

Navigating CSF Leak Care

**When you are not at a major referral center*

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Disclosures

- ▶ No financial relationships with entities that produce treatment or investigative interventions, devices or therapies.
- ▶ Member of the Spinal CSF Leak Medical Advisory Board for the Spinal CSF Leak Foundation



Bob Bové Neuroscience Institute at Honorhealth

- ▶ Neurology
- ▶ Neuroradiology
- ▶ PMR Spine
- ▶ Neurosurgery

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Diagnosis

- ▶ When do I consider intracranial hypotension?
- ▶ How much do I consider intracranial hypotension?
- ▶ When do I recommend/refer my patient to a specialty spinal CSF Leak Center?



When do I consider intracranial hypotension?

- ▶ Orthostatic Headache /other symptoms
- ▶ Findings on brain or spine imaging or low opening pressure
- ▶ When the patient asks
- ▶ Cough/Valsalva Headaches
- ▶ New Daily Persistent Headache
- ▶ Headache that never got better or changed or got worse after spinal procedure
- ▶ Refractory Headaches
- ▶ Intractable Headaches
- ▶ Progressive neurologic symptoms without other markers
- ▶ 'Weird' constellation of neurologic symptoms without explanation



How much do I consider intracranial hypotension?

What is the differential diagnosis/co-morbidities?

- ▶ Migraine / Cough Headache
- ▶ POTs (+)
- ▶ Cervicogenic Headache/Craniocervical Instability
- ▶ Tethered cord
- ▶ Inflammatory Disorder
- ▶ TMJD
- ▶ Sinus congestion
- ▶ Idiopathic intracranial hypertension / Venous congestion
- ▶ MCAS
- ▶ Eagles Syndrome

How much do I consider intracranial hypotension?

What type of testing do I frequently order?

- ▶ MRI Brain wwo contrast
- ▶ MRI C-spine, T-spine, L-spine
 - ▶ *Comments: Please protocol with heavily-weighted T2 fat-saturated sequences in both sagittal AND axial planes please.*
 - ▶ *If possible, please have Dr. Soenso protocol.*
- ▶ Autonomic Testing
- ▶ Flex/ex imaging
- ▶ MRV
- ▶ Inflammatory Panel/tryptase
- ▶ Lumbar puncture
- ▶ Cisternogram



Imaging at a non-CSF Center



- ▶ MRI Brain wwo contrast
- ▶ MRI C-spine, T-spine, L-spine
- ▶ CT- Myelogram
- ▶ Cisternogram



Imaging at a non-CSF Center



- ▶ MRI Brain wwo contrast
- ▶ MRI C-spine, T-spine, L-spine
- ▶ ~~CT-Mammogram~~
- ▶ Radioisotope Cisternography

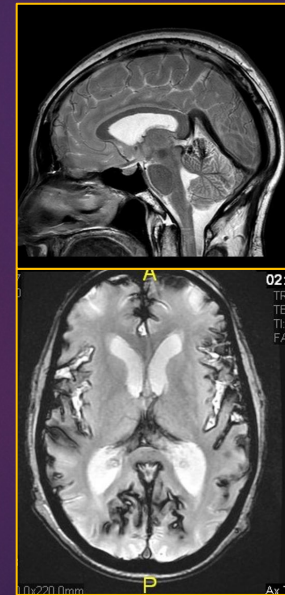
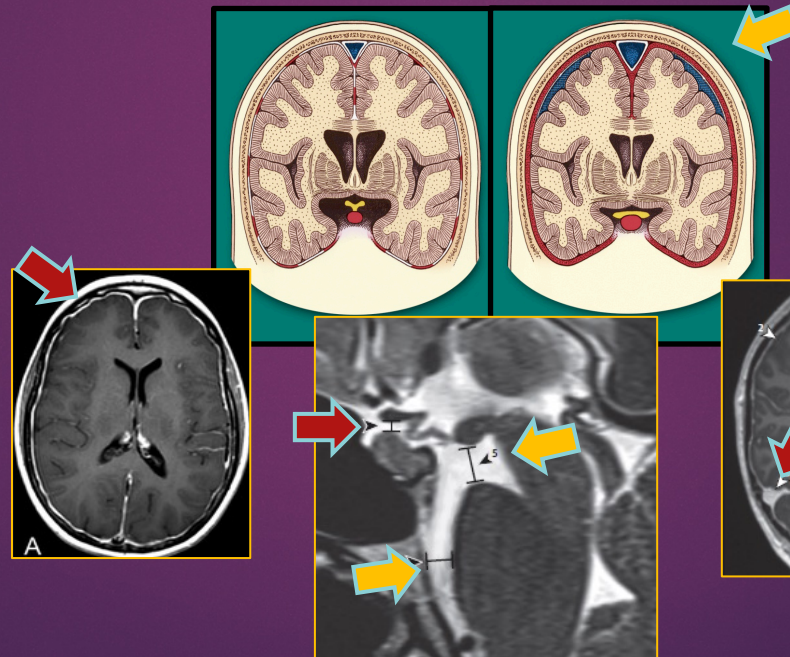
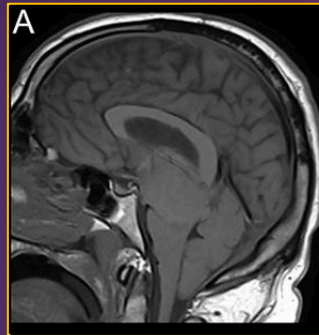




Imaging at a non-CSF Center

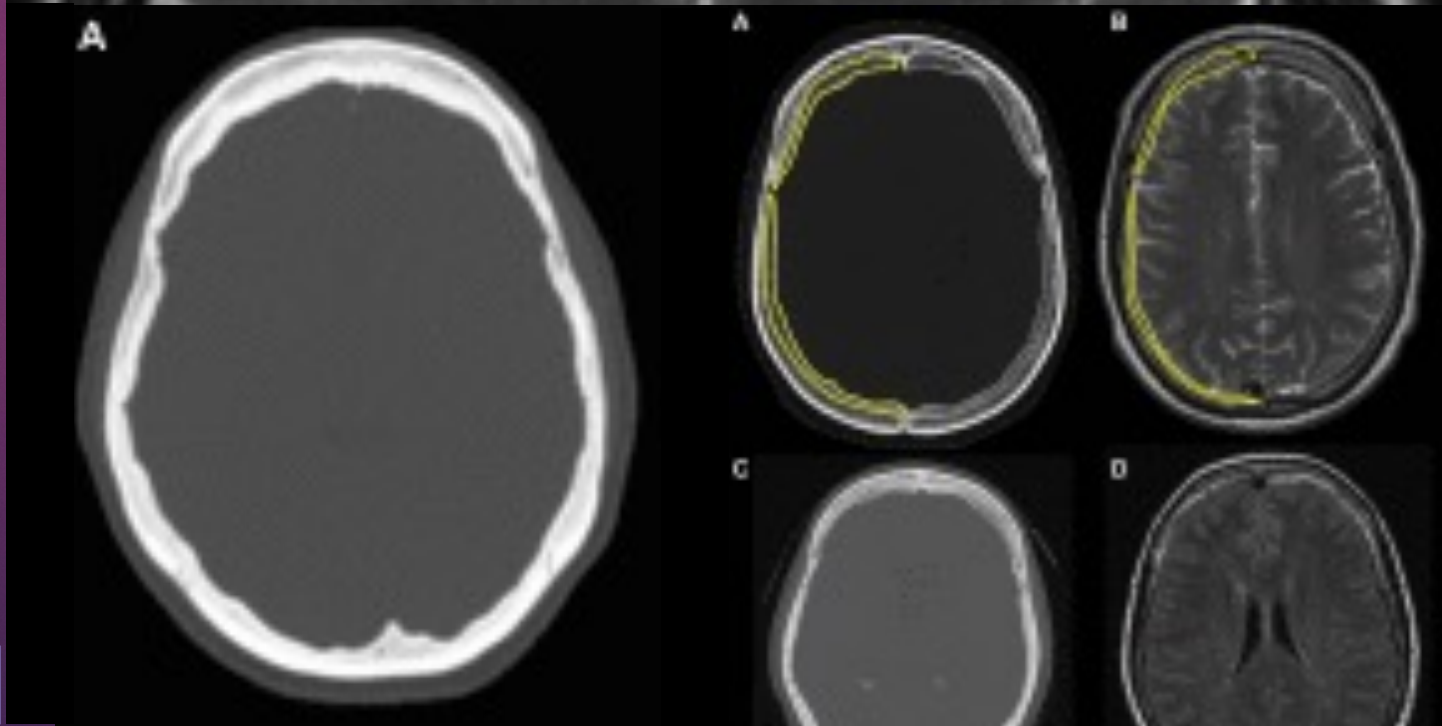
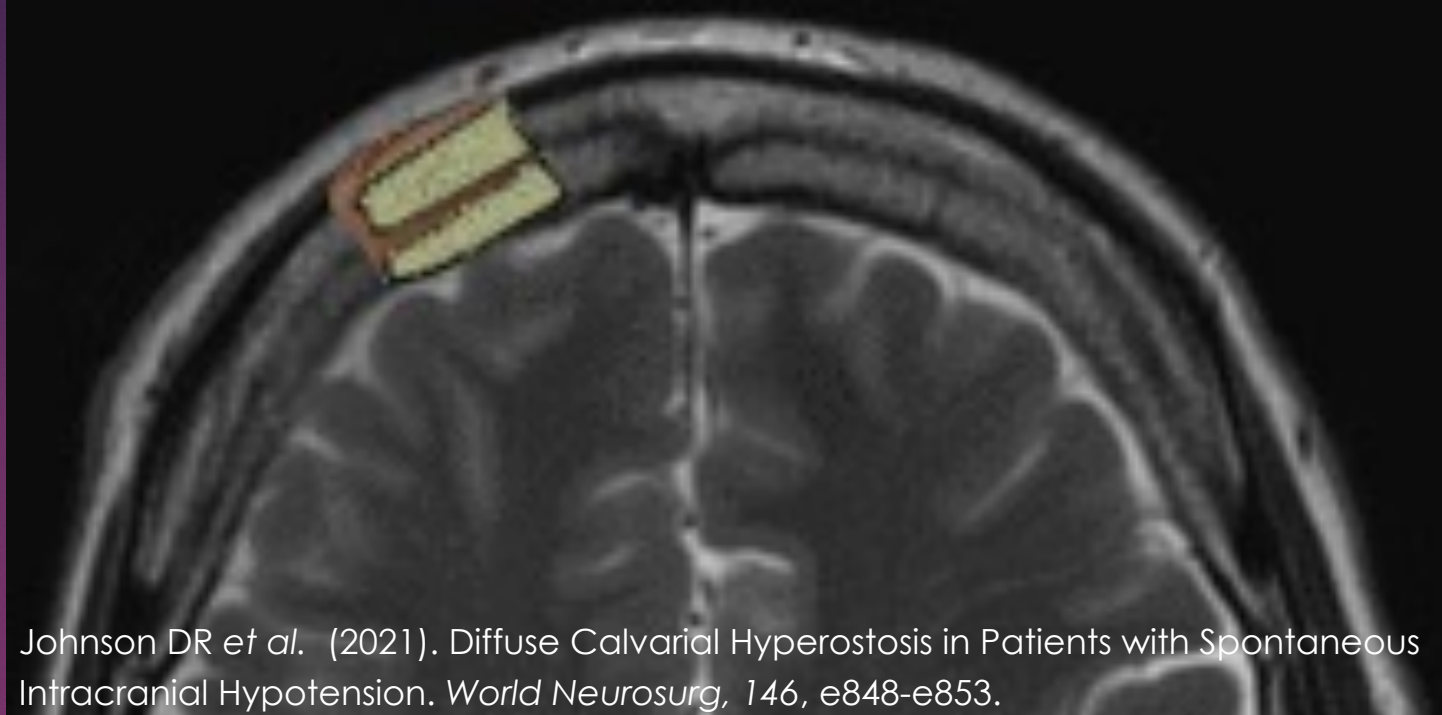


- ▶ MRI Brain wwo contrast



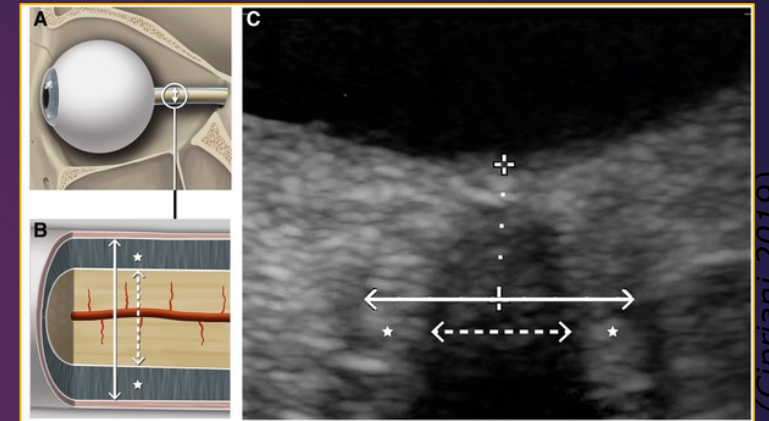
Diffuse Calvarial Hyperostosis in SIH

- ▶ Retrospective review of CT & MRI of 285 patients who had myelography for SIH
 - ▶ generalized calvarial thickening
 - ▶ secondary layer of bone
 - ▶ typical benign hyperostosis frontalis was excluded
- ▶ 14% - diffuse calvarial hyperostosis
 - ▶ 80.0% - distinct circumferentially layered appearance
 - ▶ 20.0% had generalized calvarial thickening without layering



Optic Nerve as a Diagnostic Tool

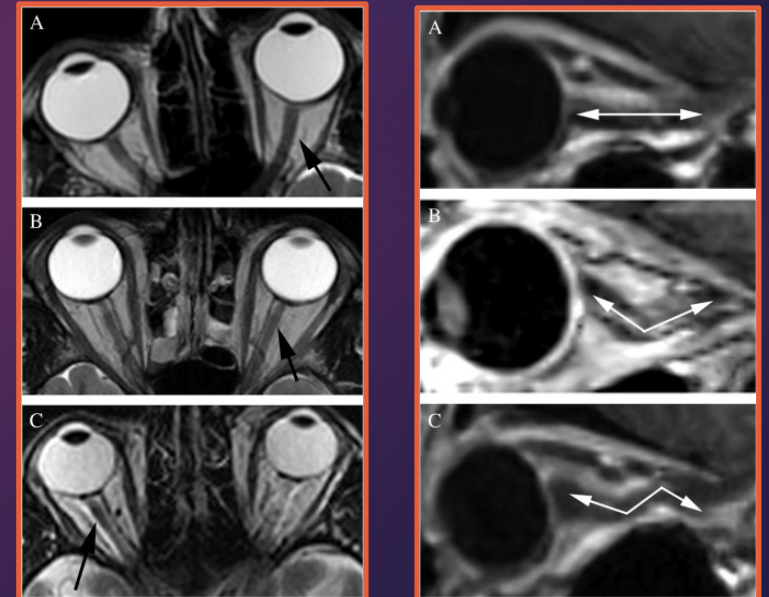
- ▶ Wang *et al.* (2017)
 - ▶ $ICP = -111.92 + 77.36 \times ONSD$
 - ▶ ONSD independent predictor of ICP.
 - ▶ Sex, age, BMI, waist circumference, head circumference, and DBP
- ▶ Gupta and Pachisia (2019)
 - ▶ CSF pressure of >20 cm H₂O ~ ONSD >0.63 cm (n=100 patients, 81% men, $r = 0.715$)



(Cipriani 2019)

Optic nerve sheath CSF: A–C: Axial T2w images through the orbits;

- A. Decreased CSF in the optic nerve sheath in a patient with IH (arrow);
- B. Normal optic nerve sheath CSF in a normal control (arrow);
- C. Increased CSF in the optic nerve sheath in a patient with idiopathic intracranial hypertension (arrow).



Orthostatic change alters ONS diameter in SIH, but not POTs

	POTS + OSH (n = 7)	POTS—OSH (n = 7)	SIH (n = 5)	Control (n = 8)	P value
Optic nerve sheath diameter					0.003**
Supine	4.8 ± 0.1	4.5 ± 0.2	5.3 ± 0.1	4.8 ± 0.2	
Upright	4.8 ± 0.2	4.5 ± 0.2	4.6 ± 0.1	4.6 ± 0.2	
Optic nerve diameter					0.080
Supine	3.7 ± 0.3	3.1 ± 0.2	3.5 ± 0.2	3.8 ± 0.2	
Upright	3.8 ± 0.2	3.3 ± 0.2	3.4 ± 0.2	3.6 ± 0.2	
Perineural space diameter					0.050*
Supine	2.5 ± 0.1	2.6 ± 0.2	3.1 ± 0.1	2.2 ± 0.1	
Upright	2.1 ± 0.2	2.4 ± 0.1	2.4 ± 0.2	2.2 ± 0.1	

Note. Values are reported in mm. Data are reported as mean ± S.E.M. P values refer to the interactions of group and position, derived from analyses of variance for repeated measures.

* $P \leq 0.05$;

** $P \leq 0.01$

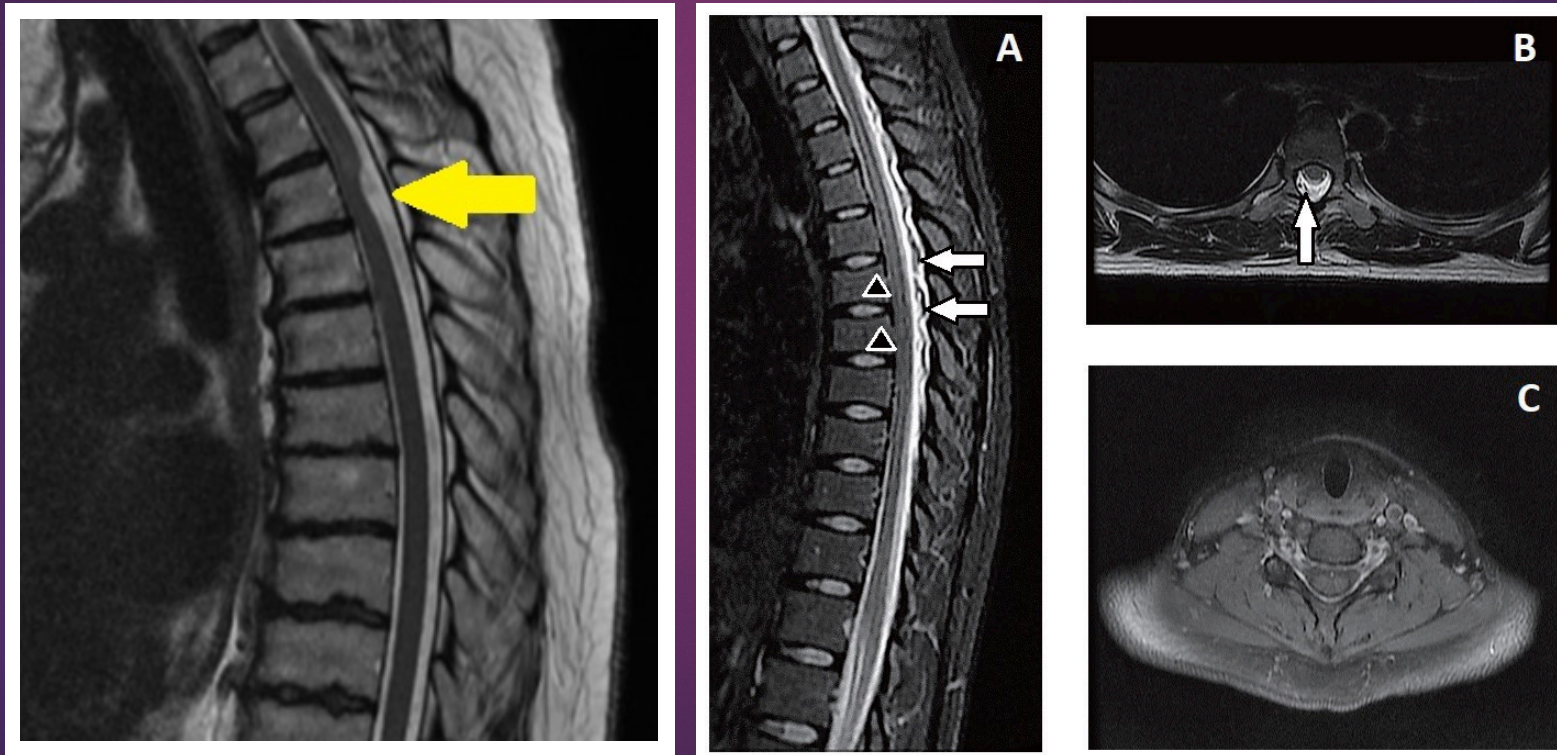
POTS, postural orthostatic tachycardia syndrome; OSH, orthostatic headache; SIH, spontaneous intracranial hypotension



Imaging at a non-CSF Center



► MRI Spine - Ventral Spinal Cord Displacement - T-spine



Case courtesy of Dr Christine Goh,
Radiopaedia.org, rID: 34575

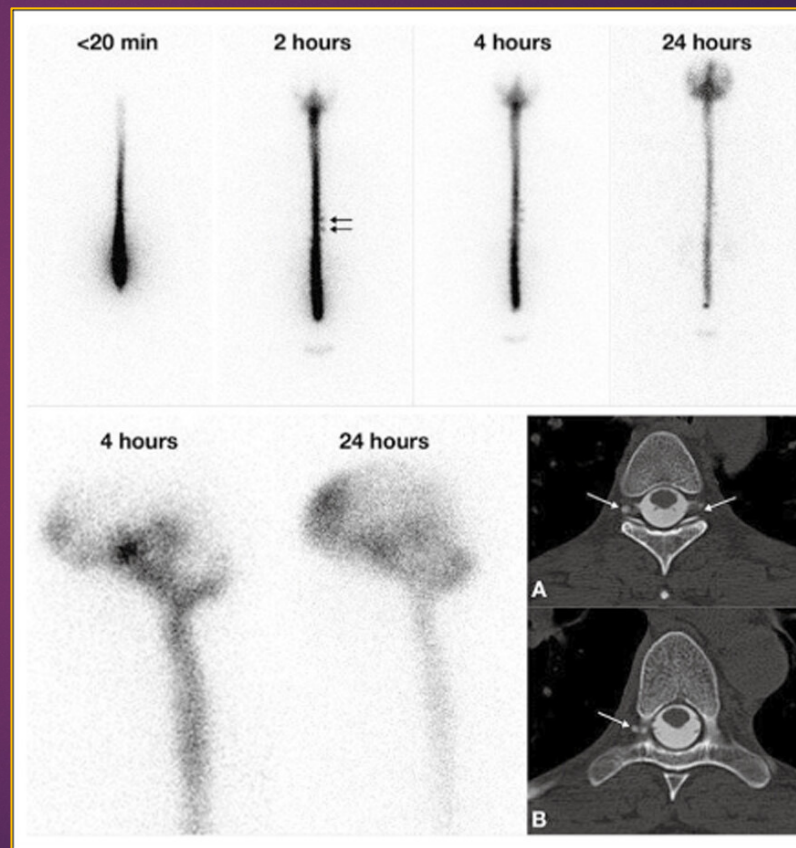
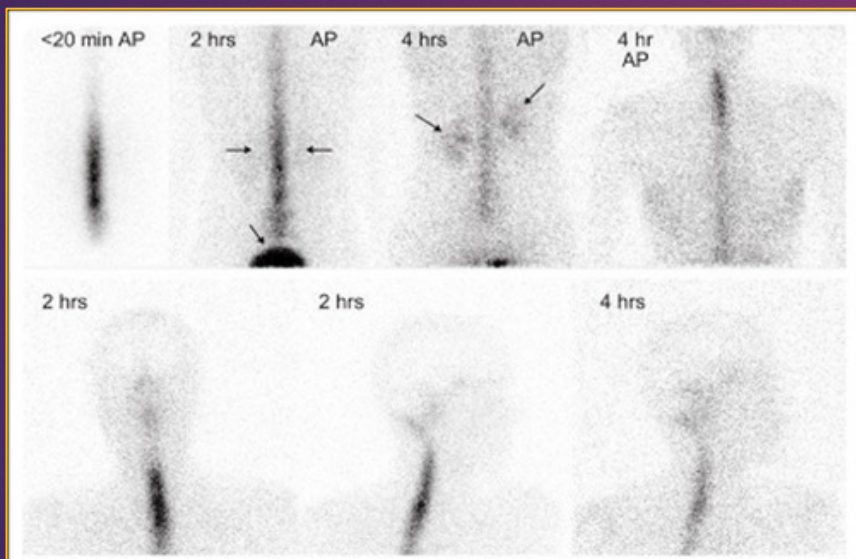
Lin MH, Hsu YC. Acta Neurol Taiwan. 2020 Jun;29(2):59-63.



Imaging at a non-CSF Center



▶ Radioisotope Cisternography



Mokri B (2014). Headache. 54(8):1358-68.

If I'm on the fence...

Treat the DDX / Comorbidities

- ▶ Migraine – prevention
- ▶ POTS – lifestyle adaptations, midodrine, fludrocortisone, beta-blockers, pyridostigmine, etc.
- ▶ PT
- ▶ Cephalic nerve blocks, Trigger points, Cervical injections
- ▶ Referrals to subspecialists

Phone a friend.



Diagnosis

- ▶ When do I recommend/refer my patient to a specialty spinal CSF Leak Center?



- ▶ After very considered conversation with the patient and often involving supporting family/friends.

Referrals

- ▶ Local academic non-specialist institute locally
- ▶ Out-of-state referrals
 - ▶ Anschutz – University of Colorado
 - ▶ Cedars Sinai
 - ▶ Duke University
 - ▶ Mayo Rochester
 - ▶ Stanford
 - ▶ Jefferson
 - ▶ ...



Treatment Locally

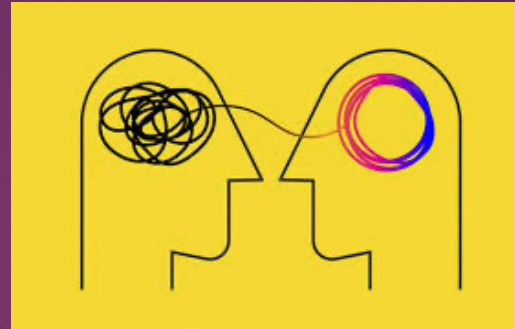
- ▶ Conservative
 - ▶ Lie flat for 48 hrs.
 - ▶ Drink fluids + caffeine
- ▶ Non-targeted epidural blood patch



- ▶ Potential for other interventional and surgical treatments.

Treatment at a community hospital center

- ▶ Non-directed Epidural Blood Patches
- ▶ Local institution
 - ▶ Making connections
 - ▶ Educating
 - ▶ Building Trust
 - ▶ Building the system
- ▶ Local Maverick
 - ▶ Getting it done

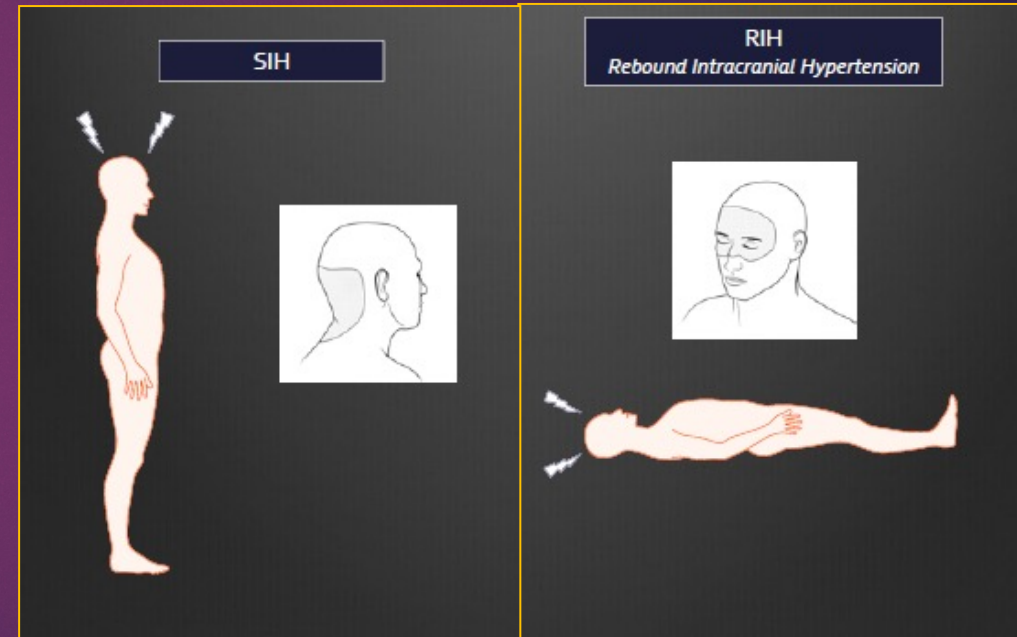


Discuss expectations, recommendations and adverse reactions before treatment

- ▶ No Bending Lifting Twisting



- ▶ Rebound Intracranial HyPERtension



Patients that come to me after going to 1 or many referral centers

▶ Poor old Michael Finnegan



Bridging the Gap



Thank you.

