



THE DIAGNOSIS OF SIH

FROM OLD TO NEW UNDERSTANDINGS

Ian Mark

Spinal CSF Leak: Bridging the Gap
Nov 2, 2024

DISCLOSURES

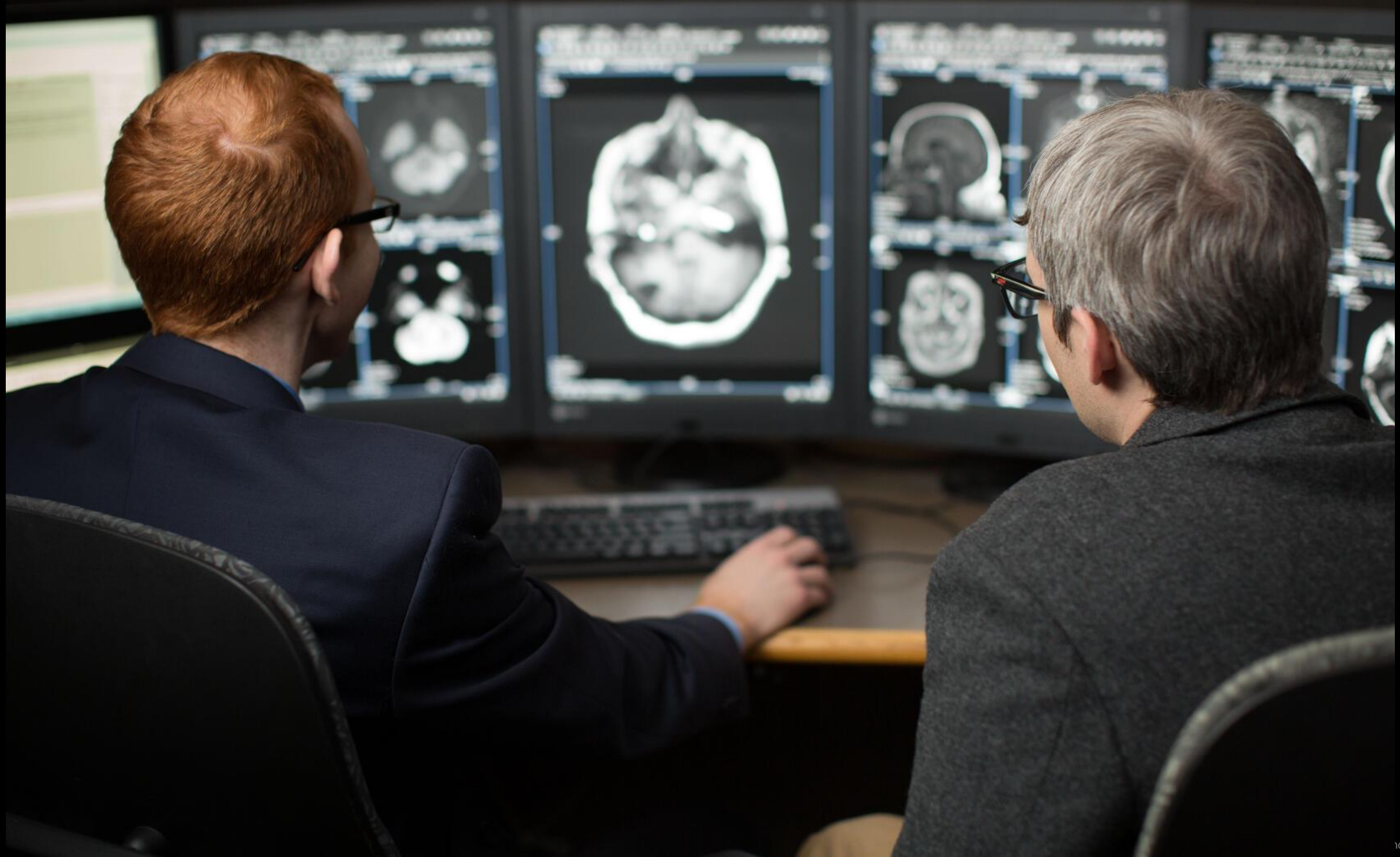
- **American Society of Spine Radiology Research Grant**
- **American Roentgen Ray Society Scholarship**
- American Society of Head & Neck Radiology William N. Hanafee Grant
- American Society of Neuroradiology Scholar Award in Neuroradiology Research
- GE Healthcare
- Lantheus Medical Imaging

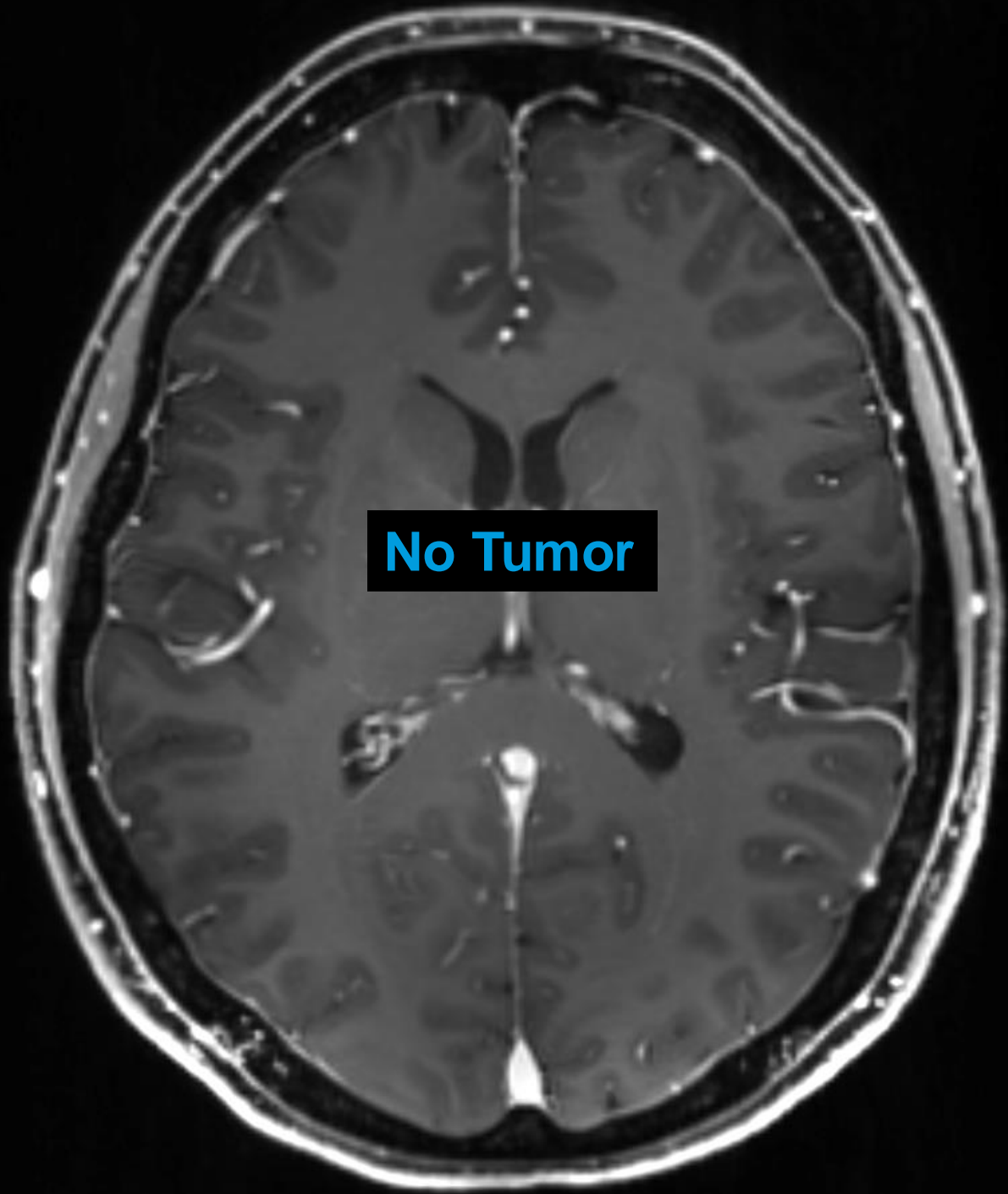
Spinal CSF Leak:



**Bridging the Gap between
Patients and Providers**







No Tumor



No Stenosis



No CVF

~~Is there a CVF?~~

Where is the CVF?

2 Related but *Separate* Problems

**Unnecessary
myelo**

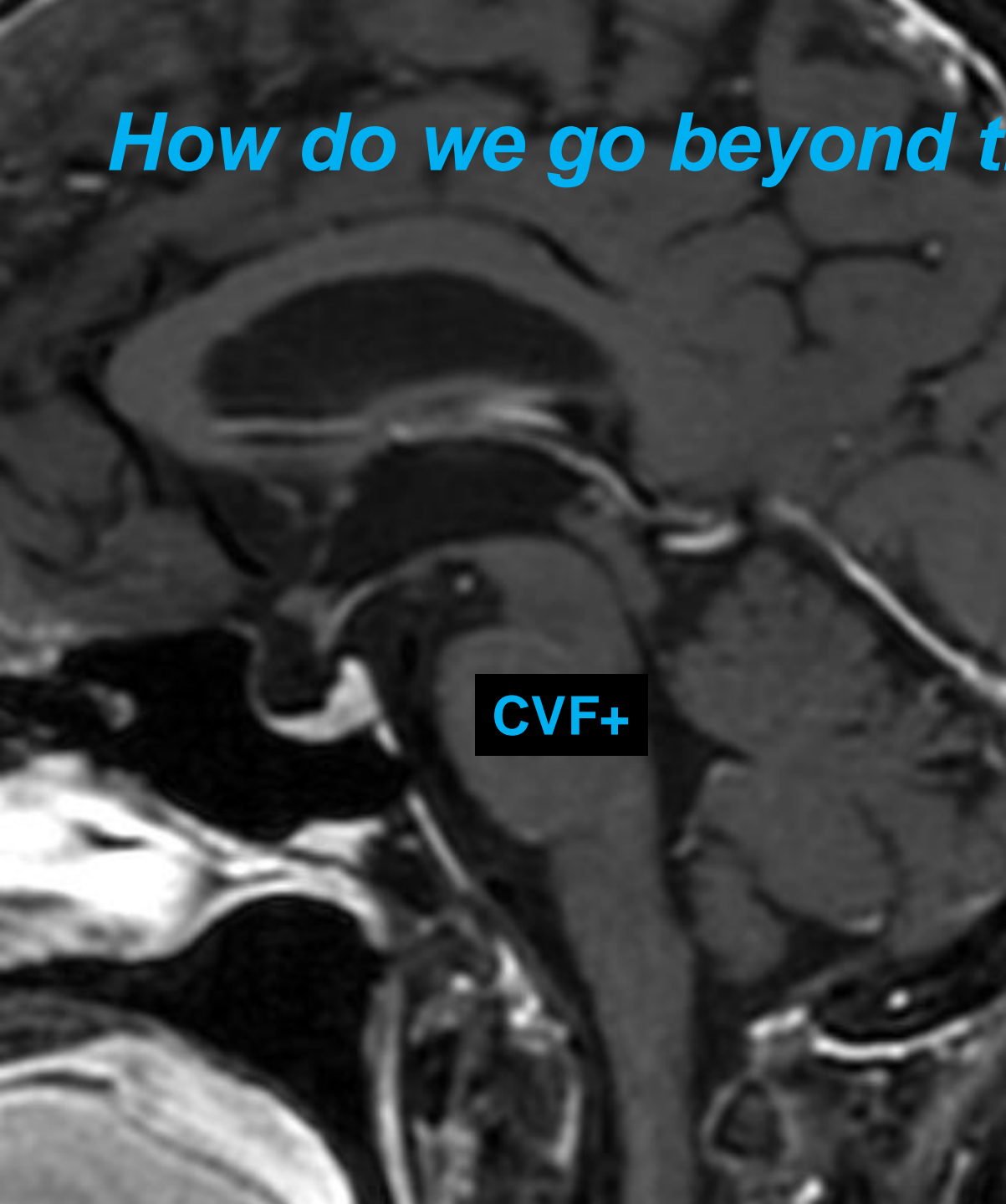
**Undiagnosed
SIH**



How do we go beyond the Bern score and SEEPS?

CVF+

SIH-



Anterior Skull Base CSF leaks \neq SIH

SIH = ~~CSF Hypotension~~

SIH = CSF Volume Depletion*

J Neurosurg 116:749–754, 2012

Lack of causal association between spontaneous intracranial hypotension and cranial cerebrospinal fluid leaks

Clinical article

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FRANKLIN G. MOSER, M.D., M.M.M.,³ AND TODD D. ROZEN, M.D.⁴

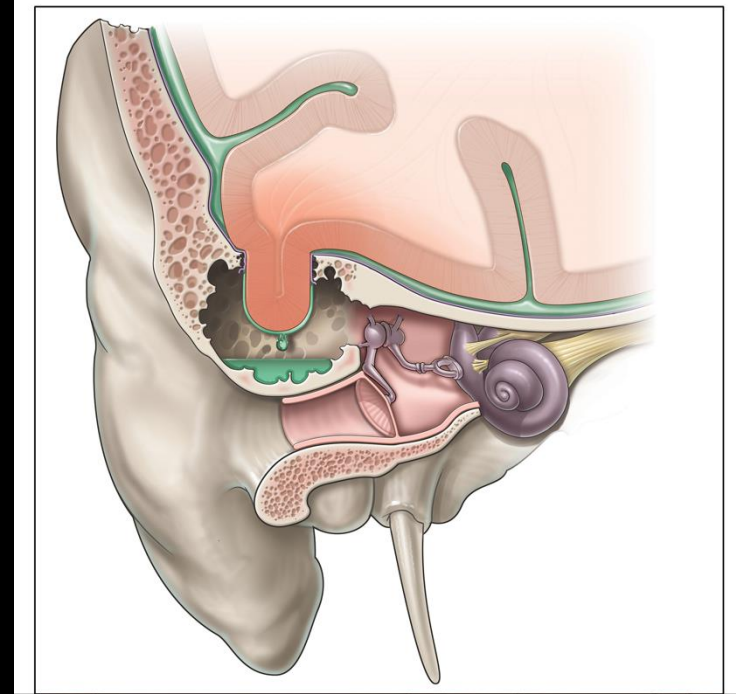
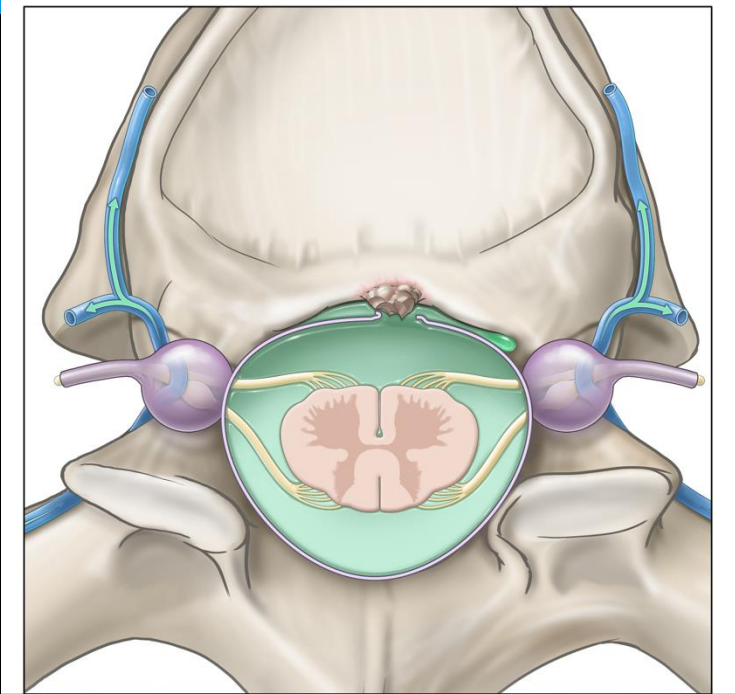
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ORIGINAL RESEARCH
HEAD AND NECK IMAGING

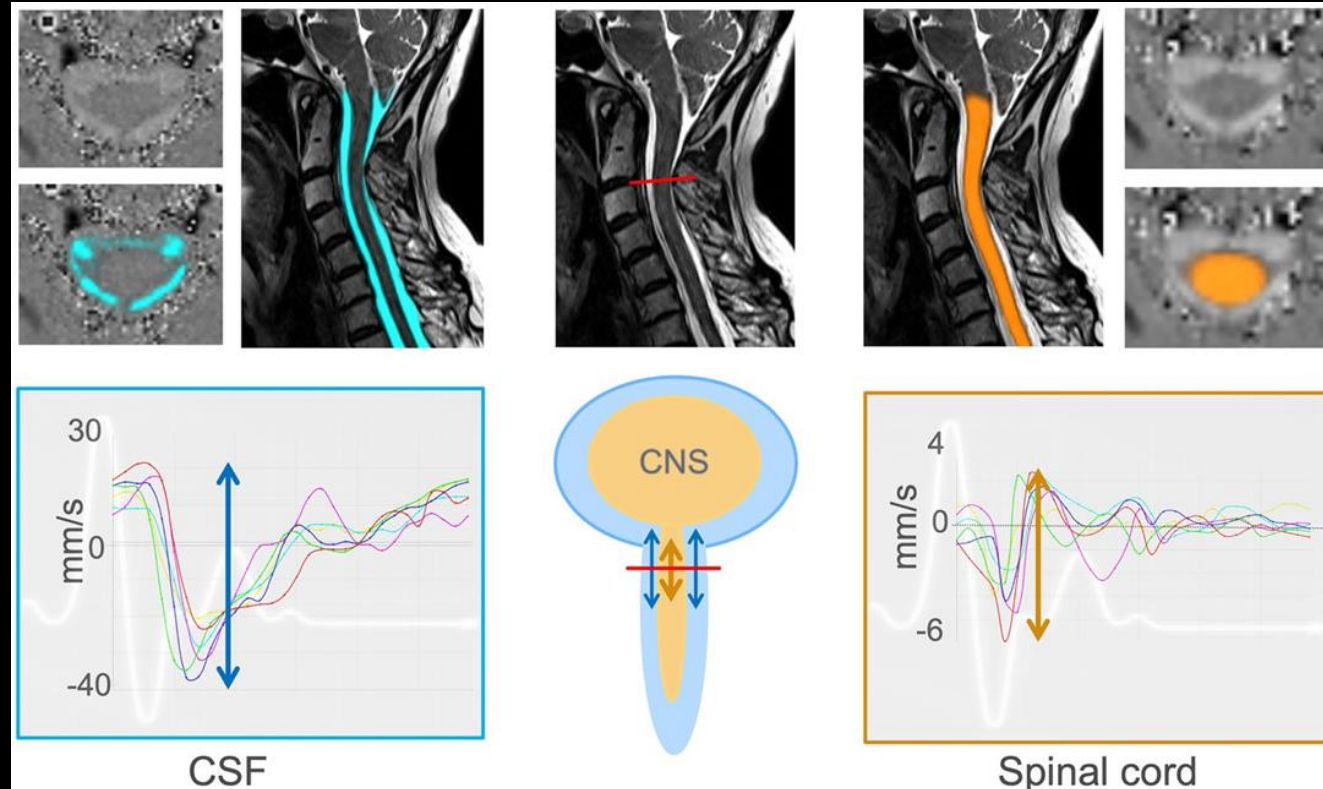
Skull Base CSF Leaks: Potential Underlying Pathophysiology and Evaluation of Brain MR Imaging Findings Associated with Spontaneous Intracranial Hypotension

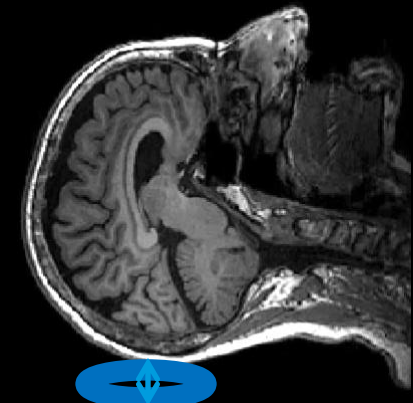
 Ian T. Mark,  Jeremy Cutsforth-Gregory,  Patrick Luetmer,  Ajay A. Madhavan,  Michael Oien,  Paul Farnsworth,  Girish Bathla,  Steve Messina,  Michael Link, and  Jamie Van Gompel



Non-invasive biomarkers for spontaneous intracranial hypotension (SIH) through phase-contrast MRI

Katharina Wolf¹  · Florian Volz¹ · Niklas Lützen² · Hansjoerg Mast² · Marco Reisert^{3,4} · Amir El Rahal^{1,5} · Christian Fung¹ · Mukesh J. Shah¹ · Jürgen Beck¹ · Horst Urbach²

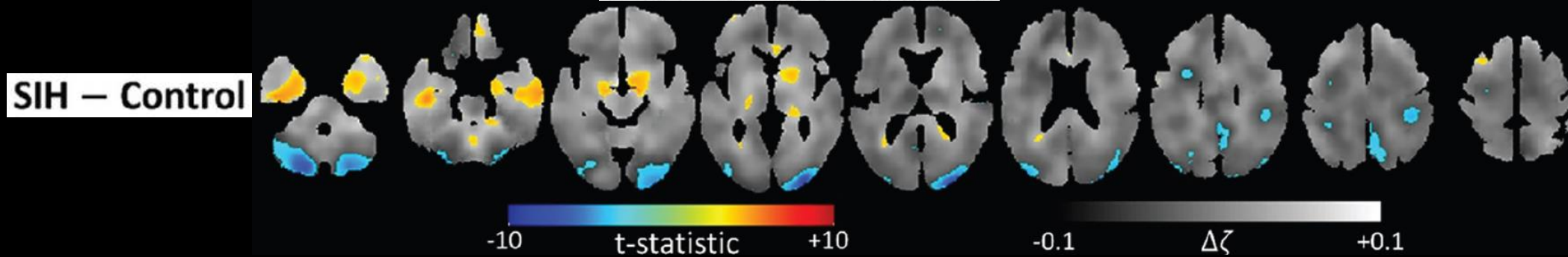




Evaluation of MR Elastography as a Noninvasive Diagnostic Test for Spontaneous Intracranial Hypotension

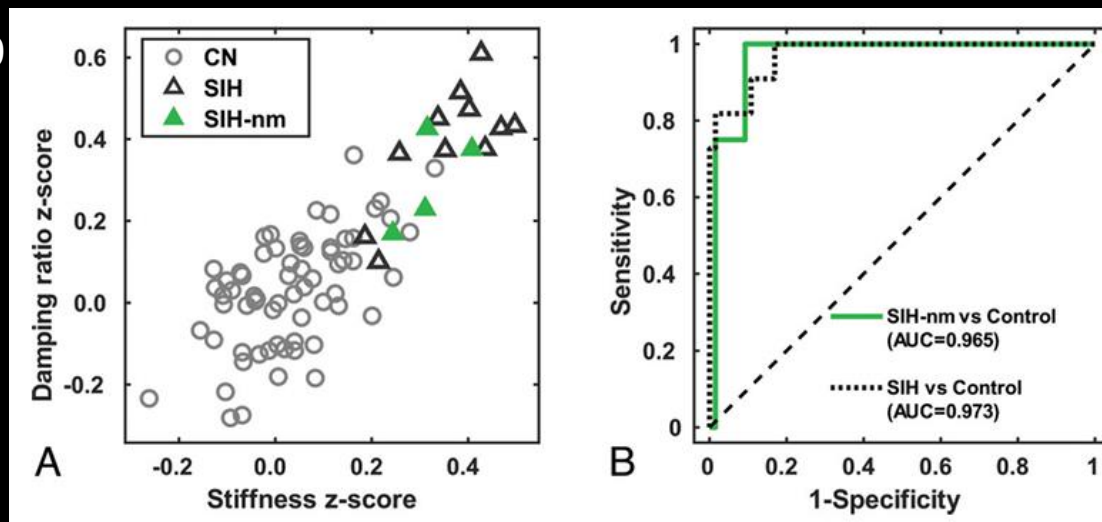
Ian T. Mark, Pragalv Karki, Jeremy Cutsforth-Gregory, Waleed Brinjikji, Ajay A. Madhavan, Steven A. Messina, Petrice M. Cogswell, John J. Chen, Richard L. Ehman, John Huston, and Matthew C. Murphy

Orange = increased damping ratio in SIH **DIFFERENCE MAPS**



▲ are Bern 0

AUC of 0.97
distinguishing SIH
from Controls



ORIGINAL RESEARCH

SPINE IMAGING AND SPINE IMAGE-GUIDED INTERVENTIONS

Beta Trace Protein as a Potential Biomarker for CSF-Venous Fistulas

Ian T. Mark, Waleed Brinjikji, Jeremy Cutsforth-Gregory, Jared T. Verdoorn, John C. Benson, Ajay A. Madhavan, Jeff W. Meeusen

Beta Trace Protein

Glycoprotein, #1 most abundant CNS derived protein

CVF (14 pts)

0.492 (SD 0.095) mg/L

Controls (20 pts)

0.720 (SD 0.191) mg/L

P < 0.001



NEED

Universally accessible *tool* to identify SIH



REALITY

It's **easy** to tell someone they have a leak, it's **hard** to say they don't. **Tools** required.



PREDICTION

The work is being done. Will likely start with imperfect tools, available to some.