Octubre 2024)



- Mielo TC convencional Oct. 2019



Mielografía con Substracción Digital

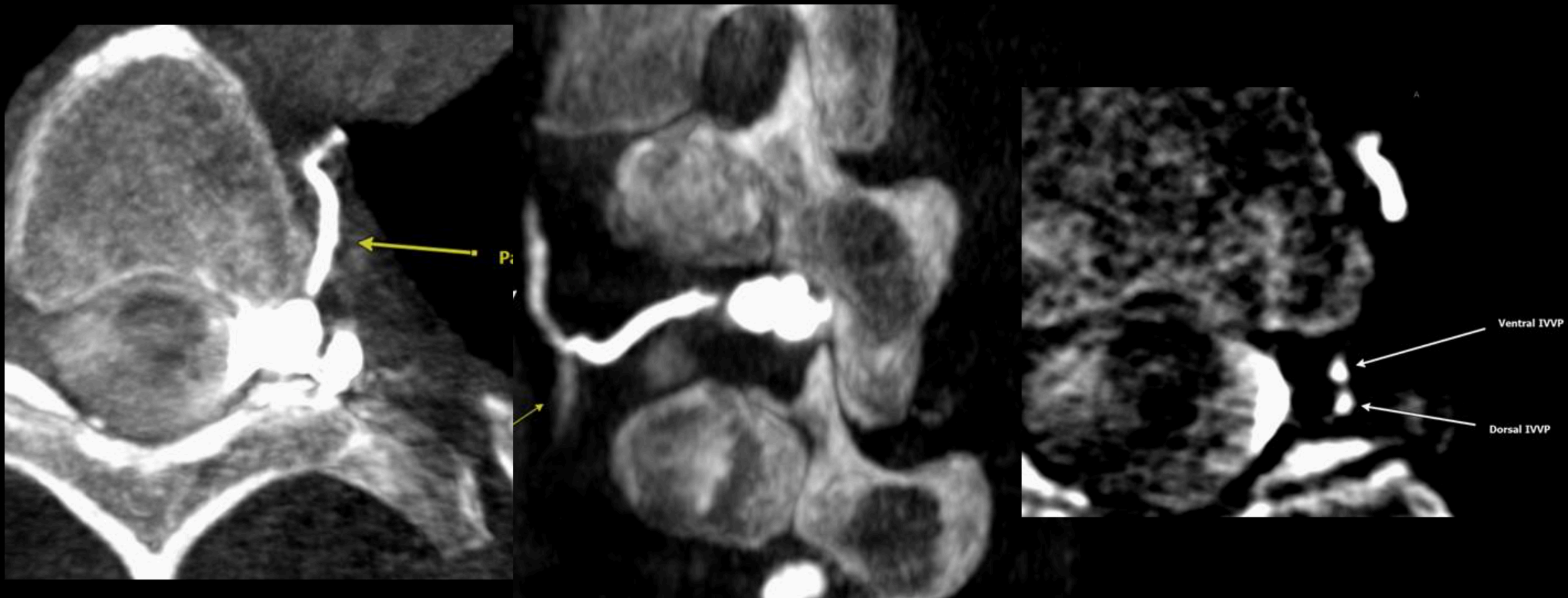


- Rendimiento diagnóstico del 70%



Imágenes cedidas por Prof. W. Brinjikji

TC de Haz Cónico Post-MSD



FV LCR: Tratamiento

CLINICAL REVIEW

CLINICIAN'S CORNER

Spontaneous Spinal Cerebrospinal Fluid Leaks and Intracranial Hypotension

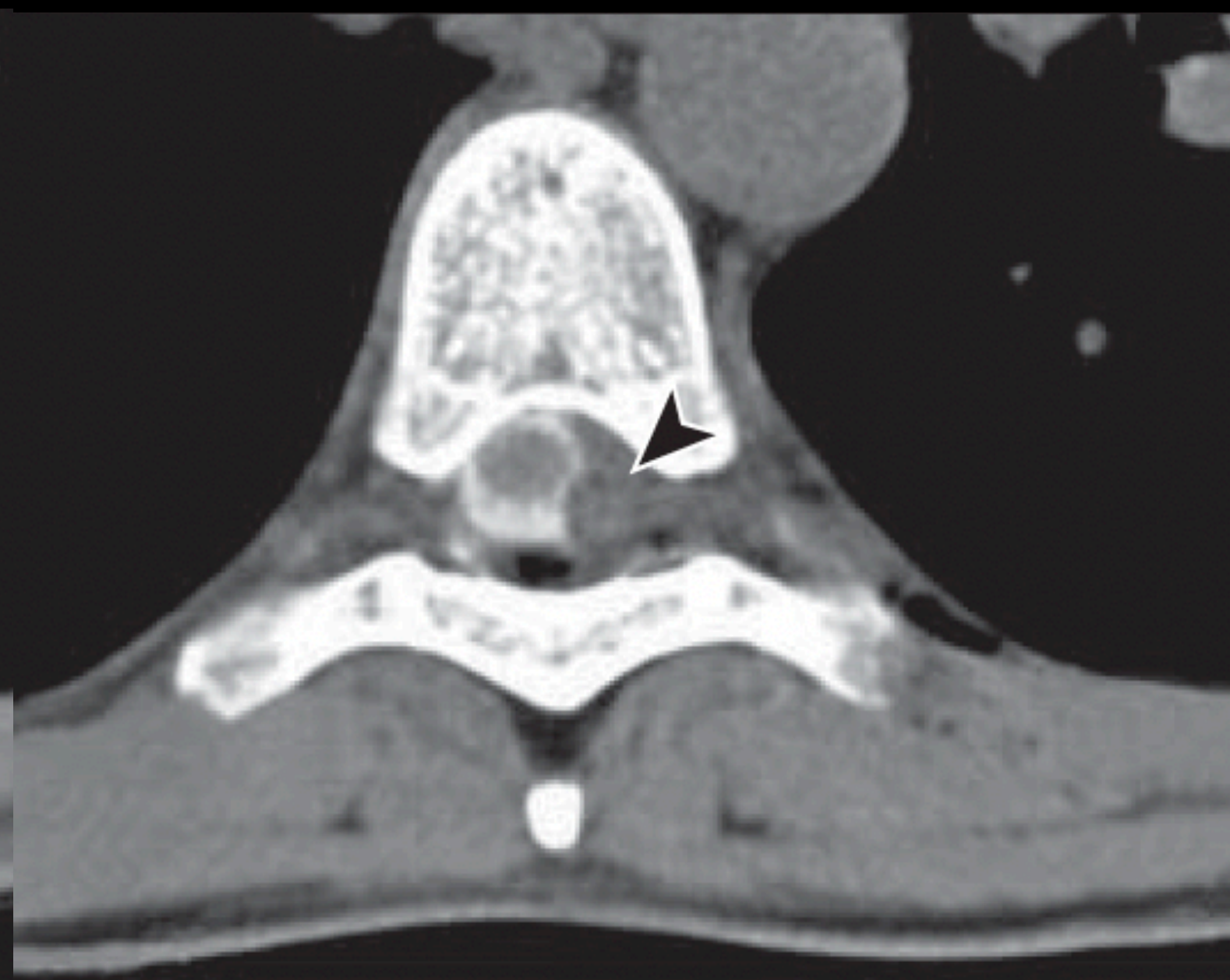
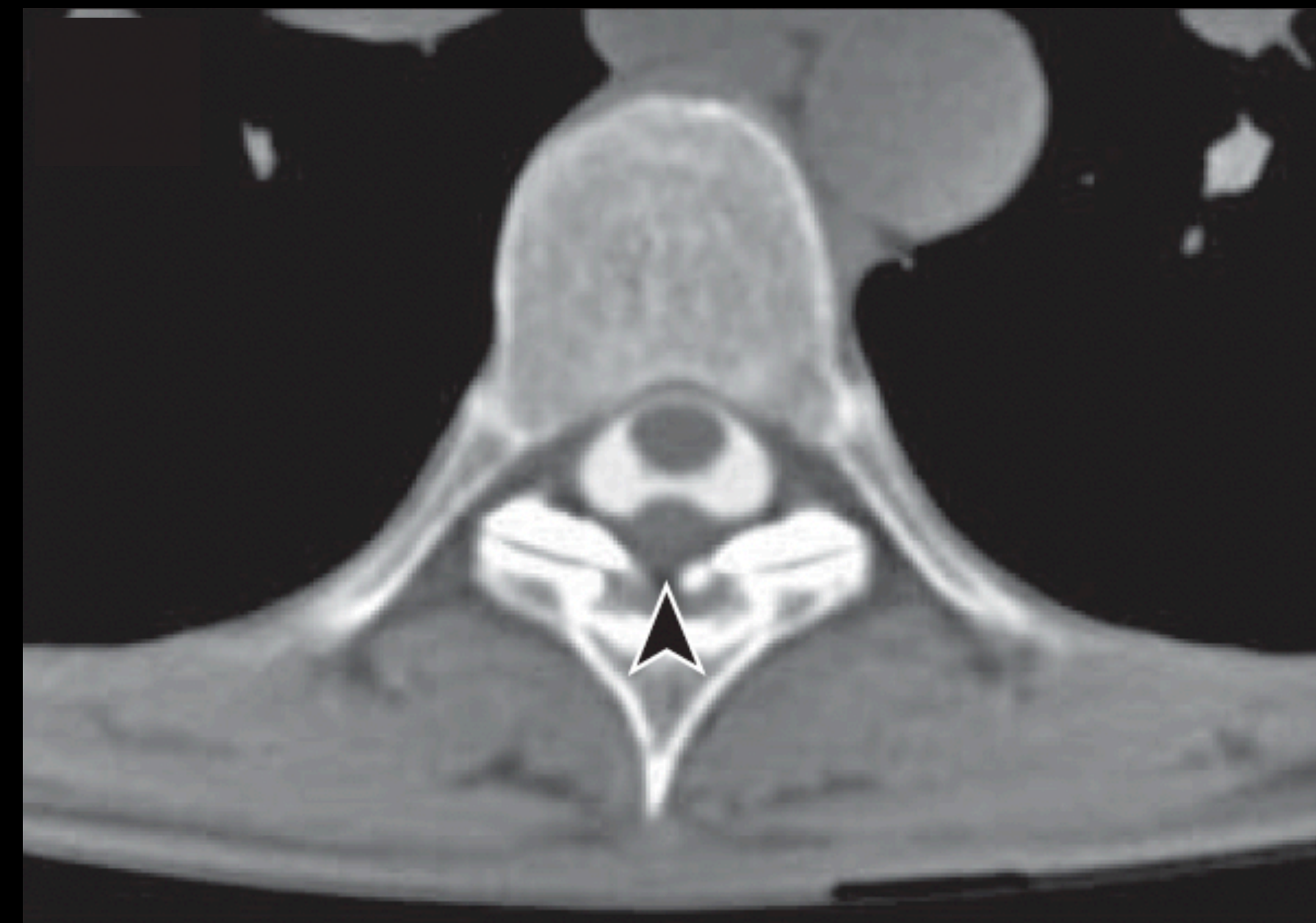
Wouter I. Schievink, MD

Tto. Conservador: Reposo + Hidratación + Cafeína (6 meses)

Parque Hemático

Inyección sellante de fibrina

Cirugía



30-70% mejoría de síntomas
< 10% cura permanente en tipos 1 y 2

Fugas alto flujo

A Novel Endovascular Therapy for CSF Hypotension Secondary to CSF-Venous Fistulas

W. Brinjikji, L.E. Savastano, J.L.D. Atkinson, I. Garza, R. Farb, and J.K. Cutsforth-Gregory

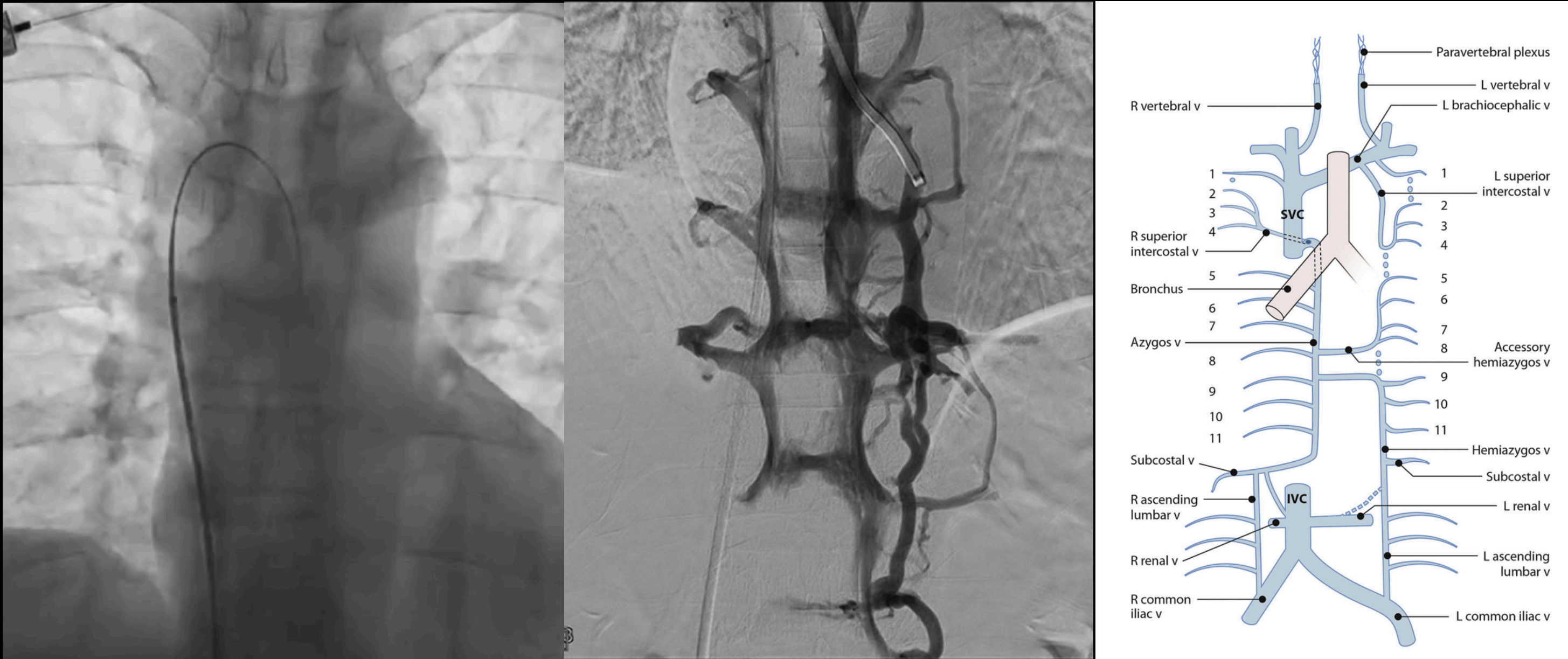
AJNR

Anatomy of Spinal Venous Drainage for the Neurointerventionalist: From Puncture Site to Intervertebral Foramen

N. Borg, J. Cutsforth-Gregory, S. Oushy, T. Huynh, L.E. Savastano, H.J. Cloft, G. Lanzino and W. Brinjikji

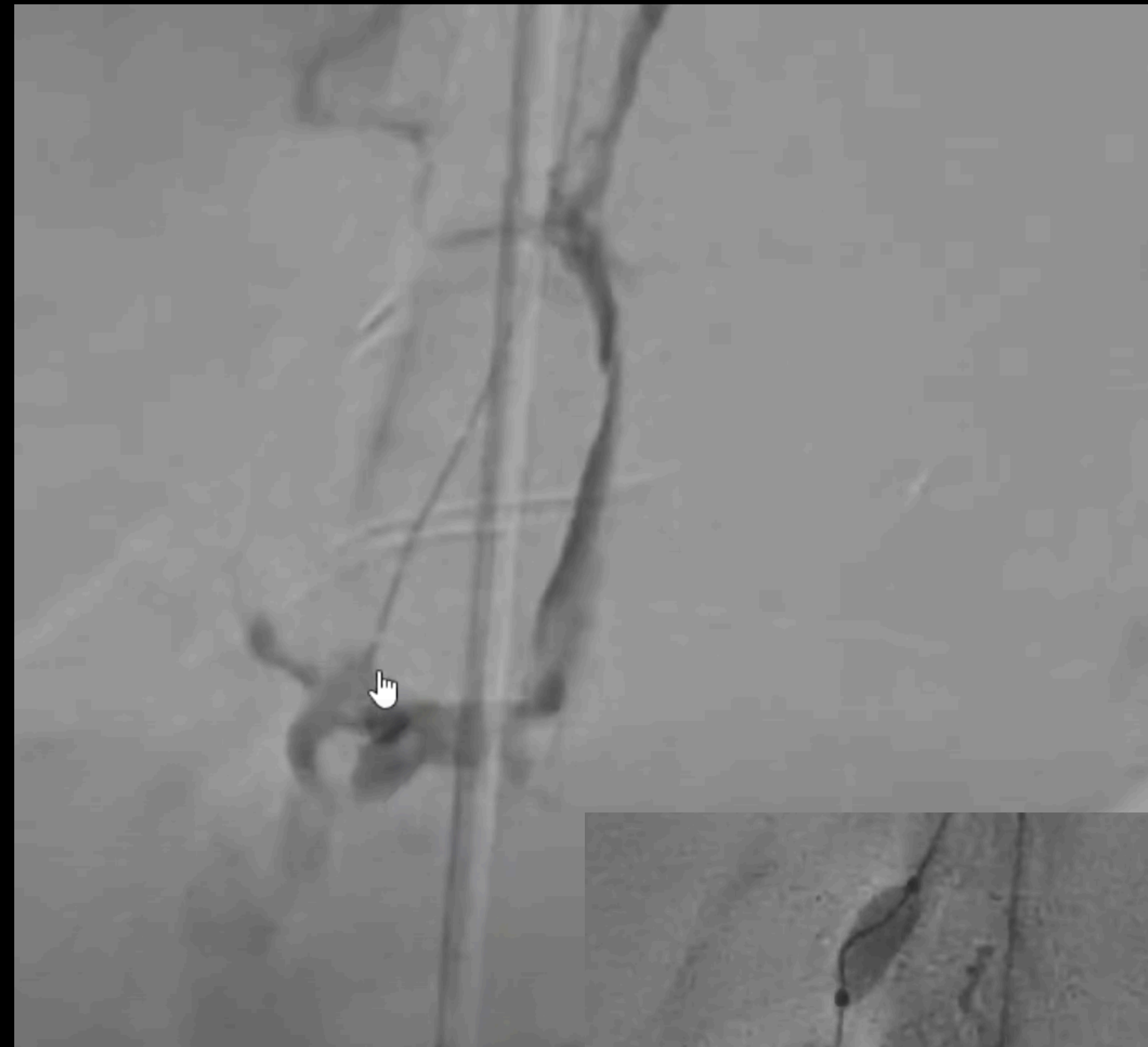
Patient No.	Age (yr)/Sex	Symptoms	Fistula Level	Approach	Complications	Bern Score Pre-Tx	Bern Score Post-Tx	Improvement in Symptoms?
1	44/M	Position- and Valsalva-dependent headache	Right T8	Transfemoral	None	8	0	Complete resolution
2	67/F	Position- and Valsalva-dependent headache, tinnitus, brain fog	Right T4	Transfemoral	Pain at right T4, resolved after 1 month	9	0	Complete resolution
3	58/M	Position- and Valsalva-dependent headache, tinnitus, brain fog, hearing loss	Right T7	Transfemoral	None	6	2	50% Improvement in headache and hearing loss, stable tinnitus
4	65/M	Position- and Valsalva-dependent headache, tinnitus, brain fog	Right T4	Transjugular	Pain at right T4, resolved after 1 month	9	0	Complete resolution
5	68/M	Position- and Valsava-induced headache, tinnitus, hearing loss, vertigo	Bilateral T9	Transfemoral	None	6	1	Complete resolution of headache and hearing loss, persistent tinnitus with SCC dehiscence

- ### Embolización (Técnica)
- Anestesia local
 - Acceso femoral inguinal / vena radial /basílica / cefálica
 - Doble densidad sobre el bronquio principal derecho (válvulas de la vena Azigos)
 - Catéter tipo Berenstein / Vertebral cCatéter BER. / Vertebral 5 F. + intermedio 6 Fr. + microcatéter / micro. balón + microguía. Curva hacia posterior y avanzar guía cruzando linea media hacia vena azigos
 - Avanzar el microcatéter hasta la vena paraespinal deseada (circulo peri-radicular del plexo venoso)



Embolización (Técnica)

- Serie con microcatéter para comprobar posición y descartar perforaciones / complicaciones
- Microcatéter balón (evitar reflujo)
- Inyectar agente embolizante (DMSO + EVOH)

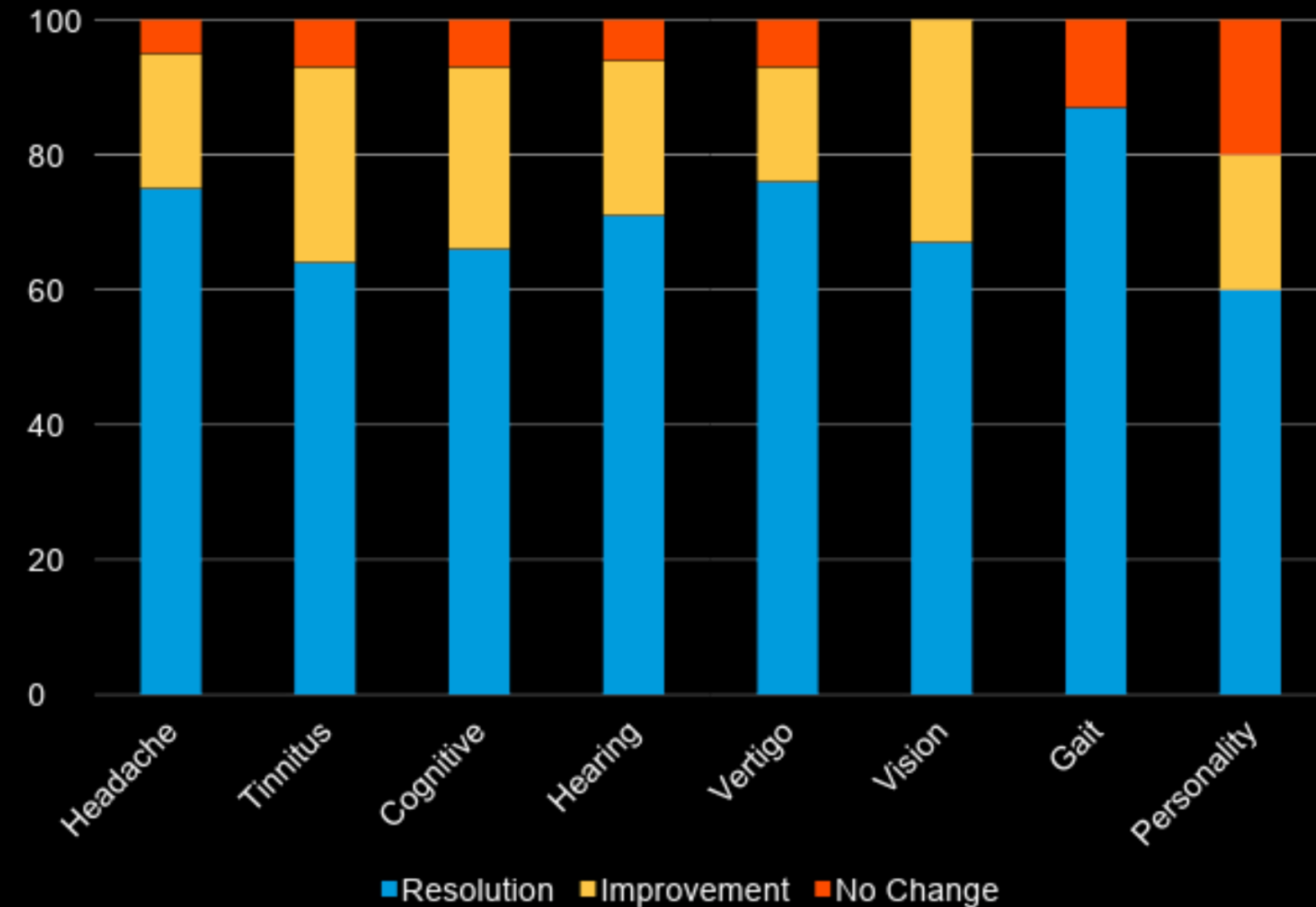
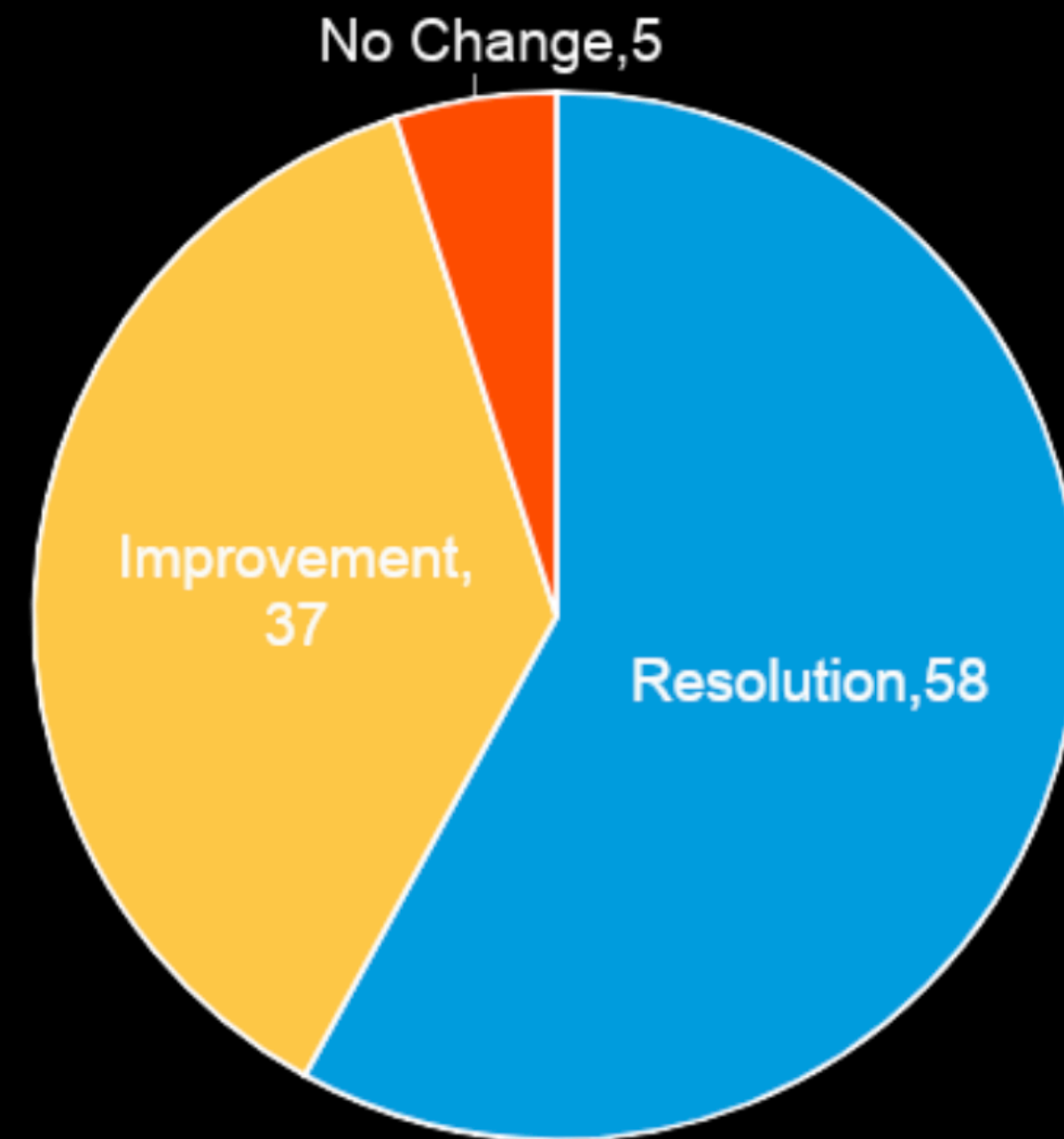


TC de Haz Cónico Post-Tto EV FV LCR



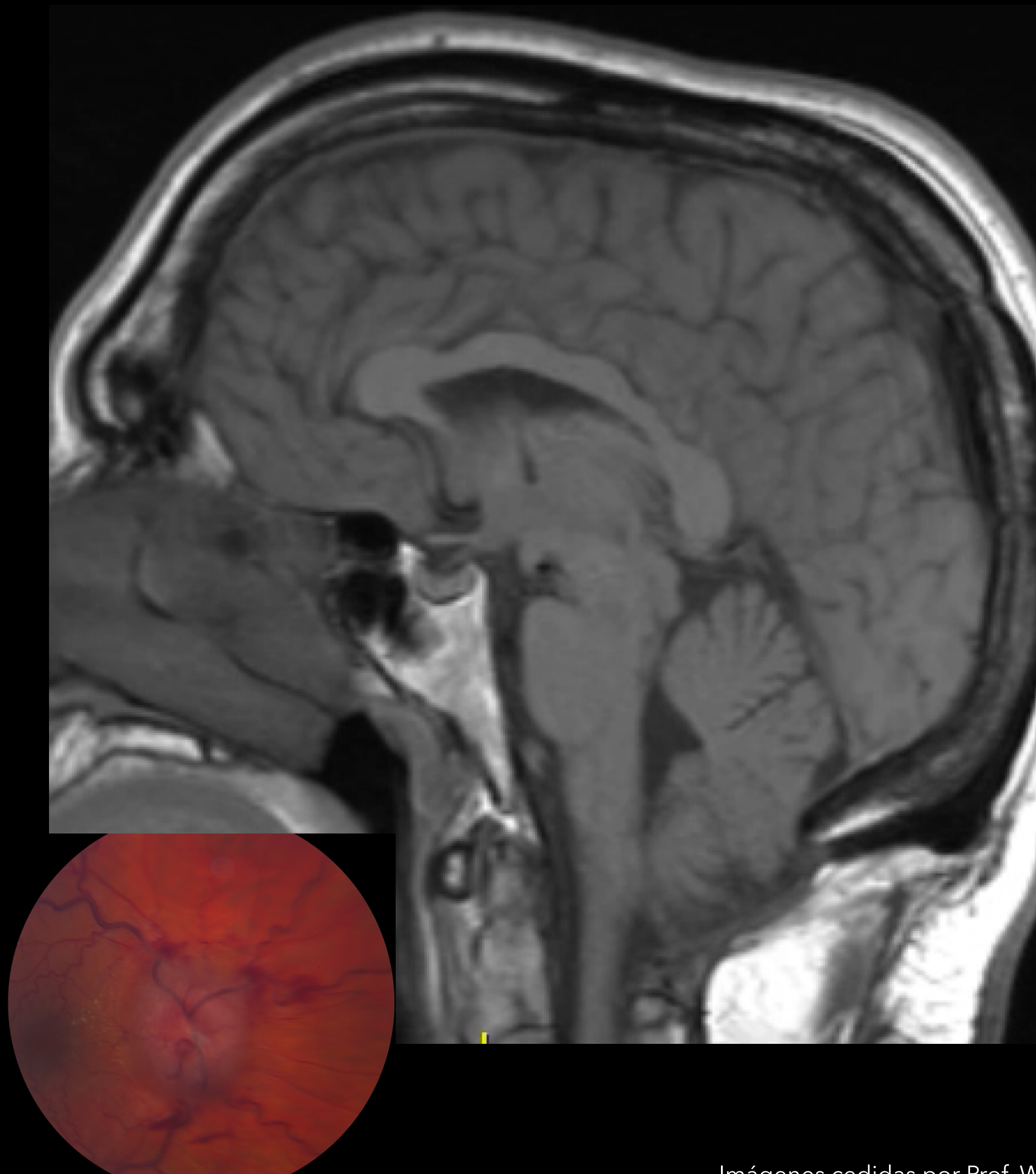
Resultados 1 año de Post-Tratamiento EV FVLCR

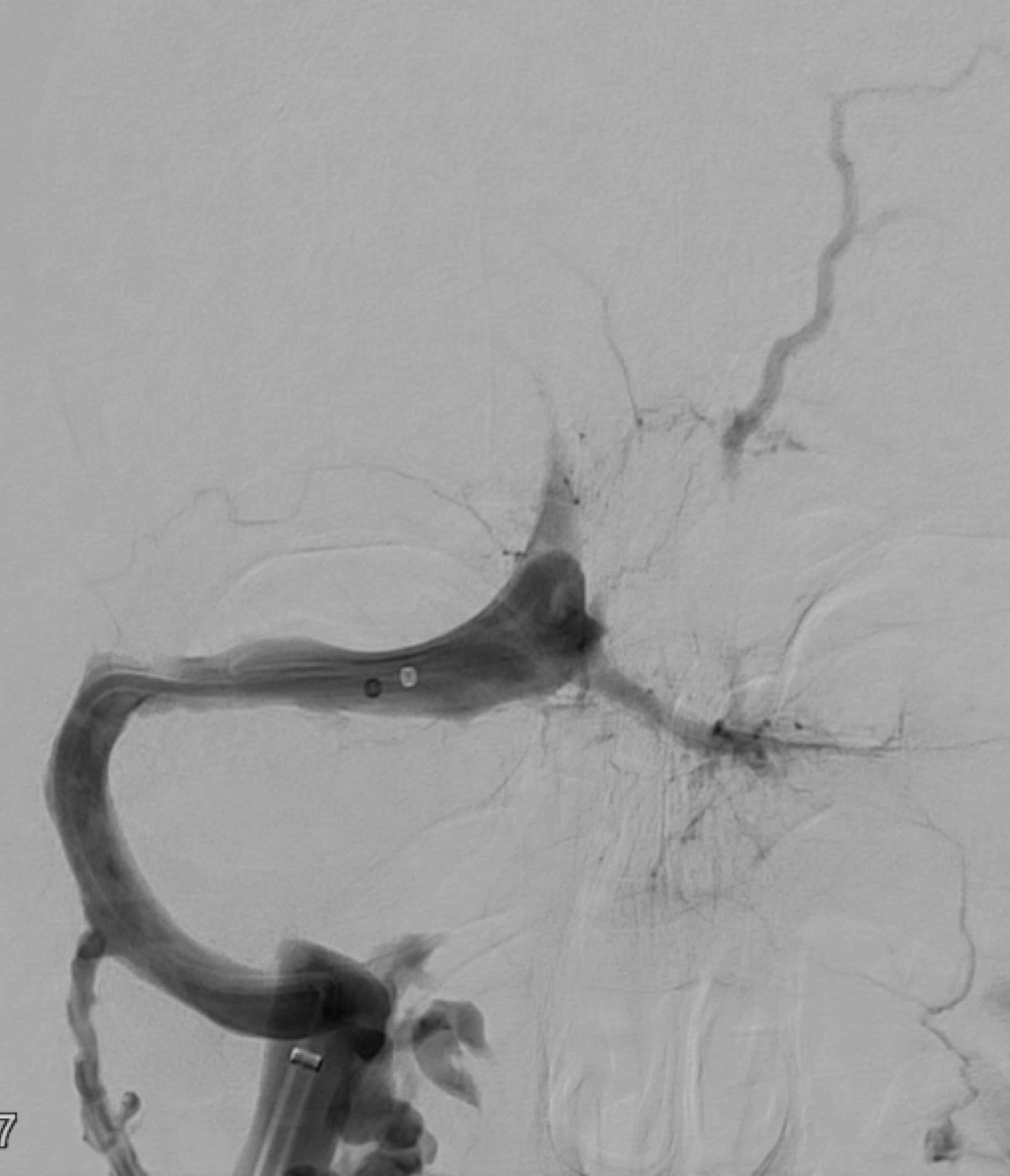
- Major complication rate: 0%
 - Loss of motor function: 0%
 - Spinal cord infarction: 0%
 - Symptomatic PE: 0%
 - Hemorrhage: 0%
 - Infection: 0%
- Minor complications
 - Post-op pain: 3%
- Technical complications
 - Venous perforation: 4%
 - Onyx emboli: 5%

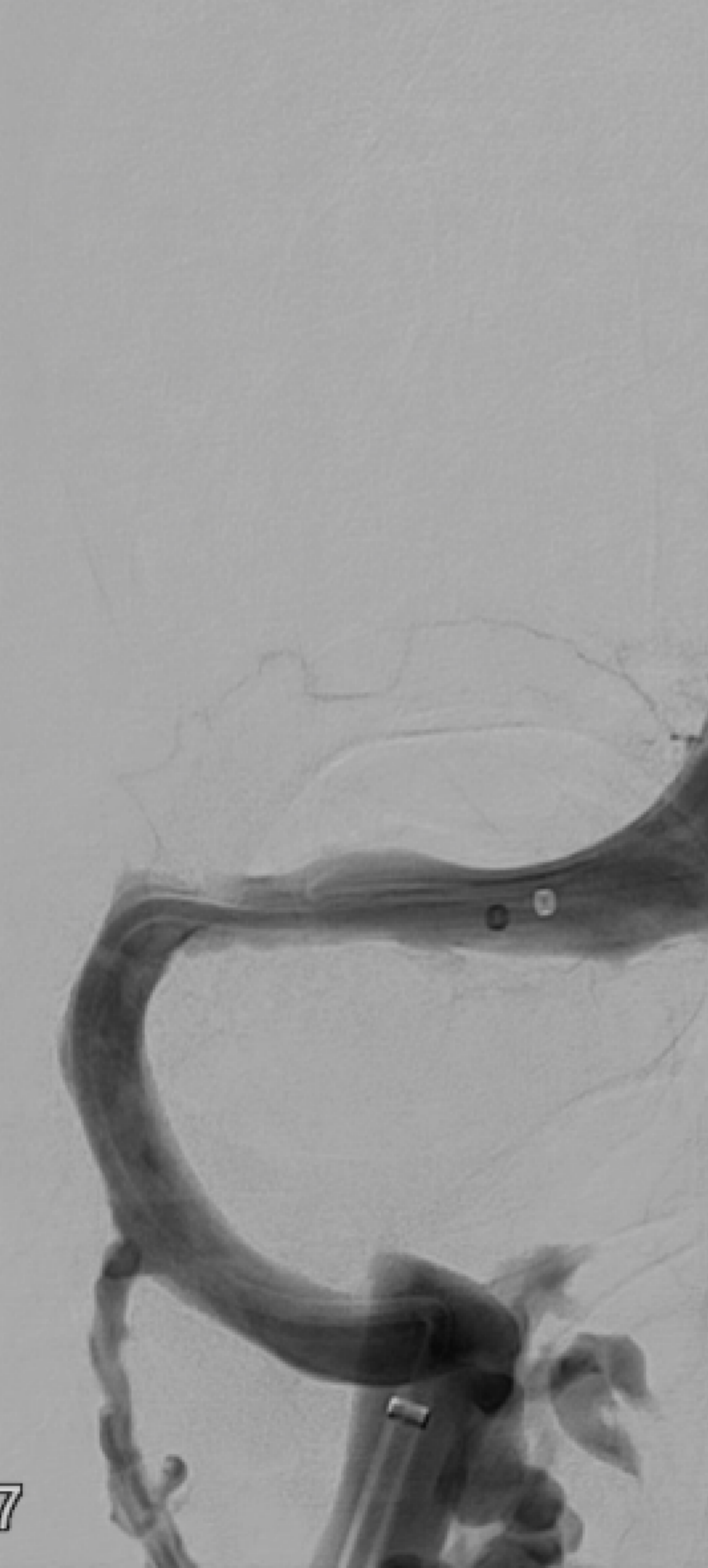


Retos en el Tratamiento FVLCR

- HIC de rebote (acetazolamida)
- Múltiples fugas (10% pacientes)
- Pacientes de larga evolución (resultados moderados)
- Embolización fallida / recanalizaciones
- Desarrollo de nuevas FVLCR









CONCLUSIONES

- El SHIE sigue siendo una entidad poco conocida y su prevalencia probablemente esté infraestimada
- Ha habido un avance significativo en el conocimiento de la evaluación y manejo del SHIE en los últimos años
- Conocer bien y aplicar correctamente un algoritmo diagnóstico actualizado con estudios técnicamente bien realizados es fundamental
- Los resultados publicados del tratamiento EV de FV de LCR están demostrando alta seguridad y eficacia a la espera de estudios que aporten evidencia de mayor nivel

