Rebound Intracranial Hypertension

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Objectives

- Define rebound intracranial hypertension
- Discuss epidemiology
- Contrast clinical presentation of SIH and RIH
- List known risk factors
- Evaluate treatment options for RIH
- Explore RIH pathophysiology

Rebound Intracranial Hypertension

Follows procedural treatment of SIH with epidural blood patching, CSF venous fistula embolization or ligation, or surgical dural repair

- Reverse orthostatic headache different from the original SIH headache
- Resolution of headache following administration of oral acetazolamide
- Not better accounted for by another cause of headache

Schievink WI et al. Rebound high-pressure headache after treatment of spontaneous intracranial hypotension: MRV study. Neurology Clin Pract. 2019.

Epidemiology

Overall Incidence

- ~1/4 of patients treated for SIH, female predominant, 5th decade of life

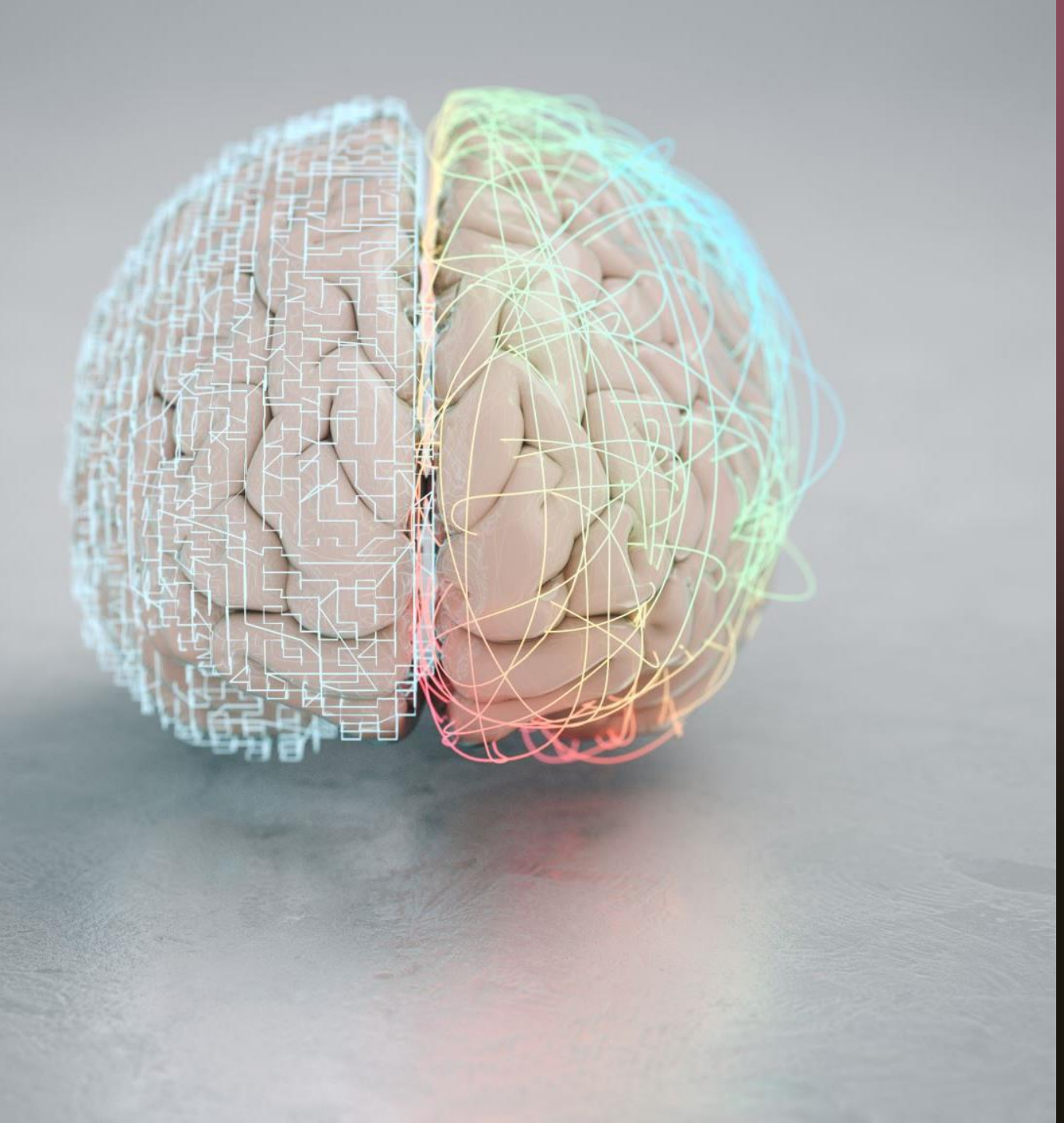
Procedural Relationship

- Slightly higher incidence with surgical vs non-surgical intervention (29.4% vs 21.4%)
- 36% after minimally invasive dural repair
- Not linked to patch volume

CSF Venous Fistula Embolization

- Linked to treatment success?
- 5.2% of patients with complete resolution, 29.7% with improvement but no resolution, and 60% with no improvement of SIH symptoms experienced RIH 3 months post-procedure

Schievink WI et al. Rebound high-pressure headache after treatment of spontaneous intracranial hypotension: MRV study. Neurology Clin Pract. 2019
Beck J et al. Minimally invasive surgery for spinal cerebrospinal fluid leaks in spontaneous intracranial hypotension. J Neurosurg Spine. 2023
Brinjikji W et al. Clinical and imaging outcomes of 100 patients with cerebrospinal fluid-venous fistulas treated by transvenous embolization. J Neurointerv Surg. 2023
Kranz PG et al. Rebound intracranial hypertension: a complication of epidural blood patching for intracranial hypotension. AJNR Am J Neuroradiol. 2014



Risk Factors

- Extensive extradural CSF collection
- Obesity + CSF Venous Fistula increased risk of developing RIH and papilledema
- IIH, history of, or risk factors of IIH (eg weight gain, untreated OSA)
- Not predictive: brain sag, pre-procedure opening pressure

Schievink WI et al. Spinal CSF-venous fistulas in morbidly and super obese patients with spontaneous intracranial hypotension. AJNR Am J Neuroradiol. 2021
Kranz PG et al. Spontaneous intracranial hypotension: pathogenesis, diagnosis, and treatment. Neuroimaging Clin N Am. 2019
Sulioti et al. Popping the balloon: Abrupt onset of a spinal CSF leak and spontaneous intracranial hypotension in idiopathic intracranial hypertension, a case report. Headache. 2022

Clinical Presentation

66-74% 24-72 hours after procedure
22% 3-7 days following
94% resolve within 3 months

SIH	RIH
Suboccipital	Frontal or peri-orbital
Worsened with recumbency	Worsened upright
Best in AM after sleep	Worsened in AM after sleep
	Nausea, vomiting, blurred vision, transient papilledema

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Exceptions

RIH presenting with occipital or non-frontal pain

Delay in symptom development (weeks to months)

SIH presenting with frontal pain

Refractory or atypical presentations of RIH need workup for other causes of intracranial hypertension

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Schievink WI et al. Rebound high-pressure headache after treatment of spontaneous intracranial hypotension: MRV study. Neurology Clin Pract. 2019

Treatment

Conservative management

- Positioning the head at a 20-30 degree elevation

Acetazolamide

- 250 mg to 500 mg 2-3 times a day, with titration as needed (up to 4000 mg daily)

Methazolamide

Topiramate

Furosemide

HCTZ

Spironolactone

CSF drainage or diversion only for intolerable symptoms or diagnostic uncertainty

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Kranz PG et al. Rebound intracranial hypertension: a complication of epidural blood patching for intracranial hypotension. AJNR Am J Neuroradiol. 2014
Cheema S et al. Multidisciplinary consensus guideline for the diagnosis and management of spontaneous intracranial hypotension. J Neurol Neurosurg Psychiatry. 2023

Treatment Considerations

? Pre-treatment in those with risk factors

Aggressive post-procedural intracranial pressure management of elevated intracranial pressure in patients with IIH-caused cranial CSF leaks has been shown to improve procedural success

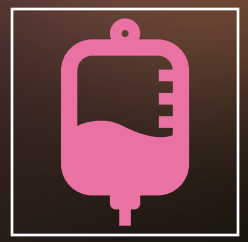
Ferrante et al. found benefit with pre-medication with acetazolamide at the dosage of 250 mg at 18 hours and 6 hours prior to a large-volume untargeted lumbar EBP

Ferrante, E et al. Epidural blood patch in Trendelenburg position pre-medicated with acetazolamide to treat spontaneous intracranial hypotension. *Eur J Neurol.* 2010
Teachey, W., et al. Intervention for elevated intracranial pressure improves success rate after repair of spontaneous cerebrospinal fluid leaks. *Laryngoscope.* 2017

Pathophysiology

Venous distension

Changes in CSF reabsorption

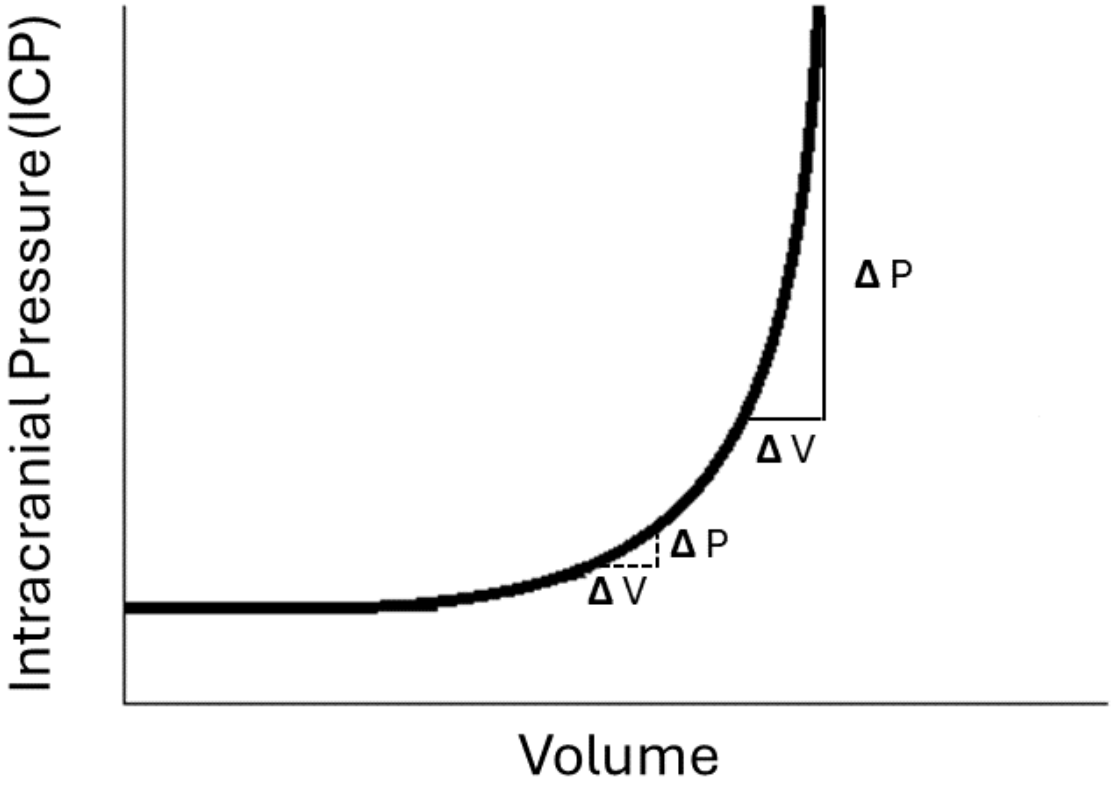


Restriction of cerebral venous outflow

Underlying IIH

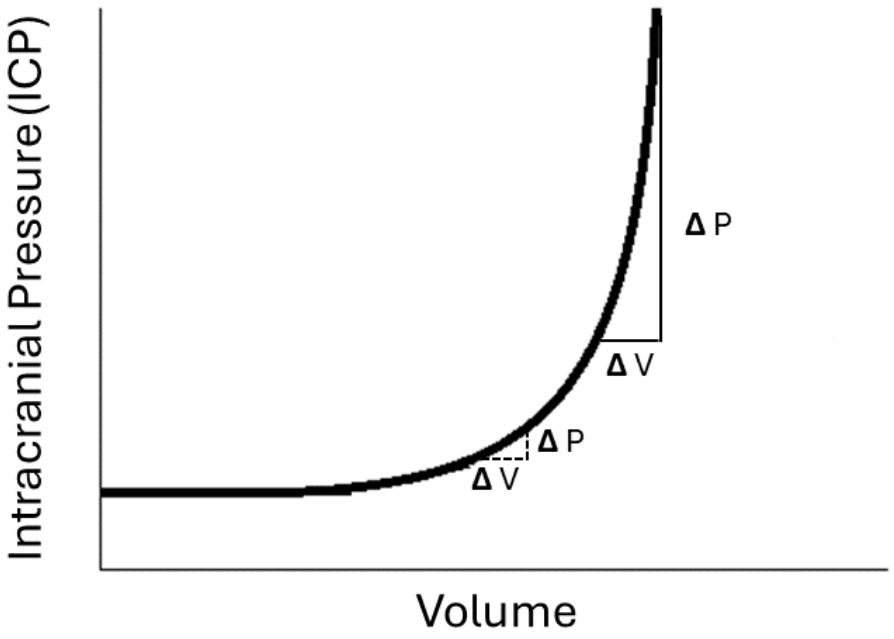
Kranz PG et al. Rebound intracranial hypertension: a complication of epidural blood patching for intracranial hypotension. AJNR Am J Neuroradiol. 2014
Schievink WI et al. Rebound high-pressure headache after treatment of spontaneous intracranial hypotension: MRV study. Neurology Clin Pract. 2019
Mokri, B. Intracranial hypertension after treatment of spontaneous cerebrospinal fluid leaks. Mayo Clin Proc. 2002

Pathophysiology: Increase in craniospinal elastance?



Elastance measures the pressure response to a known change in volume

Tsai, Y.-H et al. Noninvasive assessment of intracranial elastance and pressure in spontaneous intracranial hypotension by MRI. *J Magn Reson Imaging*. 2018



Veins as capacitance vessels

1) Compensatory increase in venous volume in the spinal epidural macro-veins

2) Decrease in transcranial venous outflow

Schievink et al.: ¼ of those with focal narrowing in one transverse sinus, and ½ with complete signal gap in one transverse sinus OR any involvement of both transverse sinuses developed RIH

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Hypothesis: Variability

Reserve of the craniospinal elastance system as a whole

Symptoms occur at the point in which volume shifts resulting from the procedure and/or subsequent healing process and resulting treatment-related fibrosis overwhelm an individual's buffering reserve

Affected by variations in the compliance of the dura itself, which affects CSF outflow resistance

Those with a highly complaint dura and low CSF outflow resistance may not or to a lesser degree experience RIH

Others, who have developed adhesions, scarring, and/or fibrosis, as part of natural or induced dural healing which results in decreased CSF compliance and increased CSF outflow resistance, may be more vulnerable to RIH

Parikh, SK. "Rebound Intracranial Hypertension." *Curr Pain Headache Rep*. 2024
Häni, L., et al. Insights into the natural history of spontaneous intracranial hypotension from infusion testing. *Neurology*. 2020

Future Research

- Add RIH to the ICHD-4 diagnostic criteria; formal diagnostic code
- Multi-institutional studies assessing the development of RIH at specific time points post-procedure
- Understanding of RIH pathophysiology could help predict response to treatment, risk factors for RIH