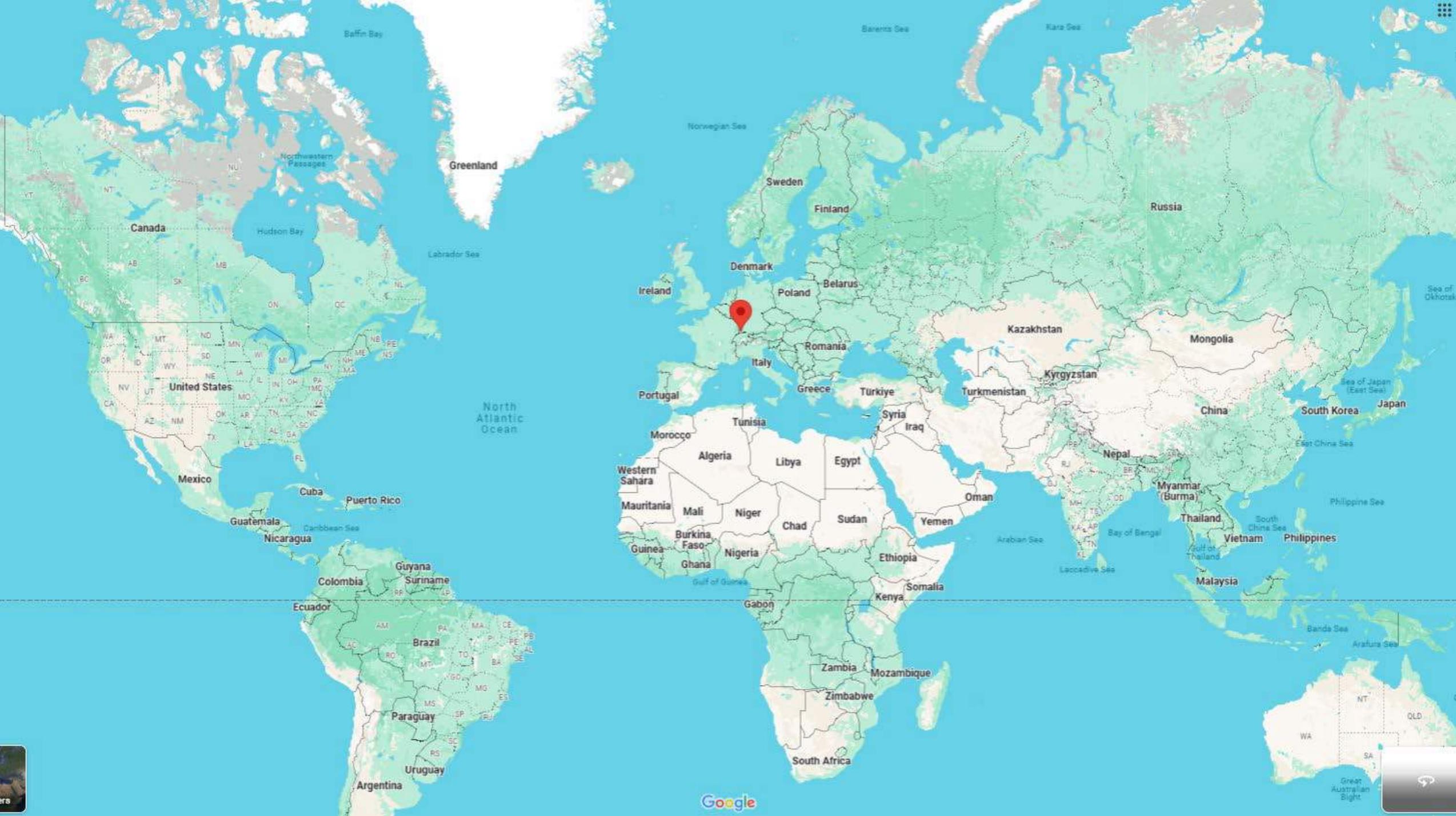


S pontaneous
I ntracranial
H ypotension

What to do?
HEADACHE after leak closure





EANS CEREBROSPINAL FLUID SECTION

International Collaborations

Inselspital Bern, Switzerland

Lindenhofspital Bern, Switzerland

UZH Zuerich, Switzerland

AKH, Vienna, Austria

University College London, UK

King's College, UK

Danish Headache Center, Denmark

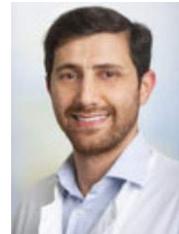
Cedars Sinai, CA, USA

Stanford, CA, USA

Nagoya University, Japan



Prof. Dr. J. Beck
Chairman
Department of Neurosurgery
Chairman EANS CSF-Section



Neurosurgery & Neurology

K. Wolf, F. Volz, A. El Rahal, V. Vieira da Silva
L. Krismer, M. Overstijns, M. Shah

Neuroradiology

H. Urbach, N. Lützen,
C. Zander, T. Demerath



Nuclear Medicine
P.T. Meyer & Team



Anesthesiology
H. Bürkle & Team



Neuroophthalmology
W. Lagrèze & Team



Neuromedical AI Lab
T. Ball & Team



Medical Physics
M. Reisert & Team

Freiburg CSF Center
Prof. Dr. Jürgen Beck



CSF CENTER

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MINISTERIUM FÜR WISSENSCHAFT, FORSCHUNG UND KUNST
Baden-Württemberg



@JrgenBeck
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@KathaDCwolf
@ZanderCharlotte



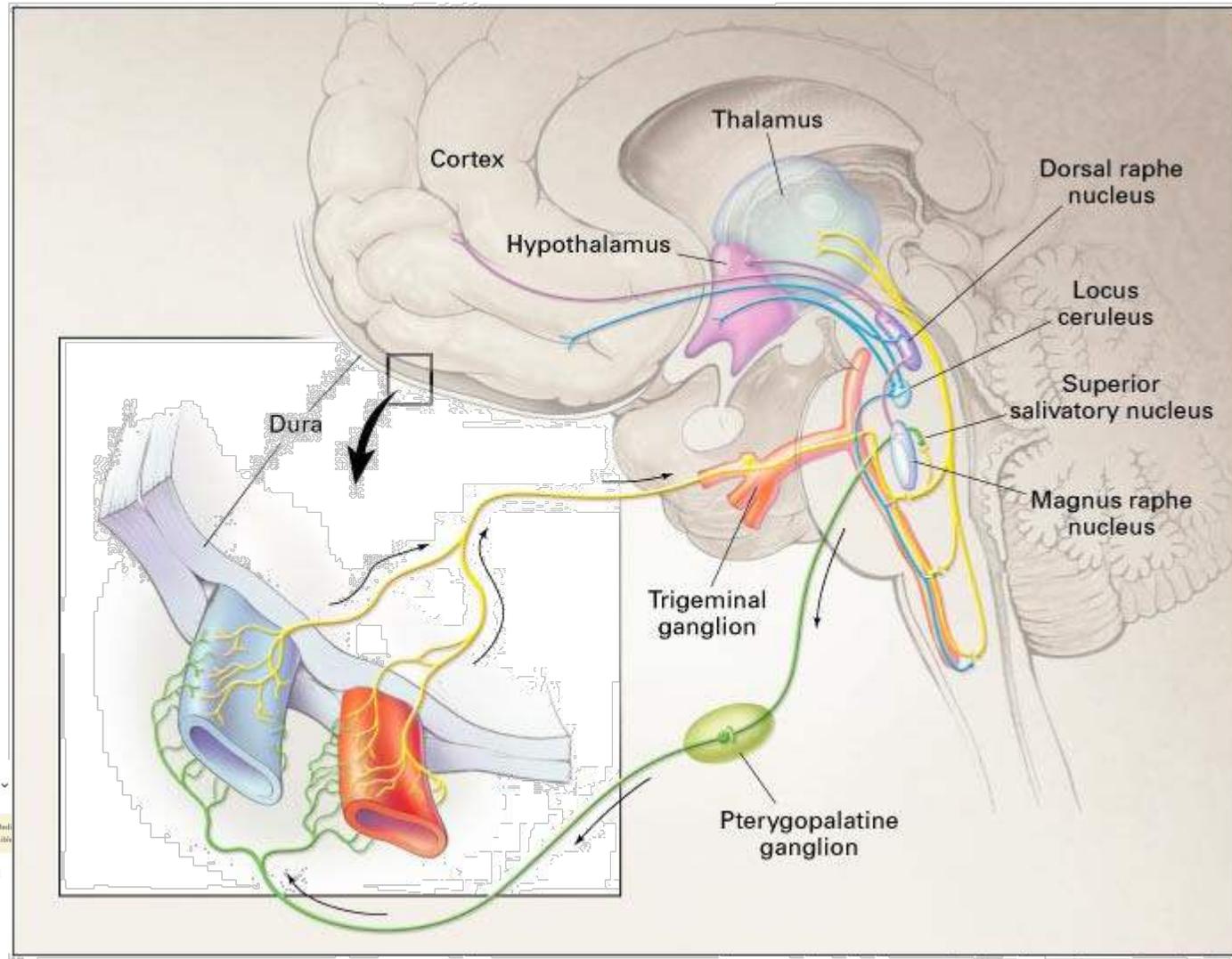
Haedache in SIH

**Concepts
of
head- &
neckpain**

**Detangling
positional
pain**

**What to do
after leak
closure?**

Current concepts of head- & neckpain



Detangling positional pain



Detangling positional pain



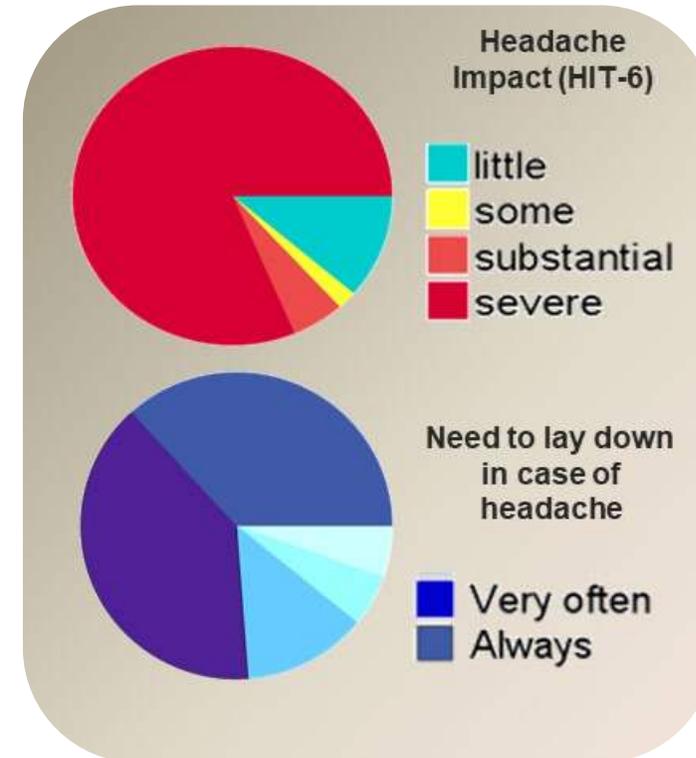
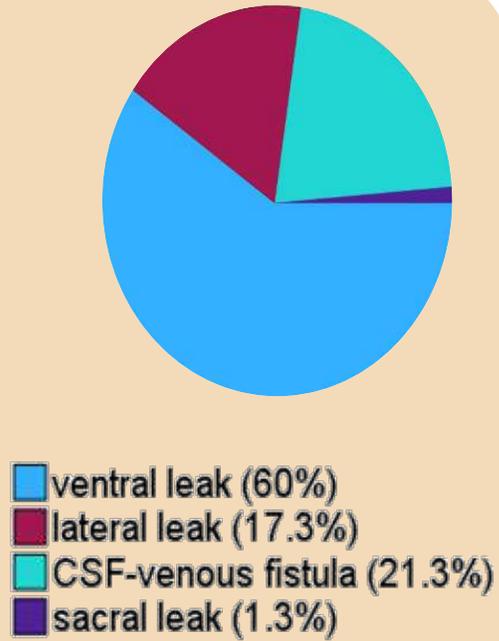
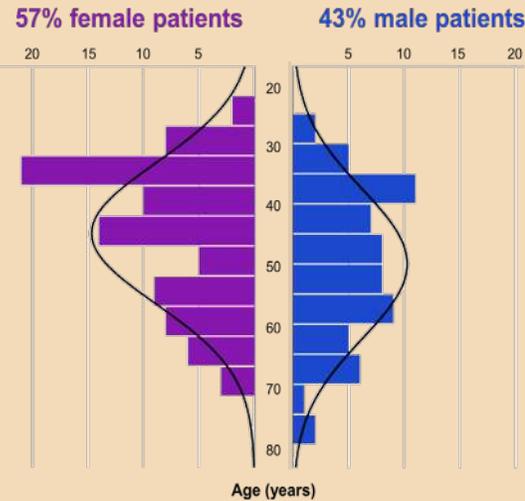
► AJNR Am J Neuroradiol. 2023 Sep;44(9):1096–1100. doi: [10.3174/ajnr.A7962](https://doi.org/10.3174/ajnr.A7962)

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

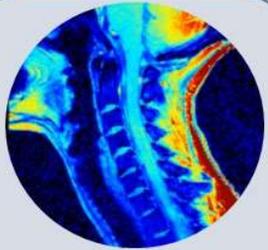
[JL Houk](#)^a, [S Morrison](#)^b, [S Peskoe](#)^b, [TJ Amrhein](#)^a, [PG Kranz](#)^{a,✉}

Detangling positional pain

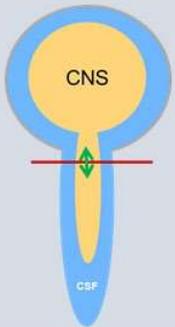
150 patients
& confirmed spinal CSF leak



Detangling positional pain



High-resolution Phase-contrast MRI CSF and spinal cord at the Cranio-cervical junction: velocities & accelerations between the cranial and the spinal compartment



age BMI sex

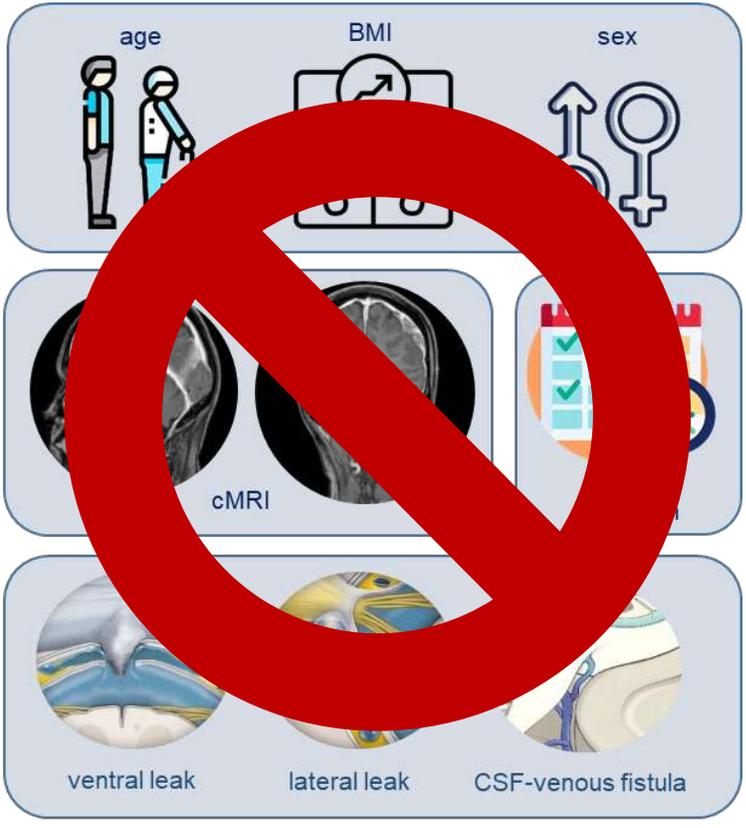
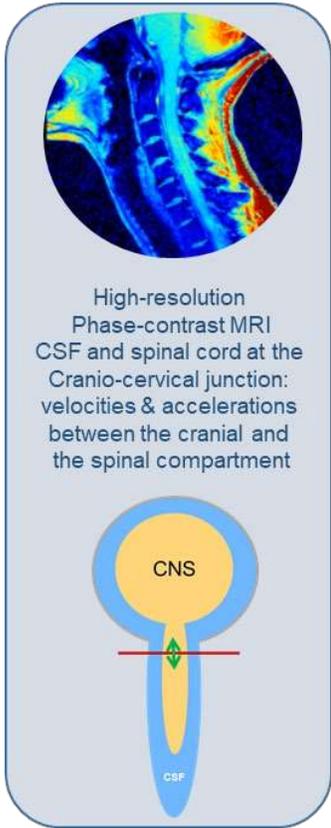
cMRI Disease duration

ventral leak lateral leak CSF-venous fistula



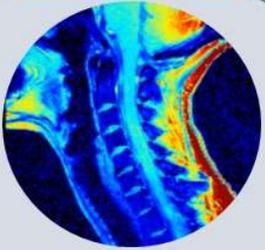
Dalle

Detangling positional pain

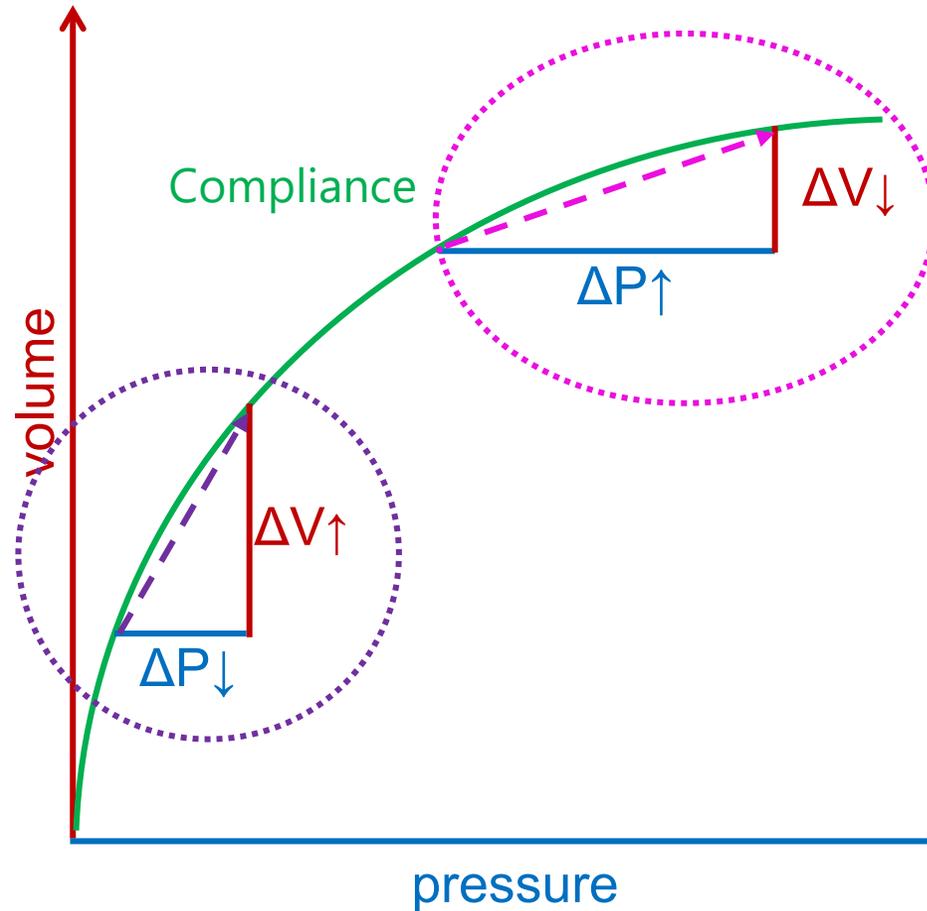
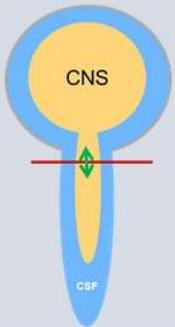


Dalle

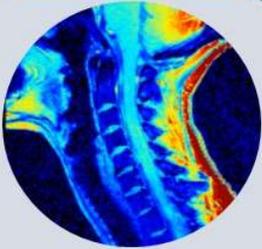
Detangling positional pain



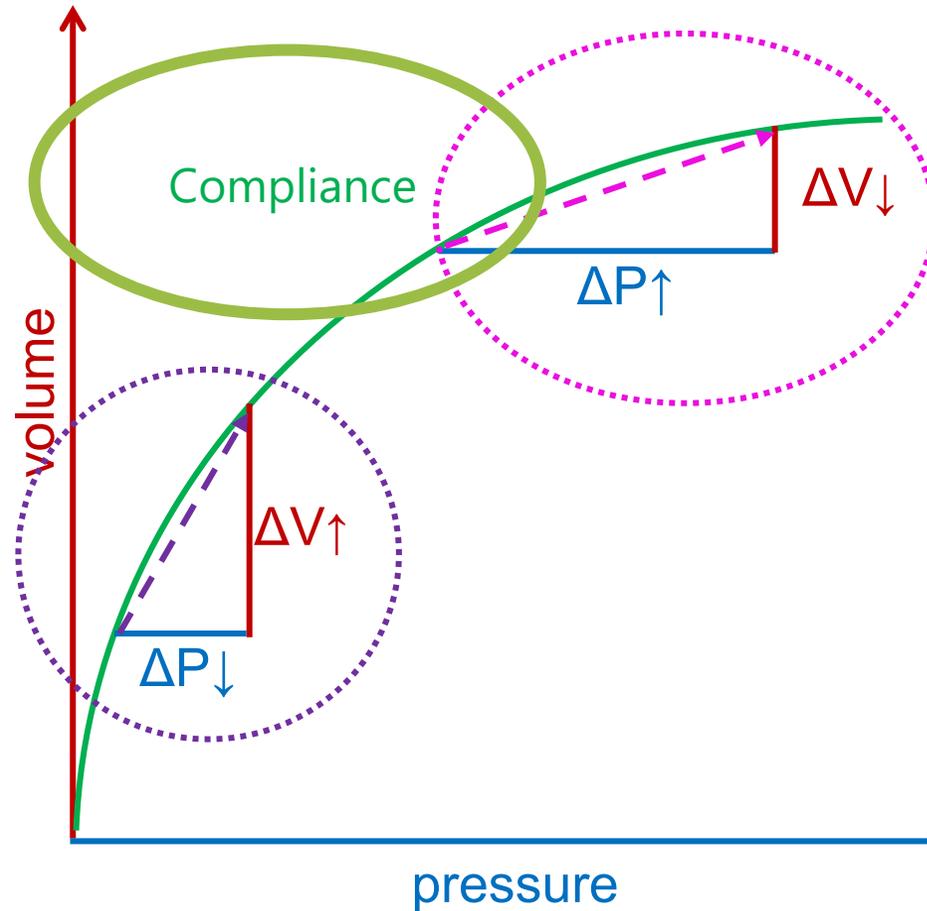
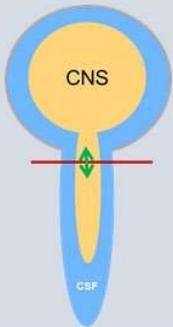
High-resolution Phase-contrast MRI CSF and spinal cord at the Cranio-cervical junction: velocities & accelerations between the cranial and the spinal compartment



Detangling positional pain



High-resolution Phase-contrast MRI CSF and spinal cord at the Cranio-cervical junction: velocities & accelerations between the cranial and the spinal compartment

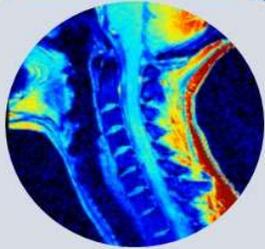


Detangling positional pain

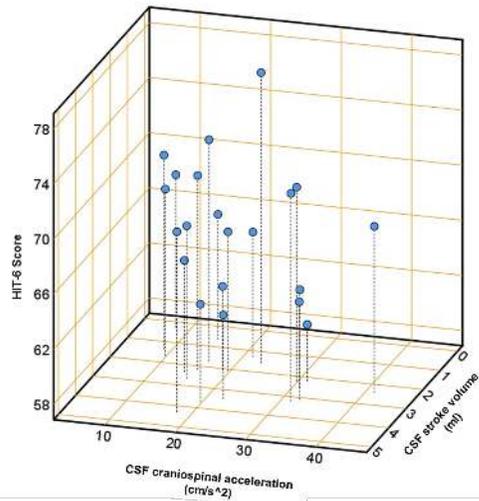
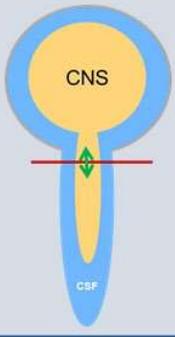
PC-MRI predicts orthostatic headache intensity in dural tears

<3 months
 $\text{corrR}^2=0.576$
, $p=0.002$

Compliance ↓



High-resolution Phase-contrast MRI CSF and spinal cord at the Cranio-cervical junction: velocities & accelerations between the cranial and the spinal compartment



orthostatic

Dalle

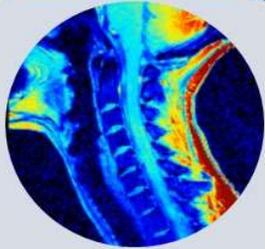
Detangling positional pain

PC-MRI predicts orthostatic headache intensity in dural tears

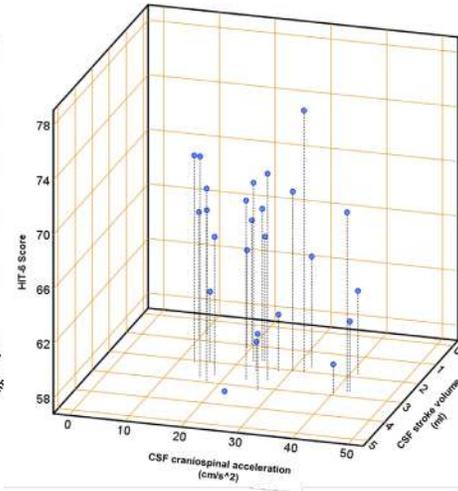
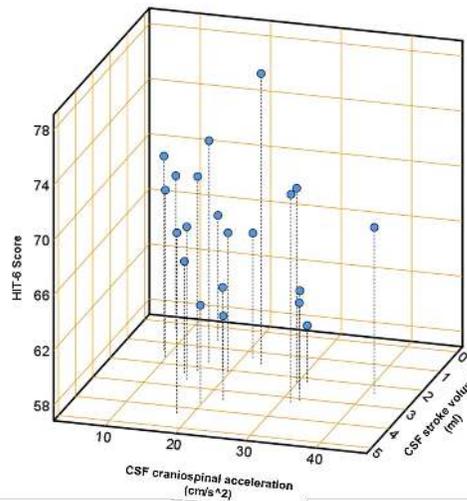
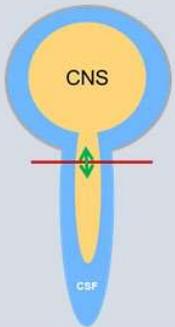
<3 months
 $\text{corrR}^2=0.576$
, $p=0.002$

3-12 months
 $\text{corrR}^2=0.203$
, $p=0.002$

Compliance ↓



High-resolution Phase-contrast MRI CSF and spinal cord at the Cranio-cervical junction: velocities & accelerations between the cranial and the spinal compartment



orthostatic

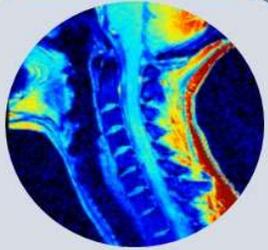


Dalle

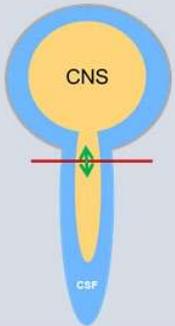
Detangling positional pain

No biomarker for orthostatic headache in prolonged SIH

> 12 months



High-resolution Phase-contrast MRI CSF and spinal cord at the Cranio-cervical junction: velocities & accelerations between the cranial and the spinal compartment



orthostatic

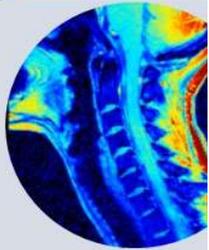


DallE

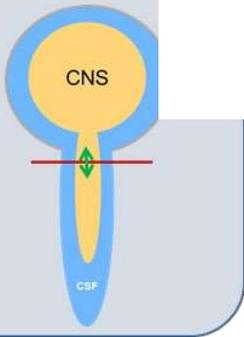
**Detangling
positional pain**

No biomarker for orthostatic headache in prolonged SIH

orthostatic



High-resolution
Phase-contrast M
CSF and spinal cord
Cranio-cervical junc
velocities & accelera
between the cranial
the spinal compart



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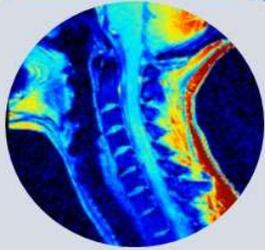
Insights into the natural history of spontaneous intracranial hypotension from infusion testing

Levin Häni, MD, Christian Fung, MD, Christopher Marvin Jesse, MD, Christian Thomas Ulrich, MD, Timo Miesbach, MD, Debora Rosalba Cipriani, MD, Tomas Dobrocky, MD, Werner Josef Z'Graggen, MD ^{ID}, Andreas Raabe, MD, Eike Imo Piechowiak, MD, and Jürgen Beck, MD | [AUTHORS](#)

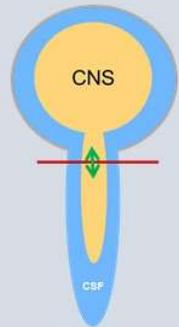
DallE

Detangling positional pain

PC-MRI predicts orthostatic headache intensity in dural tears



High-resolution
Phase-contrast MRI
CSF and spinal cord at the
Craniocervical junction:
velocities & accelerations
between the cranial and
the spinal compartment



Orthostatic Dysfunction ?



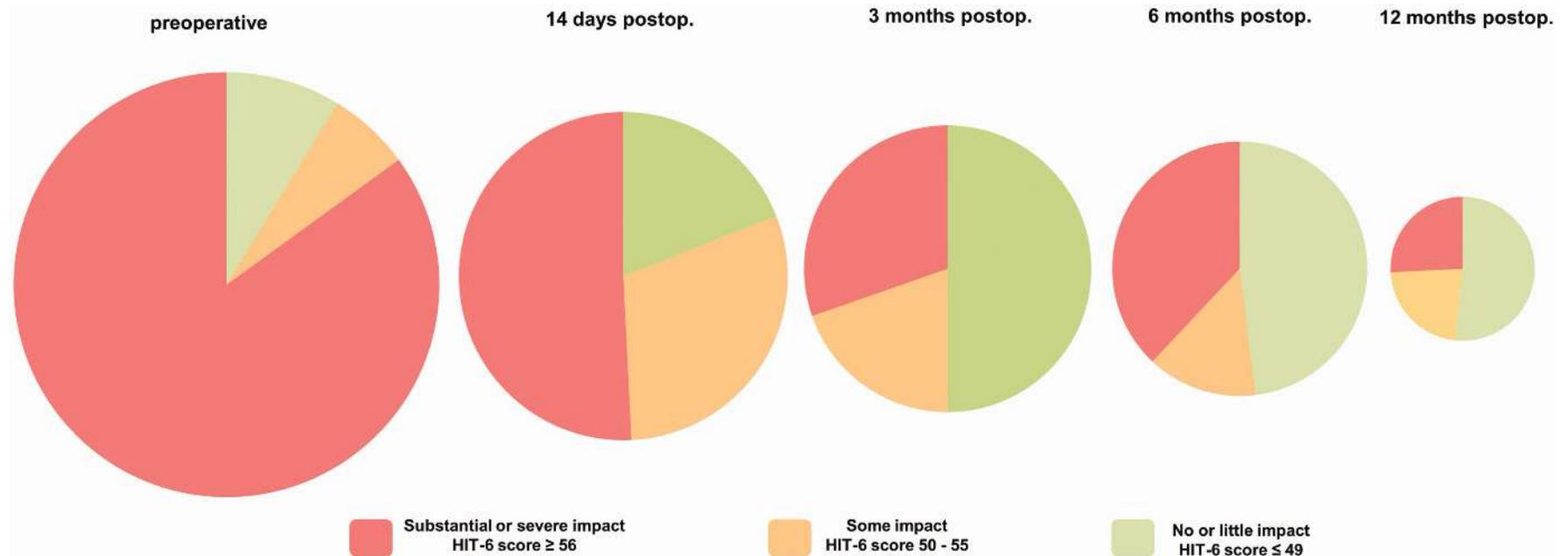
orthostatic



DallE

Detangling positional pain

- 80 patients



> Cephalalgia. 2023 Aug;43(8):3331024231196808. doi: 10.1177/03331024231195830.

Recovery and long-term outcome after neurosurgical closure of spinal CSF leaks in patients with spontaneous intracranial hypotension

Florian Volz¹, Christian Fung¹, Katharina Wolf¹, Niklas Lützen², Horst Urbach², Luisa Mona Kraus¹, Mazin Omer¹, Jürgen Beck¹, Amir El Rahal^{1,3}

Detangling positional pain

What to do after leak closure?

**What to do after
leak closure?**



DallE

What to do after leak closure?

Orthostatic?

– Follow-UP performed?

- which type of leak?
- Which prior treatment?
- Adequate follow-up imaging?



DallE

What to do after leak closure?

Orthostatic?

– Caffein??

– Acute: CSF production



– Acute: Pain perception



– Prolonged: CSF



Research article | [Open access](#) | Published: 03 September 2009

Regulation of cerebrospinal fluid production by caffeine consumption

[Myoung-Eun Han](#), [Hak-Jin Kim](#), [Young-Suk Lee](#), [Dong-Hyun Kim](#), [Joo-Taek Choi](#), [Chul-Sik Pan](#), [Sik Yoon](#), [Sun-Yong Baek](#), [Bong-Seon Kim](#), [Jae-Bong Kim](#) & [Sae-Ock Oh](#)

BMC Neuroscience **10**, Article number: 110 (2009) | [Cite this article](#)

HEADACHE

The Journal of Head and Face Pain

RESEARCH SUBMISSION | [Open Access](#) |

Effects of caffeine on intracranial pressure and pain perception in freely moving rats

Ida Marchen Egerod | [Israelsen MSc](#), [Connar Stanley James Westgate PhD](#), [Christina Kamp Jensen MSc](#), [Rigmor H. Jensen MD](#), [Sajedeh Eftekhari PhD](#)

First published: 05 October 2023 | <https://doi.org/10.1111/head.14634> | Citations: 2



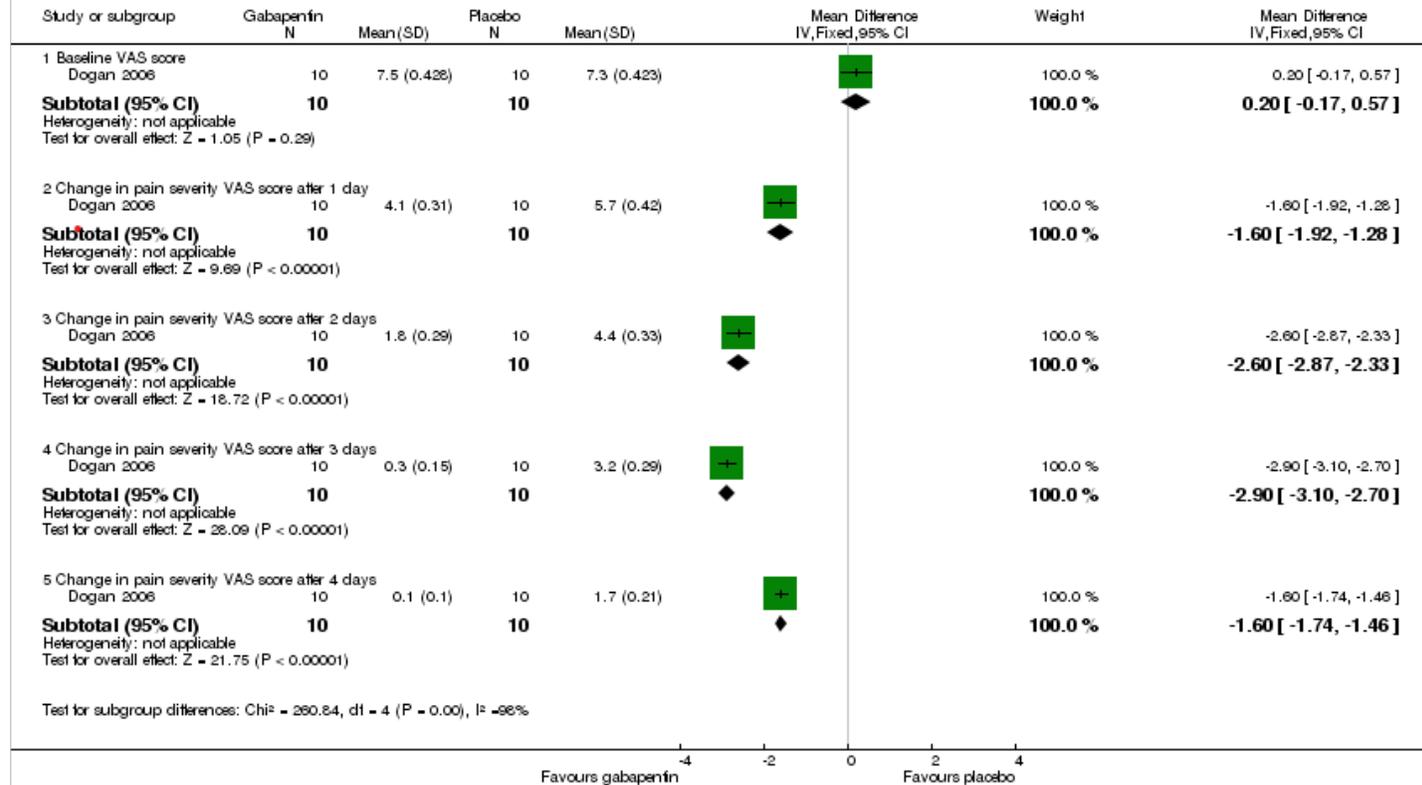
Unsplash.com

What to do after leak closure?

Orthostatic?

Gabapentine 1-4x300mg

Review: Drug therapy for treating post-dural puncture headache
 Comparison: 3 Comparison 3: Gabapentin versus placebo
 Outcome: 1 Change in pain severity scores (secondary outcome 4)



Cochrane Database of Systematic reviews | Review - Intervention

Drug therapy for treating post-dural puncture headache

Xavier Basurto Ona, Laura Martínez García, Ivan Solà, Xavier Bonfill Cosp | Authors' declarations of interest

Version published: 10 August 2011 | Version history

<https://doi.org/10.1002/14651858.CD007887.pub2>

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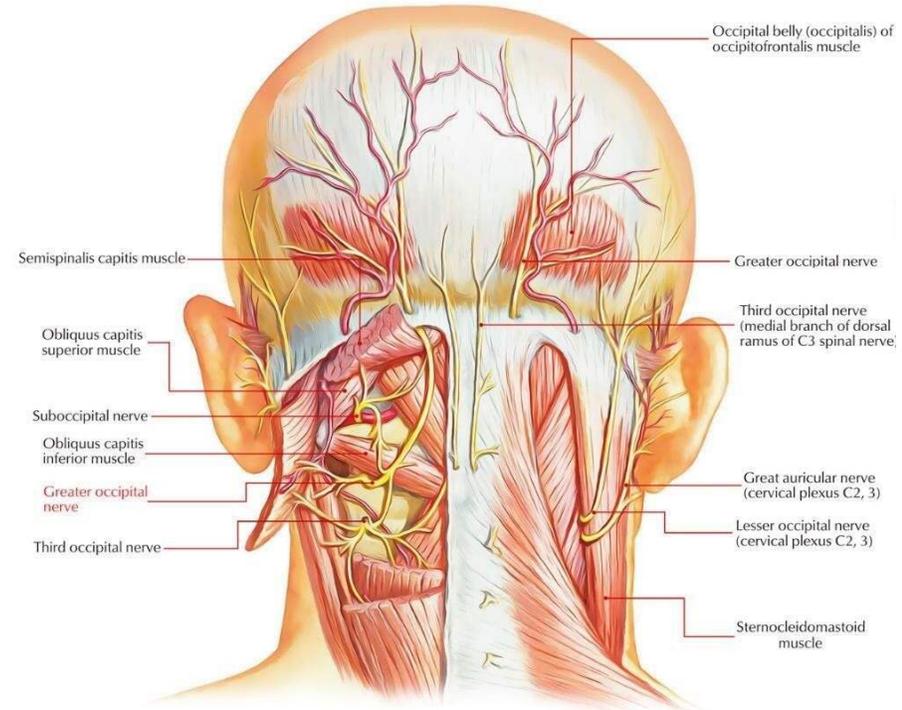
view the current version
15 July 2015

What to do after leak closure?

Orthostatic?

Nerve-Blocks

- Greater occipital nerve (GON)
- Sphenopalatine Ganglion (SPG)



Greater Occipital Nerve." Volker, Joseph. *Earthslab.com*. 8 August, 2018
[Occipital Nerve Block — NUEM Blog](#)

Case Reports > [J Neurosci Rural Pract.](#) 2024 Apr-Jun;15(2):387-389. doi: 10.25259/JNRP_30_2024. Epub 2024 Mar 21.

Sphenopalatine ganglion block for the treatment of spontaneous intracranial hypotension without demonstrable cerebrospinal fluid leak: A report of two cases

Ankur Khandelwal¹, Sanghamitra Sarma¹, Masaraf Hussain²

Review > [Braz J Anesthesiol.](#) 2023 Nov-Dec;73(6):782-793. doi: 10.1016/j.bjane.2023.06.002. Epub 2023 Jul 6.

Trans-nasal sphenopalatine ganglion block for post-dural puncture headache management: a meta-analysis of randomized trials

Priyanka Dwivedi¹, Pratibha Singh¹, Tejas K Patel², Vijeta Bajpai¹, Ankita Kabi¹, Yashpal Singh³, Santosh Sharma⁴, Surekha Kishore⁵

What to do after leak closure?

Orthostatic?

– Follow-UP performed?

What else?

- Caffein withdrawal?
- Acetazolamide/Topiramate?
- POTS?
- Is it orthostatic?

What to do after leak closure?

Rebound hypertension?

25-32%

Clinical neurology
Original research



Early brain MRI changes following transvenous embolization of cerebrospinal fluid-venous fistulas in spontaneous intracranial hypotension

Federico Cagnazzo¹, Emmanuelle Le bars¹, Gaetano Risi¹, Nicolas Lonjon², Liesjet E H van Dokkum¹, Lucas Corti³, Vincent Costalat^{1, 4}, Anne Ducros³



Neurol Clin Pract. 2019 Apr;9(2):93-100. doi: [10.1212/CPJ.0000000000000550](https://doi.org/10.1212/CPJ.0000000000000550)

Rebound high-pressure headache after treatment of spontaneous intracranial hypotension

MRV study

Wouter I Schievink^{1,✉}, M Marcel Maya¹, Stacey Jean-Pierre¹, Franklin G Moser¹, Miriam Nuño¹, Barry D Pressman¹



What to do after leak closure?

Rebound
hypertension?

Acetazolamide

- 2x250mg up to 4g/day

NO EVIDENCE



What to do after leak closure?

Rebound
hypertension?

Acetazolamide

- 2x250mg up to 4g/day
- Side-effects!
 - Keep potassium up

NO EVIDENCE



What to do after leak closure?

Rebound hypertension?

Acetazolamide

- 2x250mg up to 4g/day
- Side-effects!
 - Keep potassium up

NO EVIDENCE

Prolonged symptoms (>21 days) or severe symptoms?

What to do after leak closure?

Rebound hypertension?

Acetazolamide

- 2x250mg up to 4g/day
- Side-effects!
 - Keep potassium up

NO EVIDENCE

Prolonged symptoms (>21 days) or severe symptoms?

- Differentials!
 - Iron deficiency?
 - Vitamin A supplement?
 - Underlying IIH?
 - OSAS/PCOS/Endometriosis
 - Diastolic hypertension?
- Diagnostics:
 - Ophthalmology always
 - Lab-work
 - (cMRI with Venogram)
 - No routine lumbar puncture!

**What to do after
leak closure?**

Other phenotype?

Treat the phenotype!



Unsplash.com

What to do after leak closure?

Other phenotype?

Treat the phenotype!

Underlying primary headache?

- Migraine
- Tension-type headache
- Hemicrania continua
- ..?

Medication Overuse?



Unsplash.com

What to do after leak closure?

Other phenotype?

Treat the phenotype!

Underlying primary headache?

- Migraine
- Tension-type headache
- Hemicrania continua
- ..?

Medication Overuse?

What else?

- Bruxism? Kranio-mandibuläre Dysfunktion?
- Musculoskeletal problems?
- Anxiety/Depression?

Haedache in SIH

**Orthostatic
Headache
in SIH**

**≠
Low
volume**

**Orthostatic
Headache
in SIH**

**=
orthostatic
dysfunction**

**What to do
after leak
closure?**

**Best you
can!**



THANK YOU!

**UNIVERSITÄTS
KLINIKUM** FREIBURG

