Endoscopic sealing of ventral dural defect with transforaminal approach: a novel method and outcomes

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Background

- In Korea, SIH has been under-diagnosed and under-treated.
- Even MR myelogram was not commonly implemented, and only blind or SLEC-targeting EBPs were available until July 2023.
- Seoul National University Hospital (SNUH) opened the first CSF leak clinic in Korea in March 2022.
- We implemented a modified method of ultrafast CT myelography and targeted treatment since August 2023.
- Although some unmet needs were addressed, surgical treatment was still needed.
- SNUH neurosurgeons refused to do surgical treatment due to “risks of spinal cord injury”.

Background

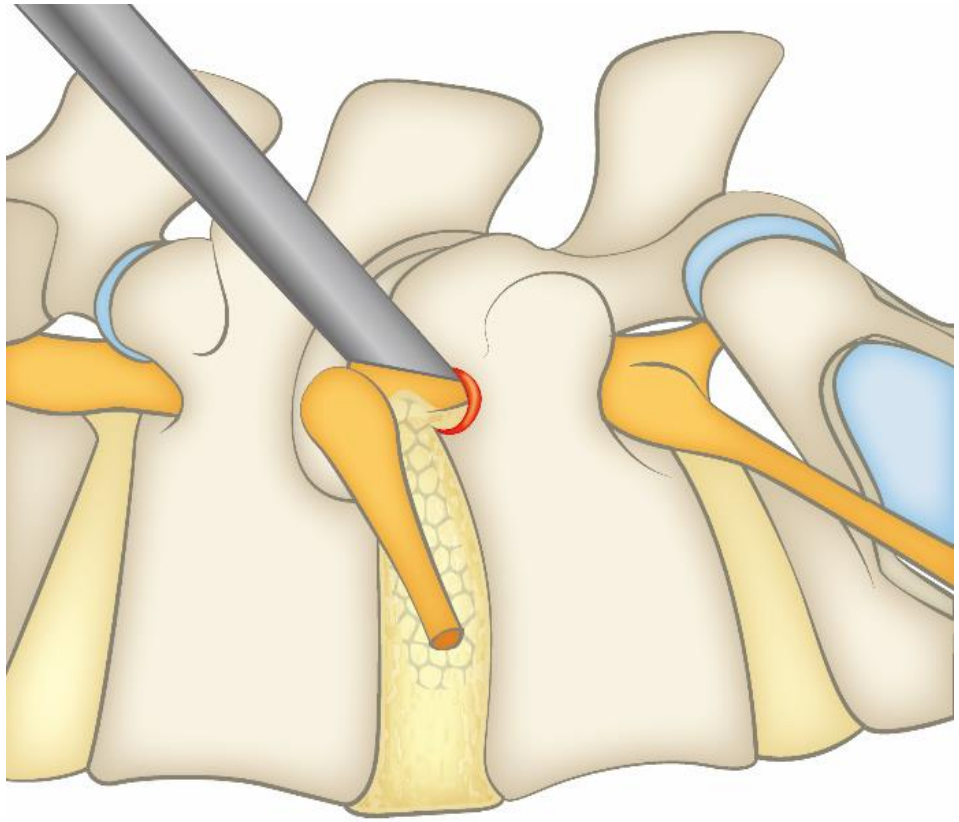
- **Question**
  - Can there be a safer surgical option that can minimize spinal cord manipulation?

- **Objective**
  - To establish a novel endoscopic sealing technique for ventral dural defects with transforaminal approach.
  - To evaluate its efficacy and safety in patients with type 1a CSF leak.

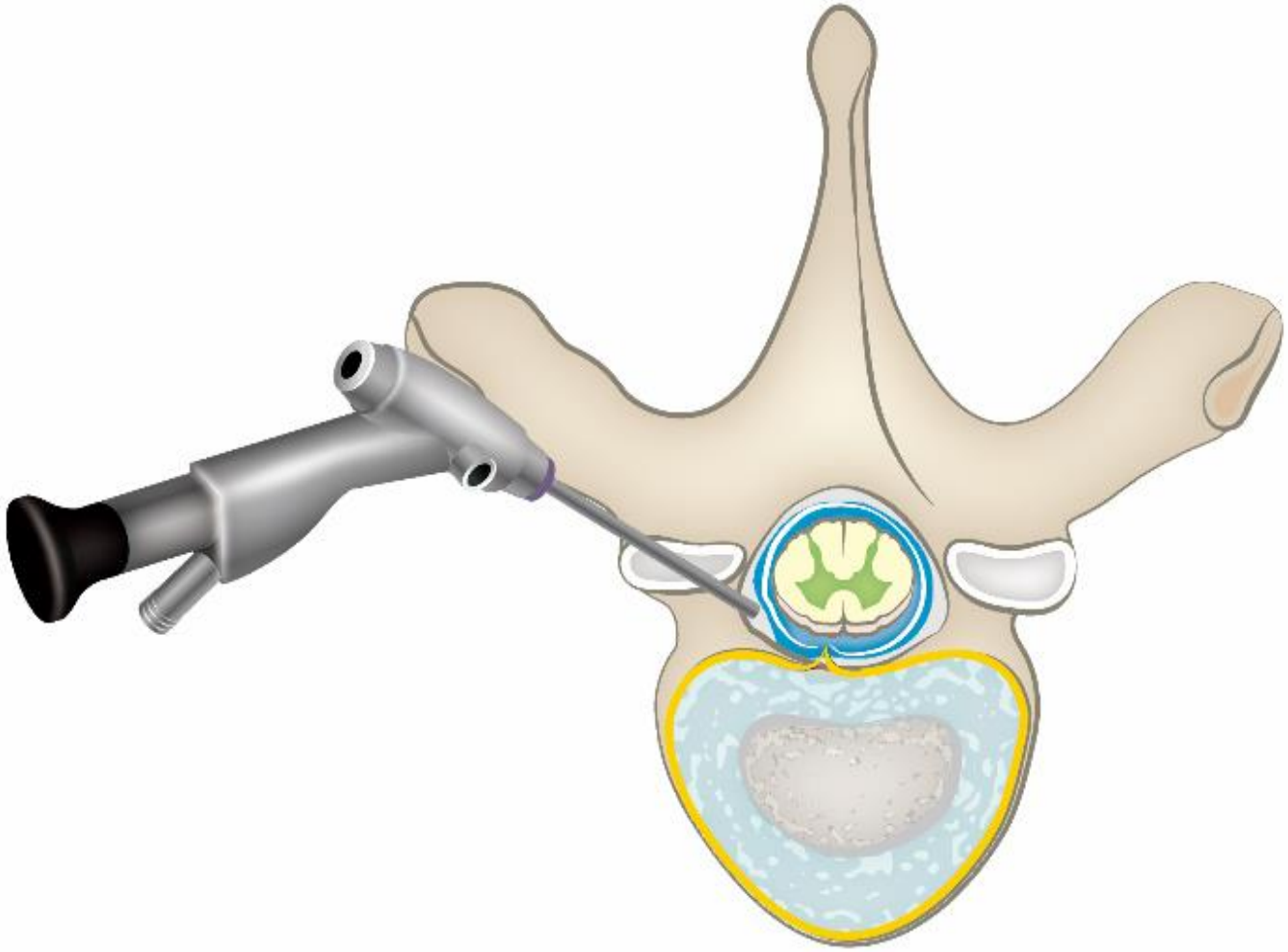
Methods

- Design: Prospective registry study
- Eligibility
  - Patients with confirmed ventral dural defects (type 1a leak) & unresolved by at least 3 EBPs
- Procedure
  - Endoscopic sealing of ventral dural defect with transforaminal approach
- Follow-up
  - Imaging: immediate, 2 weeks, and 1–3 months post-surgery
  - Evaluation of radiologic remission and symptom improvement

Surgical Approach

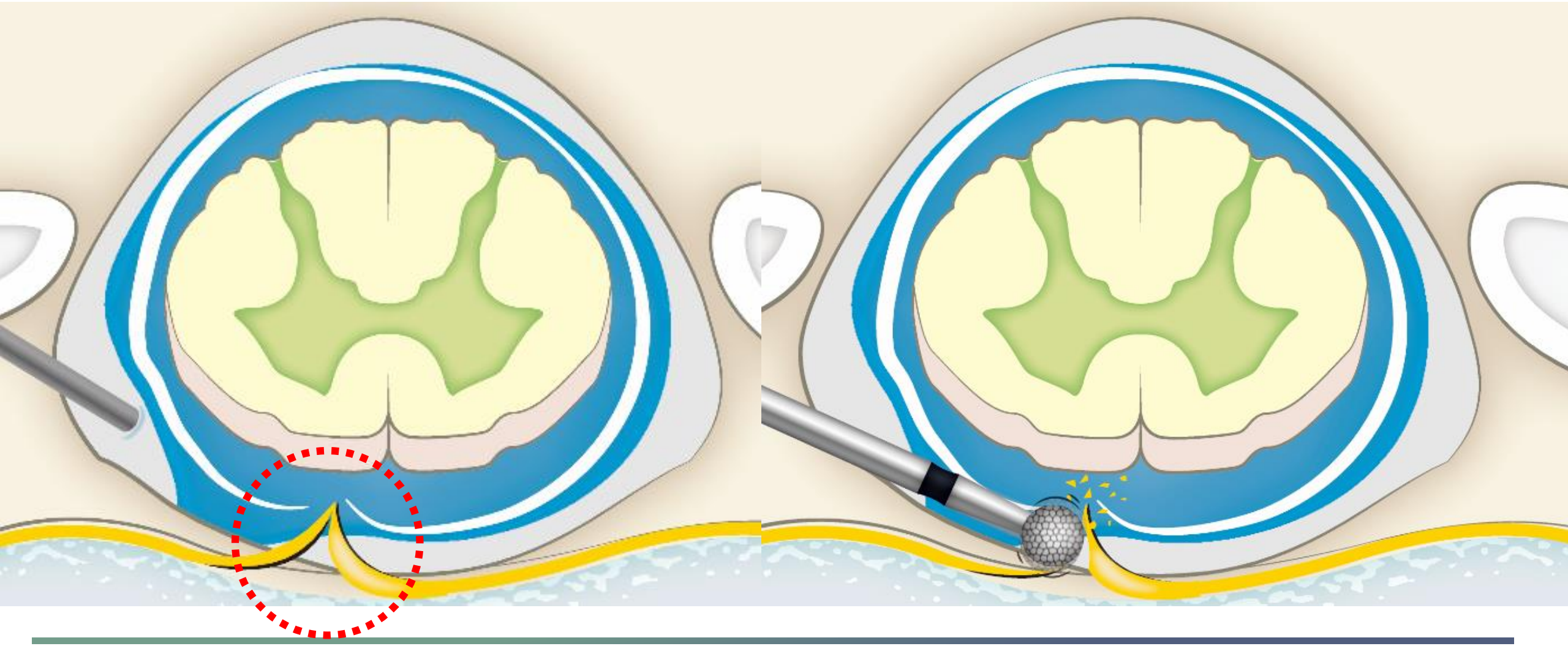


Incision <1cm, 1 portal

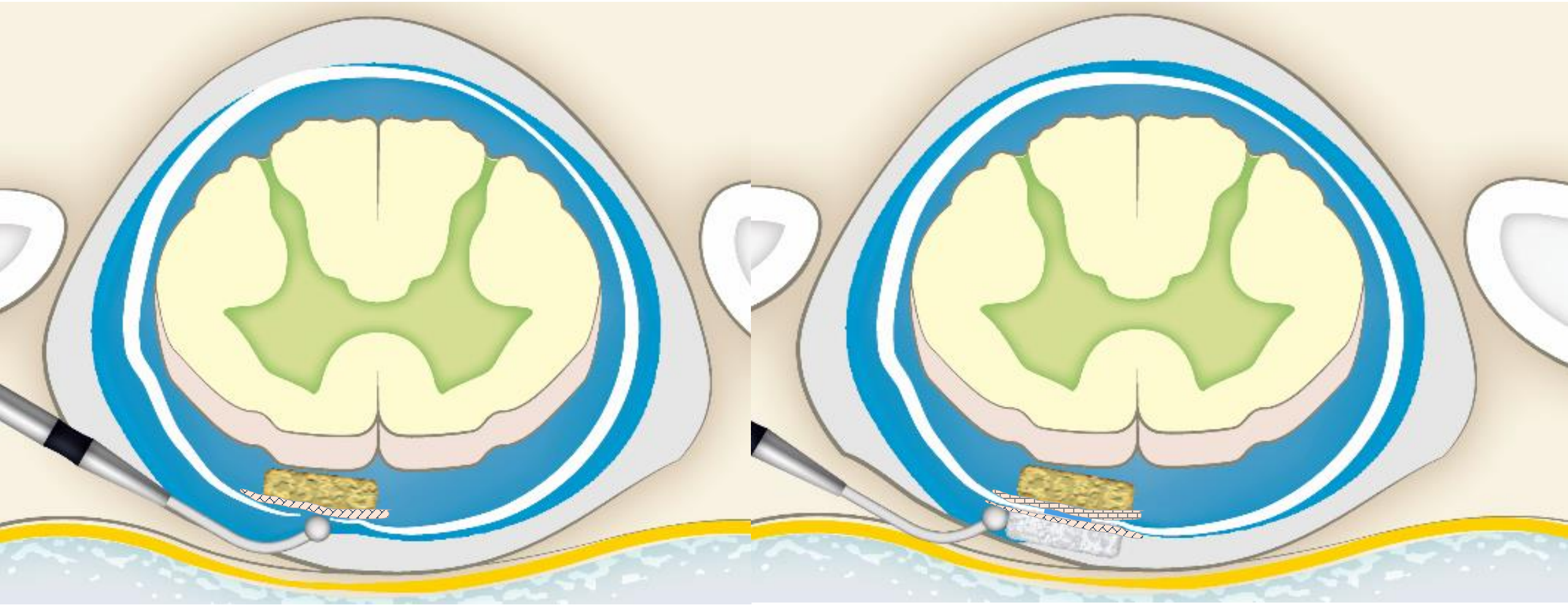


Extradural Approach

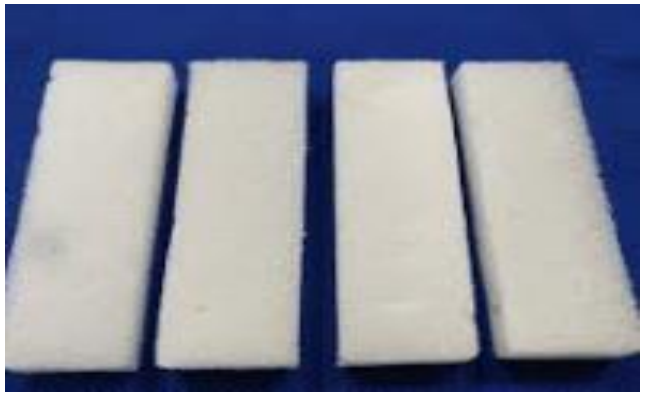
Surgical Approach



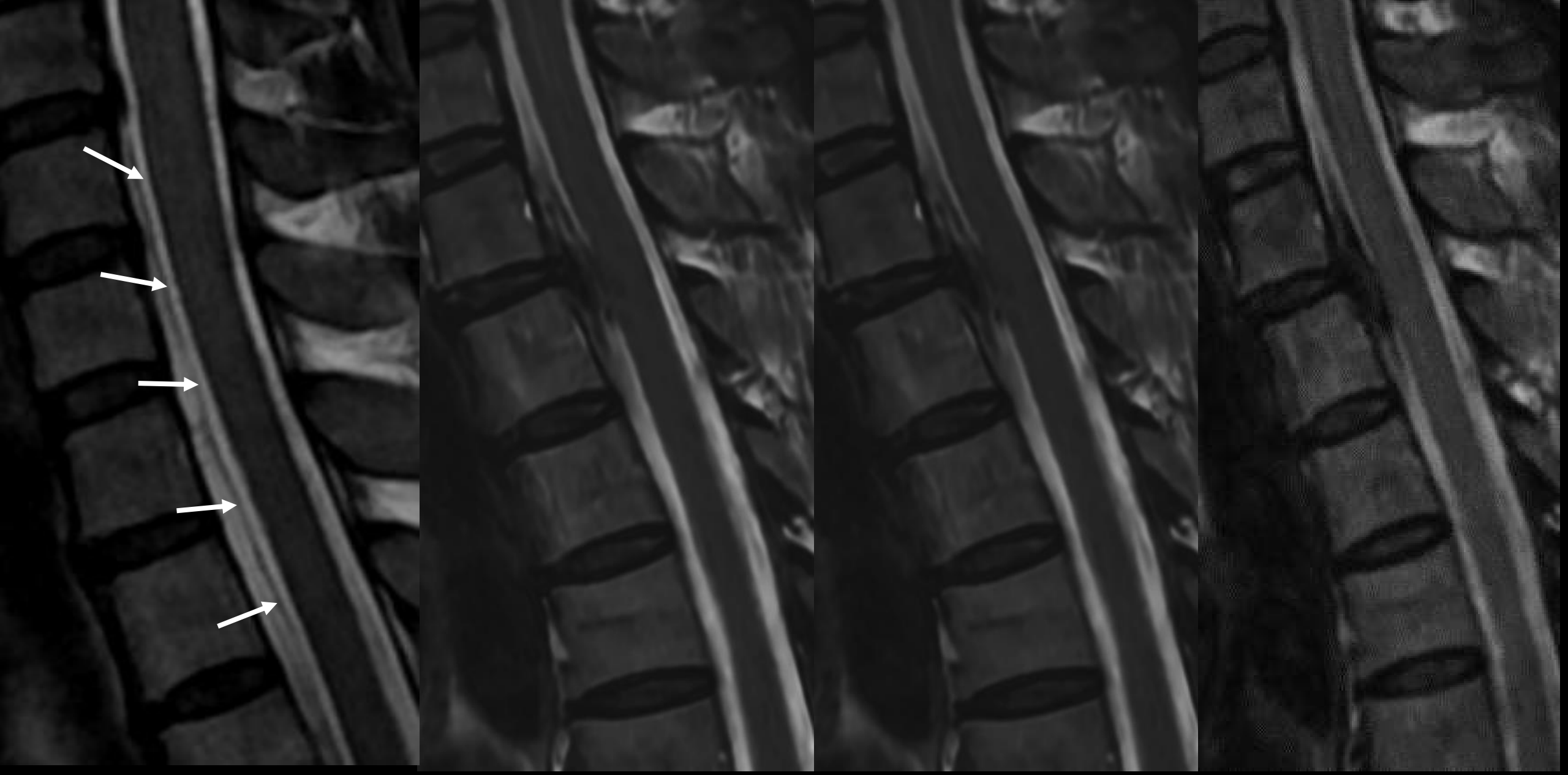
Surgical Approach



Sealing Materials

Fibrin-based hemostatic agent	Absorbable gelatin sponge	Collagen-based dural substitute
		
Fibrinogen- and thrombin-coated equine collagen patch that enables rapid sealing and hemostasis through fibrin clot formation upon tissue contact	Absorbable gelatin sponge used for hemostasis and support of sealant application	Absorbable artificial dura made of bovine collagen, offering structural reinforcement and a scaffold for fibroblast infiltration and native dura regeneration


dissection between dura and calcification



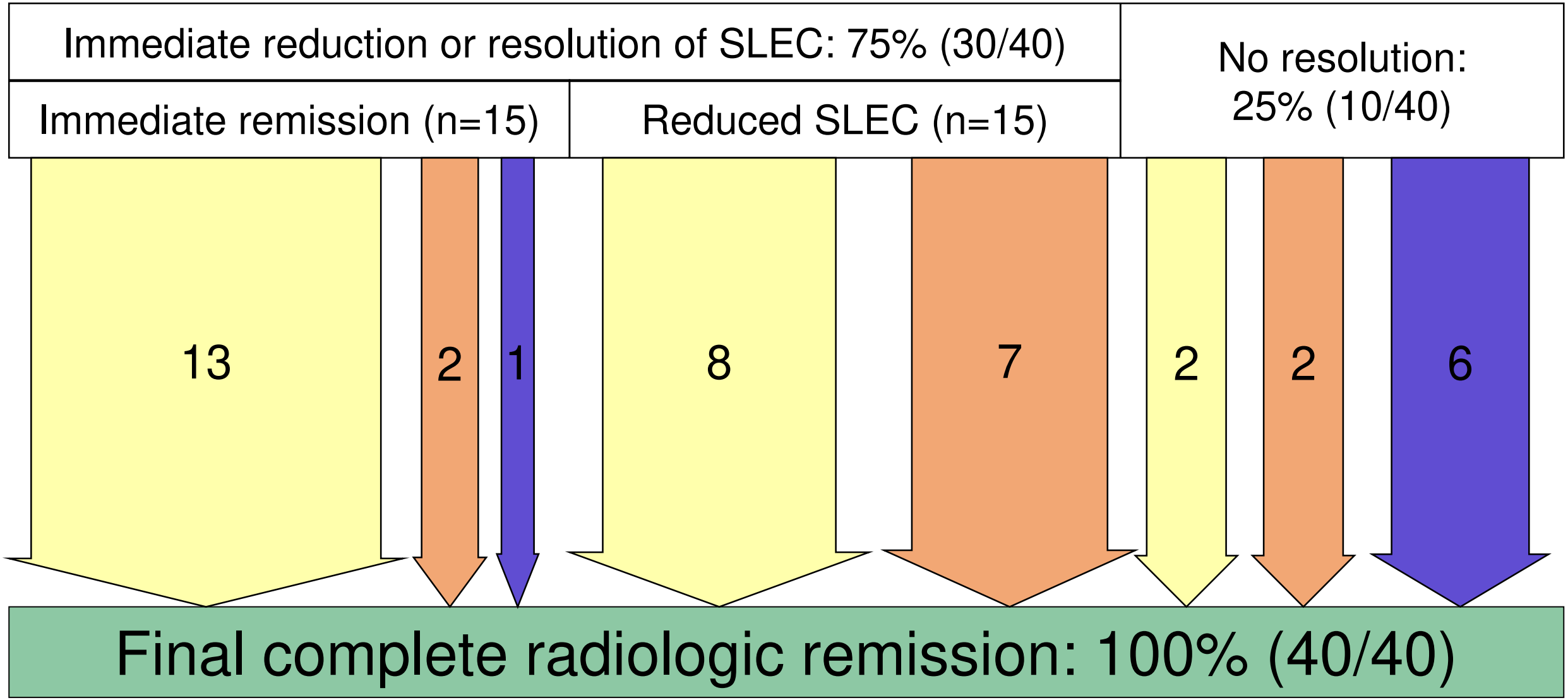
Pre-op
Organized SLEC
(4 EBPs over 2 years)

POD #1
Immediate resolution of SLEC

POD #14
Resolved SLEC

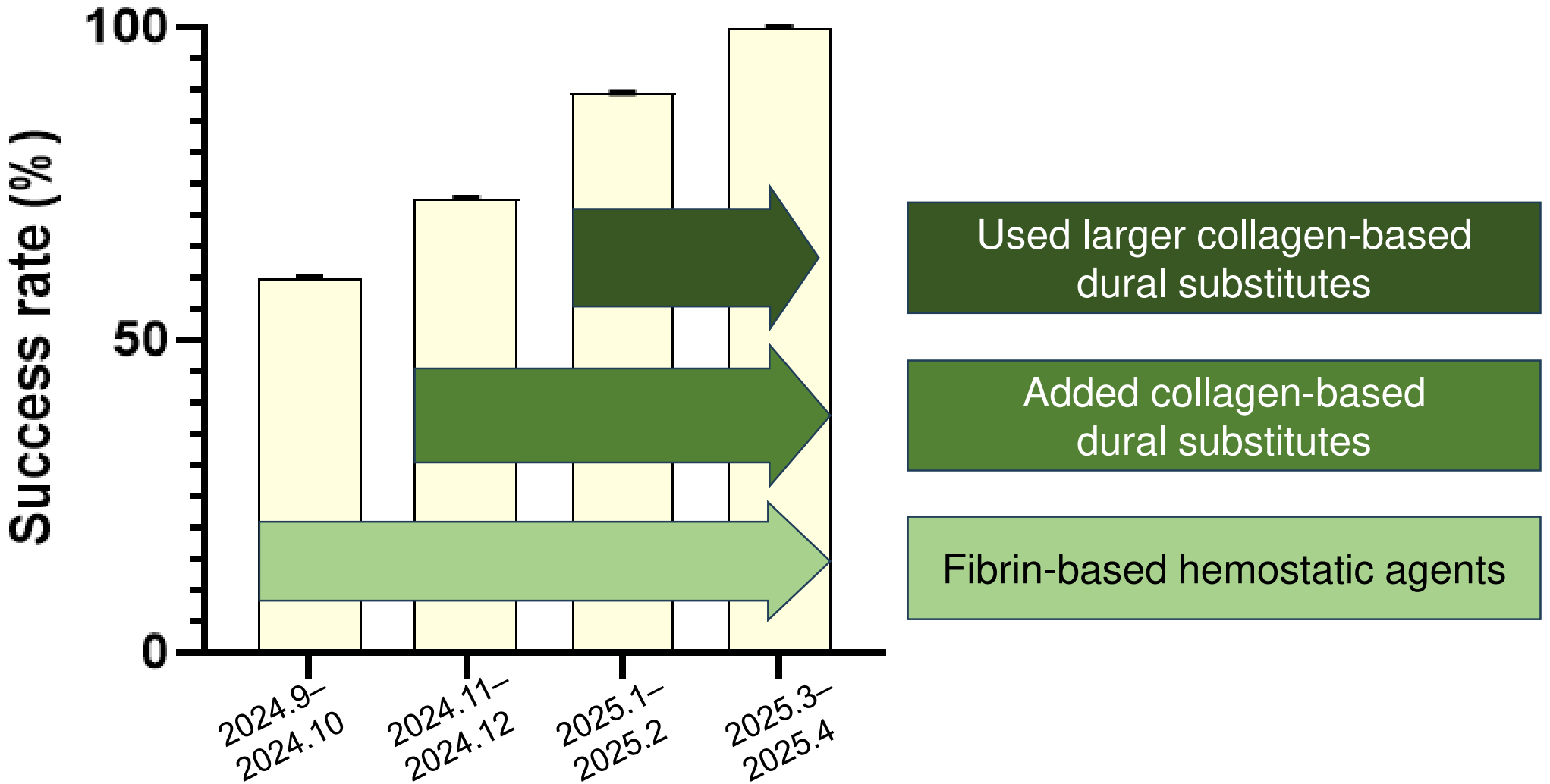
POD #30
Resolved SLEC

Outcome (1) efficacy – all patients



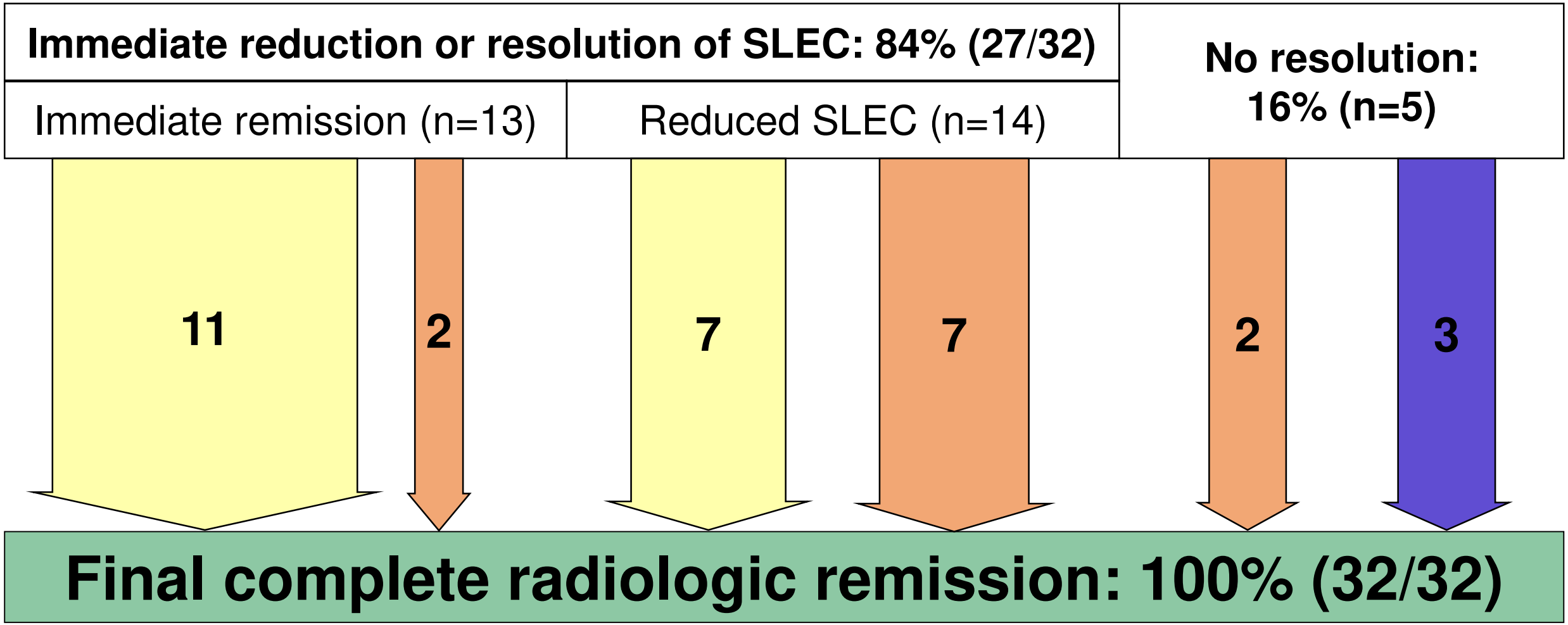
Yellow arrow: Spontaneous Remission Orange arrow: Epidural Blood Patch Blue arrow: Re-operation

Outcome (2) efficacy – remission rate without re-do surgery



Outcome (3) after the use of collagen-based dural substitute

- After adding collagen-based dural substitutes (from 9th patient, November 2024)

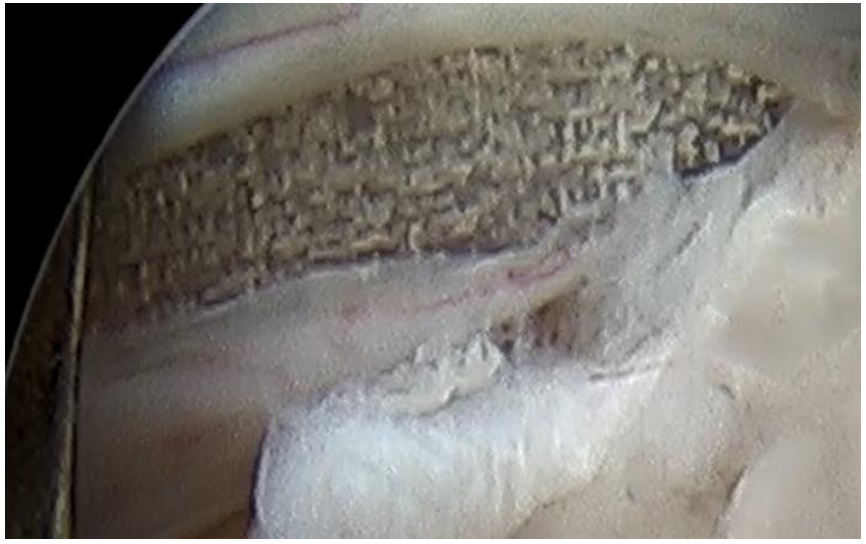


Yellow arrow: Spontaneous Remission Orange arrow: Epidural Blood Patch Blue arrow: Re-operation

Postop #28 findings after endoscopic sealing of ventral dural defect in a patient who received re-do surgery

1st surgery: ventral dural defect

2nd surgery (POD #28): nearly complete sealing with neovascularization, suggestive of dural regeneration

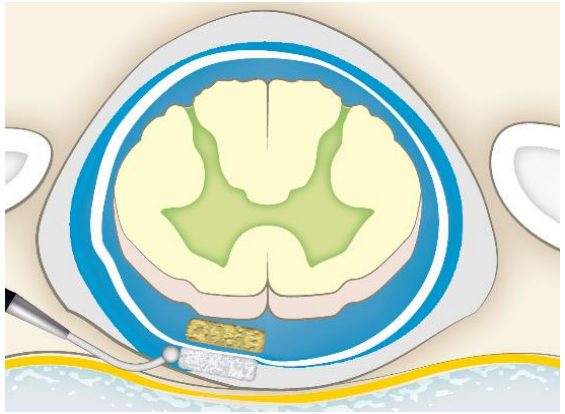
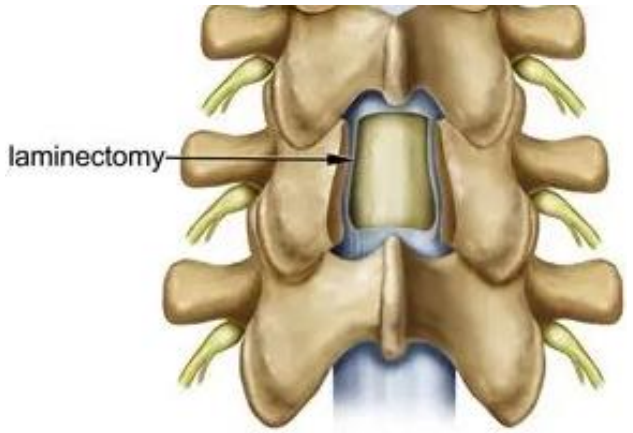


1st surgery: sealing with fibrin-based hemostatic agents and collagen-based dural substitutes

Outcome (4) safety

Infection	1 (2.5%)
Seizure	1 (2.5%)
Rebound intracranial hypertension	16 (40%)
Nausea	14 (35%)
Pulsatile tinnitus	1 (2.5%)
Paresthesia	9 (22.5%)
Blurred vision	1 (2.5%)
Neurological deficits	3 (7.5%)
Permanent	0 (0%)
Transient	3 (7.5%)
Limb weakness	3 (7.5%)

Discussion (1) Efficacy

	Our Approach	Current state-of-the-art surgery
		
Radiologic remission rate	100%	83.5~100%
Time to remission	Median 49 days	3~6 months
Surgery time	40~70 min	3 hours

→ Our surgery provides comparable efficacy with shorter time to remission, reduced operative time and potentially faster postoperative recovery

Discussion (2) Safety

	Our Approach	**Current state-of-the-art surgery**
Major complications	No permanent complication	2% Permanent paresis 1% Permanent neuralgia
Skin incision size	< 1 cm	2.5–3 cm
Bone removal	Minimized	Required
Intradural access	Not required, Extradural	Required, Intradural
Dural suturing	Not required	Required
Spinal cord manipulation	Minimized	Required

→ Our method offers a safe and minimally invasive approach through a direct access to ventral epidural space

Conclusion

- Endoscopic sealing technique through transforaminal approach represents a novel, safe approach for ventral dural defects with high rates of success.
- Use of Lyoplant with sufficient size is crucial for the success.
- Long-term outcome is being evaluated.

Thank you

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