

# Challenges in the Radiological Diagnosis of Intracranial Hypotension

*Validity of the Bern Score as a Surrogate Marker  
for Clinical Severity*

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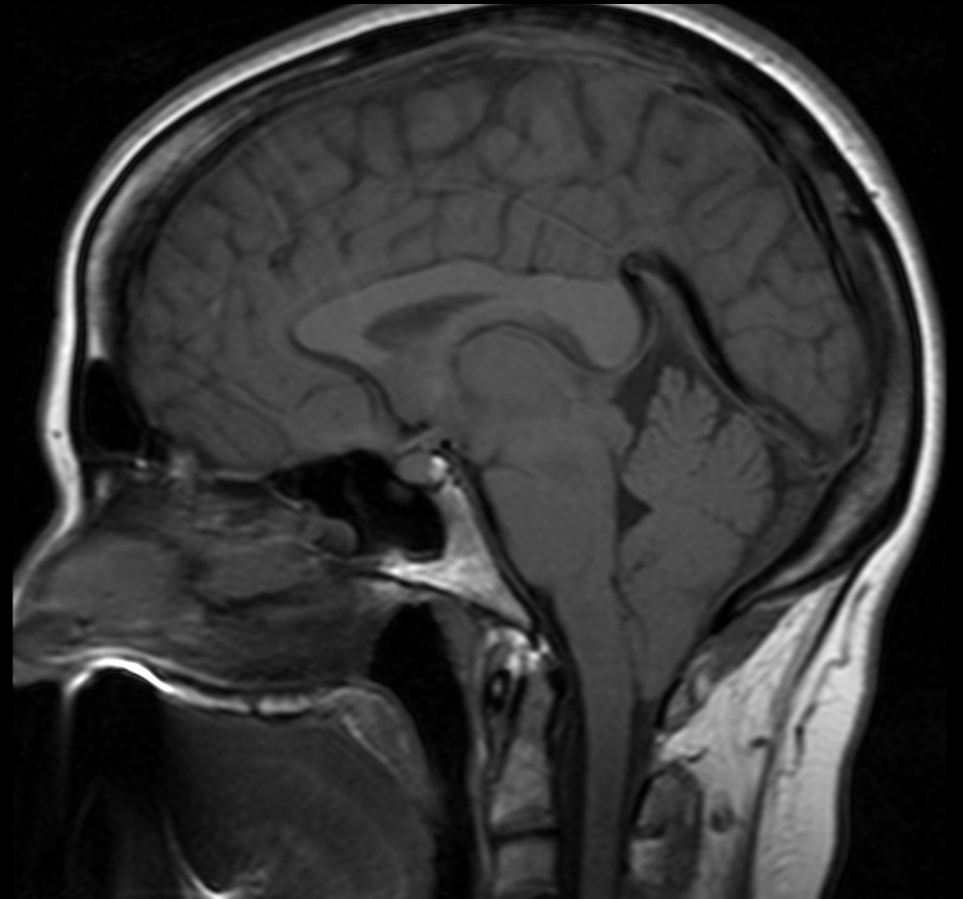


- Nothing to disclose

# Background

Bern score is a quantitative scale characterizing the **severity of brain MRI changes** in spontaneous intracranial hypotension (SIH)

*predicts the probability of a spinal leak on subsequent spine imaging*



# Background

## Original Investigation

February 18, 2019

## Assessing Spinal Cerebrospinal Fluid Leaks in Spontaneous Intracranial Hypotension With a Scoring System Based on Brain Magnetic Resonance Imaging Findings

Tomas Dobrocky, MD<sup>1</sup>; Lorenz Grunder, MD<sup>1</sup>; Philippe S. Breiding, MD<sup>1</sup>; [et al](#)

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JAMA Neurol. 2019

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March 02, 2021; 96 (9) **ARTICLE**

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*Clinical Neuroradiology*. 32, 231–238 (2022) | [Cite this article](#)

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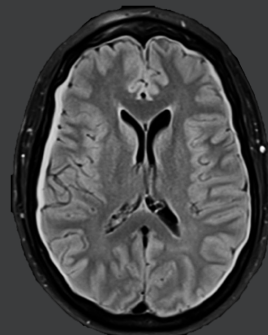
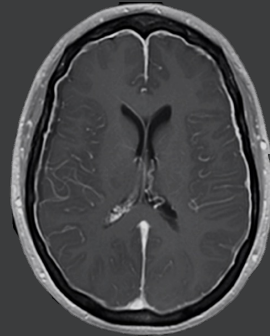
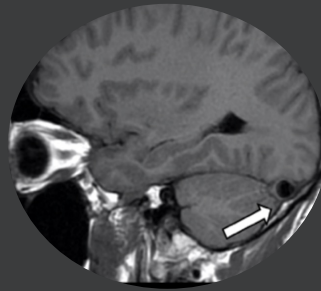
May 30, 2023; 100 (22) **RESEARCH ARTICLE**  
**OPEN ACCESS**

## Relationship of Bern Score, Spinal Elastance, and Opening Pressure in Patients With Spontaneous Intracranial Hypotension

Andrew L. Callen, Jack Pattee, ● Ashesh A. Thaker, ● Vincent M. Timpone, David A. Zander, Ryan Turner, Marius Birlea, Danielle Wilhour, Chantal O'Brien, Jennifer Evan, Fabio Grassia, Ian R. Carroll  
First published April 4, 2023. DOI: <https://doi.org/10.1212/WNL.0000000000007267>

# BERN SCORE ASSESSMENT

*Dobrocky T, Grunder L, Breiding PS, et al.  
Assessing Spinal Cerebrospinal Fluid Leaks in  
Spontaneous Intracranial Hypotension With a  
Scoring System Based on Brain Magnetic  
Resonance Imaging Findings. JAMA Neurol.  
2019;76(5):580-587*



## MAJOR CRITERIA 2 pt each

engorgement venous sinuses  
pachymeningeal enhancement  
suprasellar cistern  $\leq 4$  mm

## MINOR CRITERIA 1 pt each

subdural fluid collection  
prepontine cistern  $\leq 5$  mm  
mamillopontine distance  $\leq 6.5$  mm

probability of finding a spinal  
CSF leak:

**low  $\leq 2$**

**intermediate 3-4**

**high  $\geq 5$**

# Background

- brain MRI changes **may reverse** after successful treatment
- relationship between clinical headache severity & Bern score has not yet been evaluated

# Purpose

to determine the degree of correlation between  
**pre-treatment Bern scores & headache severity**  
in SIH

*Validity of the Bern Score as a Surrogate Marker of  
Clinical Severity in Patients with Spontaneous  
Intracranial Hypotension*

*J.L. Houk, S. Morrison, S. Peskoe, T.J. Amrhein and P.G. Kranz*



# Methods

- retrospective cohort of consecutive patients who underwent workup for SIH
- completed a questionnaire assessing clinical headache severity (Headache Impact Test, HIT-6) at presentation
- brain MRIs were reviewed & HIT-6 scores for each subject were recorded

# Methods

## INCLUSION CRITERIA

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- consecutive patients who completed pre-treatment HIT-6 questionnaire
- available brain MRI showing signs of SIH

*e.g., pachymeningeal enhancement, venous distension, brain sag*

## EXCLUSION CRITERIA

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- no available pre-treatment brain MRI w/ IV contrast
- brain MRI obtained >6 mo from date of HIT-6 collection
- incomplete HIT-6

# Methods

- to assess the **correlation between HIT-6 and Bern scores**,  $\rho$  and 95% CI were calculated
- to characterize the relationship between HIT-6 and Bern scores, a regression line was fit
- ROC curve was used to evaluate ability of Bern score to discriminate **between low & high severity** headache groups

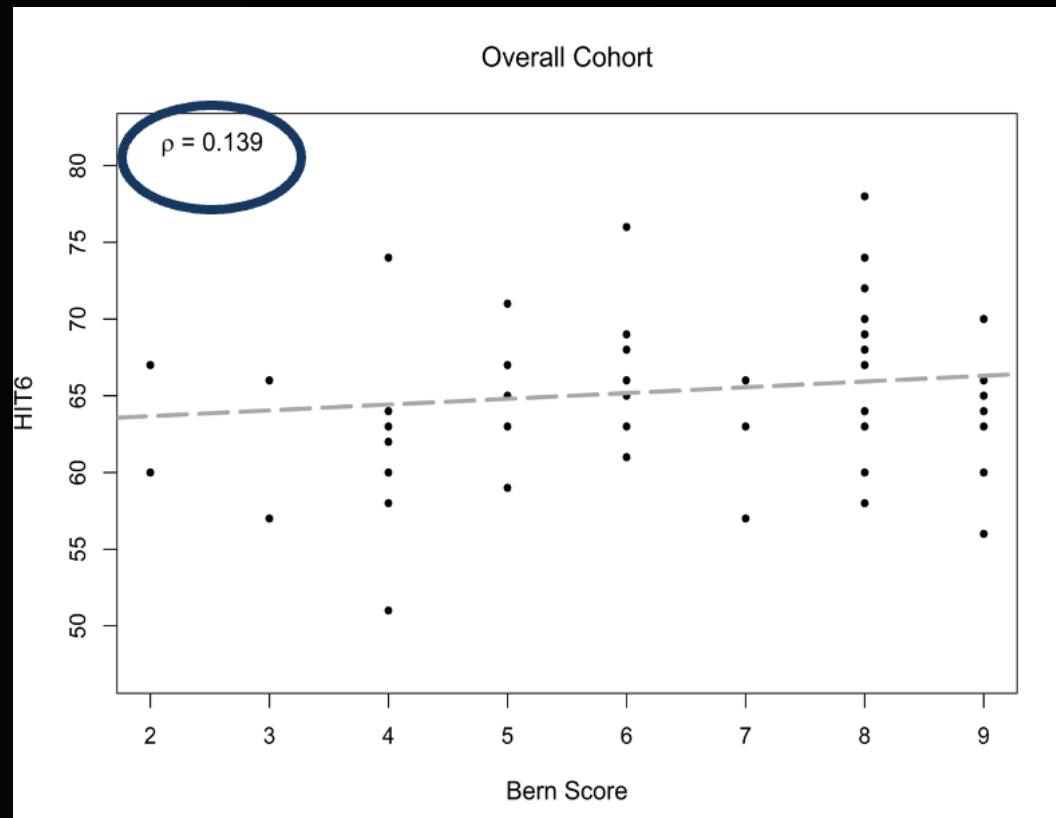
# Results

## *Demographics*

- 57 subjects, 35 (61%) female
- mean age 53.6 years (range 30-73)

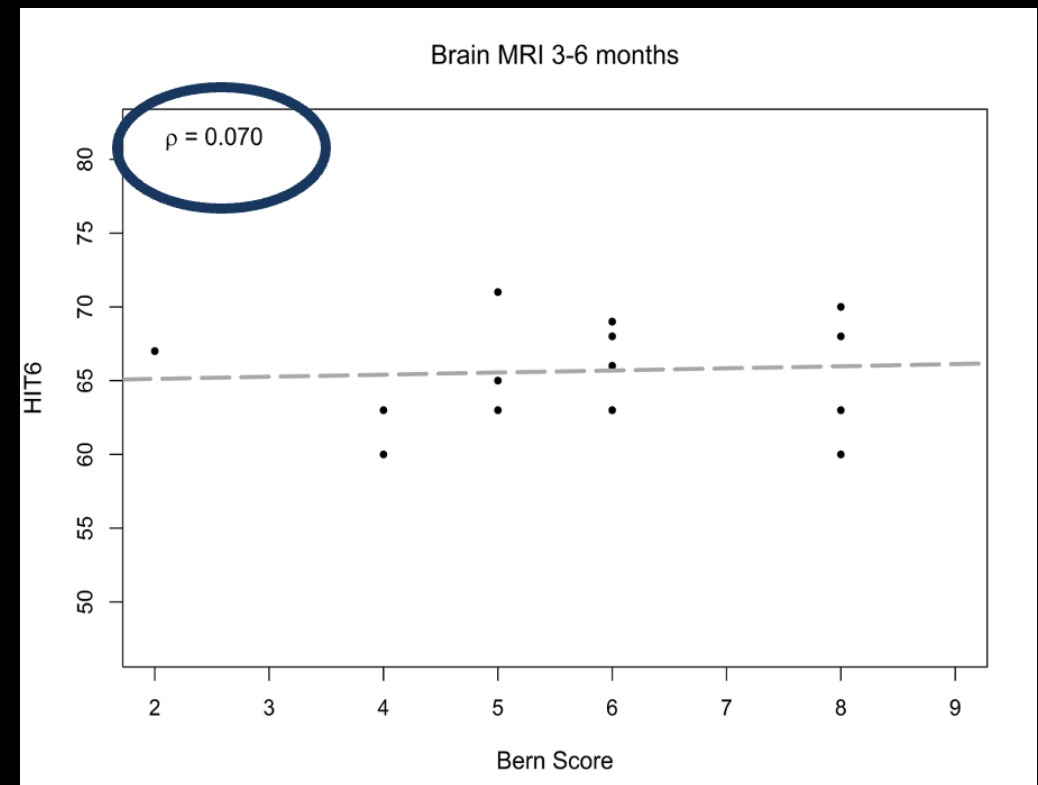
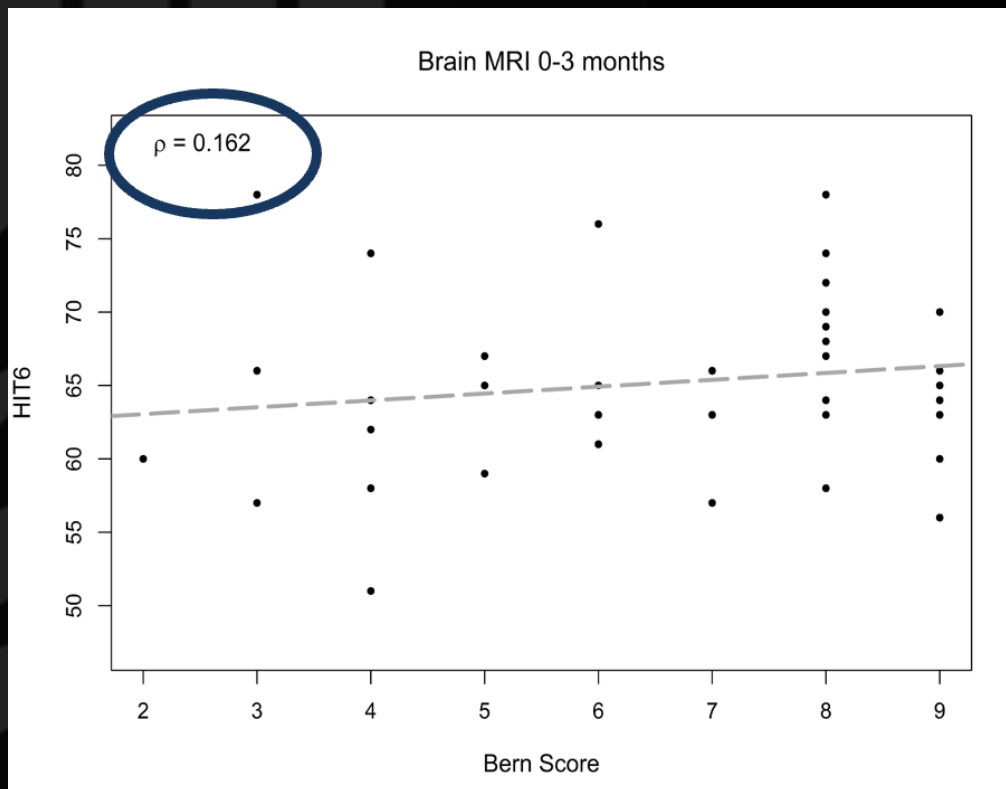
# Results

**low correlation between HIT-6 and Bern scores  
in all groups**



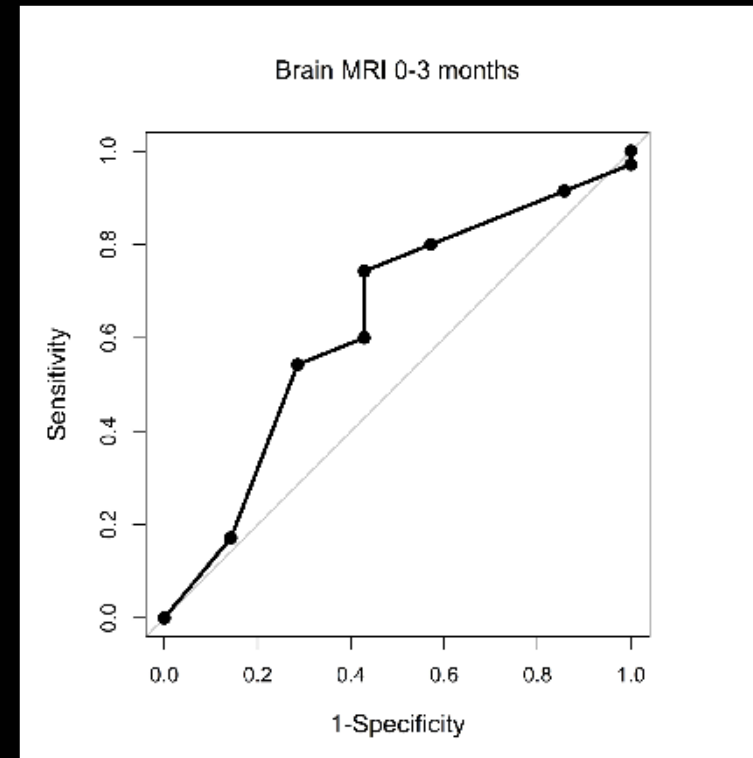
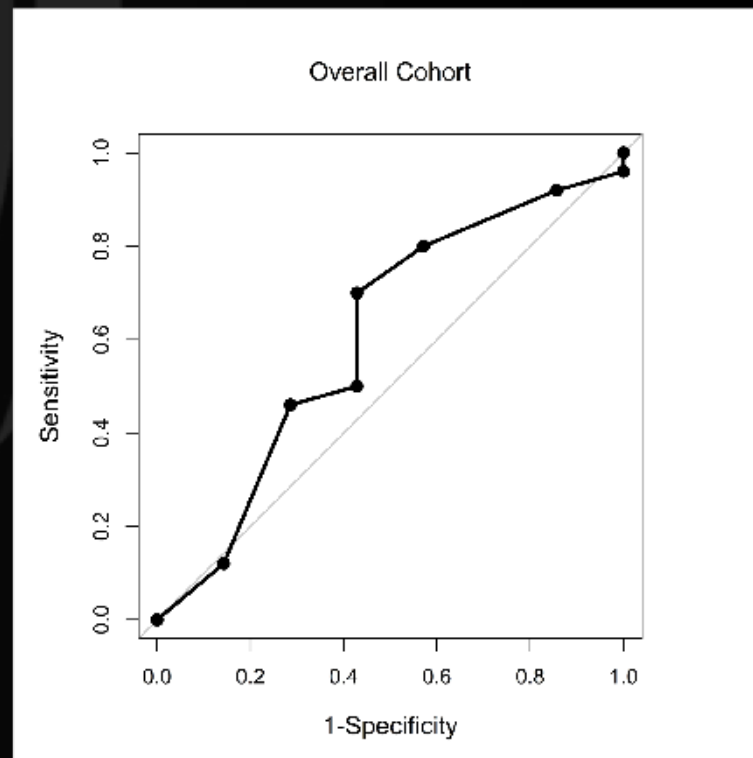
# Results

## low correlation between HIT-6 and Bern scores in all groups



# Results

Bern score performed poorly at discriminating subjects who fell into the headache severity categories of **severe versus not severe**



# Limitations

- retrospective study
- quaternary institution
- HIT-6 has not yet been validated specifically in SIH



# Conclusions

pre treatment Bern scores show **low correlation**  
with clinical headache severity in SIH

Bern scores **do not reliably reflect headache severity** and  
should not replace clinical outcomes measures

probability of  
finding a spinal CSF  
leak:

low  $\leq 2$

intermediate 3-4

high  $\geq 5$



HIT-6 evaluation:

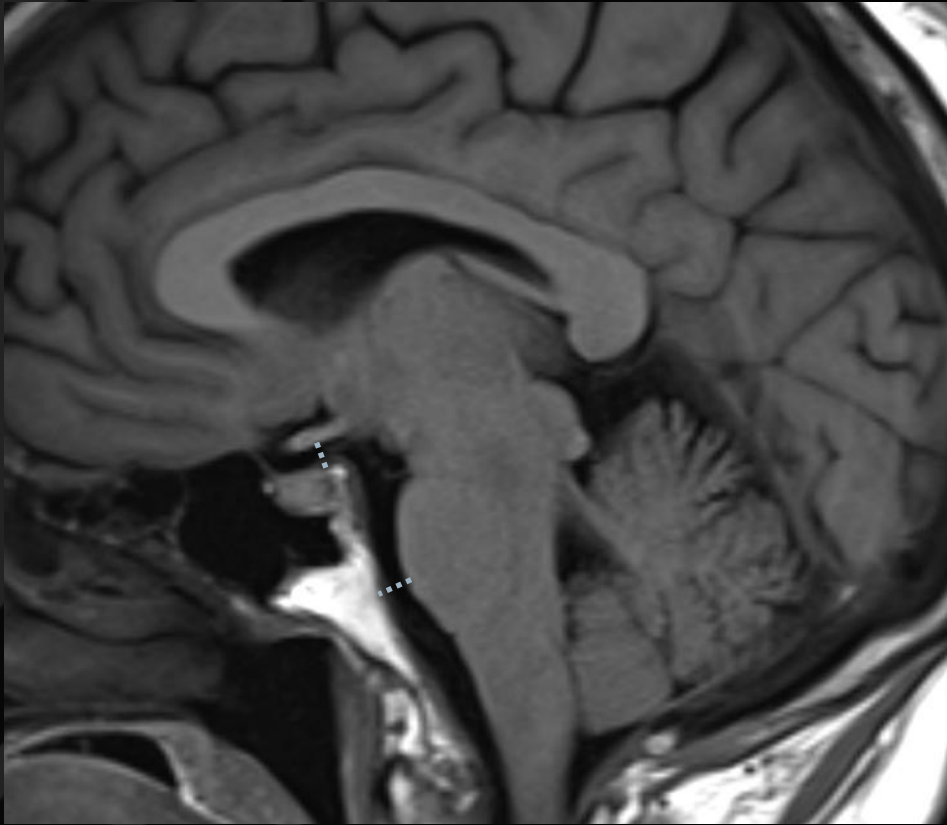
low severity  $< 60$

high severity  $> 60$

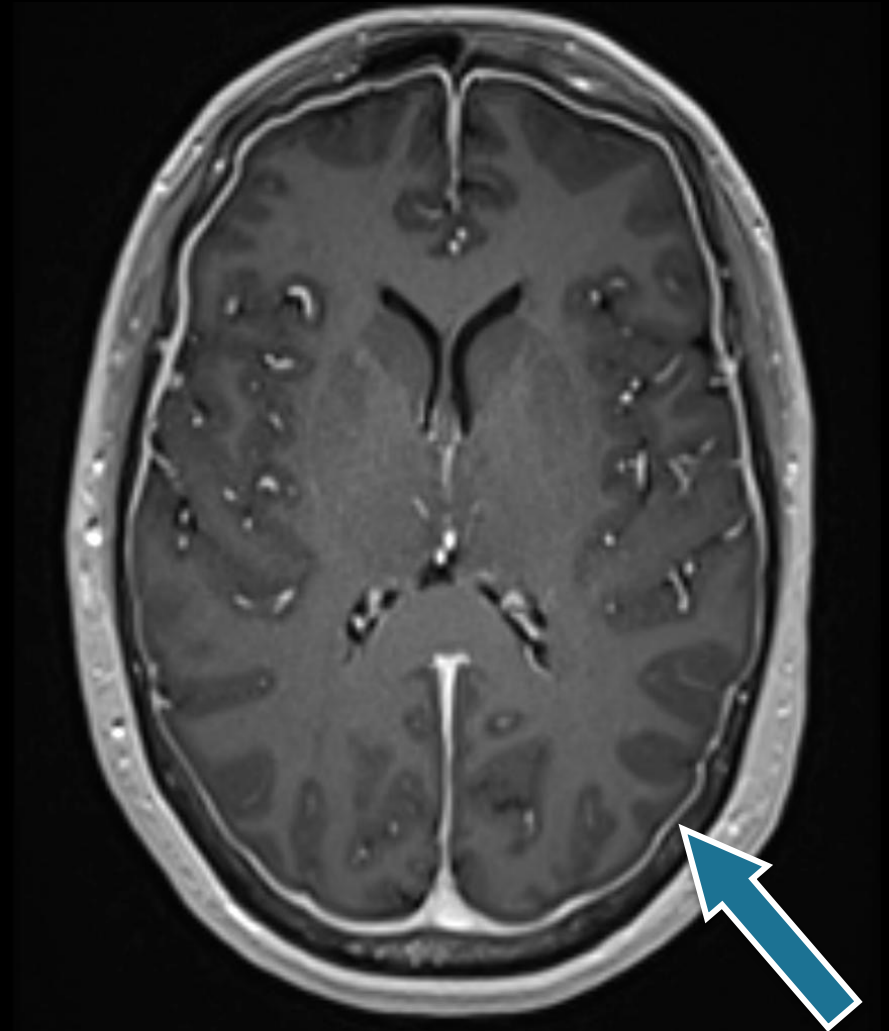
*Bern = 2*

*HIT-6 = 67*





*Bern = 4*



*HIT-6 = 51*



# Takeaways

*Bern score is an important tool for standardized imaging analysis in patients with SIH*

*brain MRI following treatment should be interpreted in conjunction with clinical evaluation*



*Thank you!*

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