

Murphy's Law in Neuraxial Anesthesia: *A Case of Iatrogenic Pneumocephalus After Repeat Epidural Blood Patch*

Anna R. Wright, MD
Joseph Mullis, DO
John Thomas, MD
Jessica Meister-Berger, MD, JD
Medge Owen, MD

Wake Forest University
School of Medicine
Department of Anesthesiology

PNEUMOCEPHALUS

- Air in the intracranial subarachnoid space
- Simple pneumocephalus (majority of cases) - asymptomatic to mildly or moderately symptomatic
- Tension pneumocephalus - large volumes of air cause increased intracranial pressure and potentially brain herniation, which is a surgical emergency

NEURAXIAL ASSOCIATION

- Rarely associated with neuraxial anesthesia; particularly rare with epidural blood patch (EBP) procedures
- Incidence is difficult to determine based on imaging requirements - proposed 11% with epidural anesthesia⁽¹⁾
- No statistically significant difference in overall success or complications between using loss of resistance to air (LORA) or saline (LORS) during EBP

Case: 24 year old G3P0020 parturient requested LEA

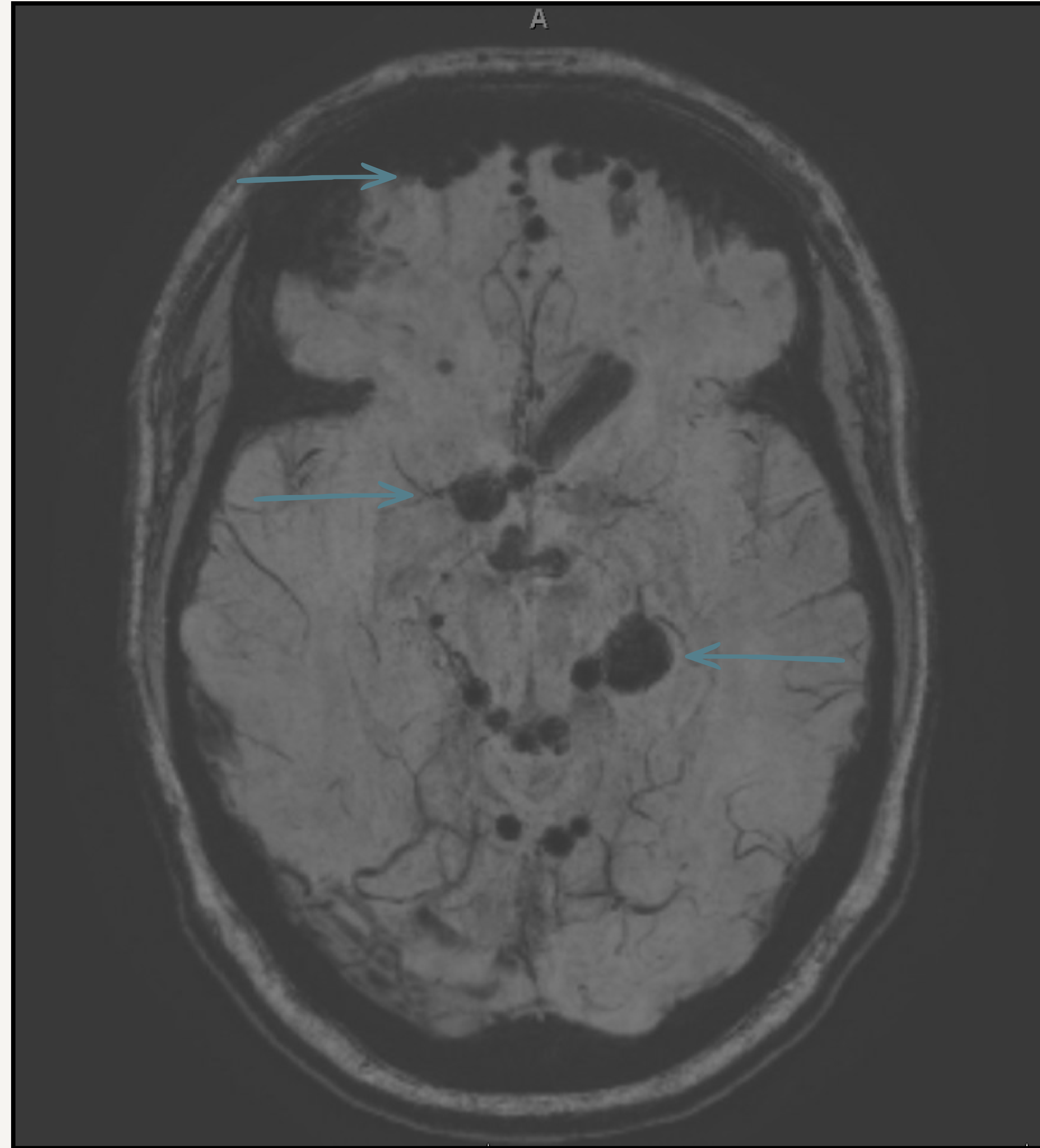


Figure 1: T2 MRI imaging with moderate to large volume pneumocephalus seen after epidural blood patch. Air (arrows) predominately in left greater than right lateral ventricle frontal horns, along the bifrontal CSF spaces, as well as tracking into the basal cisterns and to a lesser extent the cerebellar CSF spaces (not shown).

PPD1: developed PDPH, received EBP with LORS at L3/4 due to severity and limited access to care

1 hr post EBP2: developed severe, non-positional headache symptomatically different than her PDPH, MRI imaging obtained

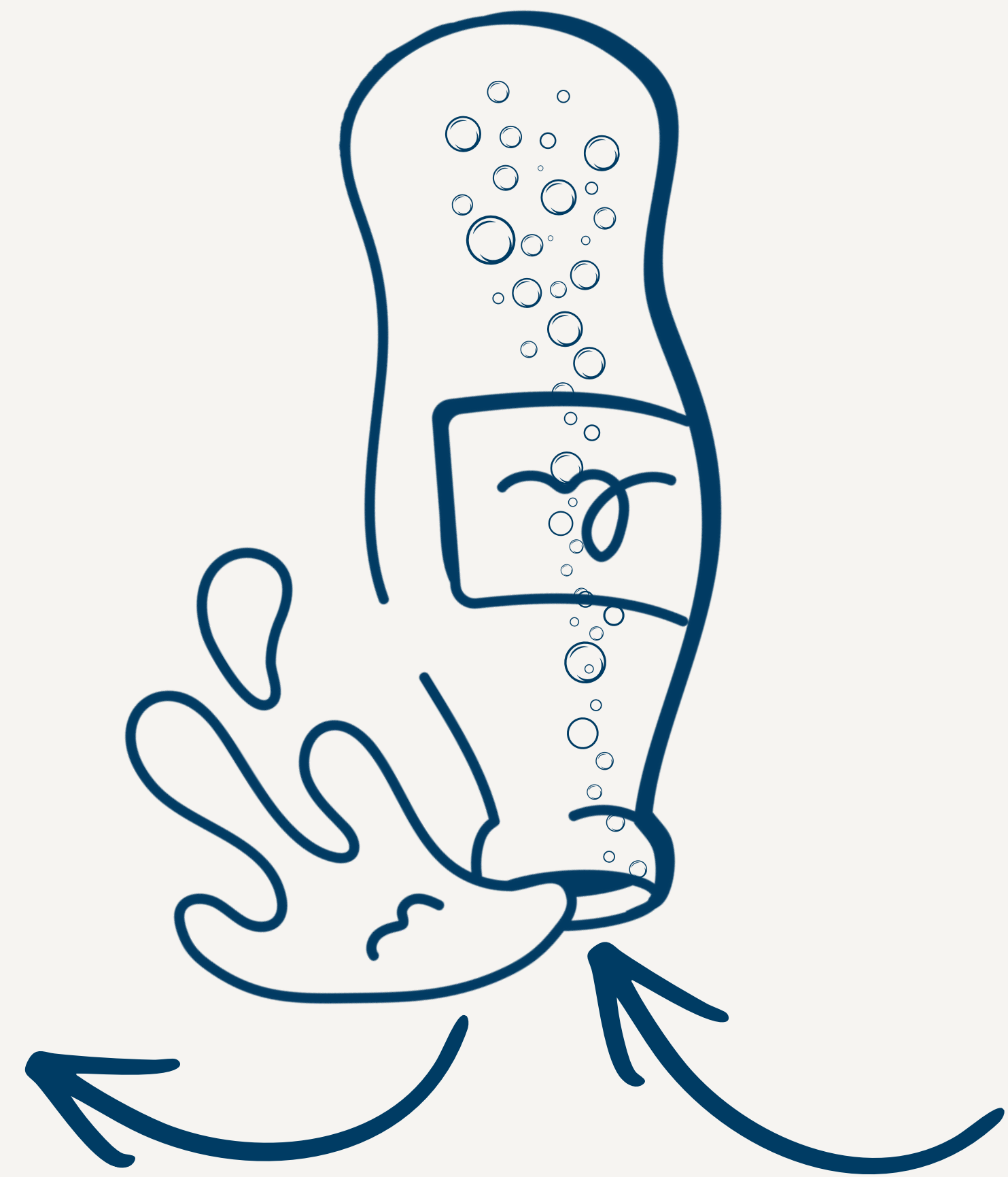
PPD0: inadvertent dural puncture at L4/5, intrathecal catheter placed, utilized, and removed postpartum without complication

PPD3: symptoms returned after ~36 hours of relief, and she received a second EBP with LORA (< 1mL) at L4/5 with immediate PDPH relief

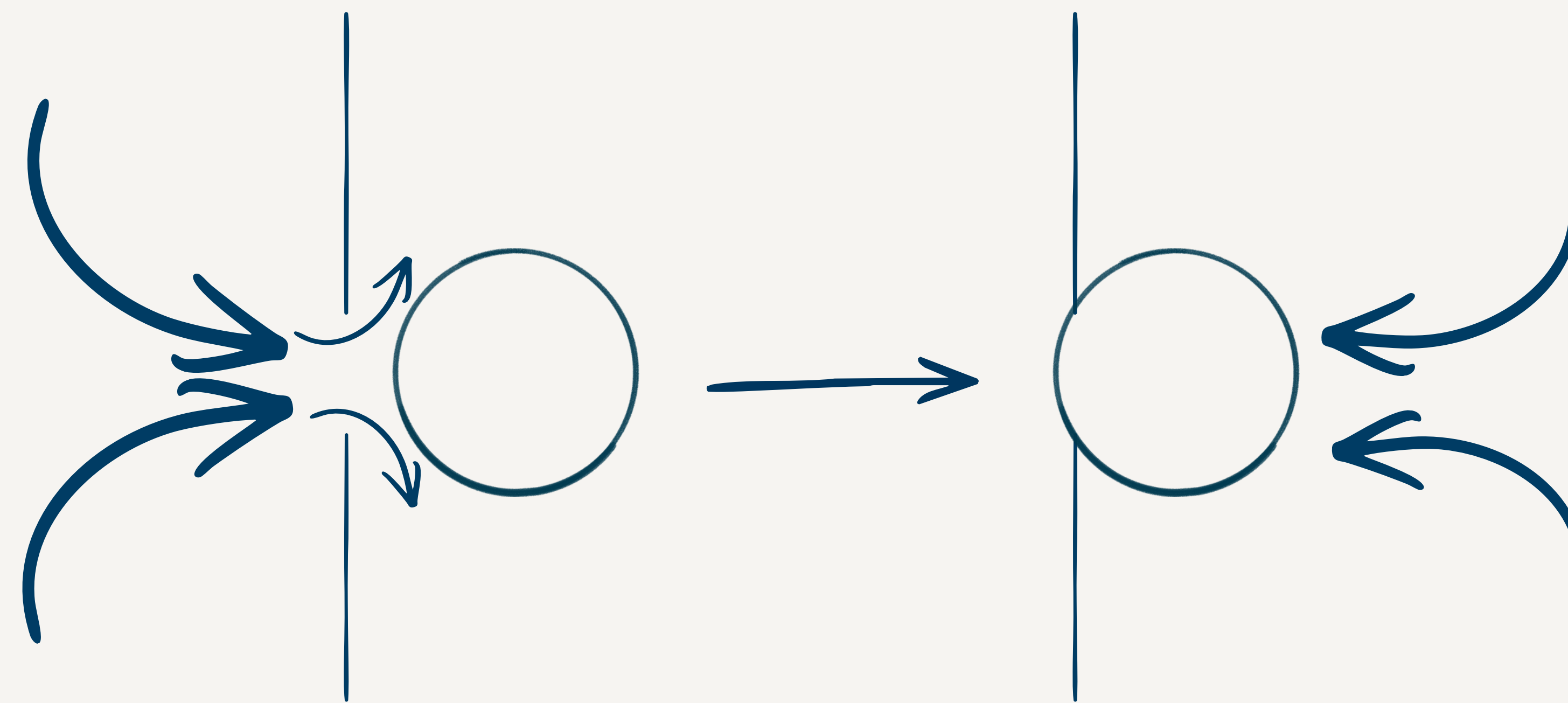
PPD5: full symptom resolution after conservative therapy and discharge to home

Theories of Entrainment

01 Inverted Soda Bottle Theory⁽²⁾



02 Ball Valve Theory⁽³⁾



MANAGEMENT

- Early recognition allows for resolution in 85% of cases⁽¹⁾
 - HA, N/V, dizziness, HTN
- Simple pneumocephalus - oxygen therapy, symptomatic treatment^(2,3)
- Tension pneumocephalus - prompt evaluation and imaging with possible neurosurgery evaluation^(2,3)

PRACTICE ADJUSTMENTS

- Be aware of unstyleted Touhy time
- Utilize loss of resistance to saline technique for PDPH EBP

1. Sindu Mukesh, et al; Acute pneumocephalus following epidural procedure: An unusual presentation with hypertensive emergency and loss of consciousness; eNeurologicalSci, Volume 41, 2025,100595, ISSN 2405-6502, <https://doi.org/10.1016/j.ensci.2025.100595>.

2. Kozikowski, Grzegorz P. MD; Cohen, Steven P. MD. Lumbar Puncture Associated with Pneumocephalus: Report of a Case. Anesthesia & Analgesia 98(2):p 524-526, February 2004. | DOI: 10.1213/01.ANE.0000095153.75625.1F

3. Ahmad M, Bellamy S, Ott W, Mekhail R. Pneumocephalus secondary to epidural analgesia: a case report. J Med Case Rep. 2023 May 26;17(1):217. doi: 10.1186/s13256-023-03955-5. PMID: 37231513; PMCID: PMC10214711. 3