

How I do it: EBP



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Conflicts of interest

- Advisory Board Biogen, Lilly
- paid for lectures from Eisai, Biogen, Lilly, Mbits, GE, Bayer (2020-2024)
- Co-editor Clin Neuroradiol

EBP or fibrin patch : Possible indications

- PDPH
 - diagnostic lumbar puncture
 - therapeutic lumbar puncture: e.g. IIH
 - unintended dural puncture
 - PDA
 - spinal surgery
 -
- SIH
 - spinal CSF leak (type 1, 2 or 3)
 - spinal CSF leak not localized
 - low flow leak, sacral leaks
 - dural ectasia
 - no leak

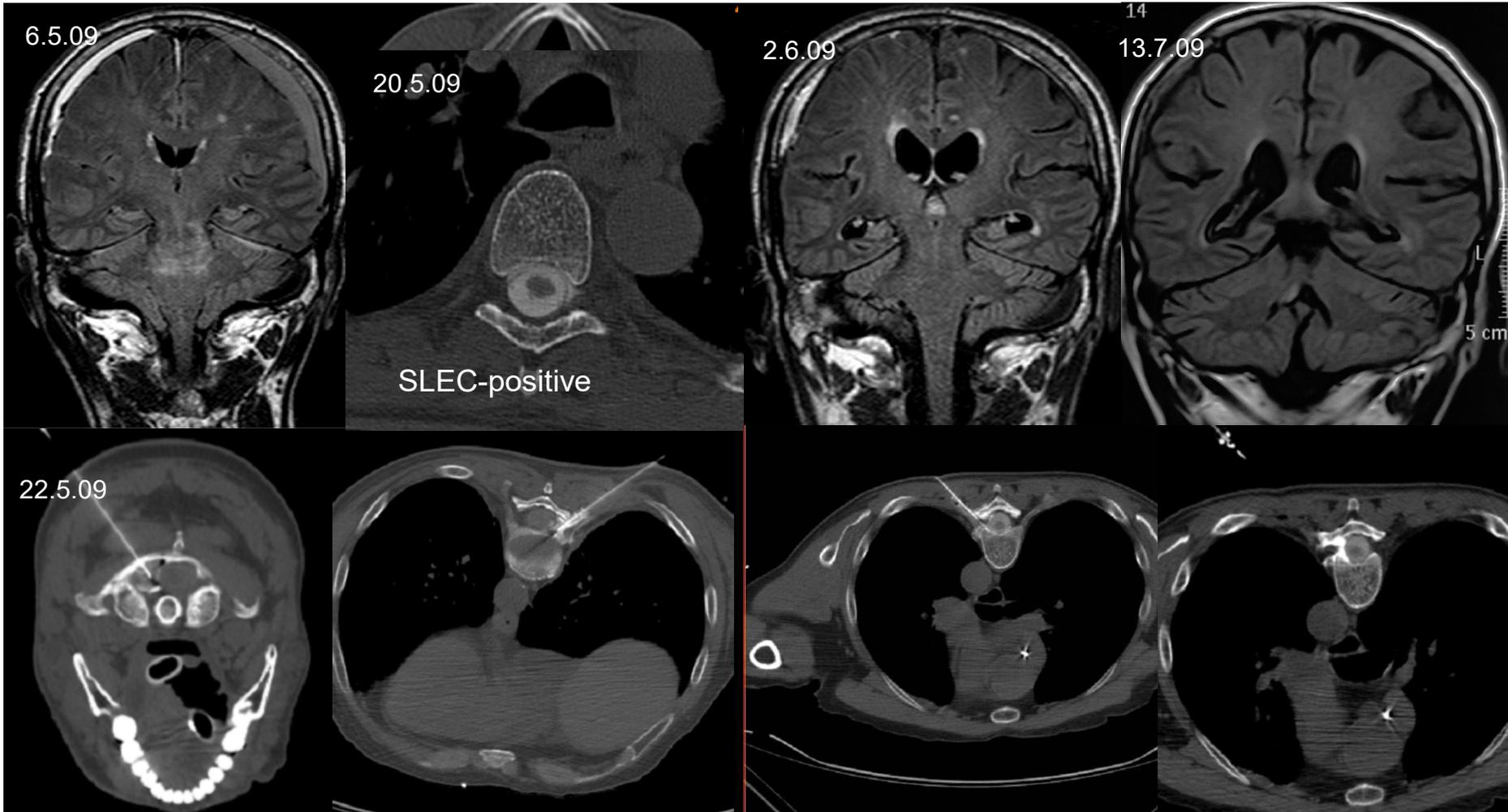
 - spinal CSF leak from preexisting IIH

EBP or fibrin patch : Current indications

- How I did it: The pre „dynamic DSM - dynamic CTM“ era
- How and when I do it now:
 - PDPH
 - with spinal CSF leaks
 - without spinal CSF leaks
 - Type 2 leaks
 - with rather small arachnoid herniations
 - (type 3 leaks)
 - Sacral leaks
 - bvFTBSS („spinal dementia“)

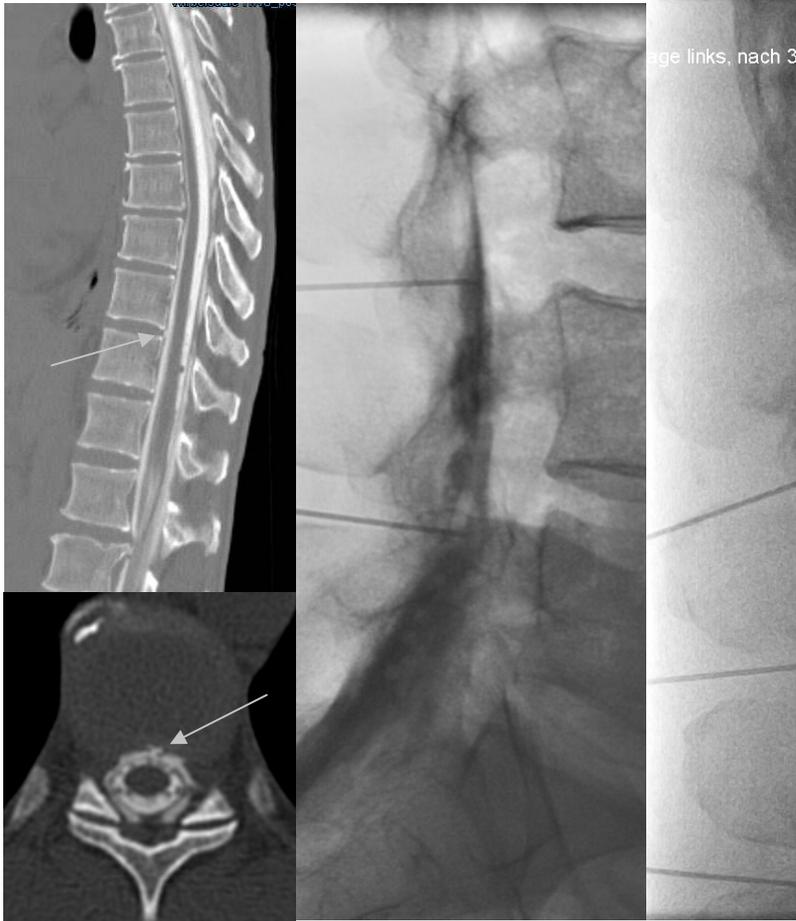
2017

Head +, SLEC +: CT-guided multi-level epidural fibrin patch



C1/2 left, C2/3 right, Th5/6 left, Th 6/7 left, Th7/8 right

Non targeted Epidural Blood Patch: Head +, SLEC +



Non targeted Epidural Blood Patch: ventral leak Th1/2

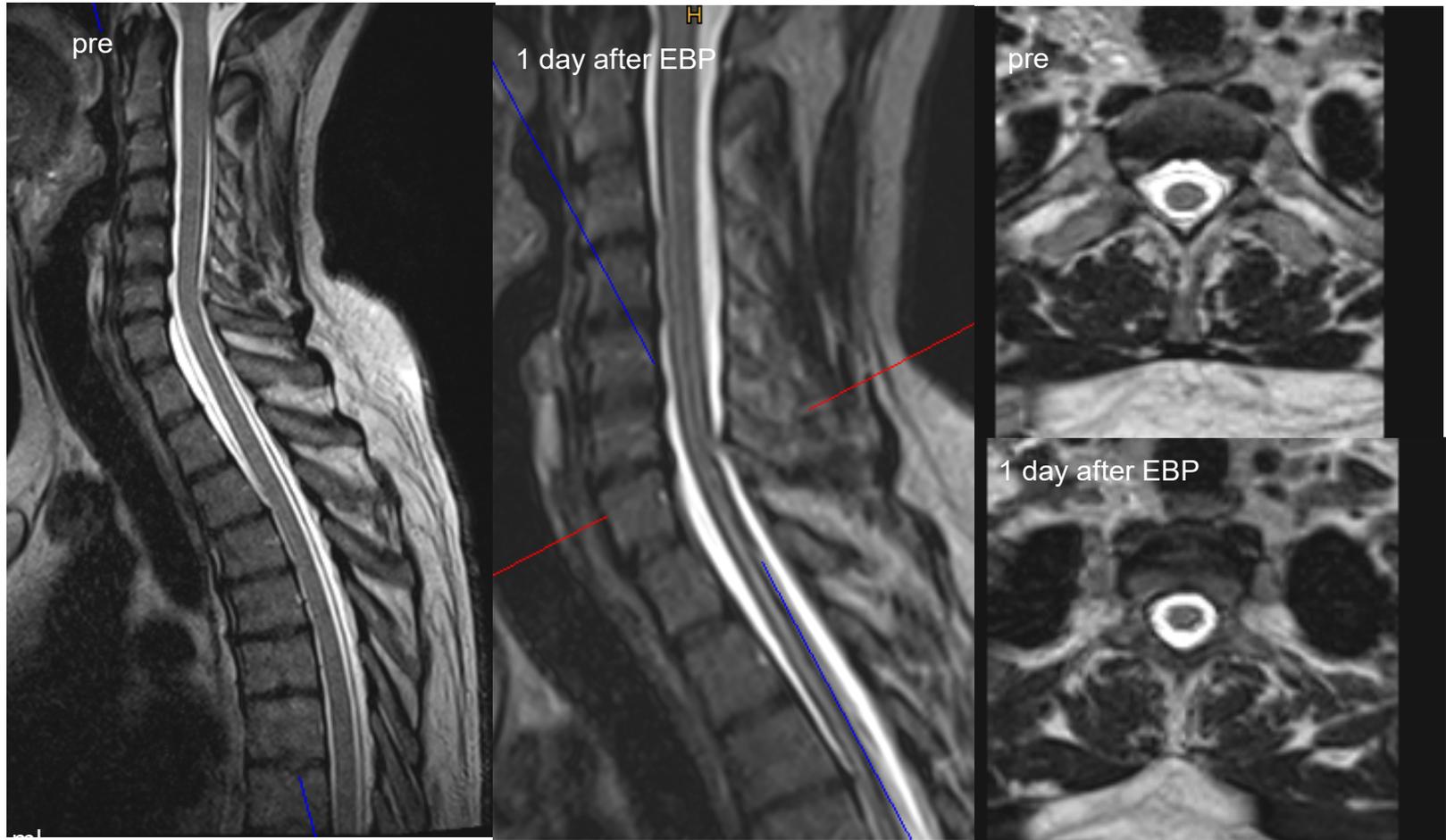
CT myelography

dynamic
CT myelography

non-targeted
EBP 50 ml



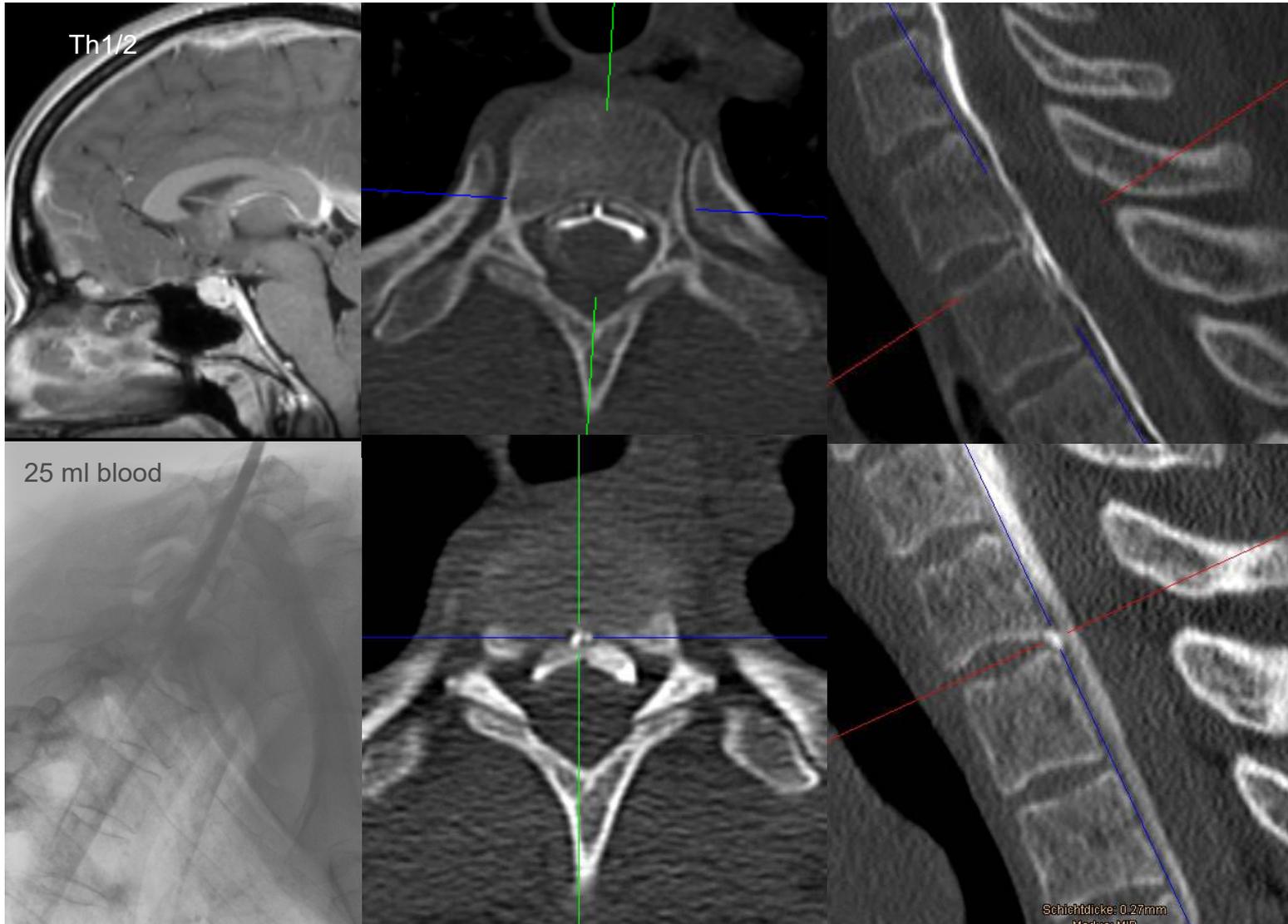
Non targeted Epidural Blood Patch: ventral leak Th1/2



m, 50, after 1 day: No headache, persisting N.VI paresis

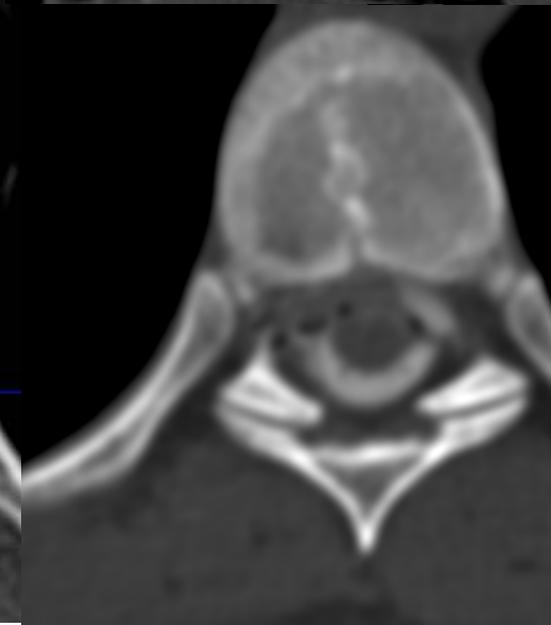
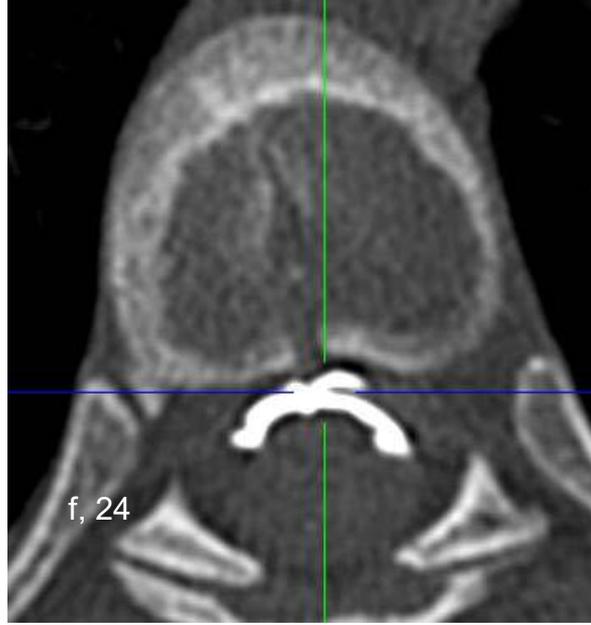
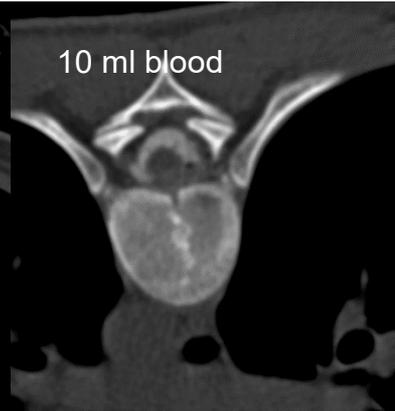
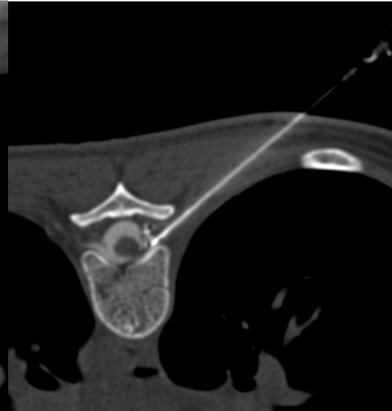
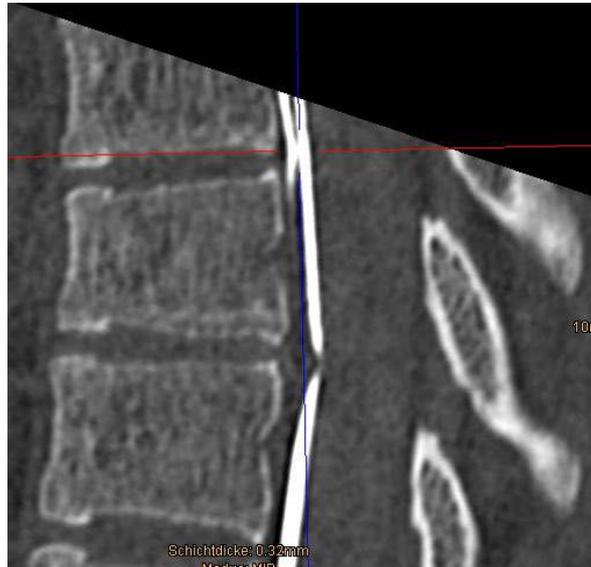
Non targeted Epidural Blood Patch: ventral leak Th1/2

f, 29



CT-guided targeted, „ventral“ Epidural Blood Patch

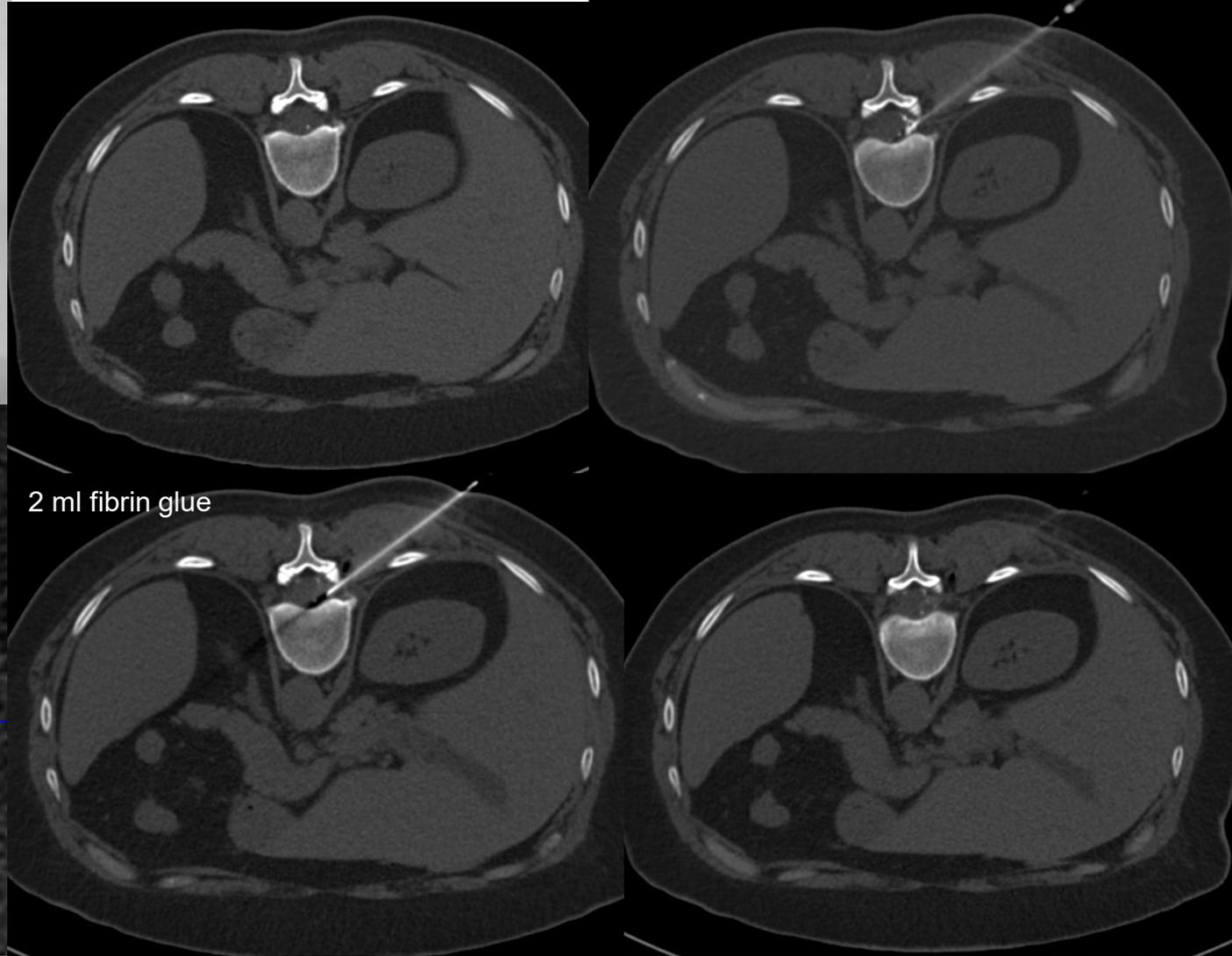
ventral leak Th7/8



CT-guided targeted, „ventral“ Epidural Fibrin Patch

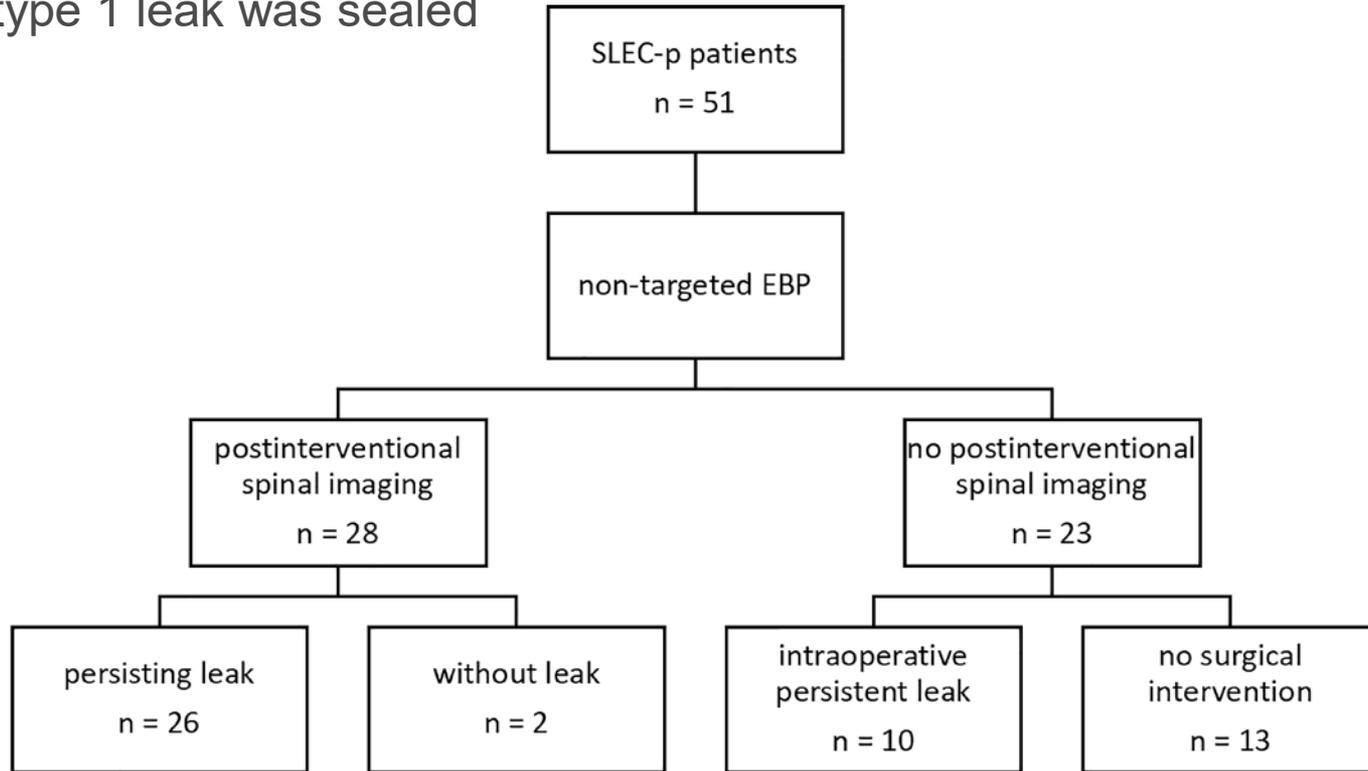
Th 11/12

Es erfolgte ein CT-gesteuerter Fibrin-Patch im Bereich der ventralen Liquorleckage, wonach die Kopfschmerzsymptomatik vollständig sistierte.



Non targeted Epidural Blood Patch

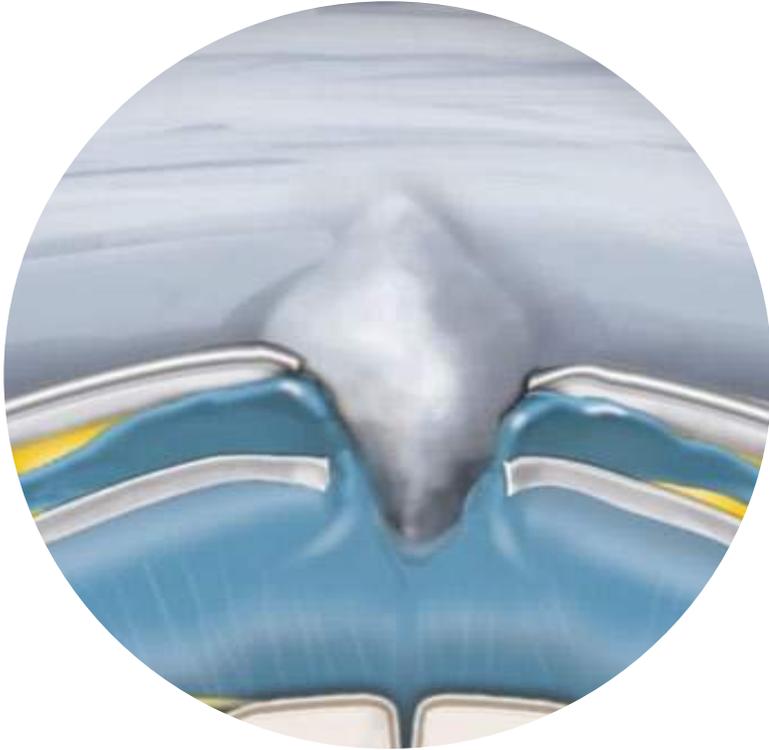
„In only 2 of 28 patients (both patients had a type 2 leak) the leak was sealed.“
→ no type 1 leak was sealed



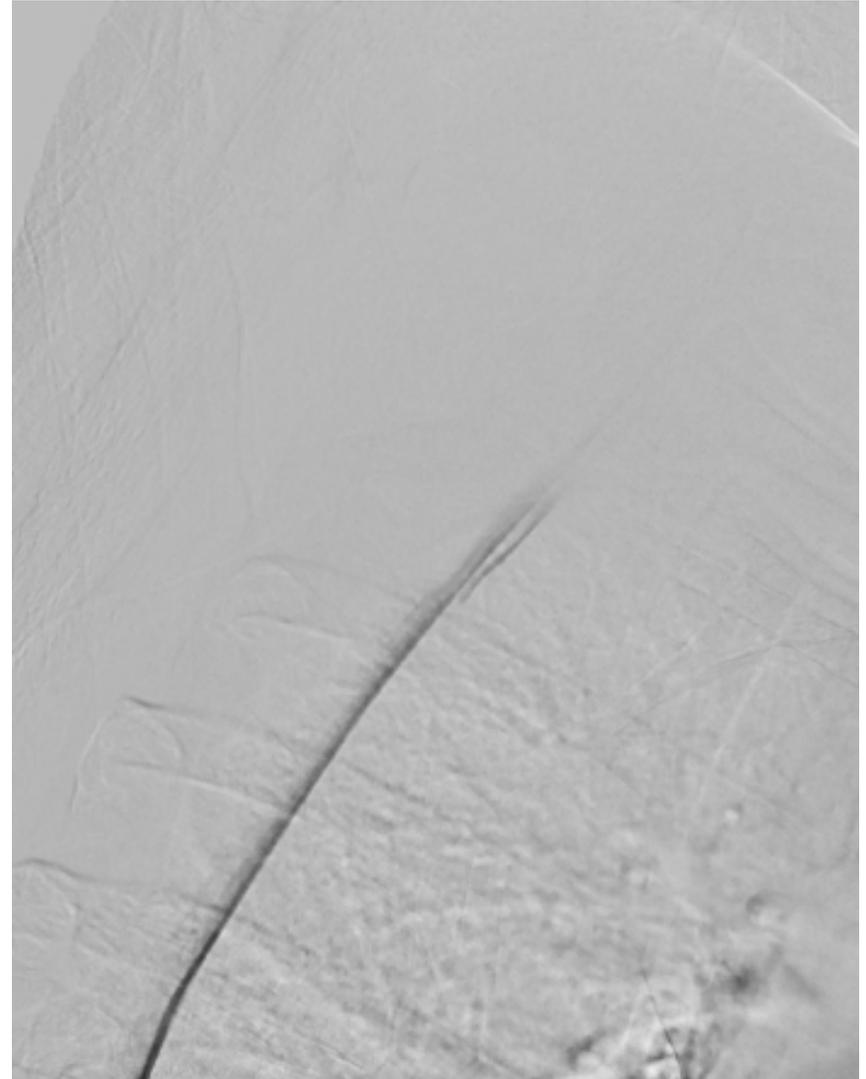
2 Type 2 leaks
(after 4, 2 EBP)

Type 1 leak:

Surgery > EBP

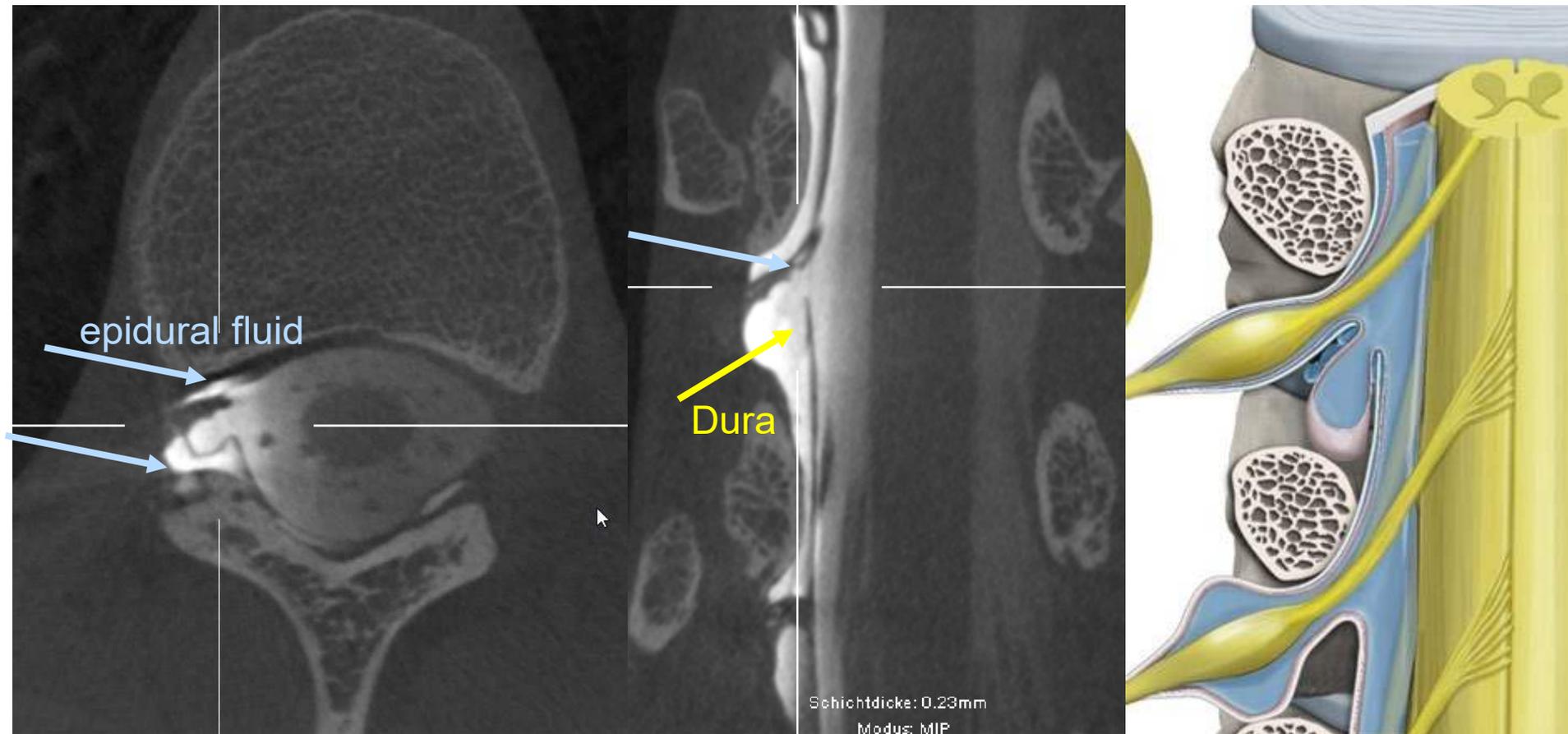


- Membrane formation
- Organized vs. non-organized SLEC

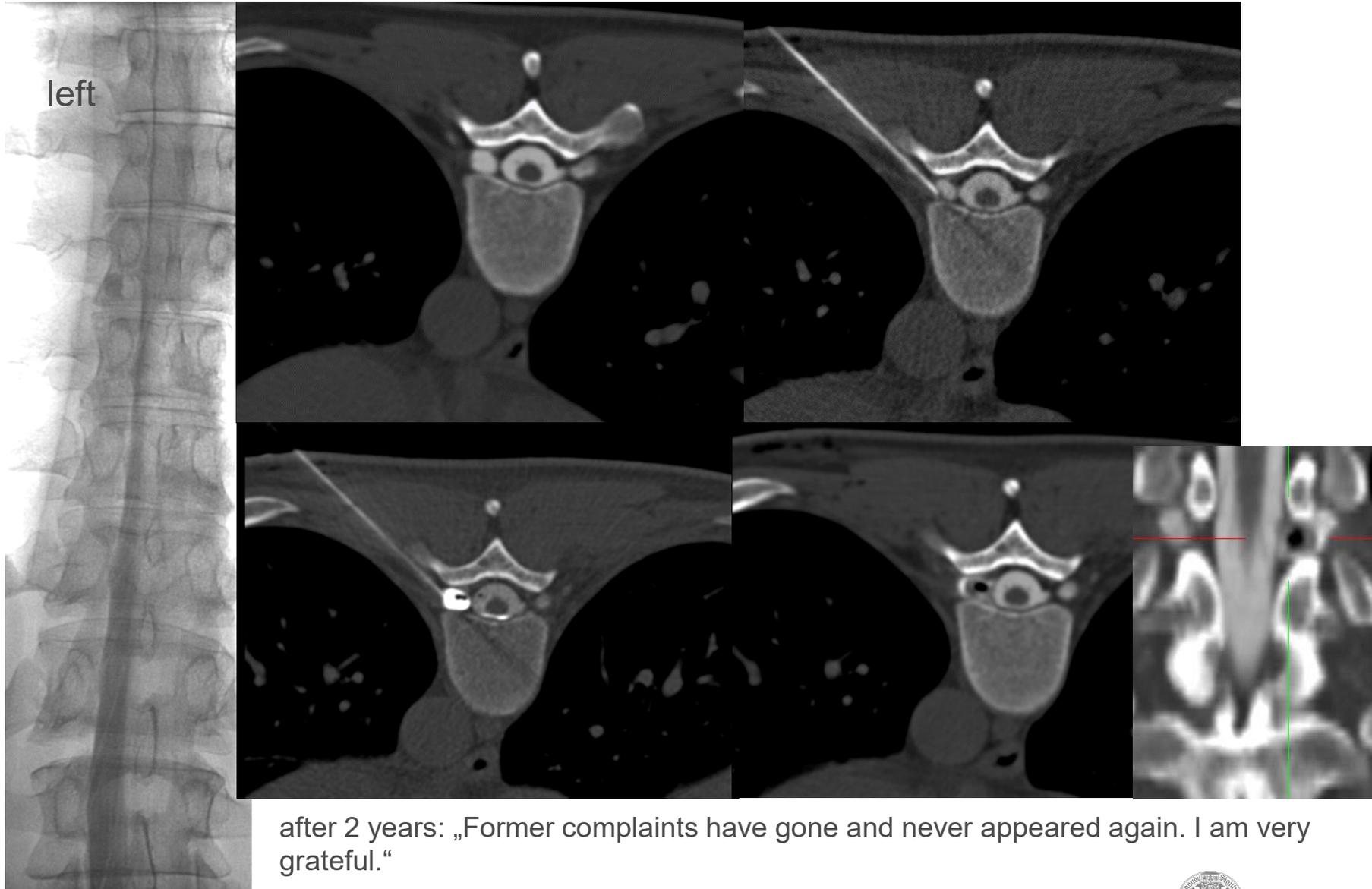


Type 2 leak: **CT-guided fibrin patch.** Surgery, when it fails

„Fill the arachnoid herniation and the surrounding“



Type 2 leak: CT-guided fibrin patch. Surgery, when it fails



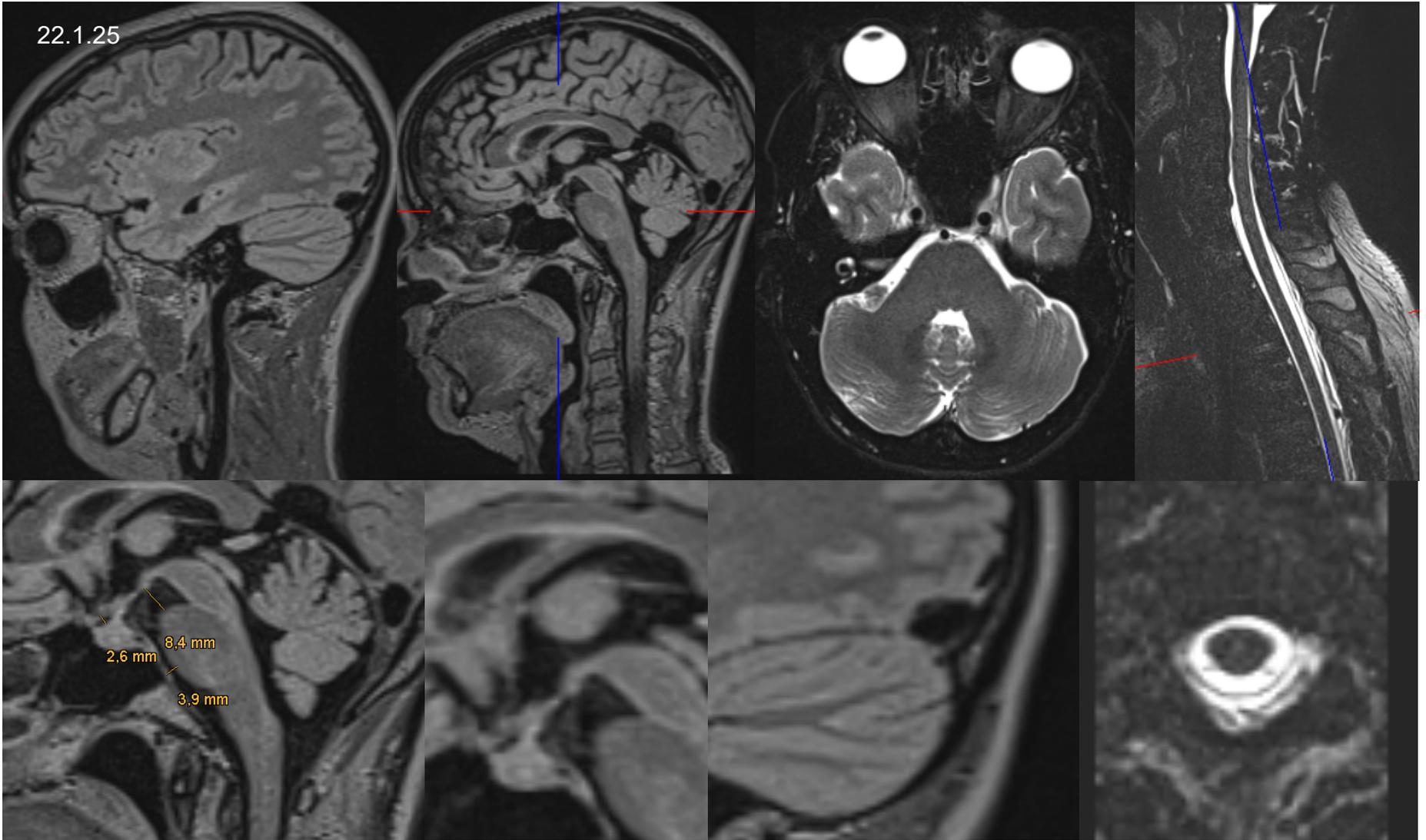
Type 3 leak: CT-guided fibrin patch

Surgery or transvenous embolization, when it fails

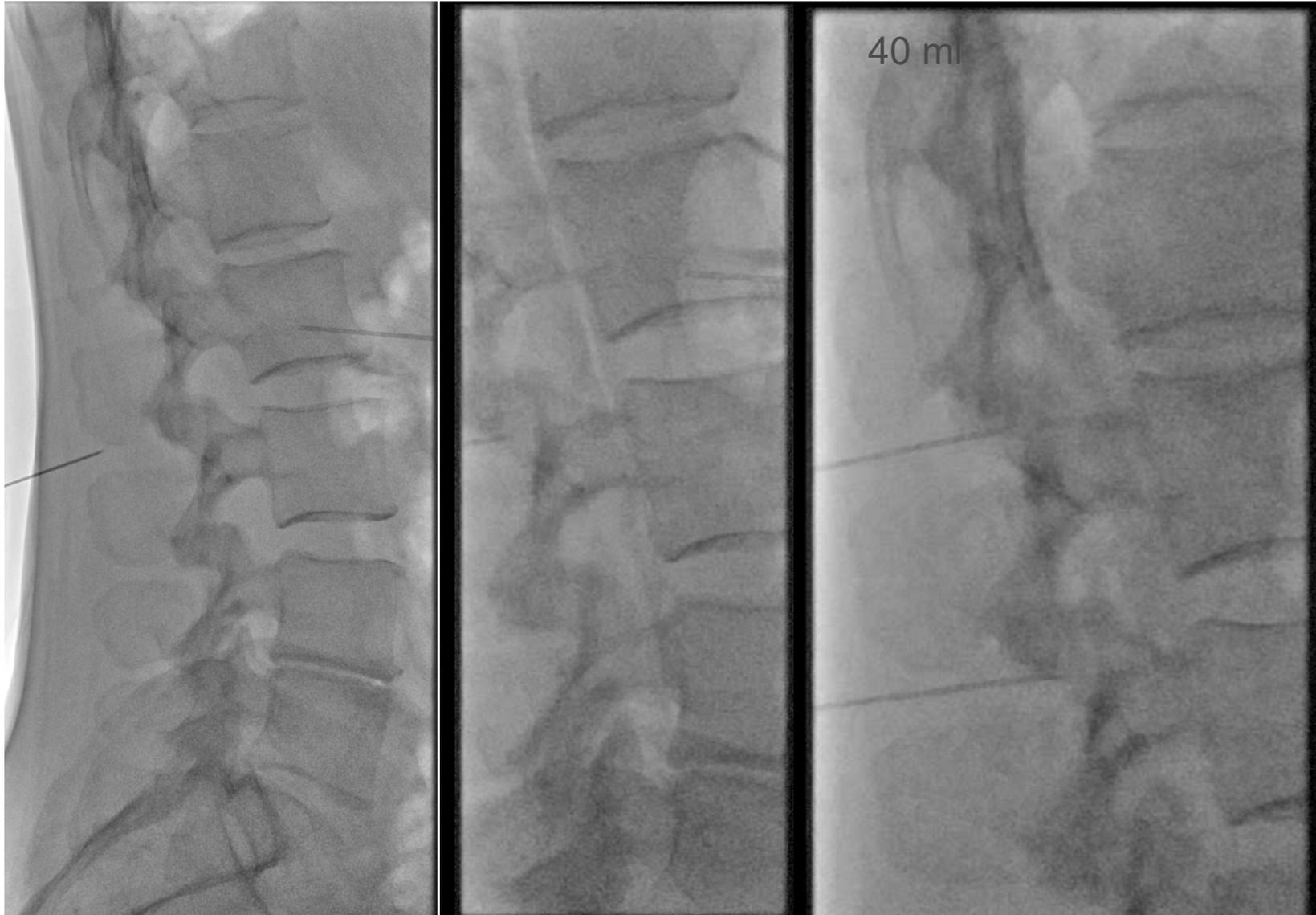


PDPH after unintended dural puncture: after PDA, head +, SLEC +

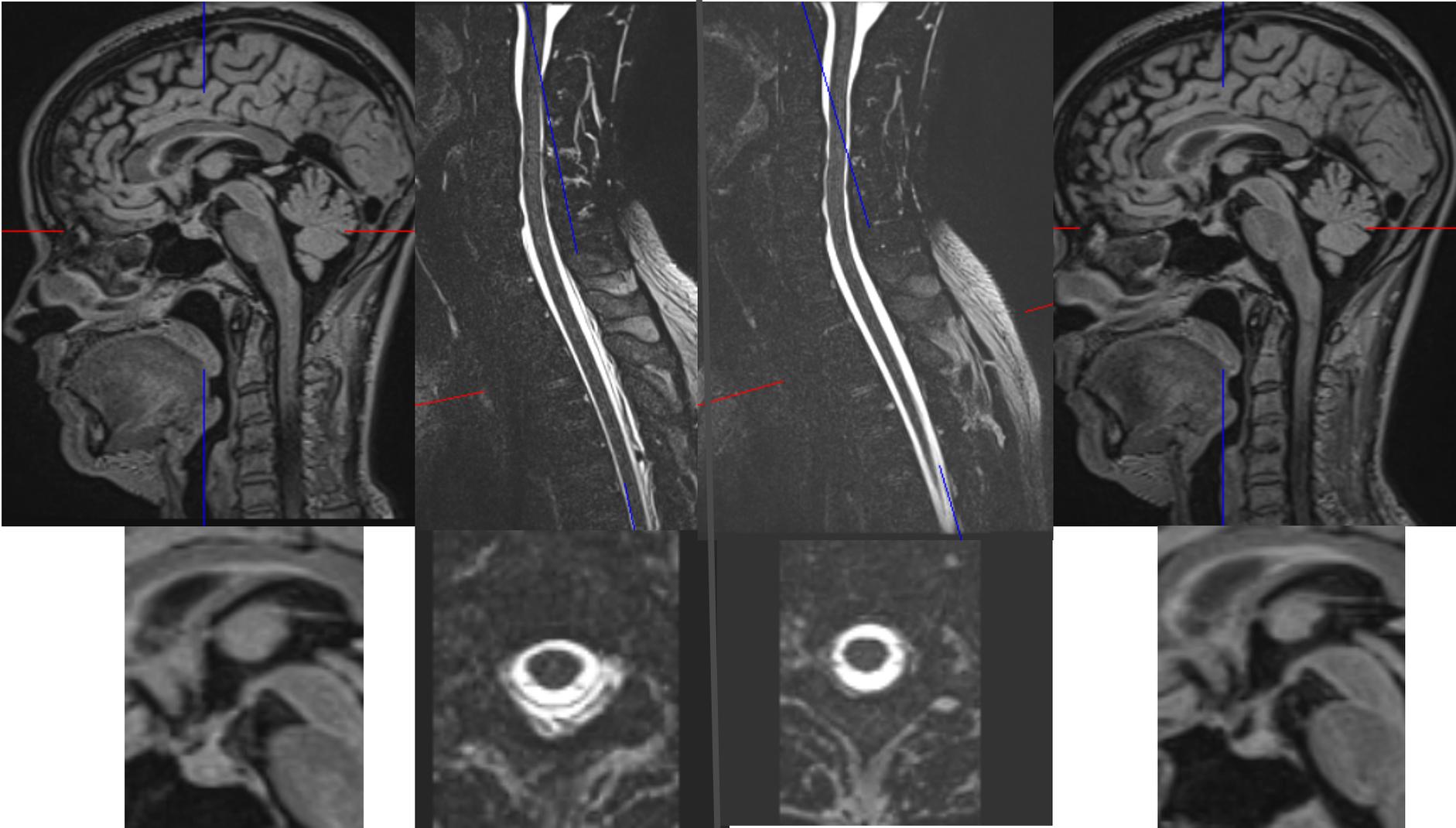
22.1.25



PDPH after unintended dural puncture: after PDA, head +, SLEC +

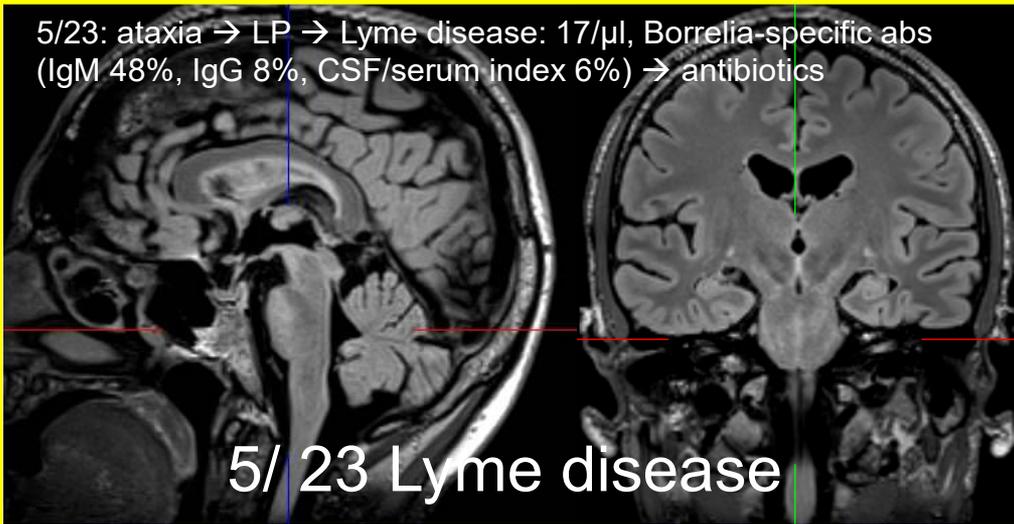


PDPH after unintended dural puncture: after PDA, head +, SLEEC + 4 days after PDA



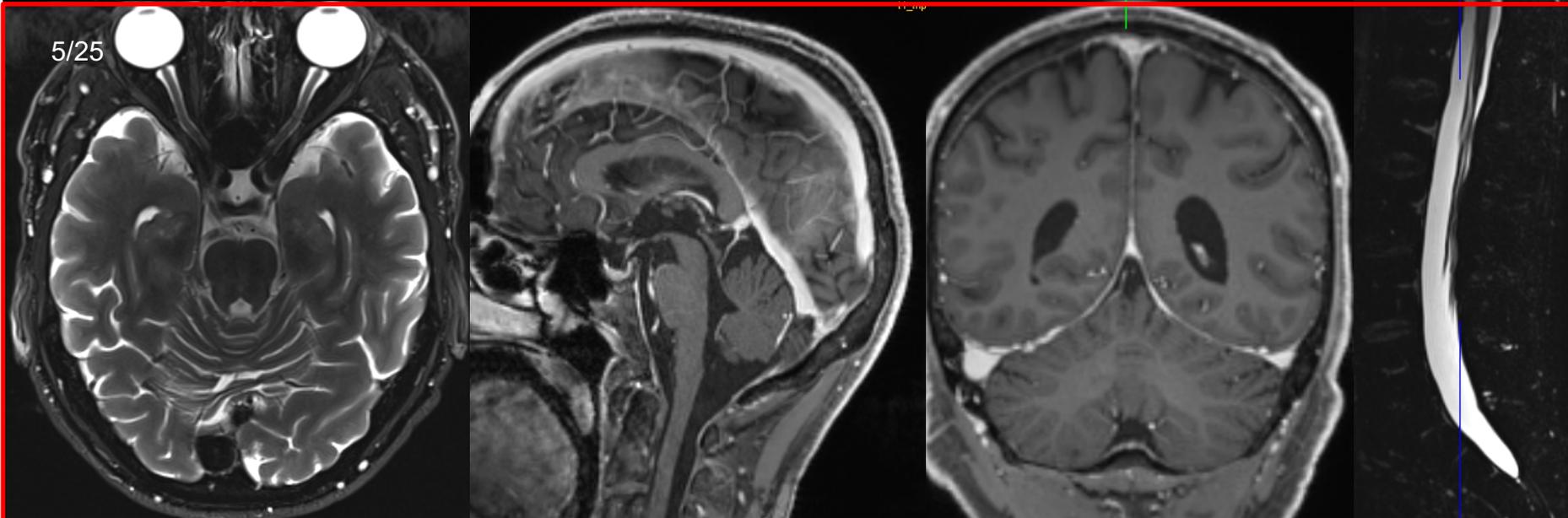
PDPH after diagnostic lumbar puncture: after 2nd LP (2/25)

5/23: ataxia → LP → Lyme disease: 17/μl, Borrelia-specific abs (IgM 48%, IgG 8%, CSF/serum index 6%) → antibiotics

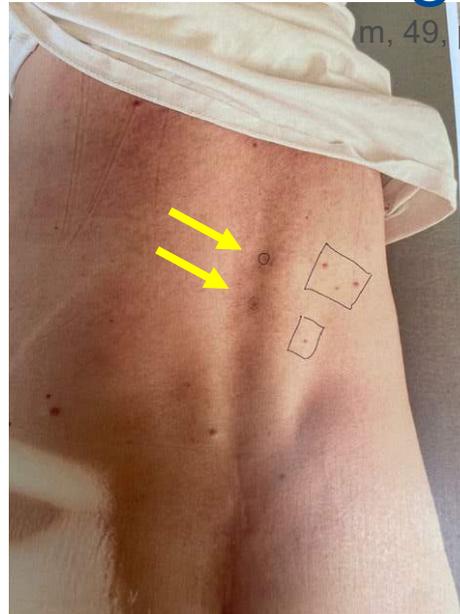


2/25: paresthesias hands, fingers, legs
→ LP: No cells, Borrelia abs (IgG), IgG CSF/serum index 70 (normal < 1.5),
→ No re-infection, Borrelia-assoc.polyneuropathy ?
→ antibiotics
→ „most severe“ PDPH

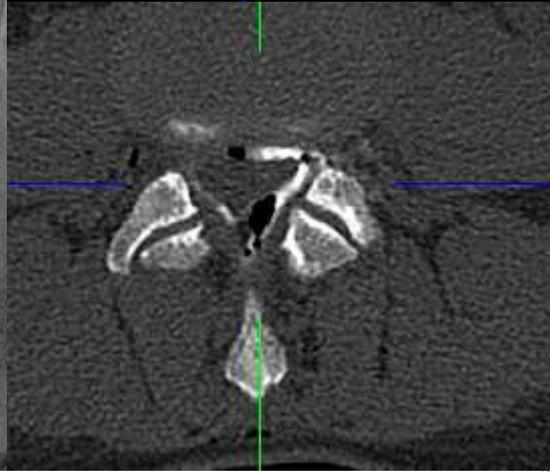
Borrelia-associated polyneuropathy vs. PDPH vs. nothing



PDPH after diagnostic lumbar puncture: after 2nd LP (2/25)



m, 49, psychiatrist



platelet rich fibrin (PRF) patch

PROTOKOLL	ZENTRIFUGAL-KRAFT	UMDREHUNGEN PRO MINUTE (UPM) BEI ZENTRIFUGEN-RADIUS VON 110 MM	ZEIT
PRF-High	710	2400	8
PRF-Medium	177	1200	8
PRF-Low	44	600	8

Tabelle 1: Zentrifugationsprotokolle des Low Speed Centrifugation Concept (LSCC)



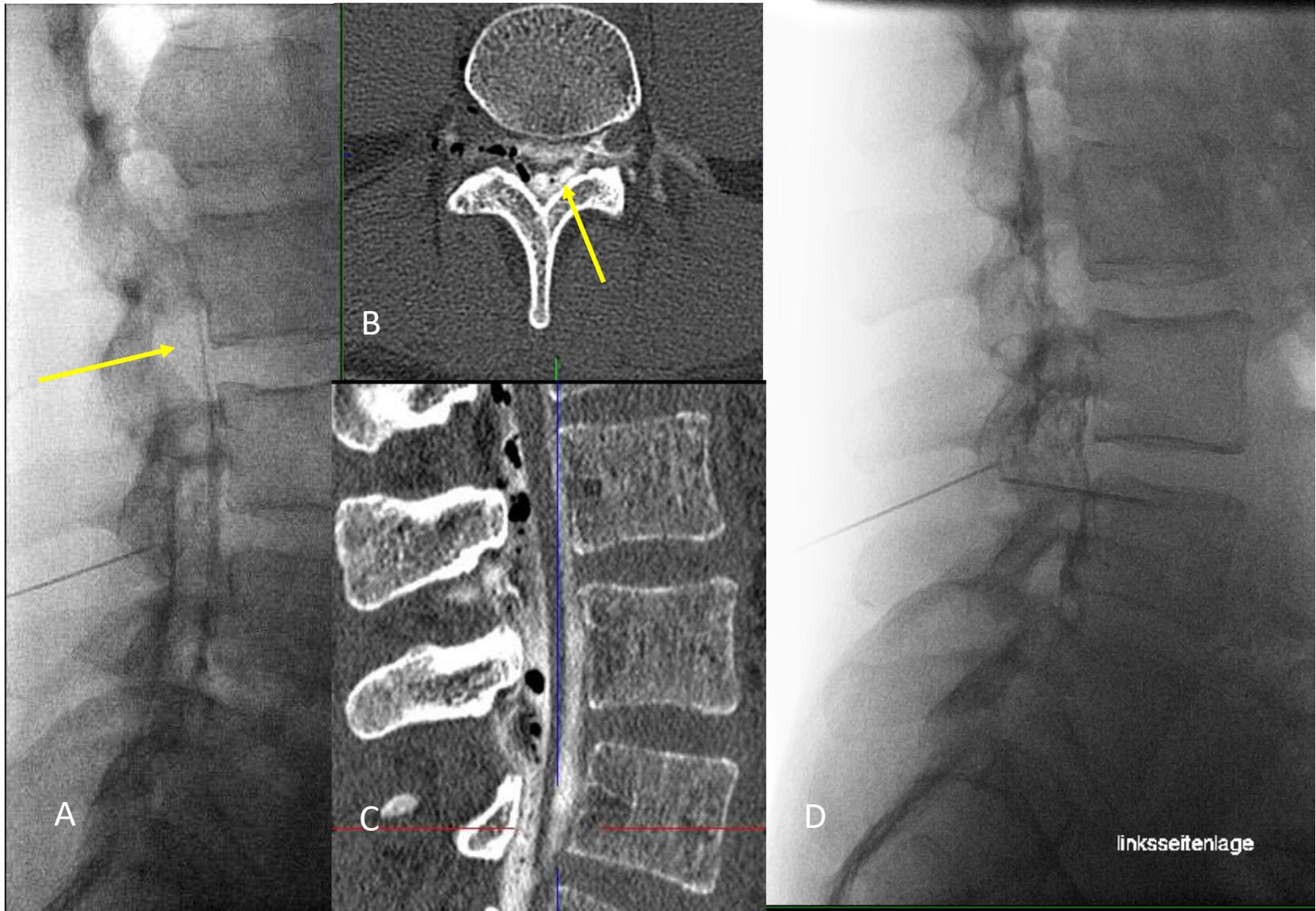
1 Solide PRF-Matrix nach der Zentrifugation



2 Flüssige PRF-Matrix nach der Zentrifugation

Ghanaati S, Al-Maawi S. 15 Jahre Anwendung von Platelet-Rich Fibrin in der Zahnmedizin und Kieferchirurgie. Wie hoch ist der klinische Evidenzgrad? https://pi.dental-online-channel.com/implantologie/anwendung_von_platelet_rich_fibrin/

platelet rich fibrin (PRF) patch

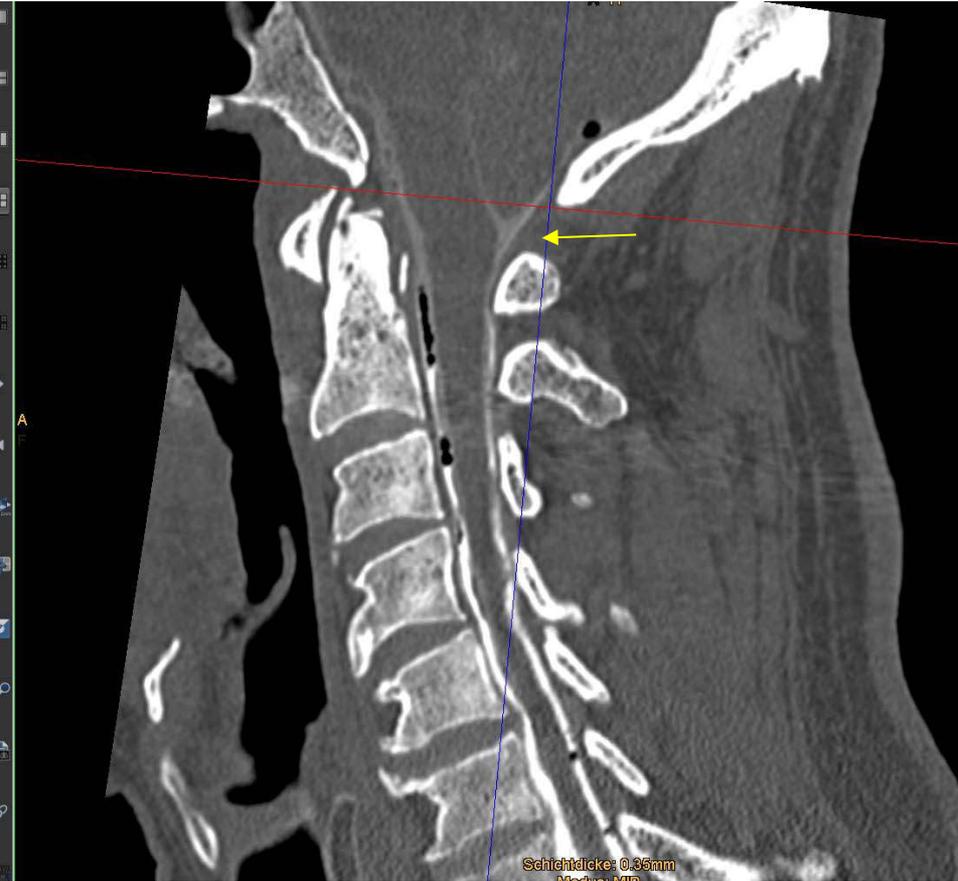


behavioral variant frontotemporal brain sagging syndrome

m, 60

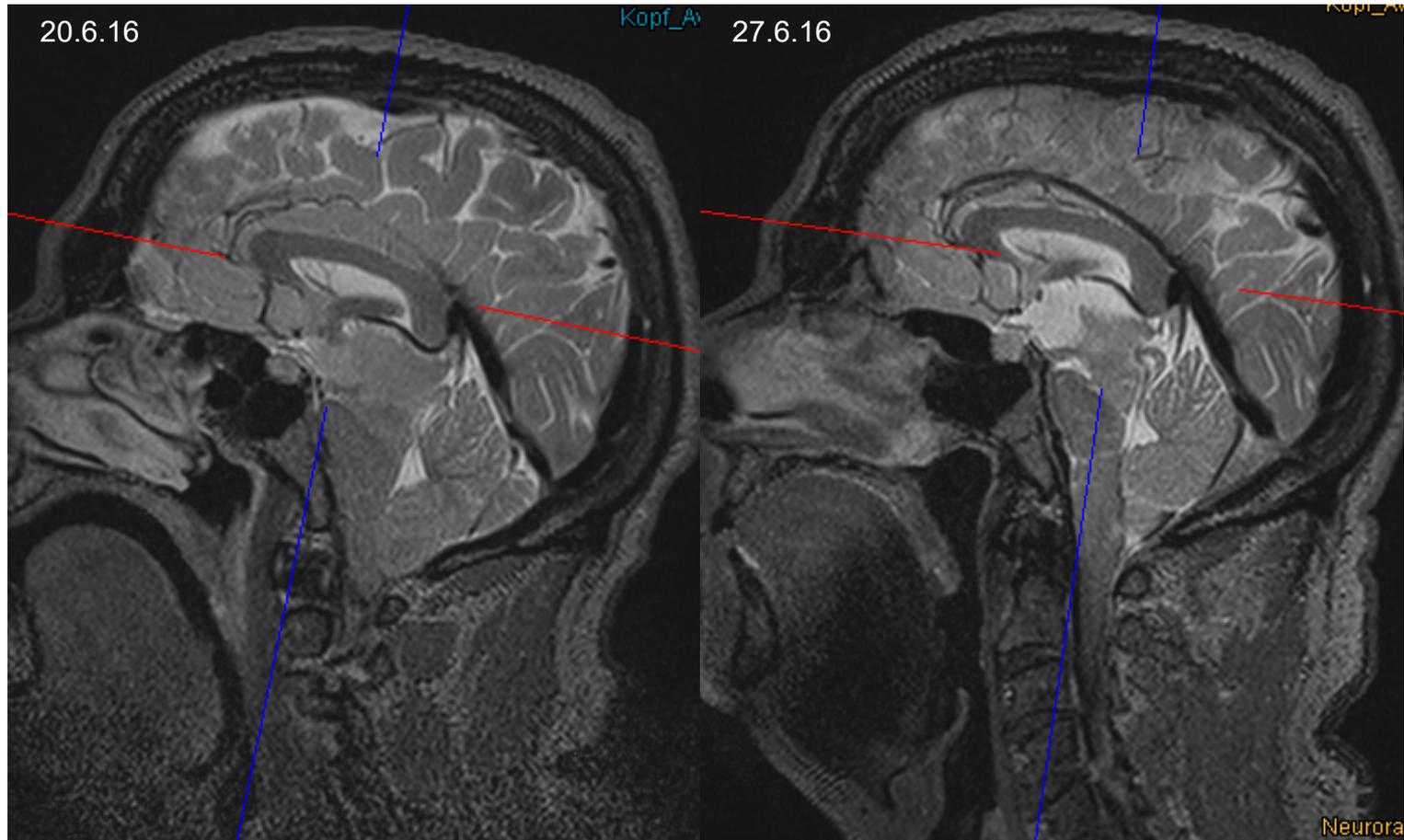
8.12.15: intrathecal injection

9.12.15: epidural injection



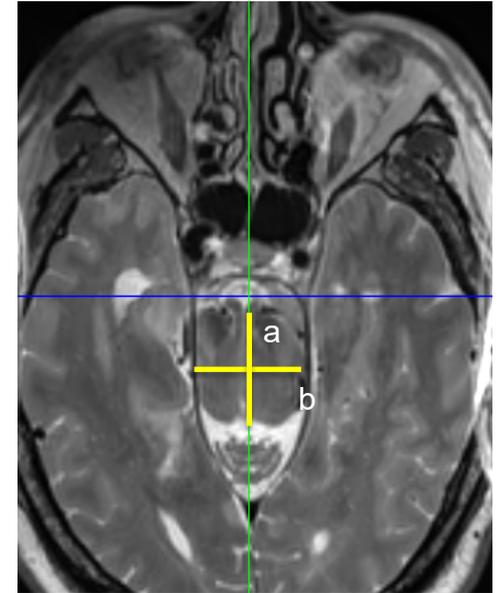
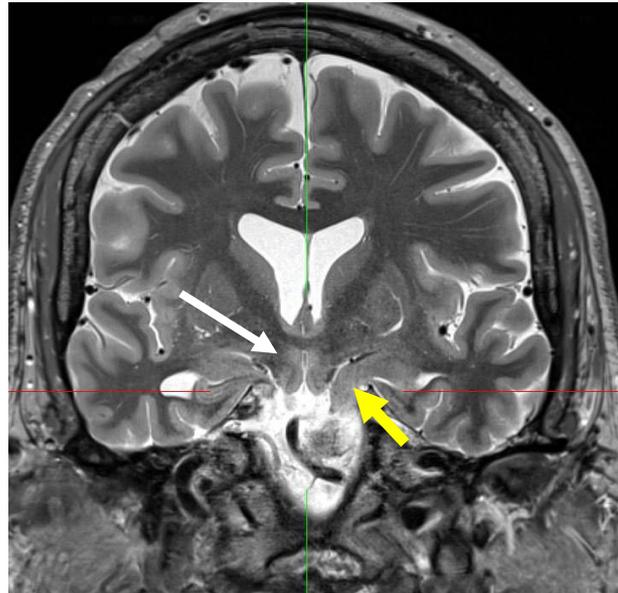
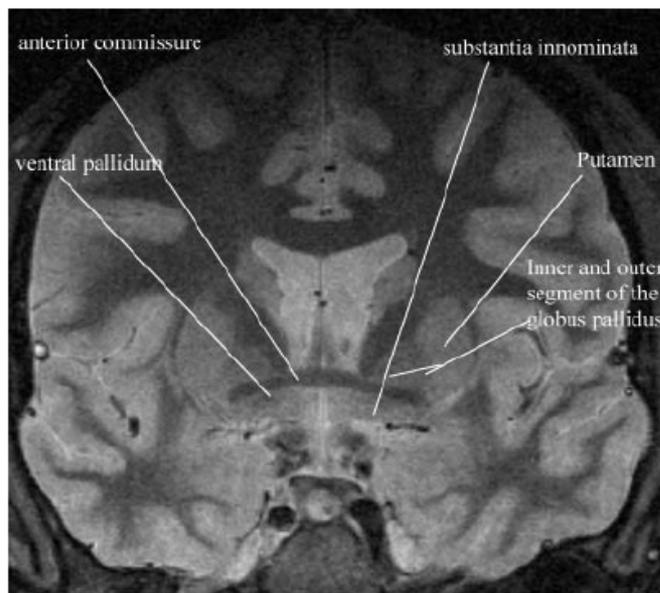
behavioral variant frontotemporal brain sagging syndrome

m, 60



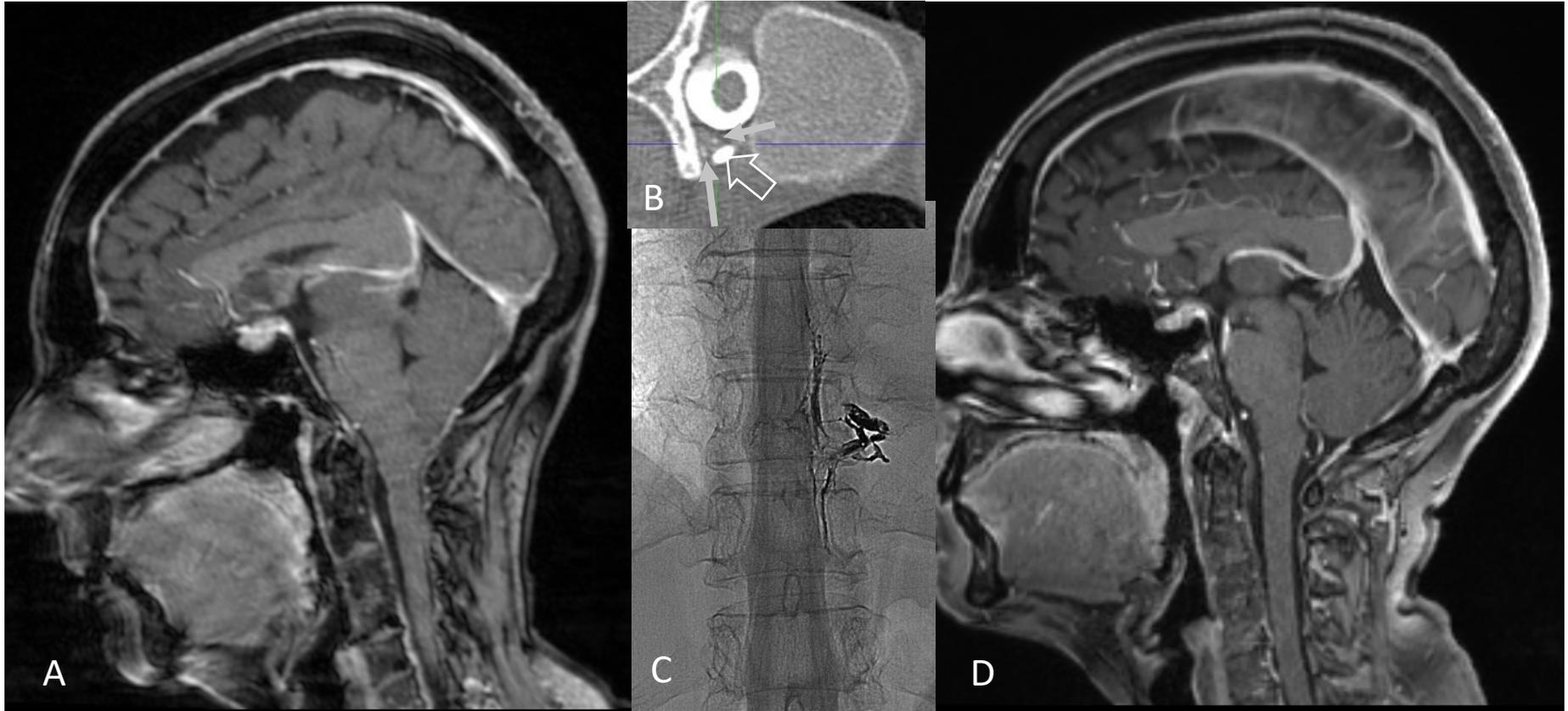
behavioral variant frontotemporal brain sagging syndrome

apathy, attention > memory deficits



behavioral variant frontotemporal brain sagging syndrome

f, 60, apathy, not able to handle the household any longer



Schievink WI et al. The reversible impairment of behavioral variant frontotemporal brain sagging syndrome: Challenges and opportunities. *Alzheimer's Dement.* 2022

Lützen N et al. Reversible frontotemporale Demenz bei spinaler Liquor-Vene-Fistel. *Dtsch Ärztebl* 2024

Urbach H et al. Spinal dementia: Don't miss it, it's treatable. *Neuroradiology* 2024

behavioral variant frontotemporal brain sagging syndrome →

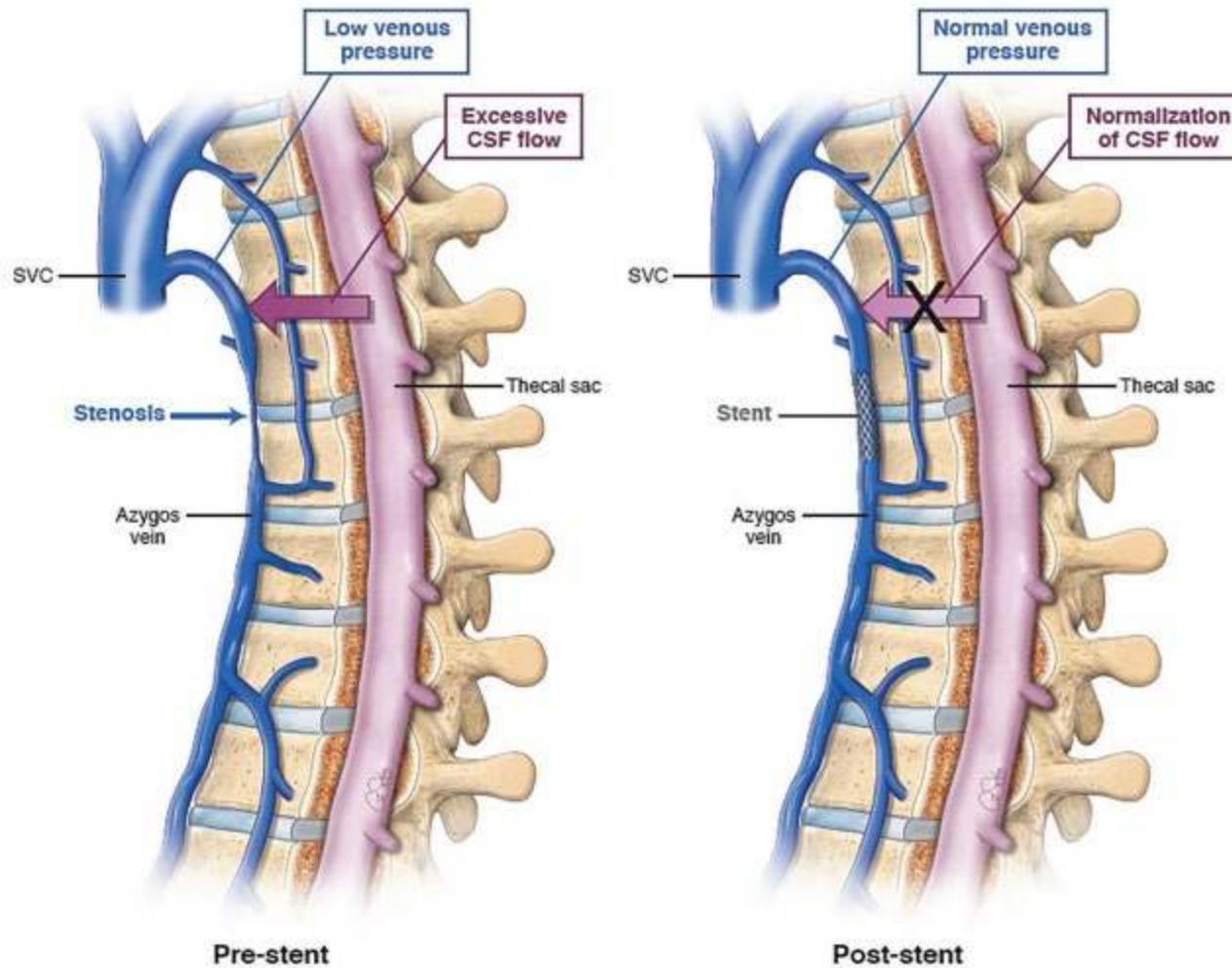
n=51 →
ventral dural tear n=1,
CVF n=12,
nothing n=38

In 2/3 of patients,
no CSF leak is found



compulsive repetitive
flexion with breath-holding

Schmahmann J,
Schievink WI
Neurol Clin Pract 2024

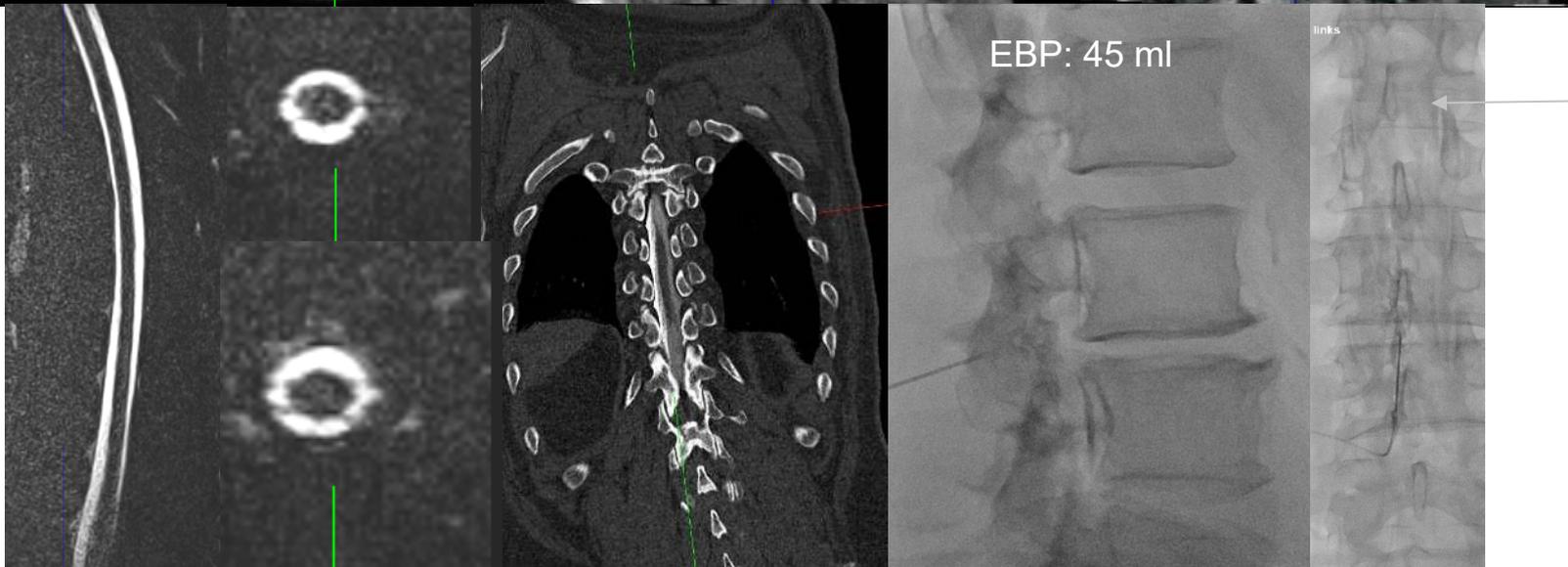


© 2004 Giovanni Santoni, CIMI

m, 62, brain sagging dementia, benefit from EBP with incomplete improvement

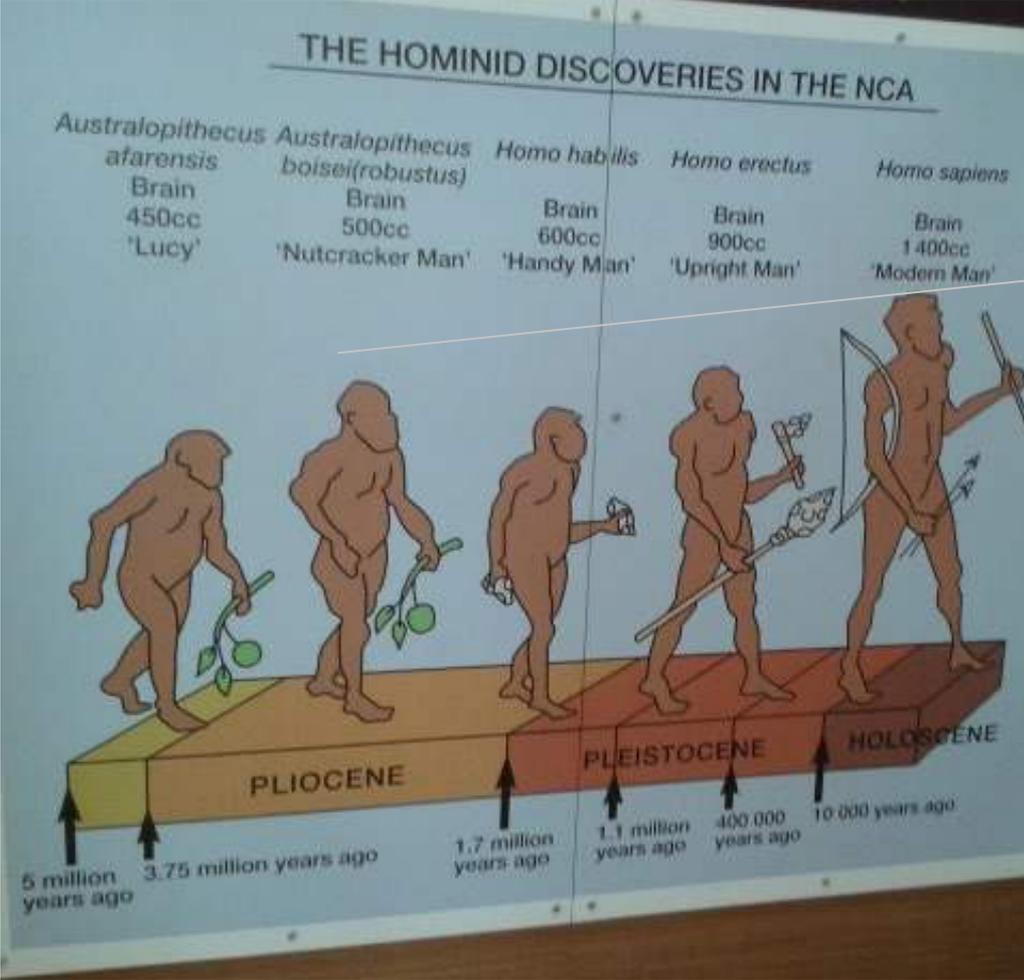


Head +
SLEC -
CVF -



Why does a patient with a spinal CSF leak orthostatic headache?

Mary **Leak**ey skull



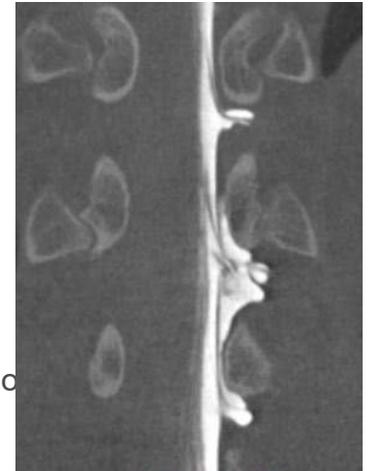
Olduvai-Museum Tansania

Why does a patient get a spinal CSF leak?



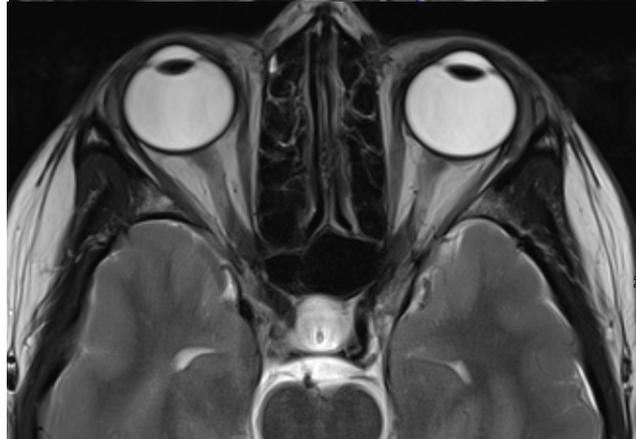
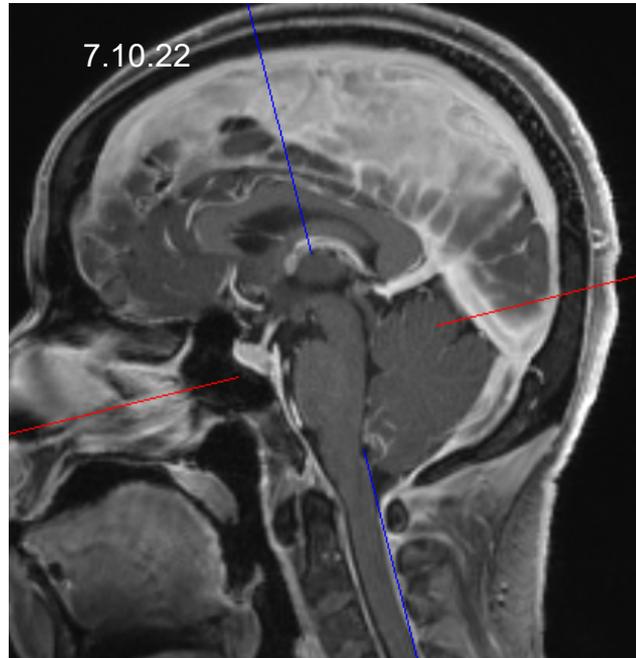
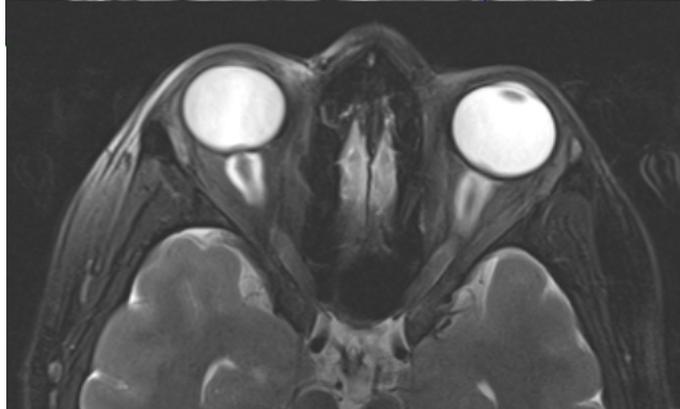
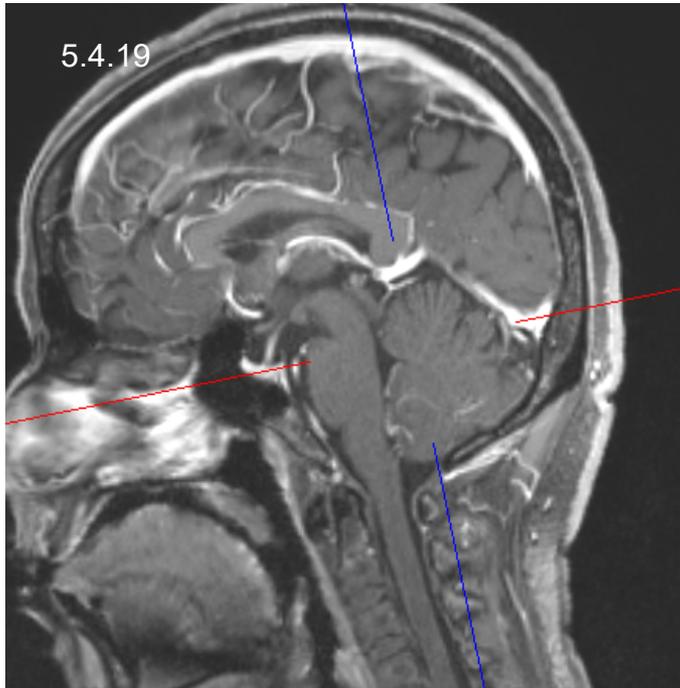
- foreign body pricks bicycle tube
→ bony spur (type 1 leak)
- worn bicycle tube
→ tissue weakness (type 2 leak)
- pressure too high
→ CSF venous fistula (pre-pressurization)
→ leak from pre-existing IIH

Dilemma: When a patient gets a CSF leak from preexisting IIH, CSF pressure may be normal again and IIH signs on MRI may have disappeared



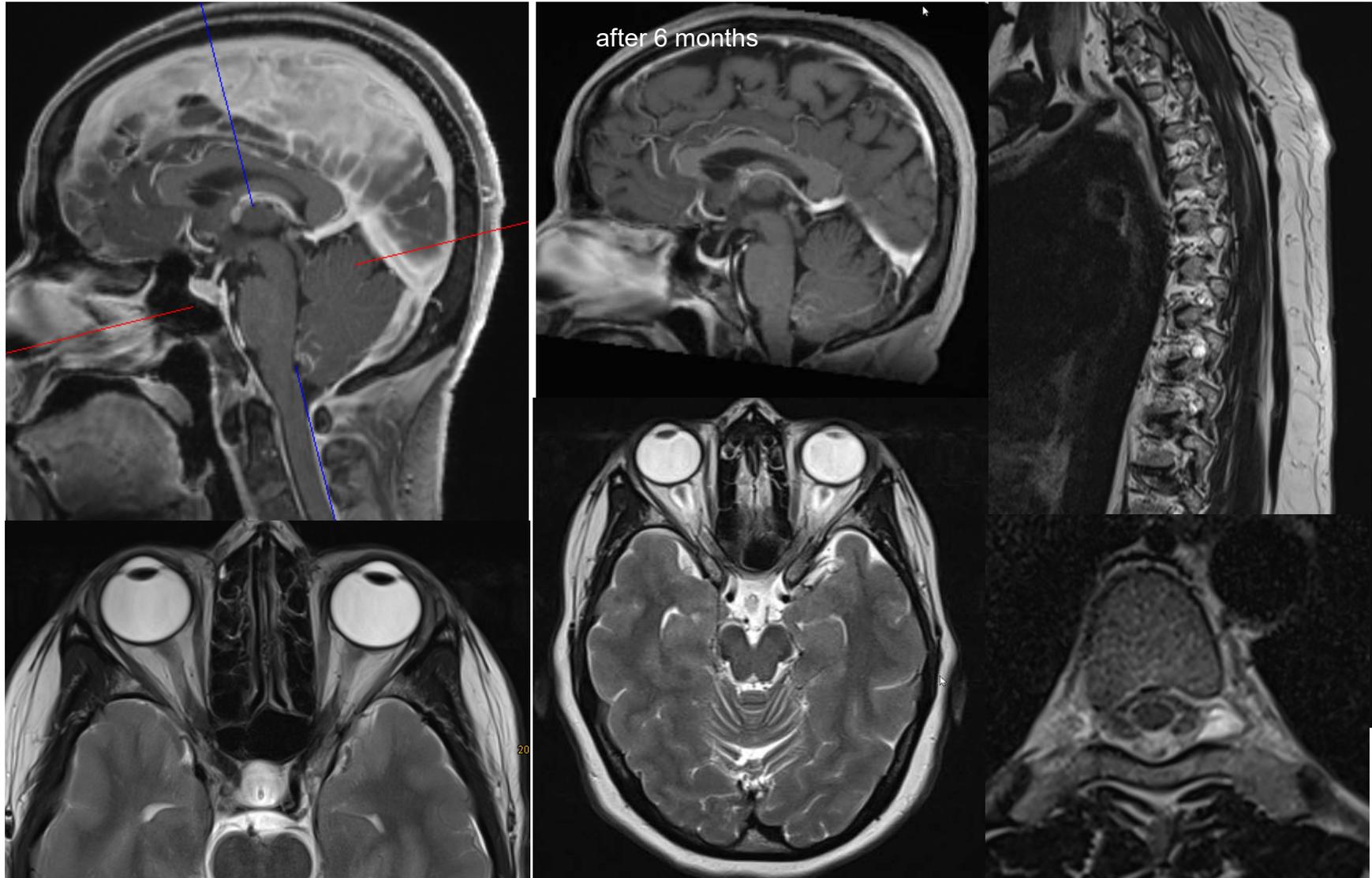
IIIH → lumbar puncture → intracranial hypotension → EBP_{19.10.22}: free of symptoms

♀, 42, BMI 32.9, papilledema



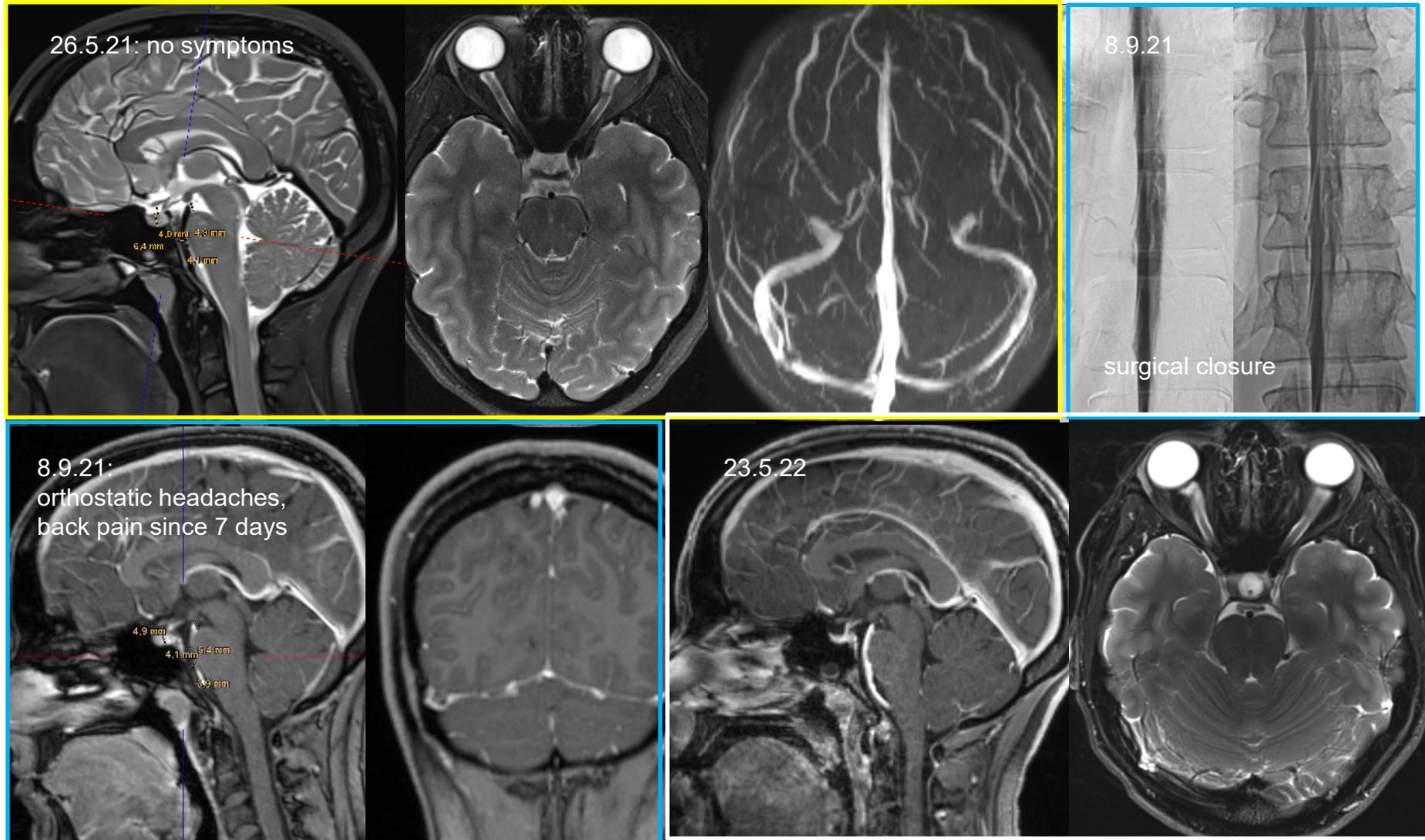
IIH → lumbar puncture → intracranial hypotension → EBP 19.10.22

30.5.23: free of symptoms, persisting arachnid herniation

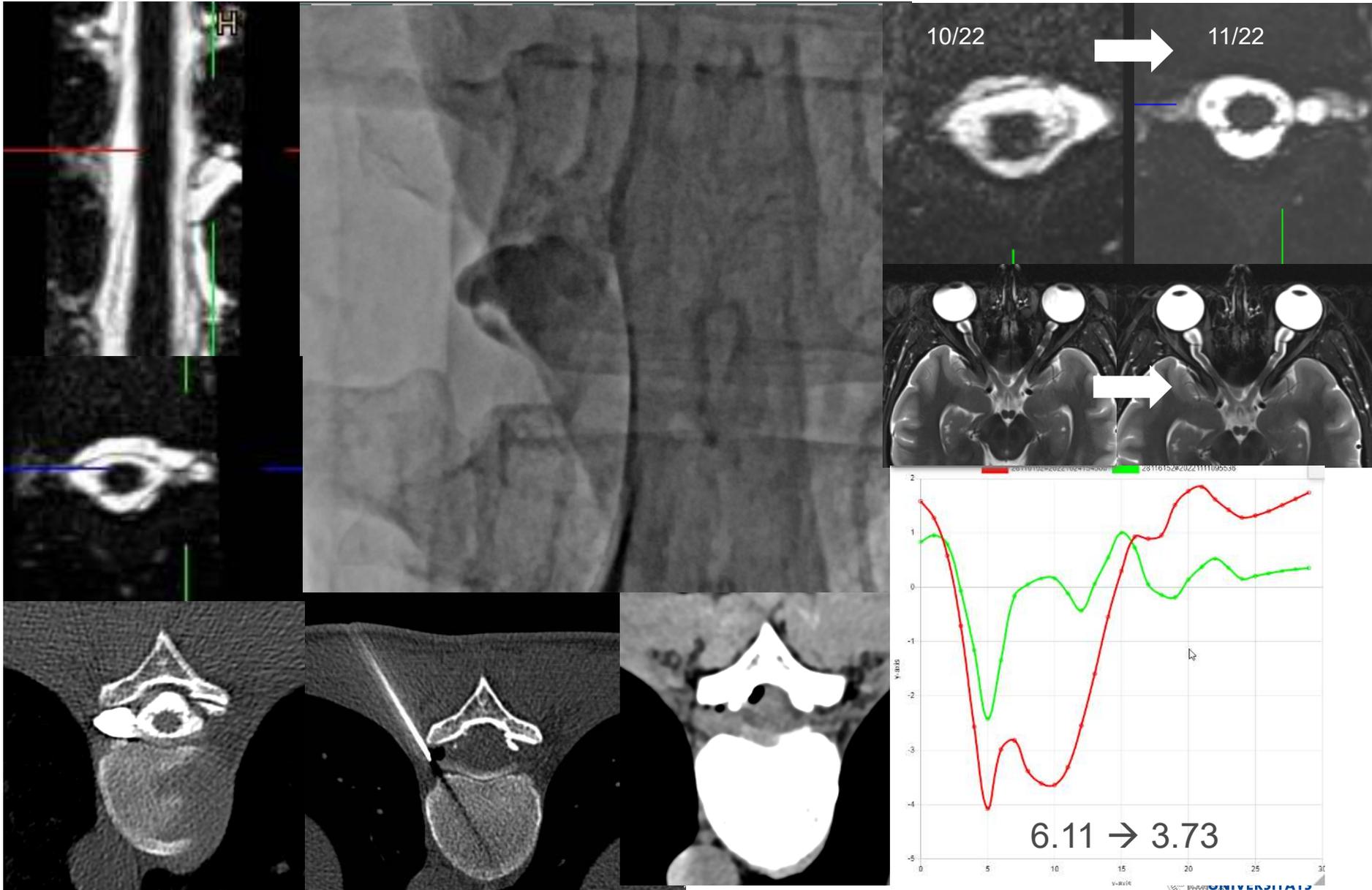


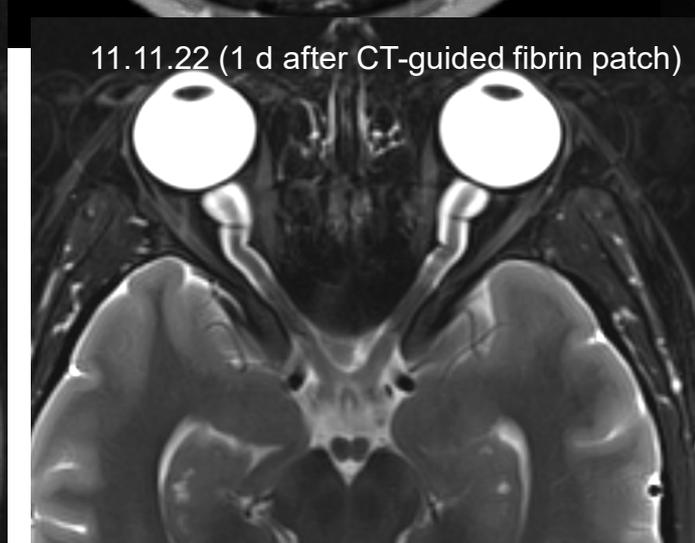
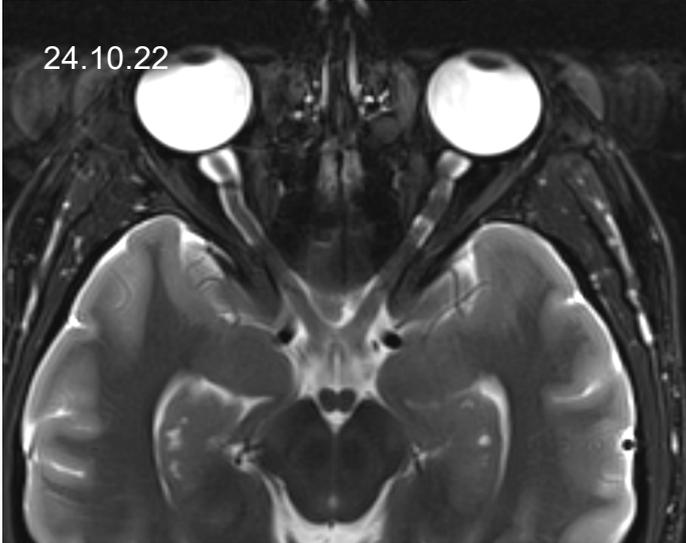
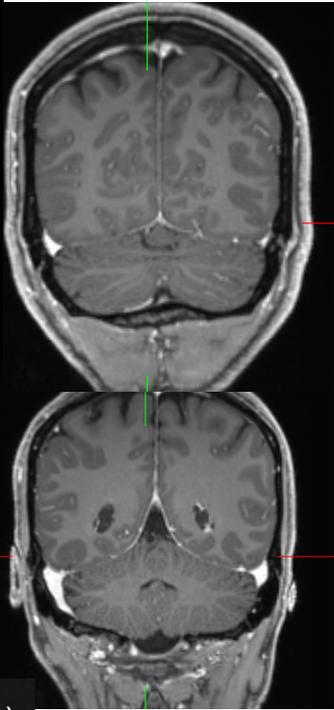
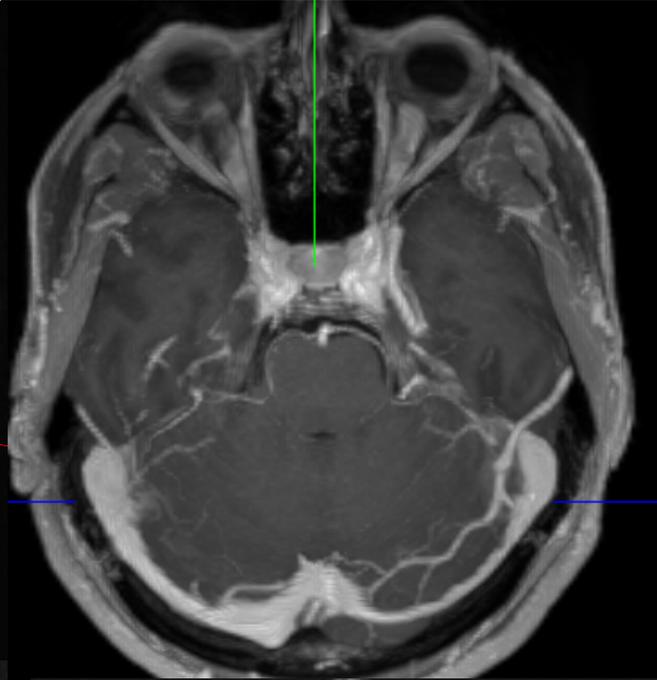
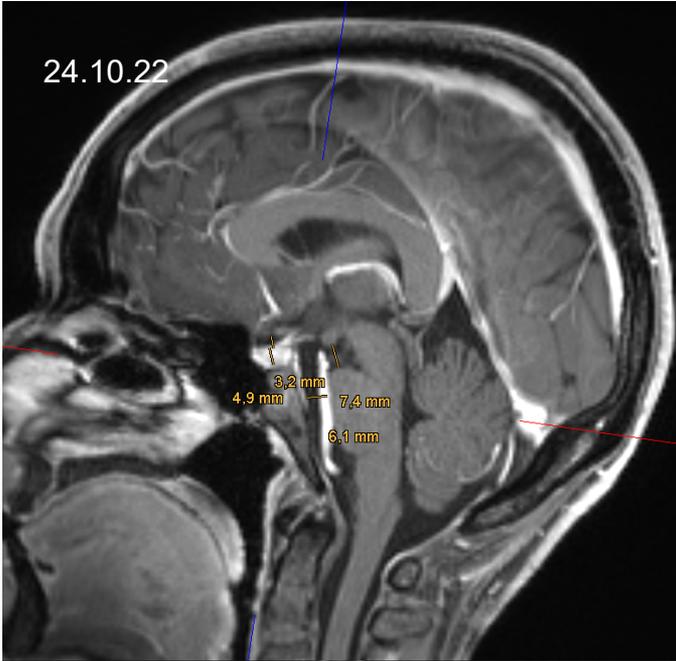
SIH from preexisting IIH

f, 32, BMI 29.4, MRI study: IIH signs, but no symptoms (A-C), orthostatic headaches, small lateral dural tear, EBP



Type II leak, CT-guided targeted fibrin glue patch





RIH

Preexisting intracranial hypertension should be considered in patients with refractory rebound intracranial hypertension.

Sulioti G, Gray L, Amrhein TJ. Popping the balloon: abrupt onset of a spinal CSF leak and spontaneous intracranial hypotension in idiopathic intracranial hypertension, a case report. *Headache*. 2022;62:208-211

Callen A et al. Diagnosis and Treatment of Spontaneous Intracranial Hypotension: Role of Epidural Blood Patching. *Neurology Clin Practice* 2024

Summary

- current indications:
PDPH, Type 2 leaks with small arachnoid herniations, sacral leaks, spinal dementia with no leak
- Inject as much blood as possible * and check that the contrast flows upwards
- Prefer fibrin injections if the leak is identified
- Aim at sealing the leak + increasing epidural space pressure

* Wu J et al. Factors predicting response to the first epidural blood patch in spontaneous intracranial hypotension. *Brain* 2017;140:344

Lee JY et al. Clinical effect of the proximity of epidural blood patch injection to the leakage site in spontaneous intracranial hypotension. *Br J Neurosurg.* 2018;32:671

Amrhein T et al. Efficacy of epidural blood patching or surgery in spontaneous intracranial hypotension: an evidence map protocol. *Systematic Reviews* 2022;11:116

D'Antona L et al. Clinical presentation, investigation findings, and treatment outcomes of spontaneous intracranial hypotension syndrome: a systematic review and meta-analysis. *JAMA Neurol.* 2021;78:629