Schweizerische Interessengemeinschaft für Anästhesiepflege
Fédération suisse des infirmières et infirmiers anesthésistes
Federazione svizzera infermiere e infermieri anestesisti

Kantonsspital Aarau

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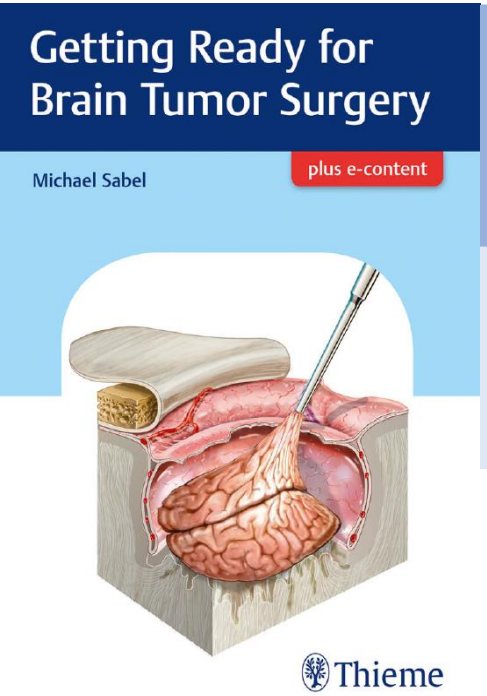
Aargauische Fachschule für
Anästhesie-, Intensiv- und Notfallpflege

Refresher Neuroanästhesie

Kongress SIGA/FSIA 27. April 2019



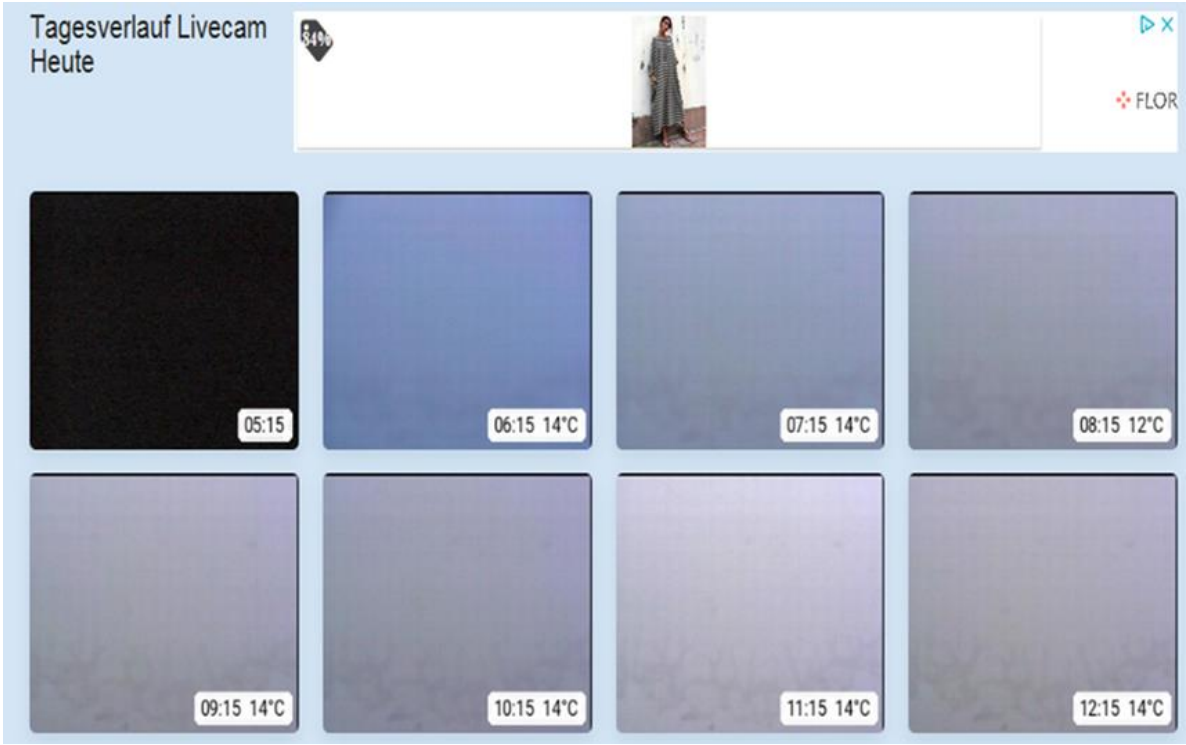
6

2 The Craniotomy

2.2
You Need

You need a coconut, a mobile drill, craniotome, a Mayfield clamp, a fixation system for the Mayfield clamp (a simple board), and a pen, as well as lots of irrigation and (to spare you a lot of cleaning work) drapes and a bucket, which collects the irrigation/coconut debris.

Markus Gautschi


Tagesverlauf Livecam
Heute
FLOR
05:15
06:15 14°C
07:15 14°C
08:15 12°C
09:15 14°C
10:15 14°C
11:15 14°C
12:15 14°C

Programm

- Der Weg ins Gehirn
- Komponenten intrakranielles Volumen
- CBF / Autoregulation
- ICP
- CPP
- Anästhesieführung
- Dies und das…

aha
Allergiezentrum Schweiz
Centre d'Allergie Suisse
Centro Allergie Svizzera

myrepublica.nagariknetwork.com

miaminewtimes.com

Quellen

Swisscom 06:00 100%

Wissen

20 minuten

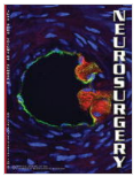
Rettende OP

Frau läuft Hirnflüssigkeit statt Rotz aus der Nase

4/6 - Um Jackson ein für alle Mal von ihrem Leiden zu befreien, schlossen die Mediziner das Leck im Kopf mit Jacksons eigenem Fettgewebe.
(Bild: Facebook.com/Nebraska Medicine)

Hinter Kendra Jacksons laufender Nase vermuteten Ärzte eine Allergie. Zu Unrecht! Auslöser war ein Loch zwischen Nase und Gehirn.

Mehrere Jahre wagte sich Kendra Jackson nicht ohne einen grossen Vorrat an



Neurosurgery
Volume 64(6) pgs. 1015-1207,E1204-E1206,N7-N9,BackPage-BackPage June 2009
ISSN: 0148-396X

Kantonsspital Aarau

Anaesthesist 2010
DOI 10.1007/s00101-010-1708-8

G. Herzer · H. Trimmel
Abteilung für Anästhesie, Notfall- und allgemeine Intensivmedizin, Landesklinikum Wiener Neustadt

Neuroanästhesie

Grundlagen der perioperativen Betreuung

Erstelldatum: 09.01.2012	1940 Perioperative Medizin	Nr. 70/1 Seite 1 von 7

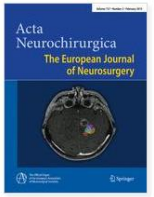
Standards / Arbeitsempfehlungen

Grundlagen der Anästhesieführung für intrakranielle Eingriffe im KSA
(nur für internen Gebrauch)

Kantonsspital Aarau

Verfasser:	Dr. med. Moritz Schürch	**Eingeführt für Bereich durch:**	**Ersetzt Versionen:**
Anlaufstelle:	Dr. med. Moritz Schürch		
Tel. Auskunft:	4548	**Gültig ab:** Erstelldatum	
E-Mail:	moritz.schuerch@ksa.ch	**Gültig bis:**	

Current Opinion in Anaesthesiology
Volume 24(2) pgs. v-v,117-233 April 2011
ISSN: 0952-7907



Rao et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2013, 21:78
http://www.sjtrem.com/content/21/1/78

trauma, resuscitation & emergency medicine

ORIGINAL RESEARCH Open Access

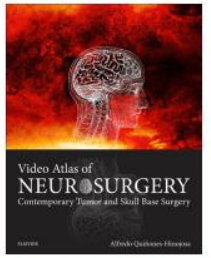
Confusion with cerebral perfusion pressure in a literature review of current guidelines and survey of clinical practise

Vidar Rao[1,2*], Pål Klepstad[3,4], Ole Kristian Losvik[5] and Ole Solheim[1,2]

Anästhesie in der Neurochirurgie

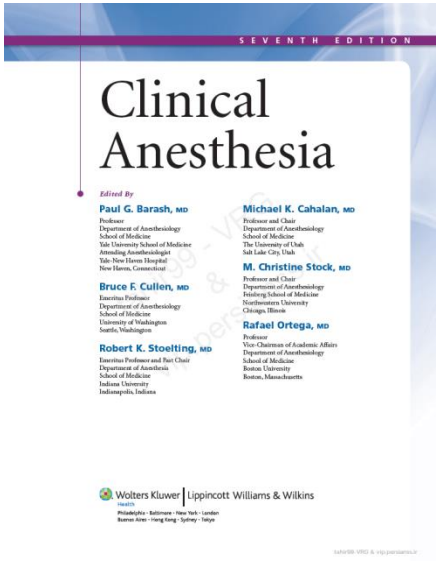
I. Tzanova, T. Kerz

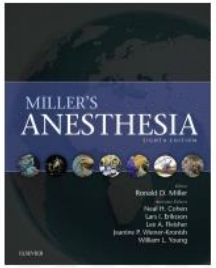
R. Rossaint, et al. (Hrsg.), *Die Anästhesiologie*, DOI 10.1007/978-3-642-21125-6_45,



Quiñones-Hinojosa, Alfredo, MD FAANS FACS

Anaesthesist 2015 · 64:159–174
DOI 10.1007/s00101-014-2337-4
Online publiziert: 23. Januar 2015





Miller's Anesthesia
Eighth Edition

Anaesthesist
DOI 10.1007/s00101-015-0121-8

DGAInfo

Aus dem wiss. Arbeitskreis Neuroanästhesie:

Perioperatives Management bei neurochirurgischen Operationen in sitzender oder halbsitzender Position

Empfehlungen des Wissenschaftlichen Arbeitskreises Neuroanästhesie der DGAI

T.A. Juratli[1] · S.E. Stephan[2] · A.E. Stephan[3] · S.B. Sobottka[1]
[1] Klinik und Poliklinik für Neurochirurgie, Carl Gustav Carus Universitätsklinikum, Technische Universität Dresden
[2] Freiberuflicher Notarzt, Köln
[3] Klinik für Anästhesiologie, Universitätsklinikum Heidelberg

Akutversorgung des Patienten mit schwerem Schädel-Hirn-Trauma

K. Engelhard
Klinik für Anästhesiologie, Universitätsmedizin Mainz, Mainz, Deutschland

Neuroanästhesie

Kantonsspital Aarau

Mein Arbeitsort

Bereich Perioperative Medizin

Einheiten des Bereichs Perioperative Medizin

	2017	2016
Klinik für Anästhesie		
Ambulante Leistungen		
Abrechenbare Taxpunkte (in TP)	150 451	129 068
Leistungsmerkmale		
Total Anästhesieleistungen	20 815	20 572
Total Anästhesiestunden	52 107	51 694

Bereich Chirurgie

Klinik für Neurochirurgie

	2017
Stationäre Leistungen	
Spitalaustritte total	1 524
Verweildauer in Tagen (ø)	8.2
Casemix-Index (CMI)	2.044
Ambulante Leistungen	
Abrechenbare Taxpunkte (in TP)	5 690 155
Ambulante Behandlungen	11 879
Leistungsmerkmale	
Total Operationen	2479
· davon stationär	1382
· davon ambulant	1097
Eingriffe bei Hirntumoren (inkl. Biopsien)	178
Trepanation bei chronischen Subduralhämatomen	94
Zerebrovaskuläre Eingriffe (Aneurysmen, AVMs, Hirnblutungen)	85
Schädel-Hirn-Trauma (Kraniotomien, Trepanationen)	37
Transsphenoidale Hypophysen-Operationen	39
Operationen am Liquorsystem	152
Tumor-Operationen im Sella-Bereich	77
Kranioplastik	27
Resektion spinale Tumore	29
Spinale Traumatologie (Dekompression – Stabilisation)	67
Degenerative Wirbelsäulenchirurgie (inkl. Spital Zofingen)	609
Schmerzeingriffe (inkl. ambulanter Infiltrationen)	998
Re-Operationen kraniell (Hämatom / Infekt, Tumor-Nachresektion)	14
Re-Operationen spinal (inkl. Verlängerungs-Spondylodese)	41
Stereotaktische Radiochirurgie (benigne Läsionen)	32
Intraoperative Bildgebung	
· Operationen mit intraoperativem MRI	81
· Operationen mit intraop. Angiografie und Videoangiografie (inkl. Aneurysmen, AVM, Kavernomen)	110
· Operationen mit intraop. Fluoreszenz (5-ALA)	185
· Operationen mit intraop. CT	196

Der Weg ins Gehirn

Fitforfun.de

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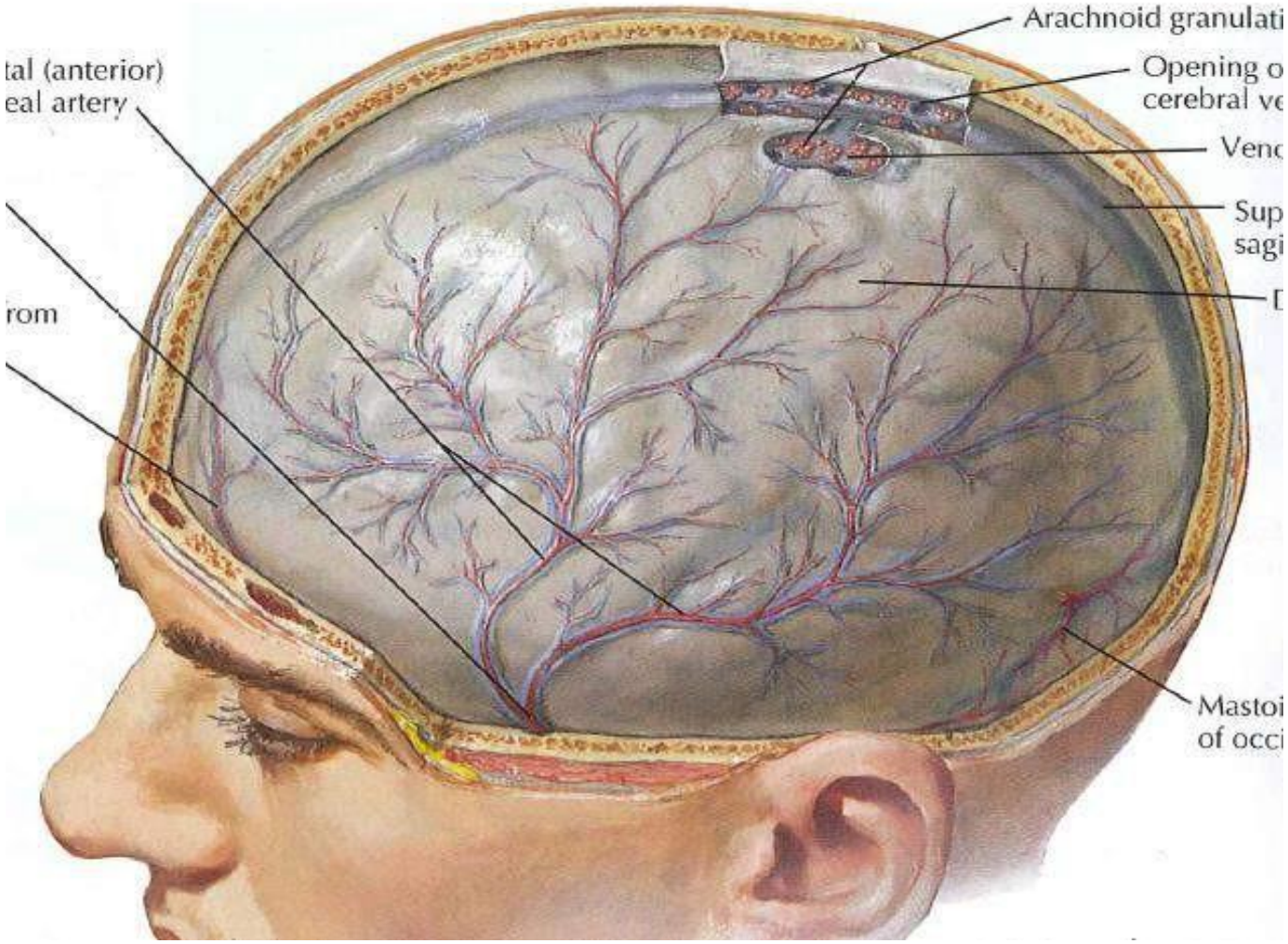
Zunächst mehr oder weniger Haut…

Getty Images

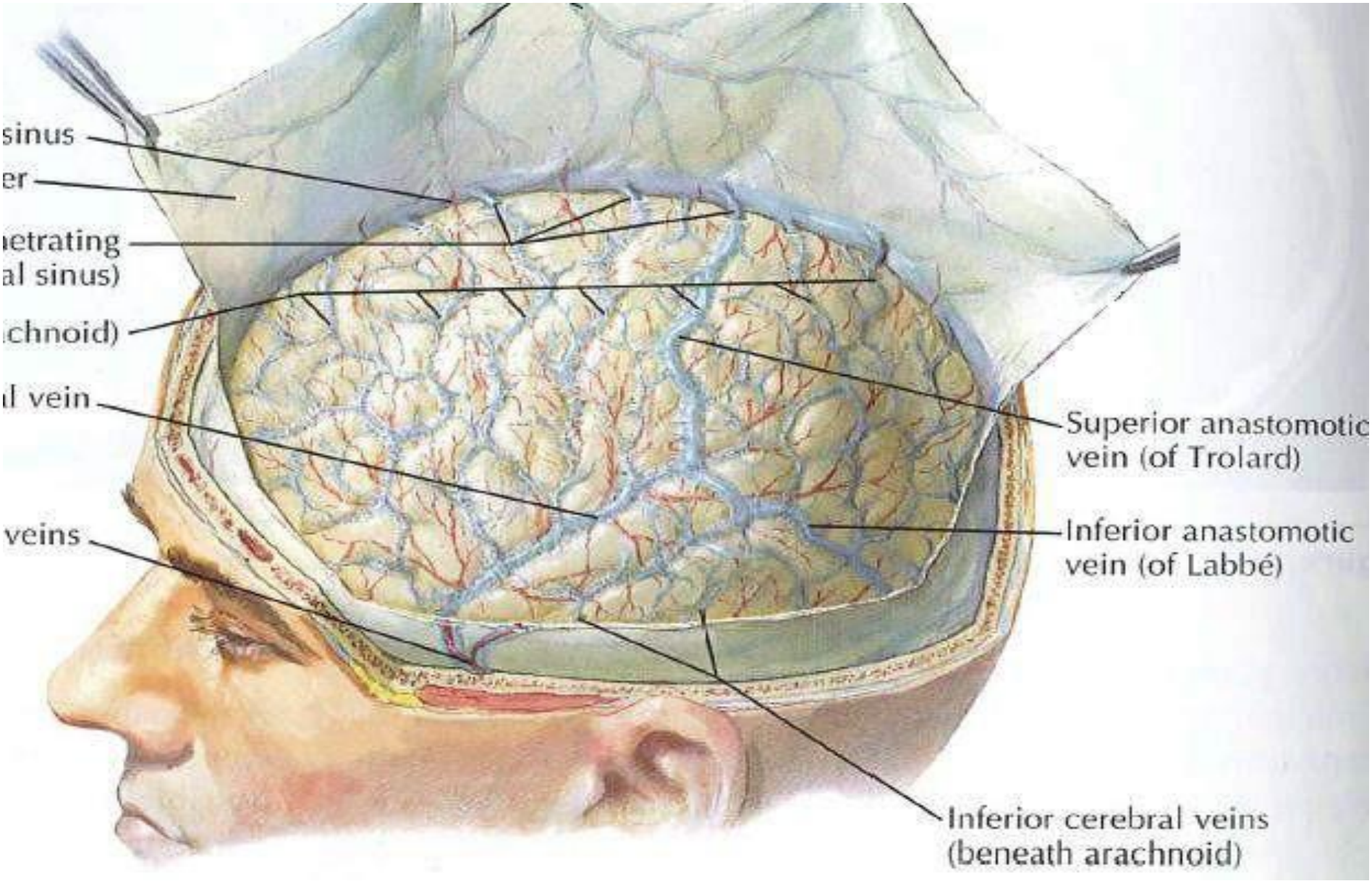
afsain Images

Die Schädelkalotte

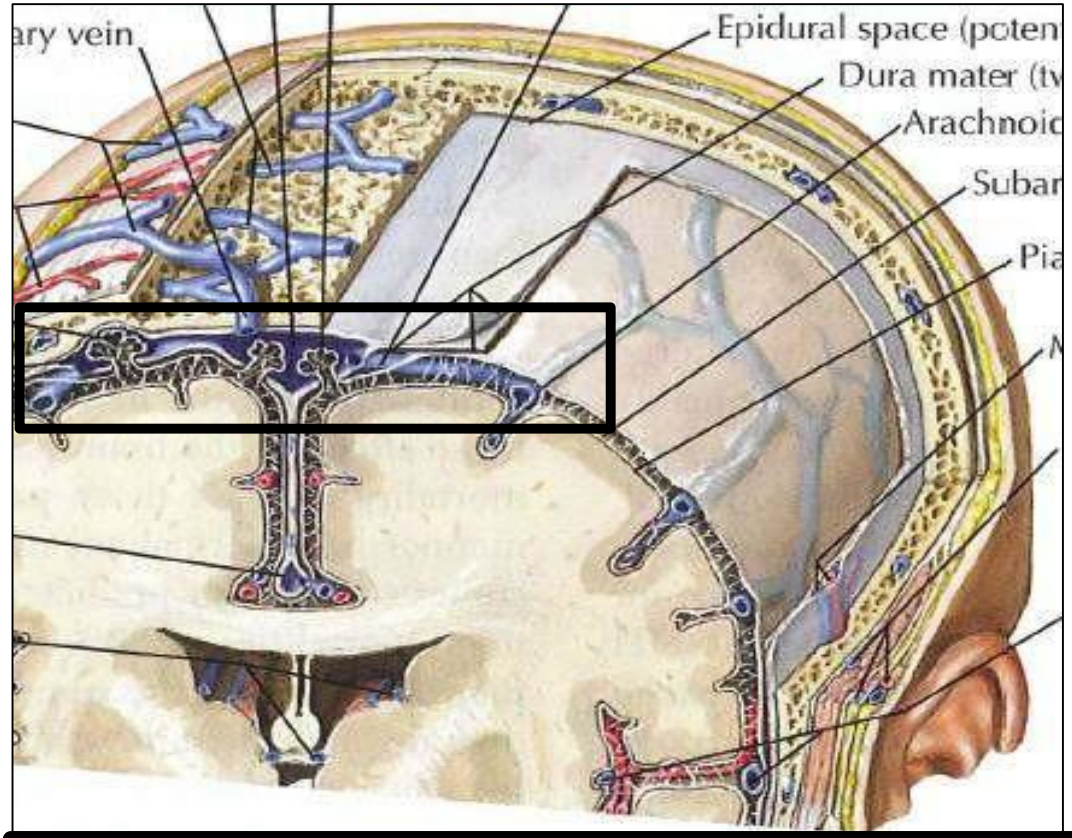
Die Dura – Die harte Hirnhaut



Netter Images



Netter Images



Netter Images

Die Arachnoidea

Arachnoidalzotten münden in die venösen Blutleiter der Dura mater – die Hirnsini. Mit ihrer Hilfe erfolgt die Resorption des Liquors.

Die Pia mater

Netter Images

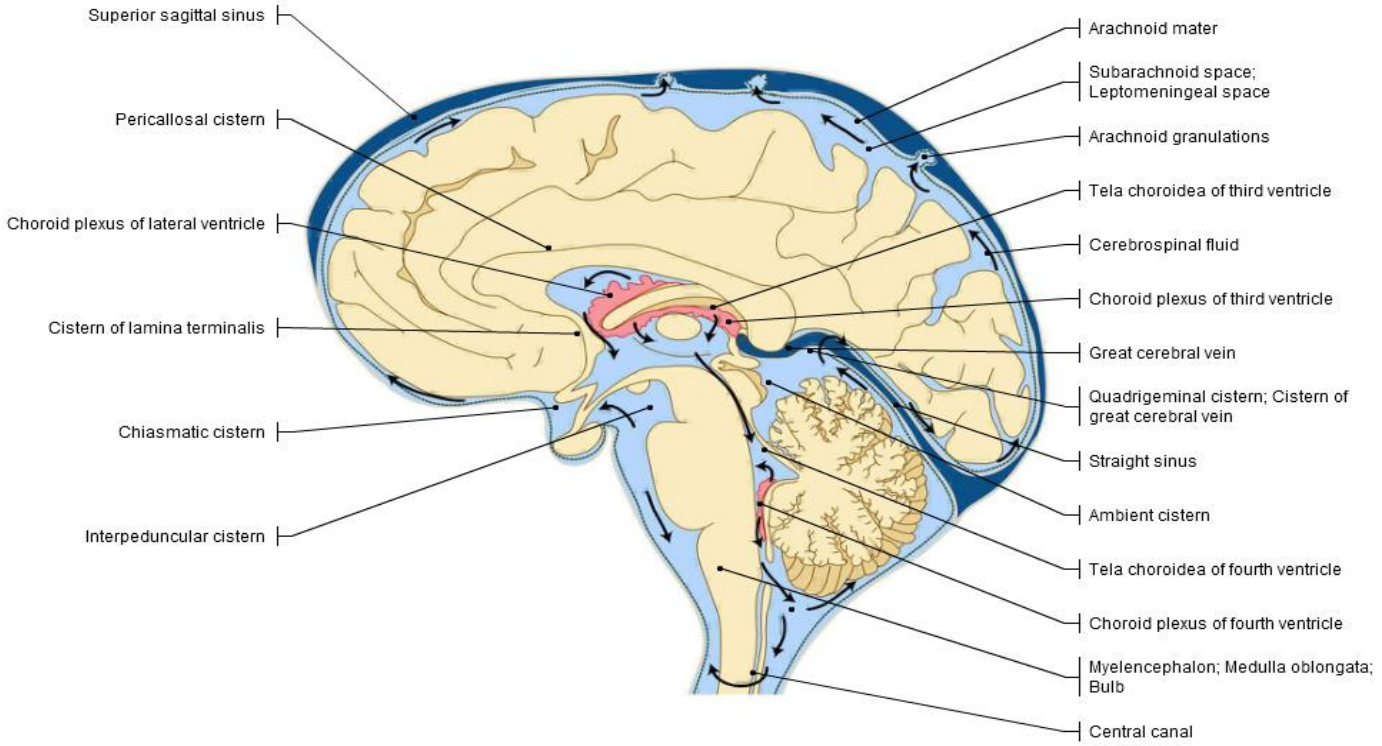
Komponenten intrakranielles Volumen

Pinterest.de

Parenchym: Anteil 80 – 85% (ca. 1400 gr)

Framepool.com

Liquor/CSF: Cerebro Spinal Fluid: Anteil 7 – 10% (ca. 75ml)

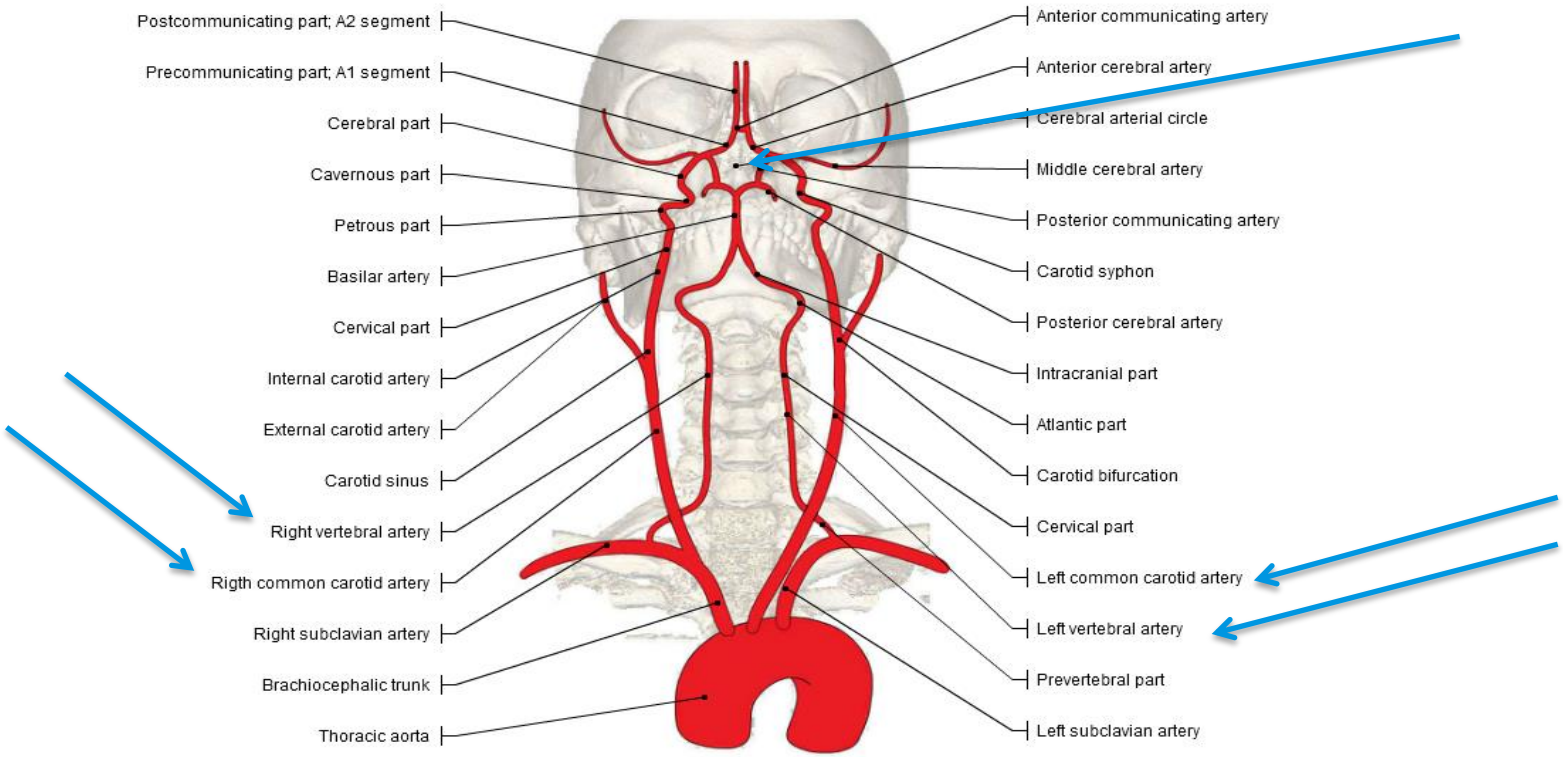


CSF

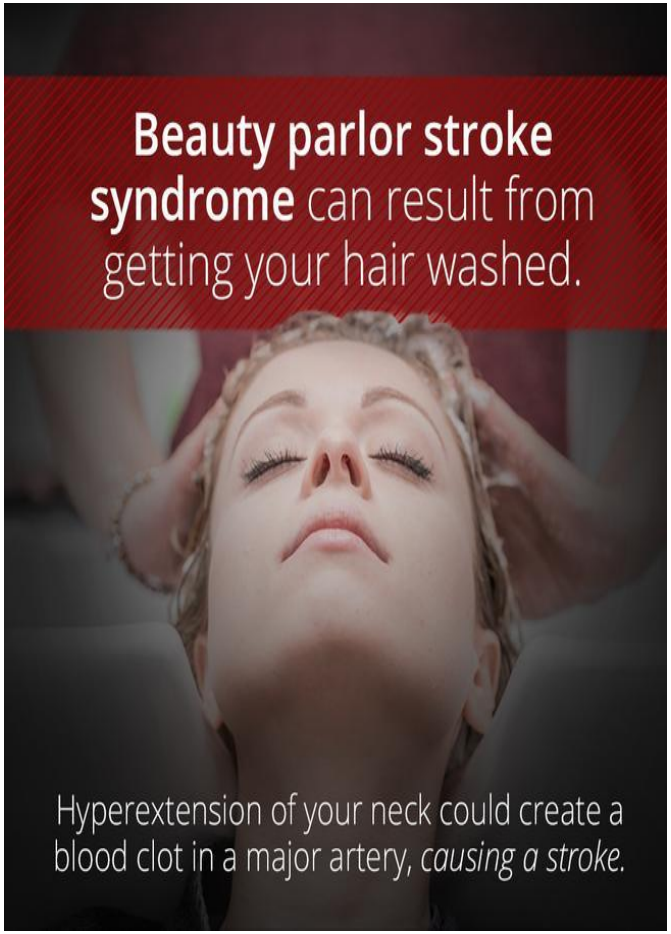
- Ca. 150 ml (50 % extracraniell)
- Tägliche CSF-Sekretionsrate etwa 500 ml v.a. aus Choroid-Plexen
- 4-5x turn-over pro Tag

Abflussstörungen CSF führen zu Hydrocephalus

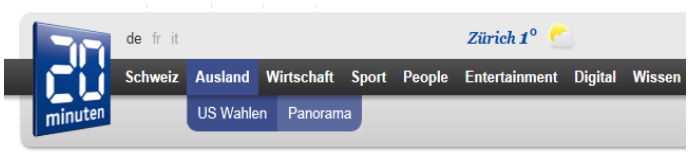
Blut/ CBV: Cerebral Blood Volume: Anteil 5 – 8% (ca. 130 ml)



Risiko arterielle Seite: Schönheitssalon-Syndrom



curiosity.com



Ihre Story, Ihre Informationen, Ihr Hinweis? feedback@20minuten.ch

Schönheitssalon-Syndrom

12. Dezember 2016 15:45; *Akt: 12.12.2016 15:45*

Mann erlitt nach Coiffeur-Besuch einen Schlaganfall

Ein vermeintlich harmloser Besuch beim Coiffeur hat für einen 45-jährigen Briten verheerende Folgen.

THE LANCET

CORRESPONDENCE | VOLUME 350, ISSUE 9093, P1777-1778, DECEMBER 13, 1997

Stroke after visit to the hairdresser

Michael I Weintraub

Michael I Weintraub
Department of Neurology, New York Medical College, Briarcliffe, NY 10510, USA

1 Nwokolo N, Bateman DE. Stroke after a visit to the hairdresser. *Lancet* 1997; **350:**

2 Weintraub MI. Beauty parlor stroke syndrome: report of two cases. *Neurology* 1992; **42** (suppl 3): 340.

3 Weintraub MI. Beauty parlor stroke syndrome: report of five cases. *JAMA* 1993; **269:** 2085–86.

4 Weintraub MI, Khoury A. Critical neck positions as an independent risk factor for posterior circulation stroke: a magnetic resonance angiographic analysis. *J Neuroimag* 1995; **5:** 16–22.

5 Weintraub MI, Khoury A. Cerebral haemodynamic changes induced by simulated tracheal intubation: a possible role in perioperative stroke? *Neurology* 1997; **48:** A158.

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Weiteres Risiko: Eng gebundene Kravatte – beeinträchtigte Hirnperfusion

SAGE-Hindawi Access to Research
Stroke Research and Treatment
Volume 2011, Article ID 692595, 4 pages
doi:10.4061/2011/692595

Clinical Study

Neckties and Cerebrovascular Reactivity in Young Healthy Males: A Pilot Randomised Crossover Trial

Mark Rafferty, Terence J. Quinn, Jesse Dawson, and Matthew Walters

Institute of Cardiovascular and Medical Sciences, College of Medical and Life Sciences, University of Glasgow, Glasgow G11 6NT, UK

Correspondence should be addressed to Terence J. Quinn, tjq1t@clinmed.gla.ac.uk

Received 11 August 2010; Revised 14 October 2010; Accepted 20 October 2010

Academic Editor: Halvor Naess

Kantonsspital Aarau

Bestätigung 2018

Neuroradiology
https://doi.org/10.1007/s00234-018-2048-7

SHORT REPORT

Should you stop wearing neckties?—wearing a tight necktie reduces cerebral blood flow

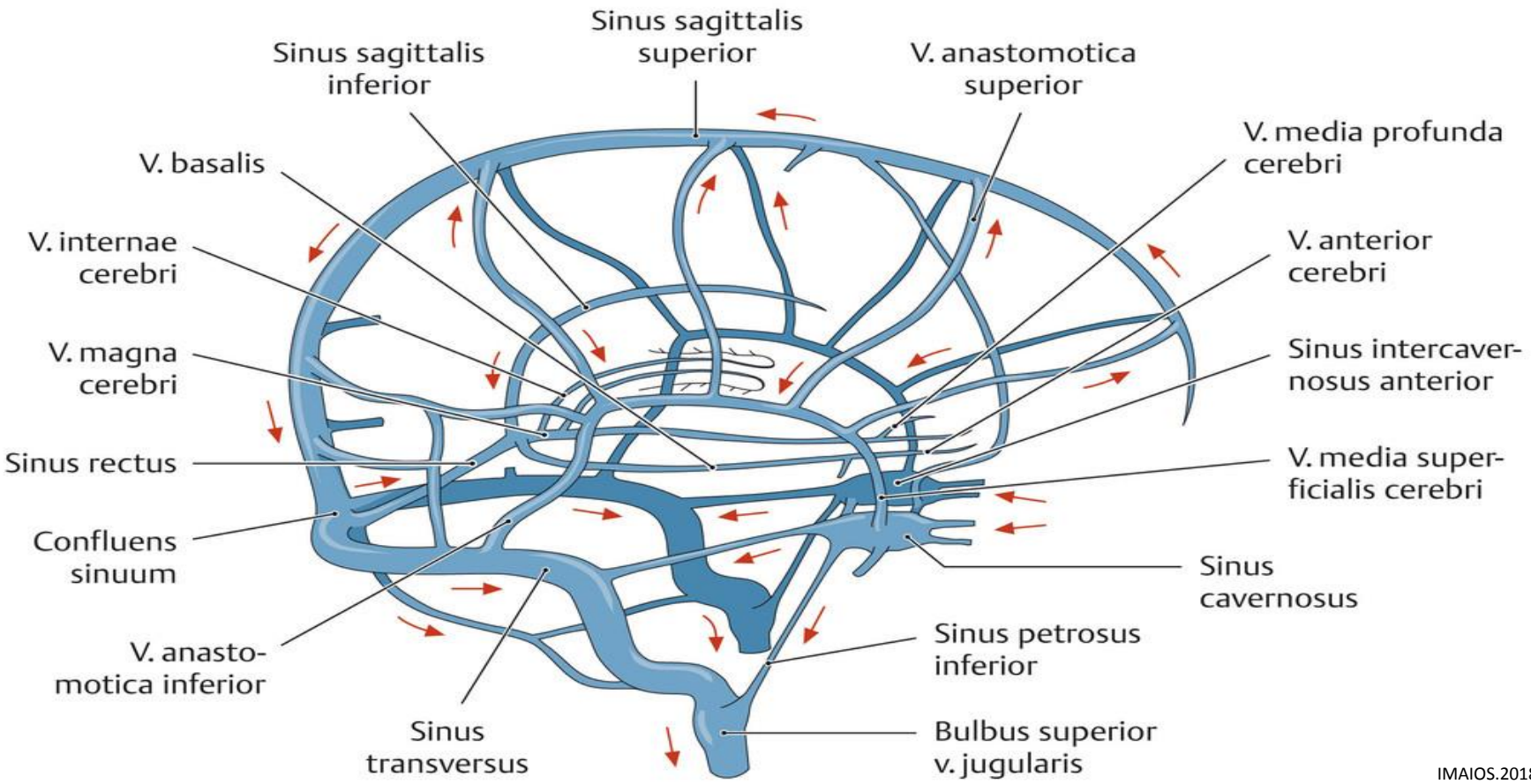
Robin Lüddecke[1] · Thomas Lindner[2] · Julia Forstenpointner[1] · Ralf Baron[1] · Olav Jansen[2] · Janne Gierthmühlen[1]

Received: 24 May 2018 / Accepted: 14 June 2018

Abstract
Purpose Negative cerebrovascular effects can be expected by compressing jugular veins and carotids by a necktie. It was already demonstrated that a necktie increases intraocular pressure. In many professions, a special dress code including a necktie and a collared shirt is mandatory although little is known about the effect of this "socially desirable strangulation."
Methods In this study, the effect of wearing a necktie concerning cerebral blood flow and jugular venous flow by magnetic resonance imaging. Thirty volunteers were divided in two groups. One underwent MRI with necktie, the other without.
Results The examination resulted in a statistically significant decrease of CBF after tightening the necktie ($p < 0.001$) while the venous flow did not show any significant changes.
Conclusion It appears that wearing a necktie leads to a reduction in CBF.

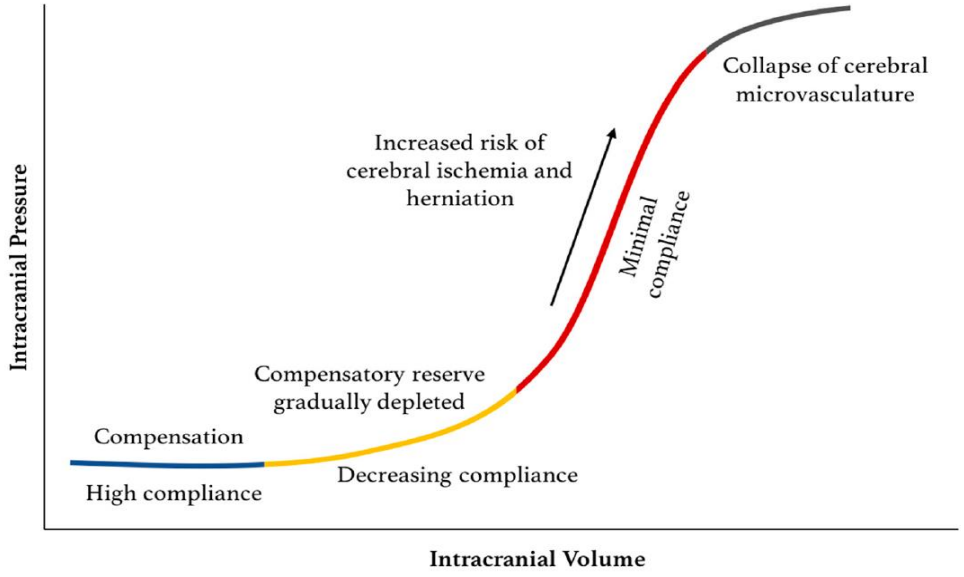
«Sozial gewünschte Strangulation» führt zu signifikanter Reduktion des CBF – Die venöse Seite zeigt keine relevanten Veränderungen.

Venöser Abfluss



Intracranielle Compliance: Monro-Kellie Doktrin

Nach Aufbrauchen der Reserveräume (v.a. Ventrikel) und Dekompensation der intrakraniellen Compliance resultiert ein steiler Druckanstieg.




sensors
MDPI
Review
Intracranial Pressure Monitoring—Review and Avenues for Development

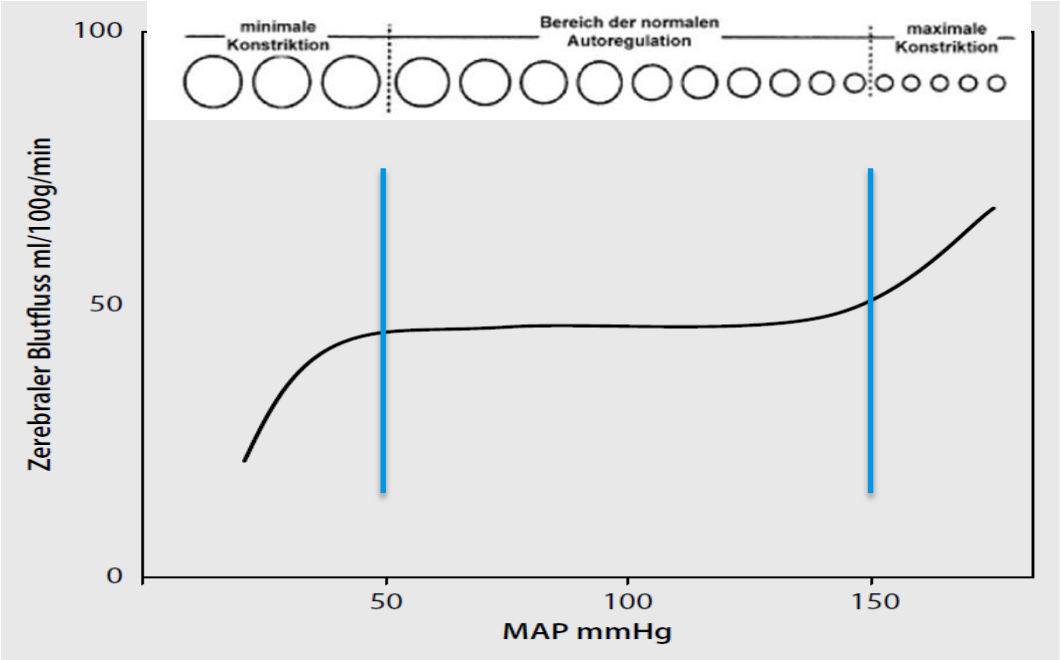
CBF: Cerebral Blood Flow

- Ca. **50 ml/min/100g** Hirnparenchym entspricht etwa 700 ml/min
- 15-20% des Herzzeitvolumens beim normalgewichtigen Erwachsenen
- Cerebral metabolic rate ($CMR0_2$) = 0_2 Umsatz ist hoch
- Reserven bei Sauerstoffunterversorgung sind klein

CBF wird bestimmt durch den cerebralen Perfusionsdruck (CPP) und den cerebralen Gefässwiderstand (CVR)

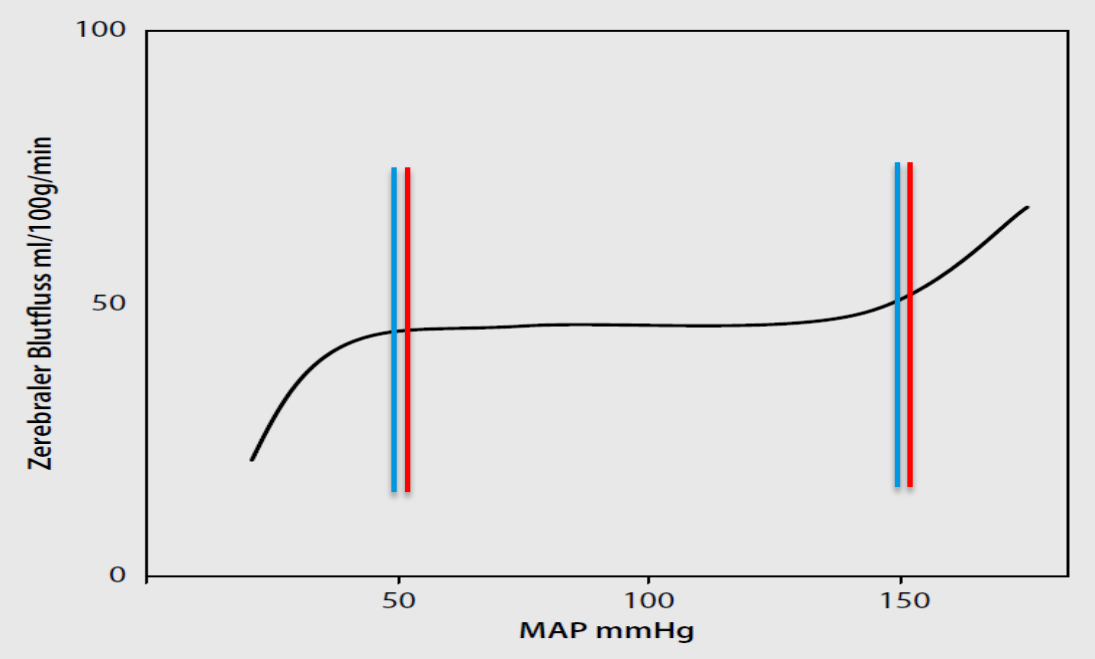
Cerebrale Autoregulation

Der cerebrale Blutfluss wird in einem Bereich des MAP von ca. 50 – 150 mmHg konstant gehalten. Individuelles Geschehen…



Cerebrale Autoregulation beim Hypertoniker

«Rechtsverschiebung» des Autoregulations-Fensters.



WAZ.de

Verlust der cerebralen Autoregulation

Hypoxie

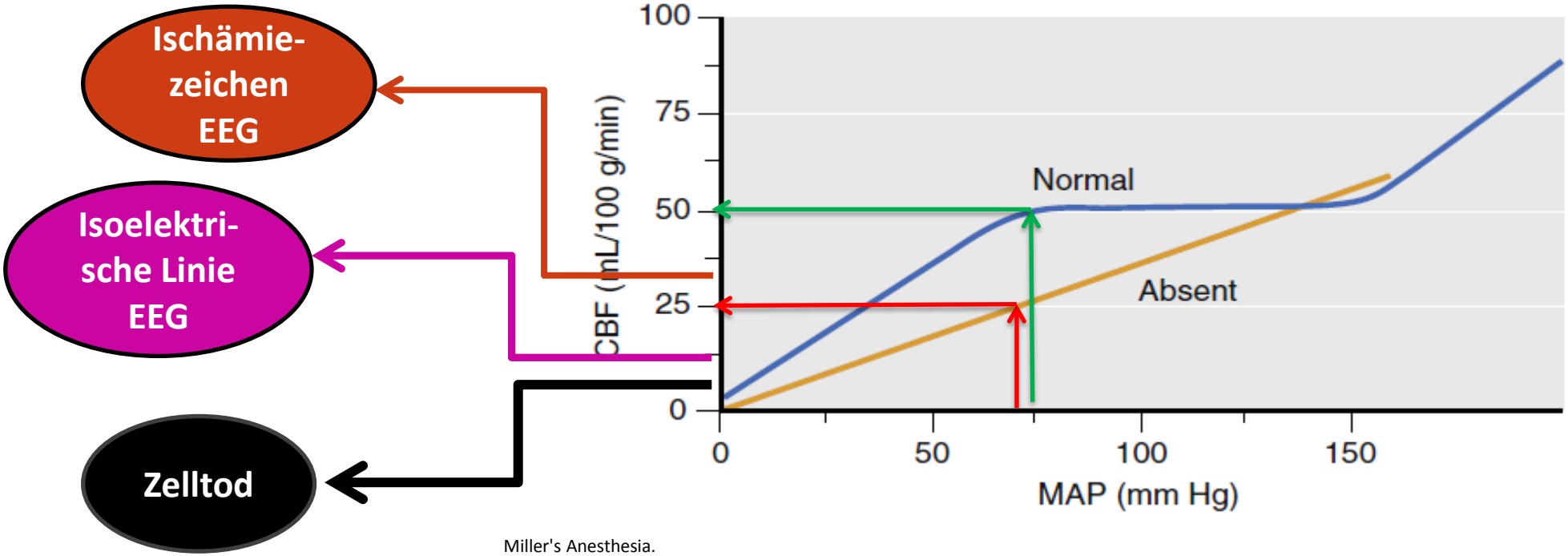
Hyperkapnie

Ischämie

Schädel- Hirntrauma

Verlust der cerebralen Autoregulation

Bei Verlust der cerebralen Autoregulation nimmt der CBF linear zum MAP resp. CPP ab.



Miller's Anesthesia.
Drummond, John C.; Patel, Piyush M.; Lemkuil, Brian P.. Veröffentlicht January 1, 2015. Seiten 2158-2199.e8. © 2015

ICP: Intracranial Pressure

Interventionsschwelle > ca. 20 mmHg (22 mmHg)

Aktivität	Erwachsene [mmHg]
Liegend in Ruhe	10±5
Stehend in Ruhe	–5±5
Husten, Niesen	30–110

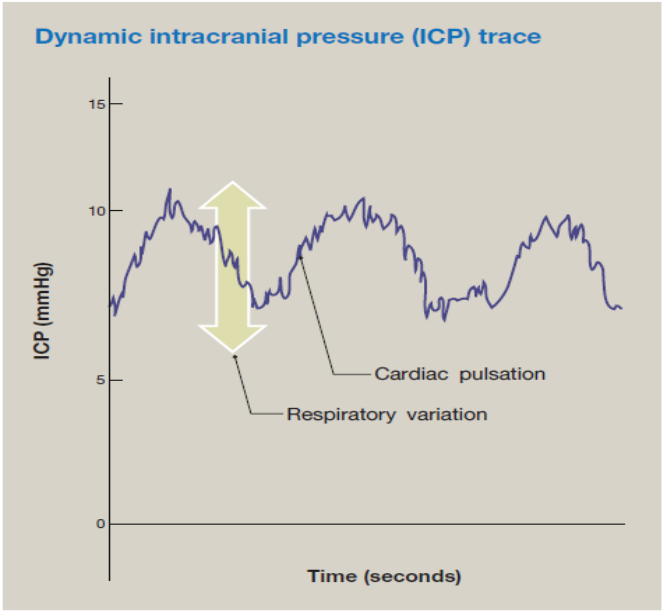


Figure 1

ANAESTHESIA AND INTENSIVE CARE MEDICINE 17:12

ICP-Erhöhung durch: Volumenzunahme

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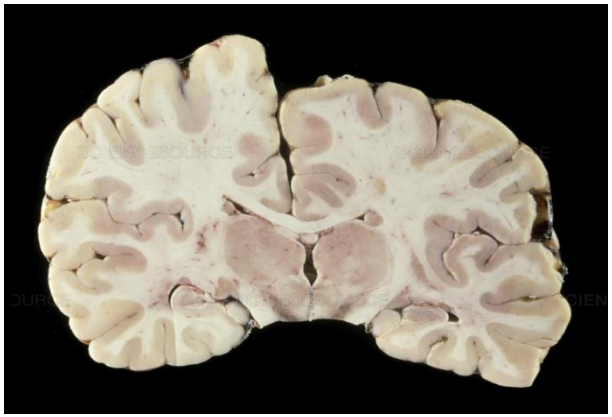
Neurosciencenews.com



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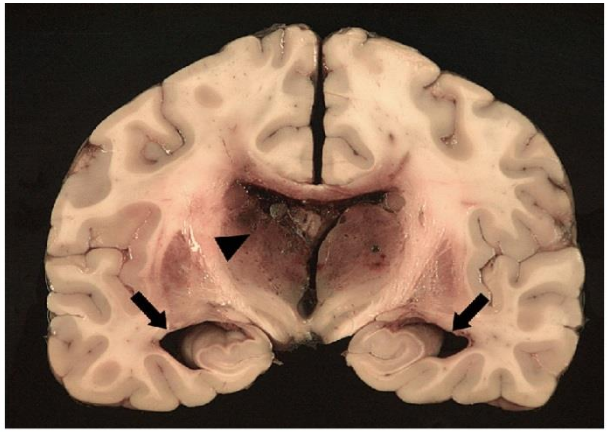
Sciencesource.com



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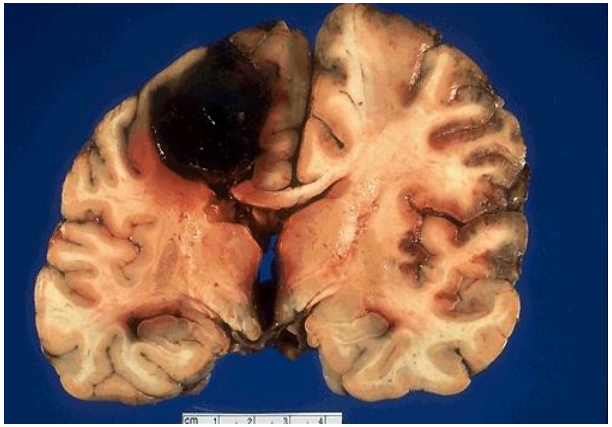
researchgate.com



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snowbrains.com

Klinik von erhöhtem ICP

- Kopfschmerzen
- Erbrechen
- Bewusstseinsstörung
- Stauungspapille
- Spätzeichen: Einklemmung

De123rf.com

Netdoktor.at

bbc.com

E-learning.studmed.unibe.ch

Deacademic.com

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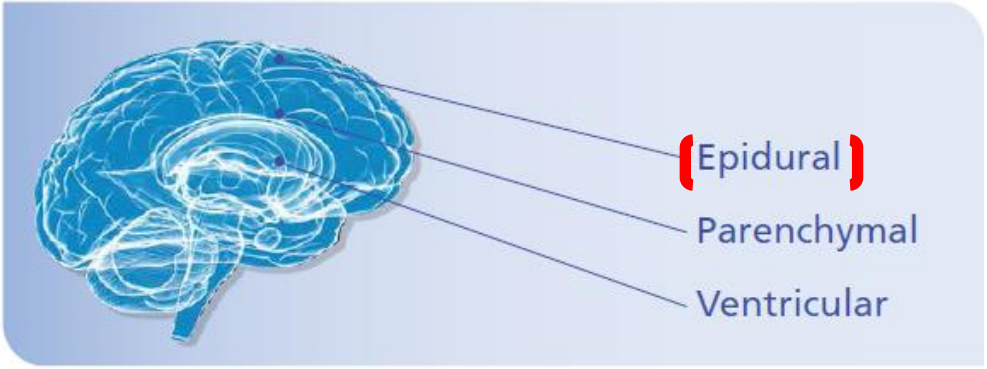
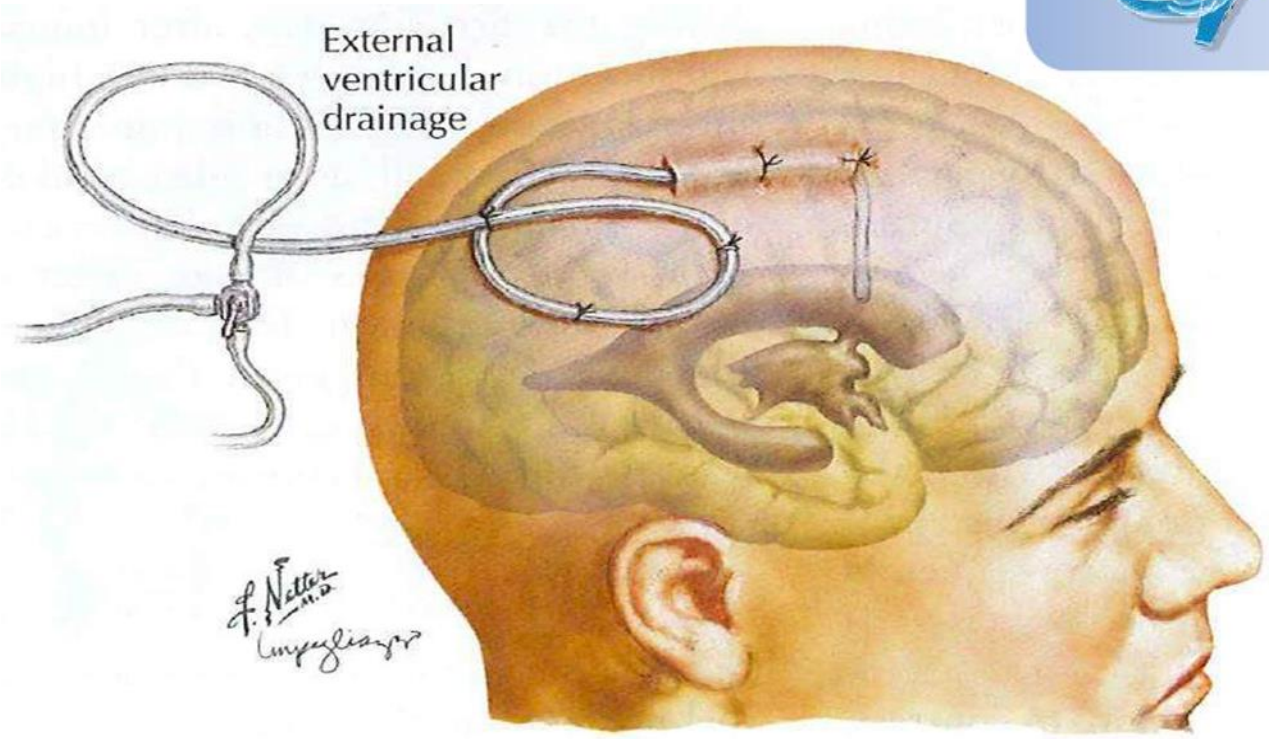
ICP-Messung





Intracranial pressure: why we monitor it, how to monitor it, what to do with the number and what's the future?

Andrea Lavinio and David K. Menon
University Division of Anaesthesia, Cambridge
University Hospitals Foundation Trust, UK

Correspondence to Dr A. Lavinio, BOX 93, Department of Anaesthesia, Addenbrooke's Hospital, Hills Road, CB2 0QQ Cambridge, UK
Tel: +44 1223 217 889; fax: +44 1223 217 223;
e-mail: a.lavinio@addenbrookes.nhs.uk

Current Opinion in Anesthesiology 2011, 24:117–123

Kantonsspital Aarau

Multiparameter-Messung via Sonde

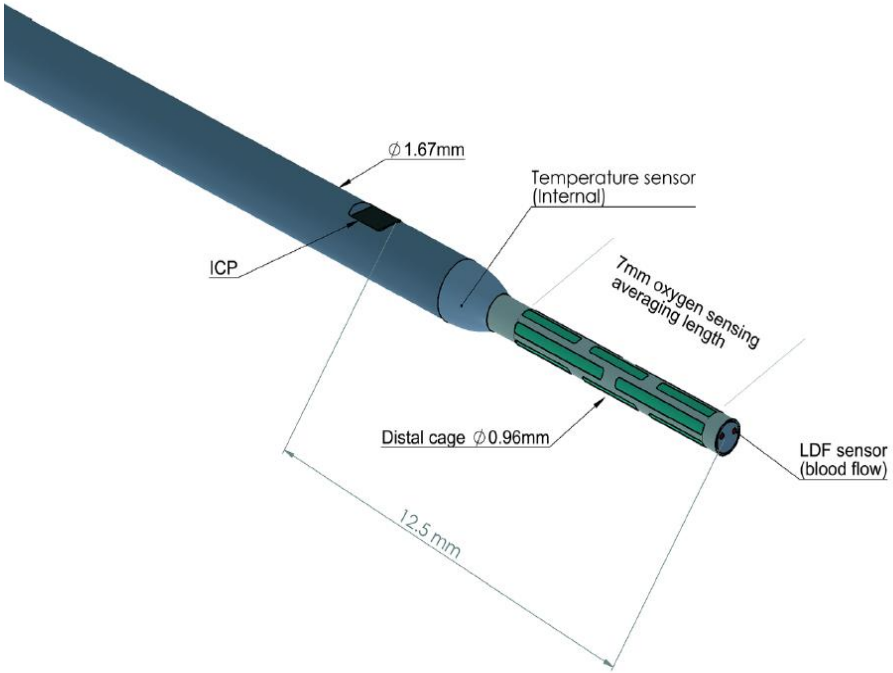
Neurocrit Care
https://doi.org/10.1007/s12028-018-0541-9

NEUROCRITICAL CARE SOCIETY

ORIGINAL ARTICLE

Evaluation of a New Multiparameter Brain Probe for Simultaneous Measurement of Brain Tissue Oxygenation, Cerebral Blood Flow, Intracranial Pressure, and Brain Temperature in a Porcine Model

Marius M. Mader[1,2], Anna Leidorf[1], Andreas Hecker[1], Axel Heimann[1], Petra S. M. Mayr[1], Oliver Kempski[1], Beat Alessandri[1*] and Gabriele Wöbker[3]



ICP-Messung bald nicht invasiv?

JNS

CLINICAL ARTICLE

J Neurosurg 123:743–747, 2015

Ultrasonographic measured optic nerve sheath diameter as an accurate and quick monitor for changes in intracranial pressure

Iscander M. Maissan, MD,[1] Perjan J. A. C. Dirven, MD,[1] Iain K. Haitsma, MD,[2] Sanne E. Hoeks, PhD,[1] Diederik Gommers, MD, PhD,[3] and Robert Jan Stolker, MD, PhD[1]

Departments of [1]Anesthesiology, [2]Neurosurgery, and [3]Intensive Care, Erasmus Medical Center, Rotterdam, The Netherlands

N = 18

CPP: Cerebral Perfusion Pressure

CPP = MAP – ICP

CPP = MAP – ZVD (Nach öffnen der Schädeldecke)

Vulkane.net

CPP Management

Rao et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2013, 21:78
http://www.sjtrem.com/content/21/1/78

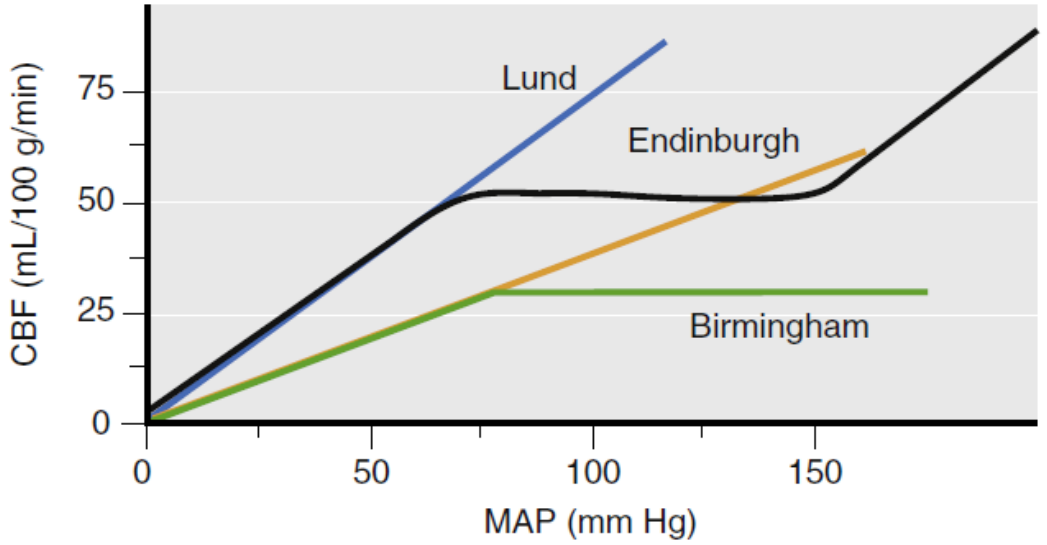
SCANDINAVIAN JOURNAL OF trauma, resuscitation & emergency medicine

ORIGINAL RESEARCH Open Access

Confusion with cerebral perfusion pressure in a literature review of current guidelines and survey of clinical practise

Vidar Rao[1,2*], Pål Klepstad[3,4], Ole Kristian Losvik[5] and Ole Solheim[1,2]

Verschiedene Strategien im Umlauf…



Empfehlungen Ziel CPP (bei SHT)

BTF (Brain Trauma Foundation, New York) 2016 und SFAR (Société Française d'Anesthésie et de Réanimation) 2018

Cerebral perfusion pressure thresholds	Level IIB
	• **The recommended target CPP value for survival and favorable outcomes is between 60 and 70 mm Hg. Whether 60 or 70 mm Hg is the minimum optimal CPP threshold is unclear and may depend upon the autoregulatory status of the patient.**
	Level III
	• Avoiding aggressive attempts to maintain CPP >70 mm Hg with fluids and pressors may be considered because of the risk of adult respiratory failure.

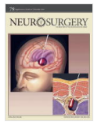
Brain Trauma Foundation

Guidelines for the Management of Severe Traumatic Brain Injury 4th Edition

Nancy Carney, PhD — Oregon Health & Science University, Portland, OR
Annette M. Totten, PhD — Oregon Health & Science University, Portland, OR
Cindy O'Reilly, BS — Oregon Health & Science University, Portland, OR
Jamie S. Ullman, MD — Hofstra North Shore-LIJ School of Medicine, Hempstead, NY
Gregory W. J. Hawryluk, MD, PhD — University of Utah, Salt Lake City, UT
Michael J. Bell, MD — University of Pittsburgh, Pittsburgh, PA
Susan L. Bratton, MD — University of Utah, Salt Lake City, UT
Randall Chesnut, MD — University of Washington, Seattle, WA
Odette A. Harris, MD, MPH — Stanford University, Stanford, CA
Niranjan Kissoon, MD — University of British Columbia, Vancouver, BC
Andres M. Rubiano, MD — El Bosque University, Bogota, Colombia; MEDITECH Foundation, Neiva, Colombia
Lori Shutter, MD — University of Pittsburgh, Pittsburgh, PA
Robert C. Tasker, MBBS, MD — Harvard Medical School & Boston Children's Hospital, Boston, MA
Monica S. Vavilala, MD — University of Washington, Seattle, WA
Jack Wilberger, MD — Drexel University, Pittsburgh, PA
David W. Wright, MD — Emory University, Atlanta, GA
Jamshid Ghajar, MD, PhD — Stanford University, Stanford, CA

Reviewed for evidence-based integrity and endorsed by the American Association of Neurological Surgeons and the Congress of Neurological Surgeons.

September 2016



Neurosurgery
Volume 79 Supplement 1 pgs. S1-S91 December 2016
ISSN: 0148-396X

Anaesth Crit Care Pain Med 37 (2018) 171–186

ELSEVIER

SFAR Société Française d'Anesthésie et de Réanimation

Guidelines

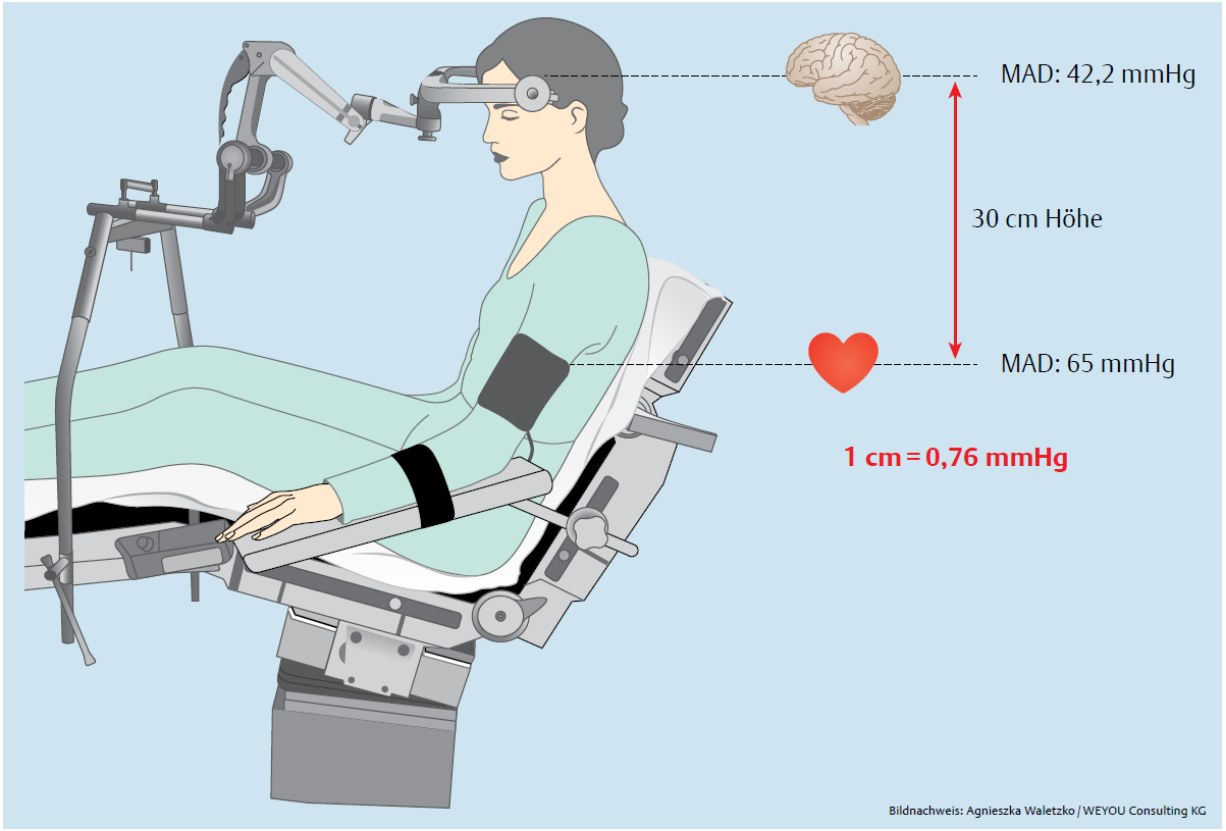
Management of severe traumatic brain injury (first 24 hours)☆,☆☆

Thomas Geeraerts[a,*], Lionel Velly[b], Lamine Abdennour[c], Karim Asehnoune[d], Gérard Audibert[e], Pierre Bouzat[f], Nicolas Bruder[b], Romain Carrillon[g], Vincent Cottenceau[h], François Cotton[i], Sonia Courtil-Teyssedre[j], Claire Dahyot-Fizelier[k], Frédéric Dailler[g], Jean-Stéphane David[l], Nicolas Engrand[m], Dominique Fletcher[n], Gilles Francony[f], Laurent Gergelé[o], Carole Ichai[p], Étienne Javouhey[j], Pierre-Etienne Leblanc[q,r], Thomas Lieutaud[s,r], Philippe Meyer[u], Sébastien Mirek[v], Gilles Orliaguet[u], François Proust[w], Hervé Quintard[p], Catherine Ract[q,r], Mohamed Srairi[a], Karim Tazarourte[x], Bernard Vigué[q,r], Jean-François Payen[f], for the French Society of Anaesthesia, Intensive Care Medicine (Société francaise d'anesthésie et de réanimation [SFAR]) in partnership with Association de neuro-anesthésie-réanimation de langue française (Anarlf) the French Society of Emergency Medicine (Société Française de Médecine d'urgence (SFMU), the Société française de neurochirurgie (SFN), Groupe francophone de réanimation et d'urgences pédiatriques (GFRUP), Association des anesthésistes-réanimateurs pédiatriques d'expression française (Adarpef)

CrossMark

R7.2 – In adults, we suggest maintaining cerebral perfusion pressure between 60 and 70 mmHg in the absence of multi-modal monitoring.
Grade 2+, Strong Agreement

Levelling Transducer: Unterschied beträchtlich



Kantonsspital Aarau

Platzierung des Transducer bei SHT

British Journal of Anaesthesia 115 (4): 487–8 (2015)
Advance Access publication 16 July 2015 · doi:10.1093/bja/aev233

Calculation of cerebral perfusion pressure in the management of traumatic brain injury: joint position statement by the councils of the Neuroanaesthesia and Critical Care Society of Great Britain and Ireland (NACCS) and the Society of British Neurological Surgeons (SBNS)

E. Thomas (on behalf of NACCS)[1,*], M. Czosnyka[2], and P. Hutchinson (on behalf of SBNS)[2]

[1] Department of Intensive Care Medicine, Derriford Hospital, Plymouth PL6 8DR, UK, and
[2] Department of Clinical Neurosciences, University of Cambridge, Cambridge CB2 0QQ, UK

*Corresponding author: E-mail: naccsgbi@gmail.com

Clinical practice involving cerebral perfusion pressure-based targets and management based on recommendations by the Brain Trauma Foundation

Whilst not wishing to dictate local clinical practice, based on the available evidence, the Councils of NACCS and SBNS would recommend that when calculating CPP in TBI the MAP used in the equation CPP=MAP–ICP should be the mean cerebral arterial pressure estimated to exist at the level of the middle cranial fossa, which can be approximated by positioning (levelling) the arterial transducer at the tragus of the ear.

They also recommend that the arterial transducer is repositioned to remain levelled with the tragus following changes in body elevation or position.

Councils do not endorse positioning (levelling) the arterial transducer at heart level (phlebostatic axis) for CPP-based treatment decisions because there is a requirement for subsequent

Interventionen bei nicht adäquatem CPP

Ziel	Massnahme
Dem Hirn Wasser entziehen	Hypertones NaCl
	Mannitol
	Furosemid
Liquorvolumen verringern	Ventrikeldrainage
	Lumbaldrainage
Cerebrales Blutvolumen senken	Kopf hoch Lagerung (15°)
	Neutralposition HWS
	Metabolische Suppression (Thio/Prop)
MAP anheben	Volumensubstitution
	Vasopressoren

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Anästhesieführung Neurochirurgie

Die 6 N’s

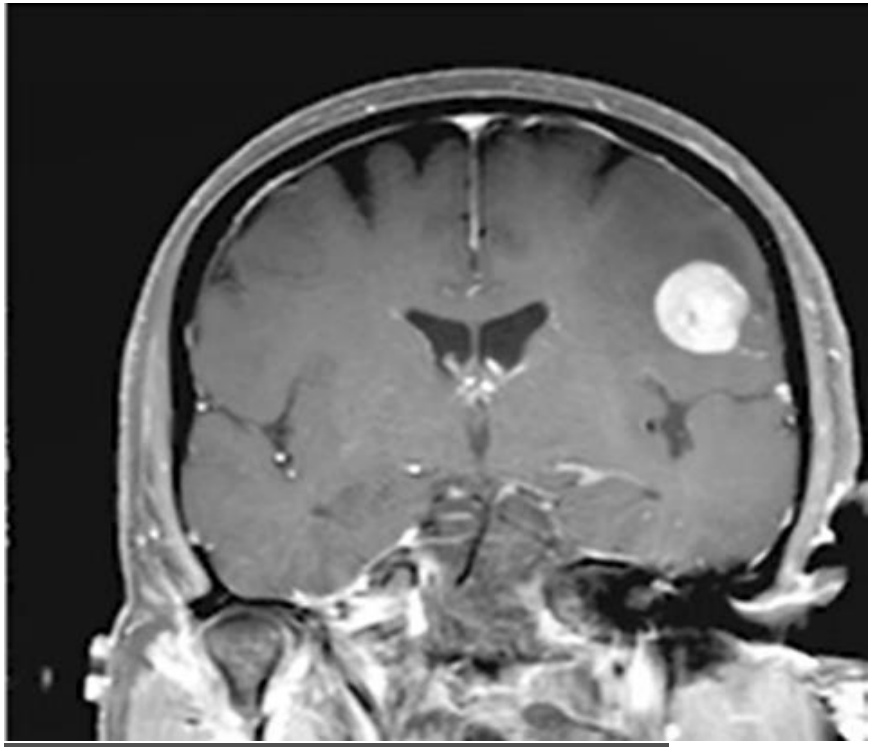
Normoxämie	**paO2 > 80 mmHg**
Normokapnie	**paCO2 35 – 38 mmHg**
Normovolämie	**Diurese > 0.5 ml/kg KG/h**
Normotension	**CPP 60 – 70 mmHg, systol. BD > 100 mmHg**
Normothermie	**T 37 +- 0.5 °C**
Normoglykämie	**Glucose 4.4 – 8.3 mmol/l**

Die 2 R’s

Relaxation

Remifentanil

Konkret: Patientin mit neurochirurgischem Problem + Neurochirurg vorhanden…



VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

Istock.photo.com

Einleitung: Einfluss von Hypnotika

Tab. 45.7 Einfluss verschiedener Hypnotika auf zerebrale Parameter

	$CMRO_2$	CBF	ICP	CO_2-Reaktivität	Zerebrale Autoregulation	Vasodilatation
Thiopental	↓↓↓	↓↓↓	↓↓	↔	↔	Nein
Etomidat	↓↓	↓↓	↓	↔	↔	Nein
Propofol	↓↓	↓↓	↓	↔	↔	Nein
Benzodiazepine	↓	↓	–	↔	↔	Nein
Ketamin	↑	↑↑	(↑)	↔	↔	Nein

↓ Verminderung, ↑ Steigerung (Anzahl der Pfeile = relative Gewichtung), ↔ gleichbeibend.

Medical Mythology

Myth: Ketamine should not be used as an induction agent for intubation in patients with head injury

Yevgeny Filanovsky, MD;* Philip Miller, MD;† Jesse Kao, MD‡

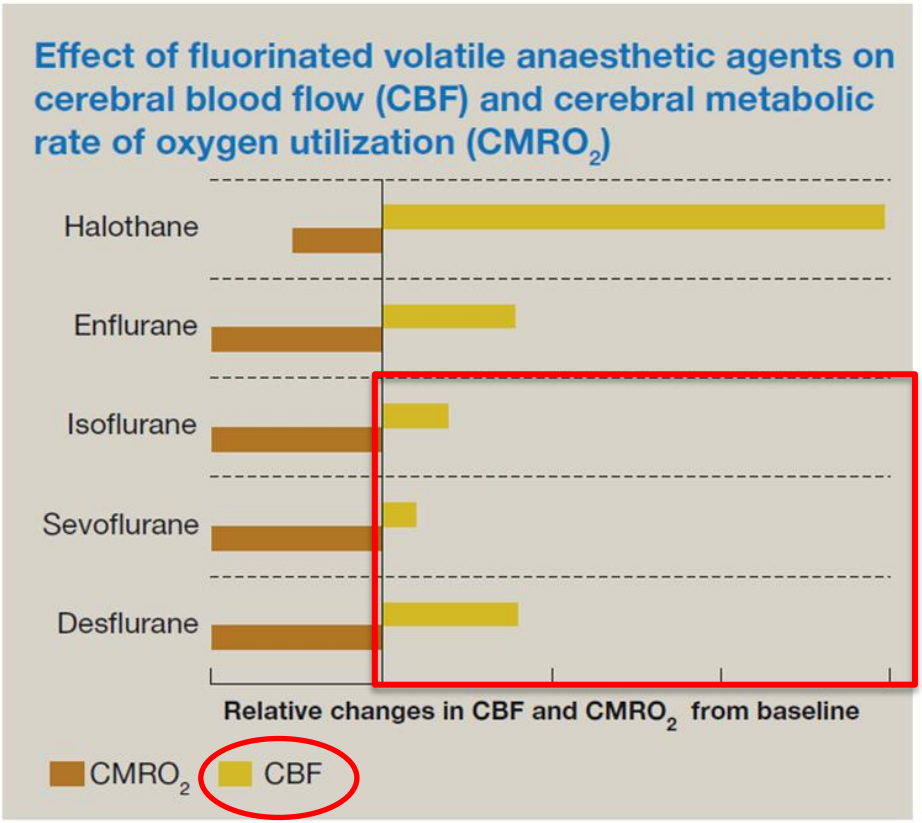
From the *Emergency Department, Nanaimo Regional General Hospital, Nanaimo BC, the †Department of Emergency Medicine, University of Toronto, Toronto, Ont., and the ‡Department of Emergency Medicine, University of British Columbia, Vancouver, BC

Submitted Mar. 3, 2009; Accepted Apr. 3, 2009

This article has not been peer reviewed.

CJEM 2010;12(2):154-7

Volatile Anästhetika (mögliche ICP Steigerung)



Nicholas Hirsch FRCA FRCP FFICM is a Consultant Neuroanaesthetist at the National Hospital for Neurology and Neurosurgery and Honorary Senior Lecturer at the Institute of Neurology, London, UK. Conflicts of interest: none declared.

Christopher Taylor MRCP FRCA FFICM is a Consultant Neuroanaesthetist at the National Hospital for Neurology and Neurosurgery, Queen Square, London, UK. Conflicts of interest: none declared.

ANAESTHESIA AND INTENSIVE CARE MEDICINE 17:12

Volatile Anästhetika: Weshalb kein Desfluran?

- Stärkere cerebrale Vasodilatation als Isofluran oder Sevofluran
- CBF und ICP Anstieg schon bei < 1 MAC Desfluran
- Allerdings fand sich bezüglich intra- und postoperativer Komplikationen im Vergleich zwischen Sevoflurane und Desflurane kein relevanter Unterschied.

Magni G, La Rosa I, Melillo G, Savio A, Rosa G (2009) A comparison between sevoflurane and desflurane anesthesia in patients undergoing craniotomy for supratentorial intracranial surgery. Anesth Analg 109: 567–571

Hypnotikum bei SHT, «tief» liegendem OP-Gebiet, (oder je nach Haus auch immer)

- Eher Propofol
- Bessere Operationsbedingungen (Zugang, Sicht bei Schwellung des Gehirns)

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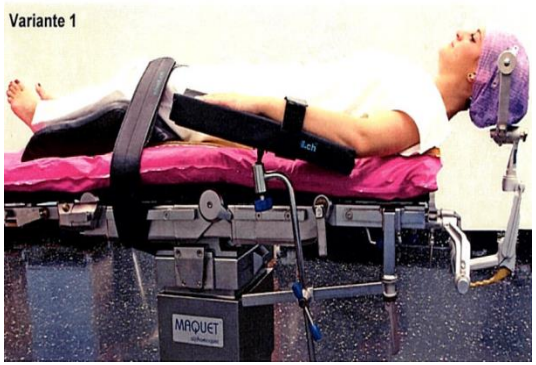
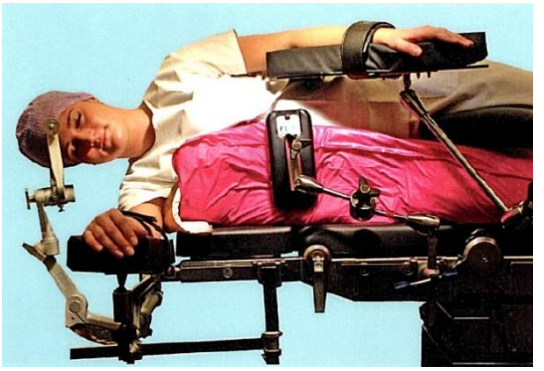
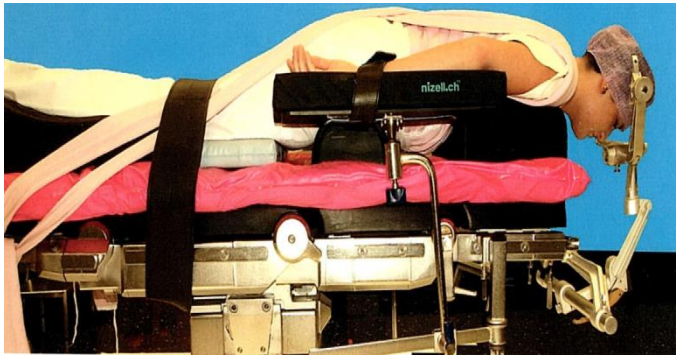
Lagerung



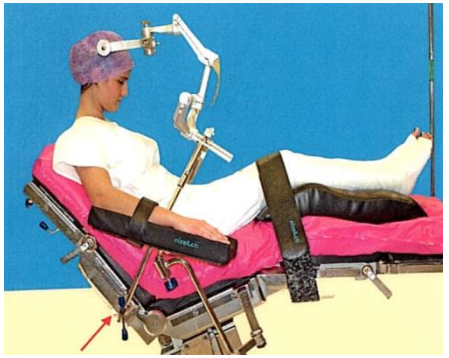


HWS – Kopfachse möglichst gerade (venöser Abfluss)

Verhinderung von Anteflexion (Gefahr der Tetraplegie)



Alle Bilder KSA.ch



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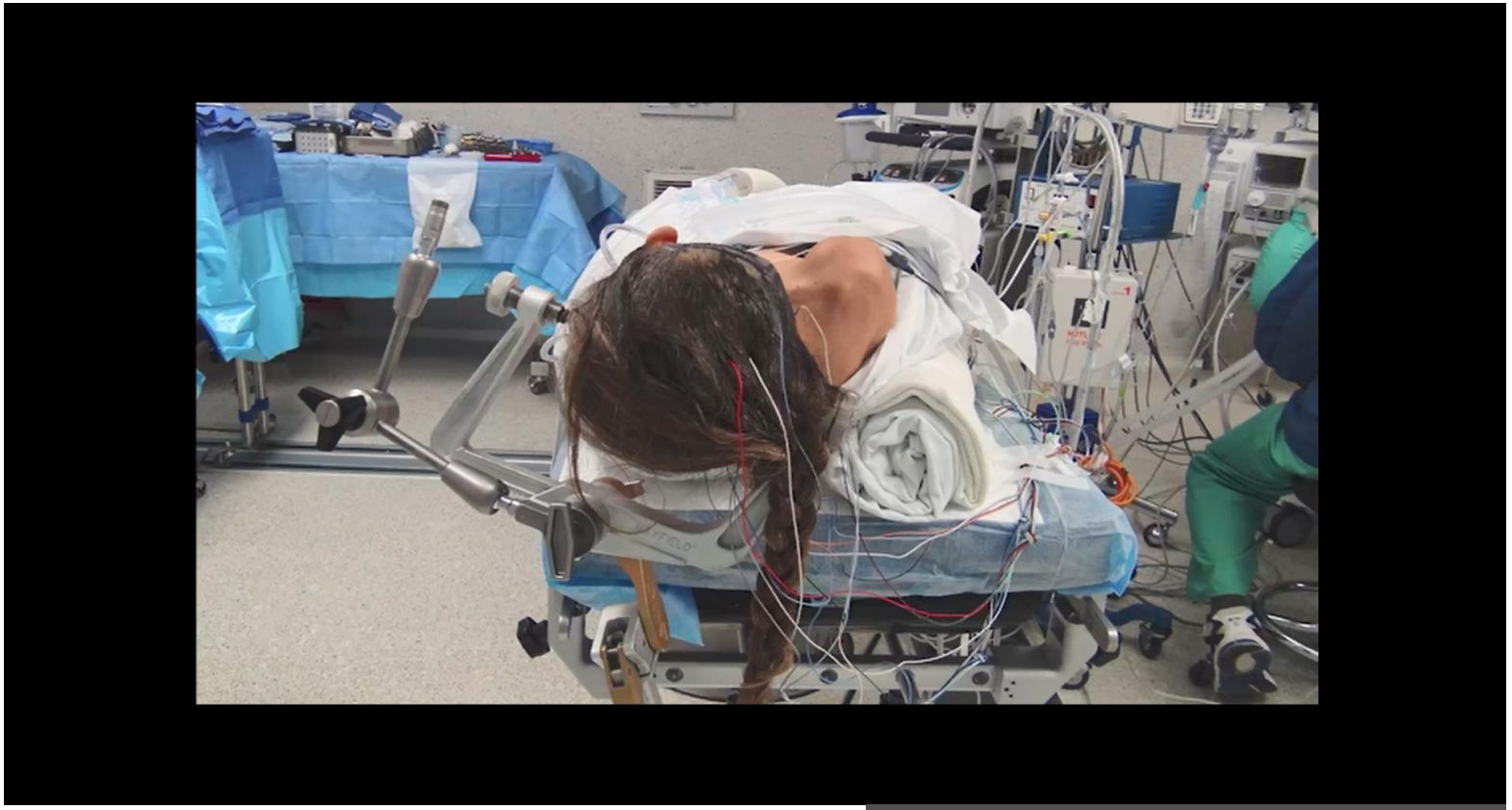
Einspannen in Mayfield: Kurzzeitig Remifentanil TCI auf 5 -7 ng/ml (Minto) steigern.



VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

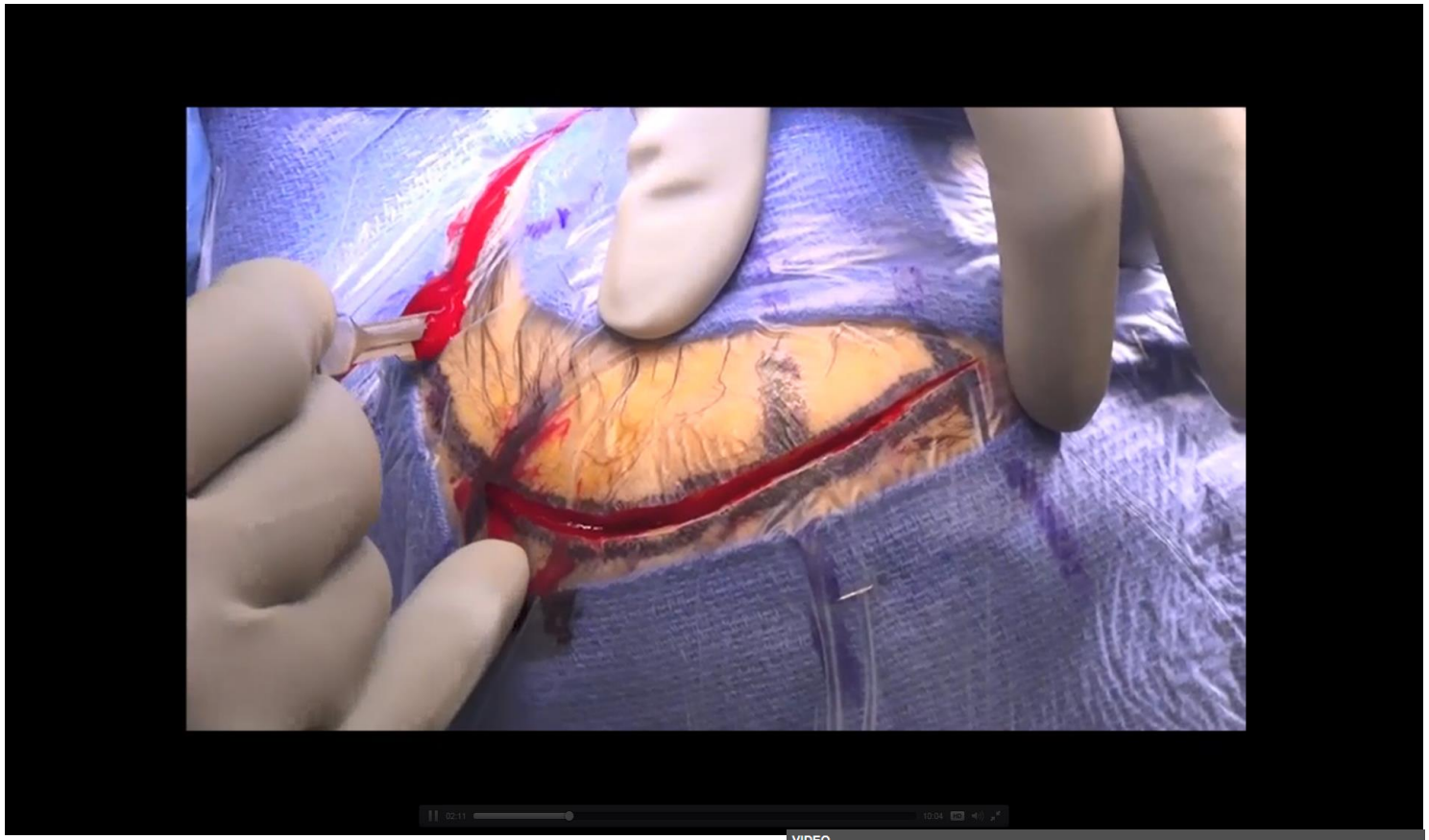
Navigation, Abdecken: Lange «reizlose» Zeit…

VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

Schnittdosis: Fentanyl 2-3 mcg/kg KG



VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

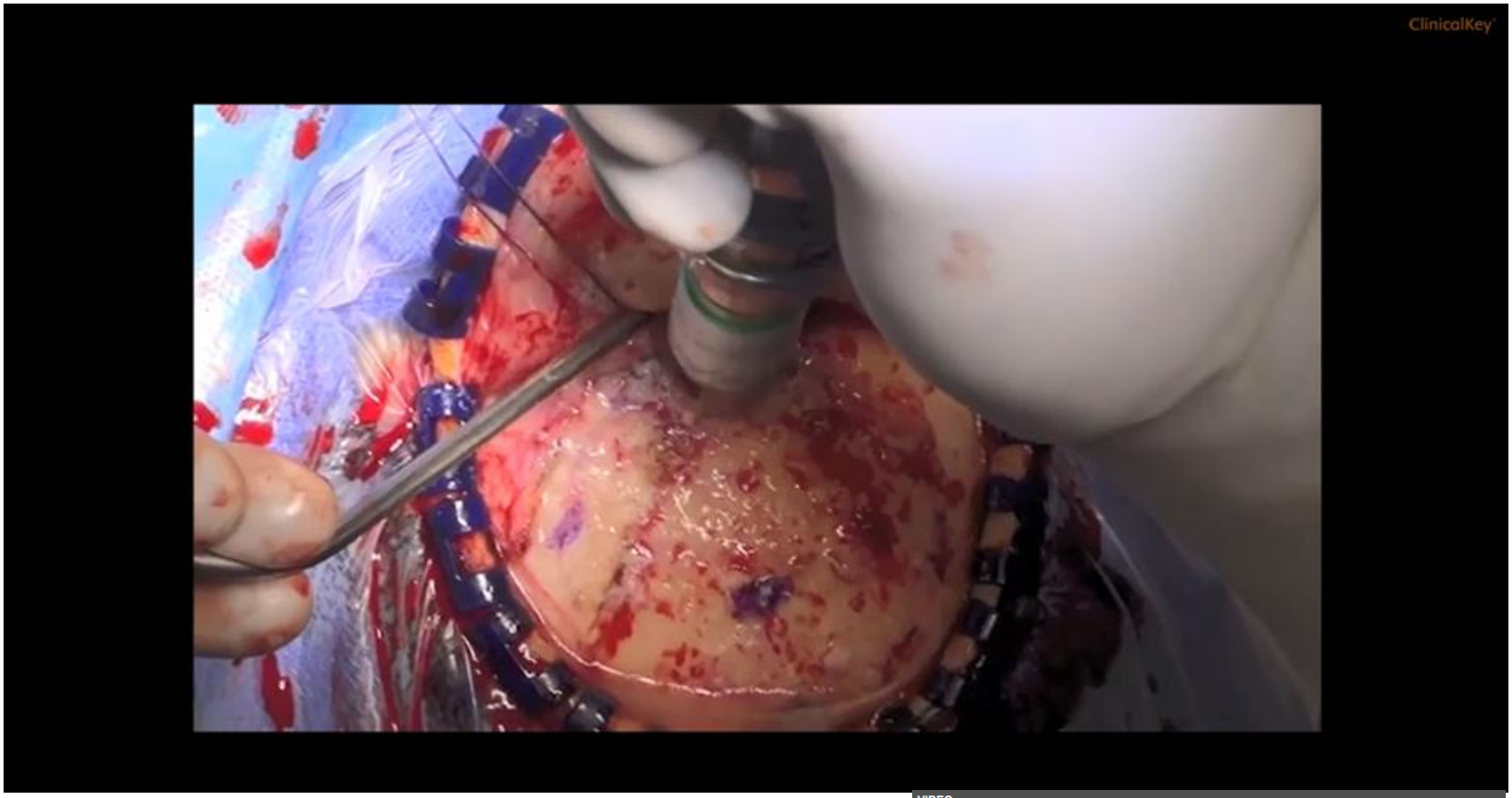
Schmerzhafte Phase, z.T. nicht unerhebliche Blutung

VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

Setzen der Bohrlöcher



VIDEO

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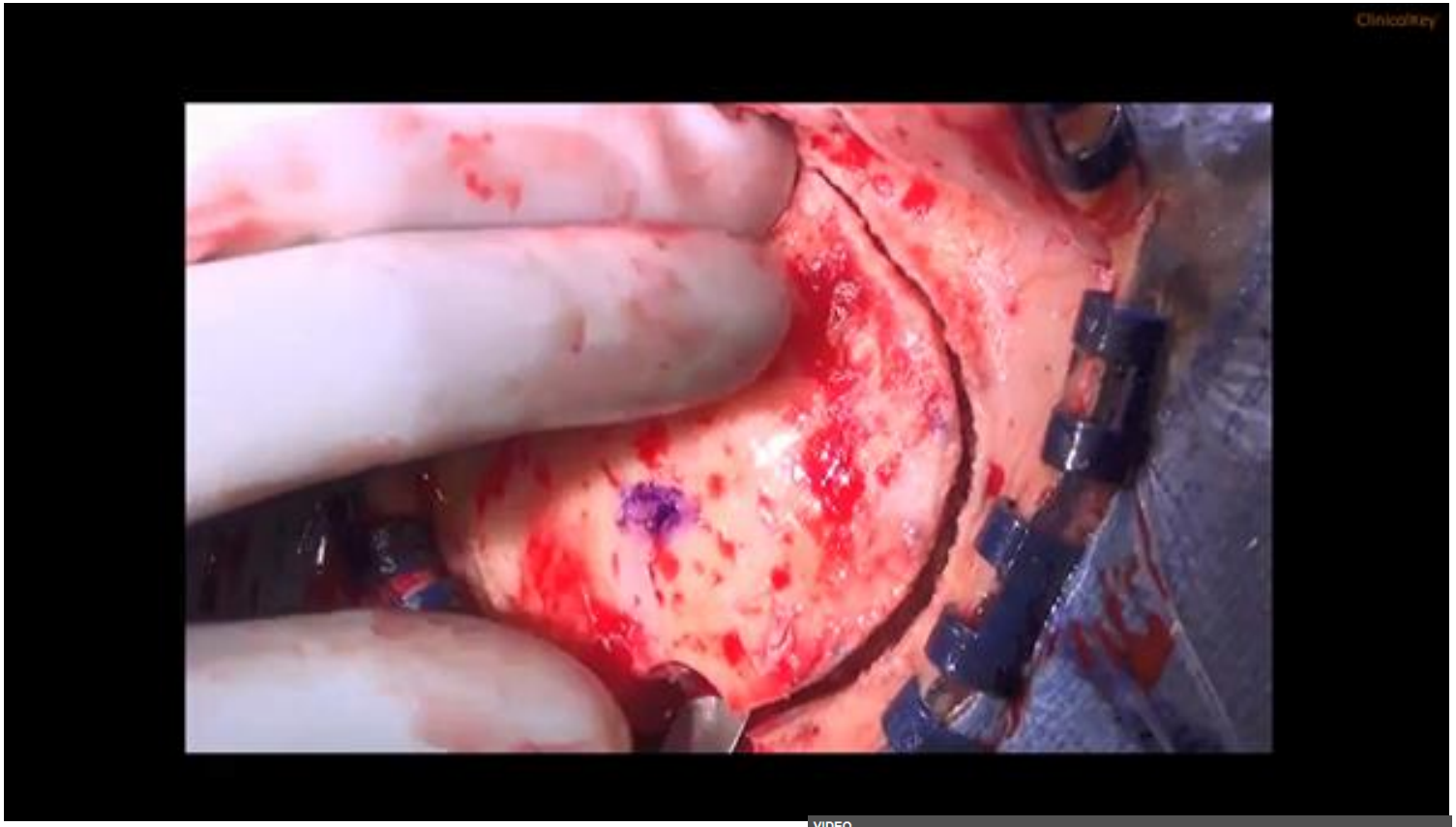
Video Atlas of Neurosurgery.

Aussägen mit Kraniotom



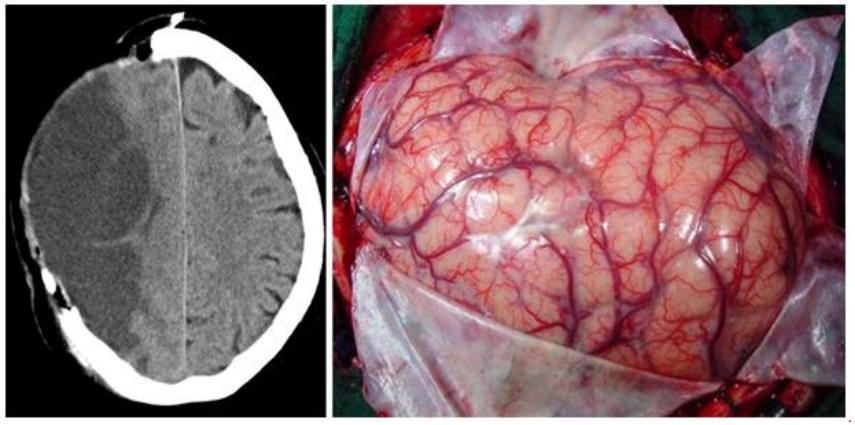
Eröffnung der Dura mater

VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

Es könnte auch so aussehen:



Researchgate.net

Schädigung Blut/Hirnschranke

Massenzunahme

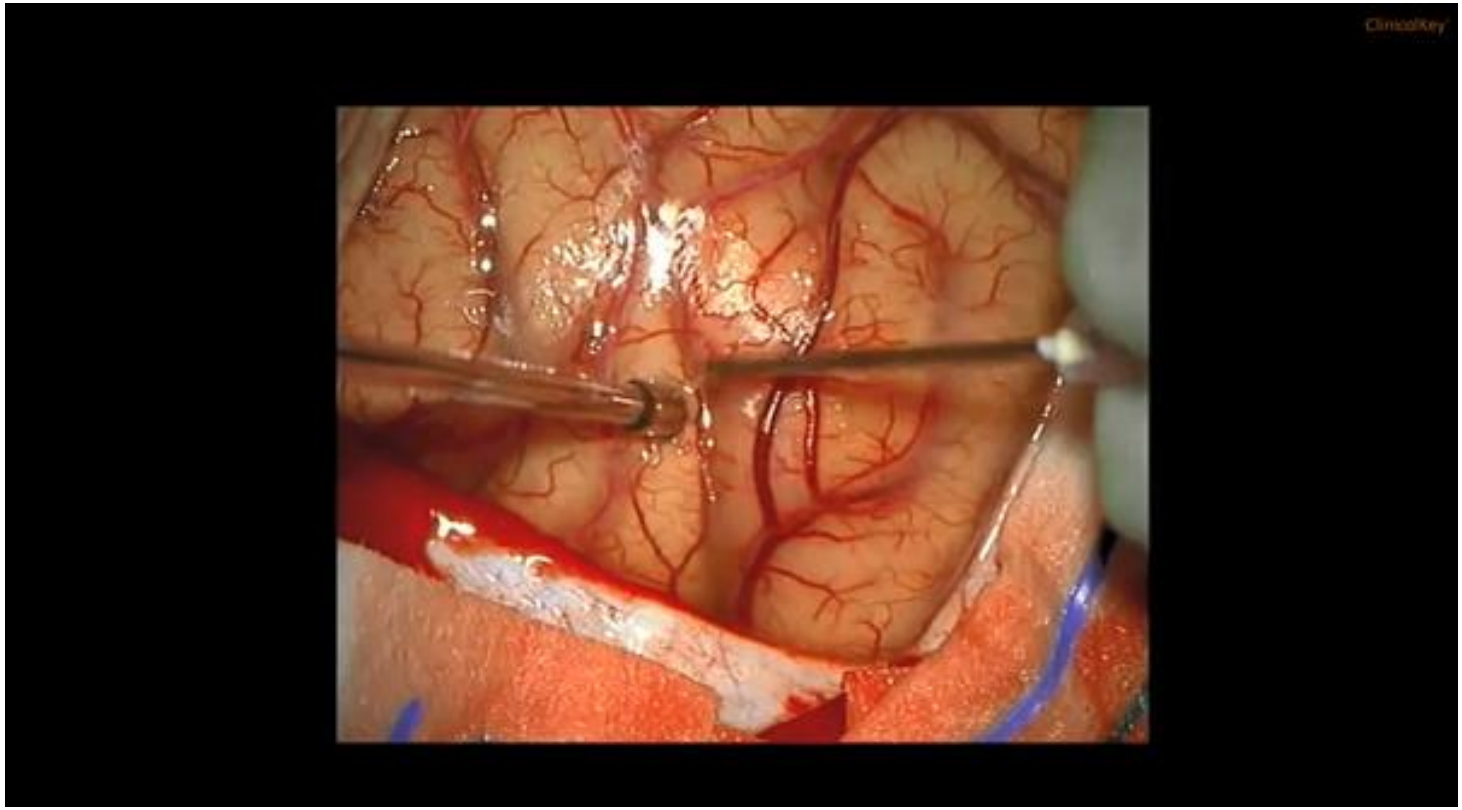
Therapie: Hyperosmolare Lösung **als Bolus.**

Hypertones NaCl soll Mannitol überlegen sein

Dostal P, Dostalova V, Schreiberova J, Tyll T, Habalova J, Cerny V, Rehak S, Cesak T (2015) A comparison of equivolume, equiosmolar solutions of hypertonic saline and mannitol for brain relaxation in patients undergoing elective intracranial tumor surgery: a randomized clinical trial. J Neurosurg Anesthesiol 27:51–56

Rickard AC, Smith JE, Newell P, Bailey A, Kehoe A, Mann C (2014) Salt or sugar for your injured brain? A meta-analysis of randomised controlled trials of mannitol versus hypertonic sodium solutions to manage raised intracranial pressure in traumatic brain injury. Emerg Med J 31:679–

Ab jetzt schmerzrezeptorenfreies Hirngewebe



VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

Happy People Fuss-Blasebalg
Produktbild

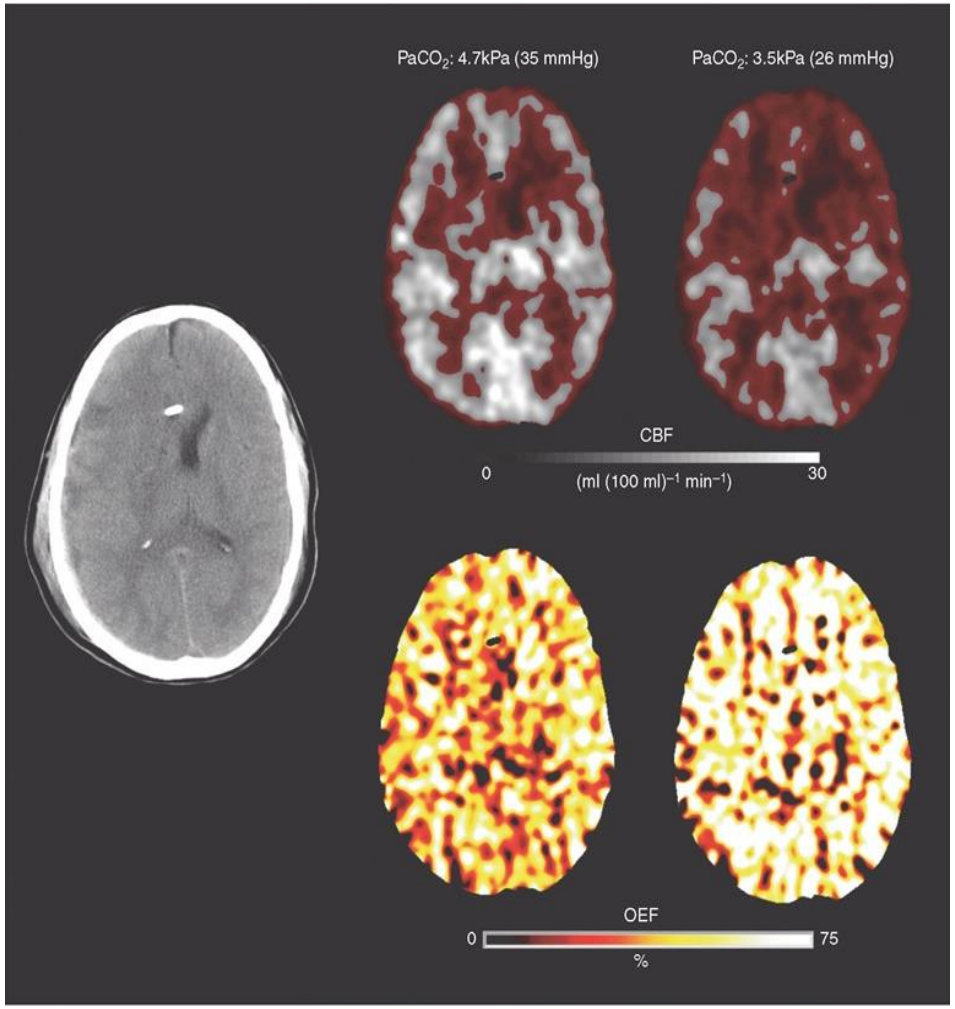
Kantonsspital Aarau

Ventilation

Die Änderung des PaCO2 um **1 mmHg** durch Hyperventilation hat eine Abnahme des CBF um **2 – 4%** zur Folge.

Gilt auch beim nicht-neurochirurgischen Patienten!!

PET- CT: CBF unter Hyperventilation



Rote Anteile CBF:
CBF < 15 ml/100g/min

ICP-Senkung von 21 auf 17 mmHg aber zu welchem Preis???

http://what-when-how.com/neuroanaesthesia-and-neurointensive-care/plate-section-neuroanaesthesia-and-neurointensive-care-part-4/

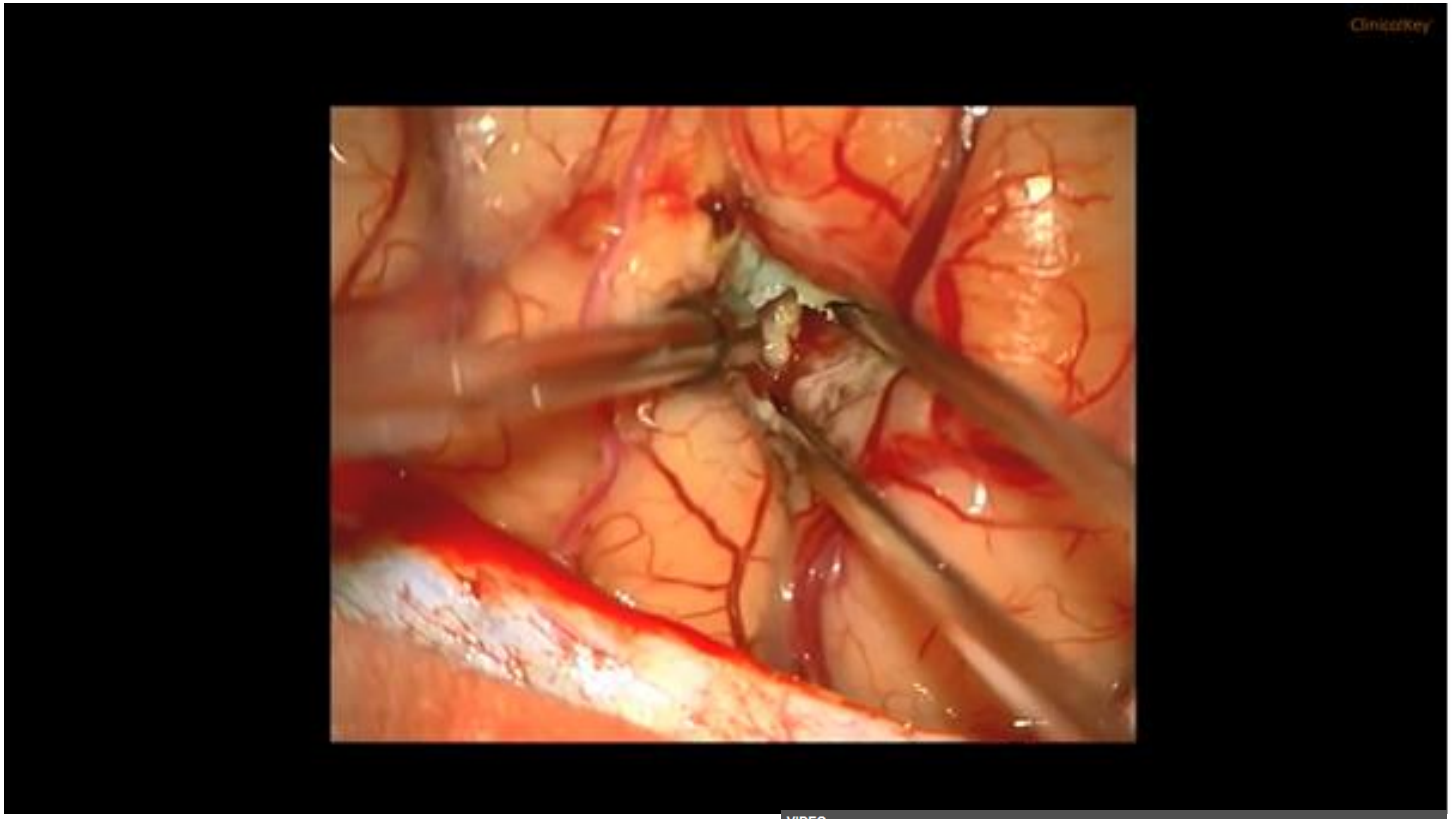
PEEP

Ein PEEP von bis zu 15 mbar behindert den venösen Abfluss aus dem Gehirn und den CBF nicht.

T-online.de

Schramm P, Closhen D, Felkel M, Berres M, Klein KU, David M, Werner C, Engelhard K (2013) Influence of PEEP on cerebral blood flow and cerebrovascular autoregulation in patients with acute respiratory distress syndrome. J Neurosurg Anesthesiol 25:162–167

Tumor ist erreicht und wird reseziert



EJA

Eur J Anaesthesiol 2016; **33**:1–34

OPEN

GUIDELINES

Intravascular volume therapy in adults

Guidelines from the Association of the Scientific Medical Societies in Germany

Gernot Marx, Achim W. Schindler, Christoph Mosch, Joerg Albers, Michael Bauer, Irmela Gnass, Carsten Hobohm, Uwe Janssens, Stefan Kluge, Peter Kranke, Tobias Maurer, Waltraut Merz,

Volumenmanagement

- Balancierte Kristalloide (Balancierte HES Produkte bei grossen Blutverlusten)

Recommendation 4a-2	GoR
Balanced crystalloid and/or balanced colloid solutions should be used for peri-interventional volume substitution	B

- **Keine hypoosmolaren** Lösungen wie Glucose 5% oder Misch 2:1

Recommendation 5b-1	GoR
Hypo-osmolar solutions must not be used for volume therapy in ICU patients with severe traumatic brain injury	A

- NaCl 3% z.T. indiziert (bei grossen kristalloiden Infusionsmengen)

Statement S-6	GoR
Recommendation 6a-1 Isotonic NaCl must not be used as a peri-interventional volume substitute	GoR A

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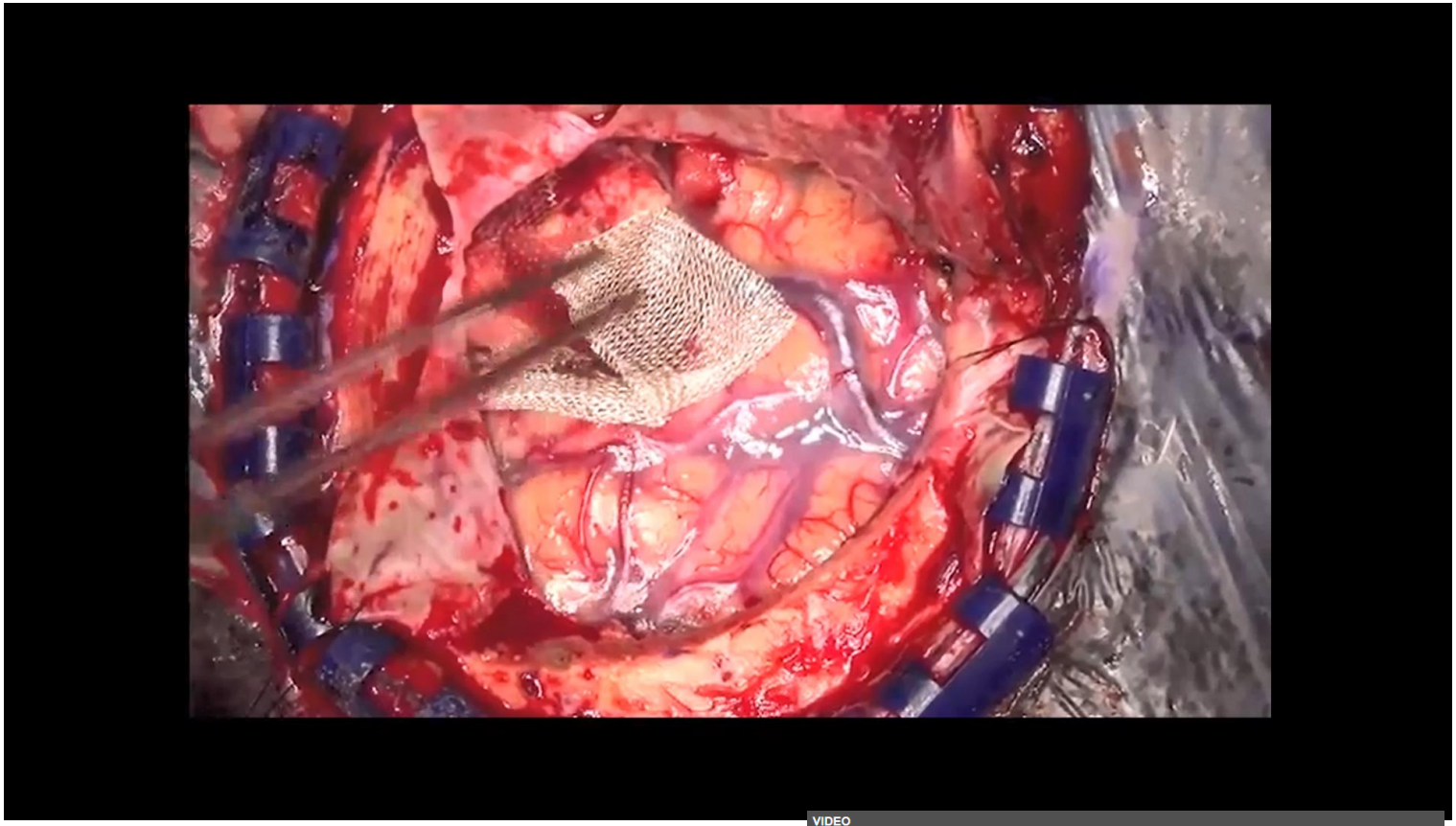
Blutstillung, vor Verschluss Dura mater Repetition von Fentanyl z.B. 0.1 mg



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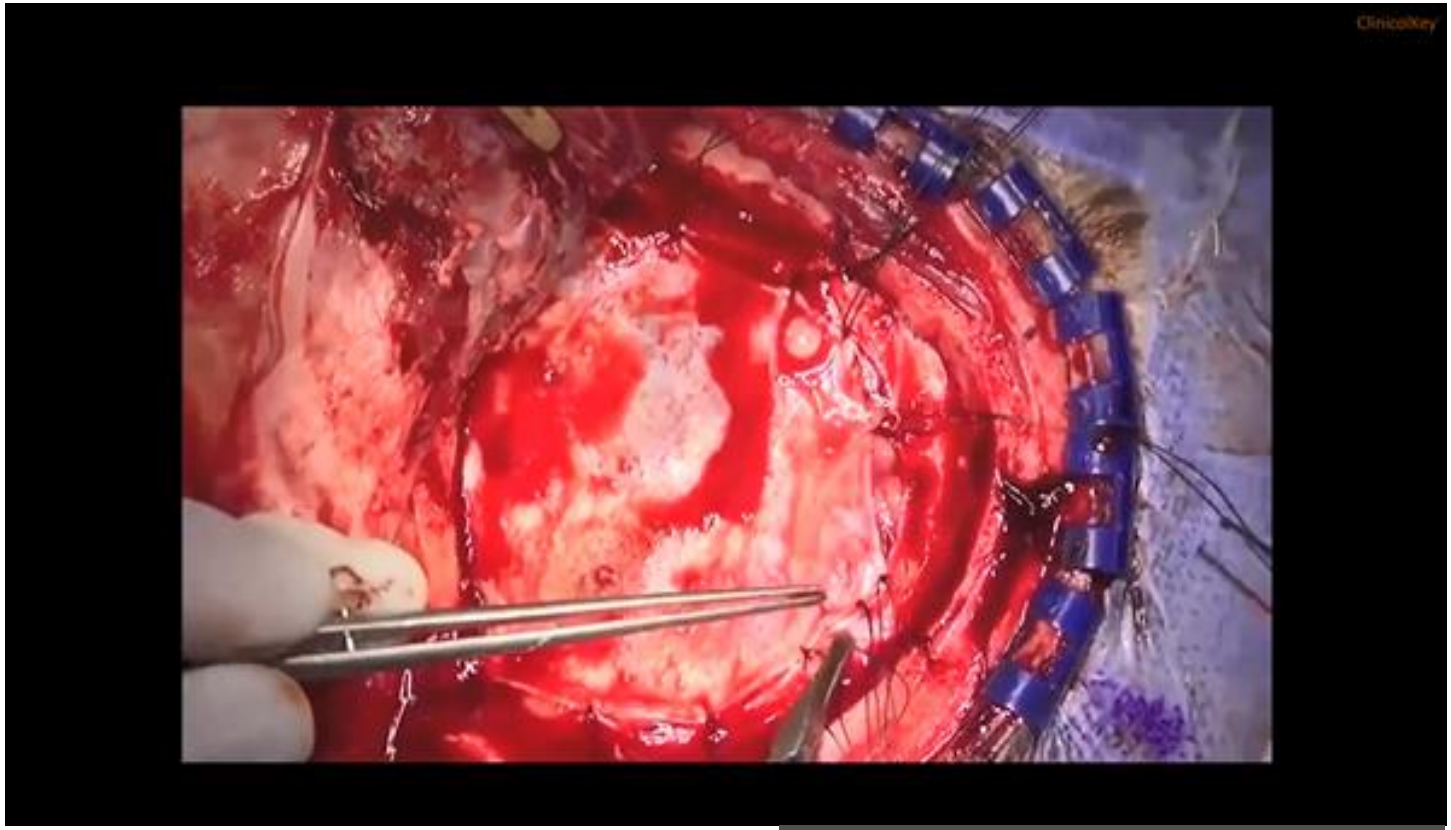
Video Atlas of Neurosurgery.

Verschluss Dura mater

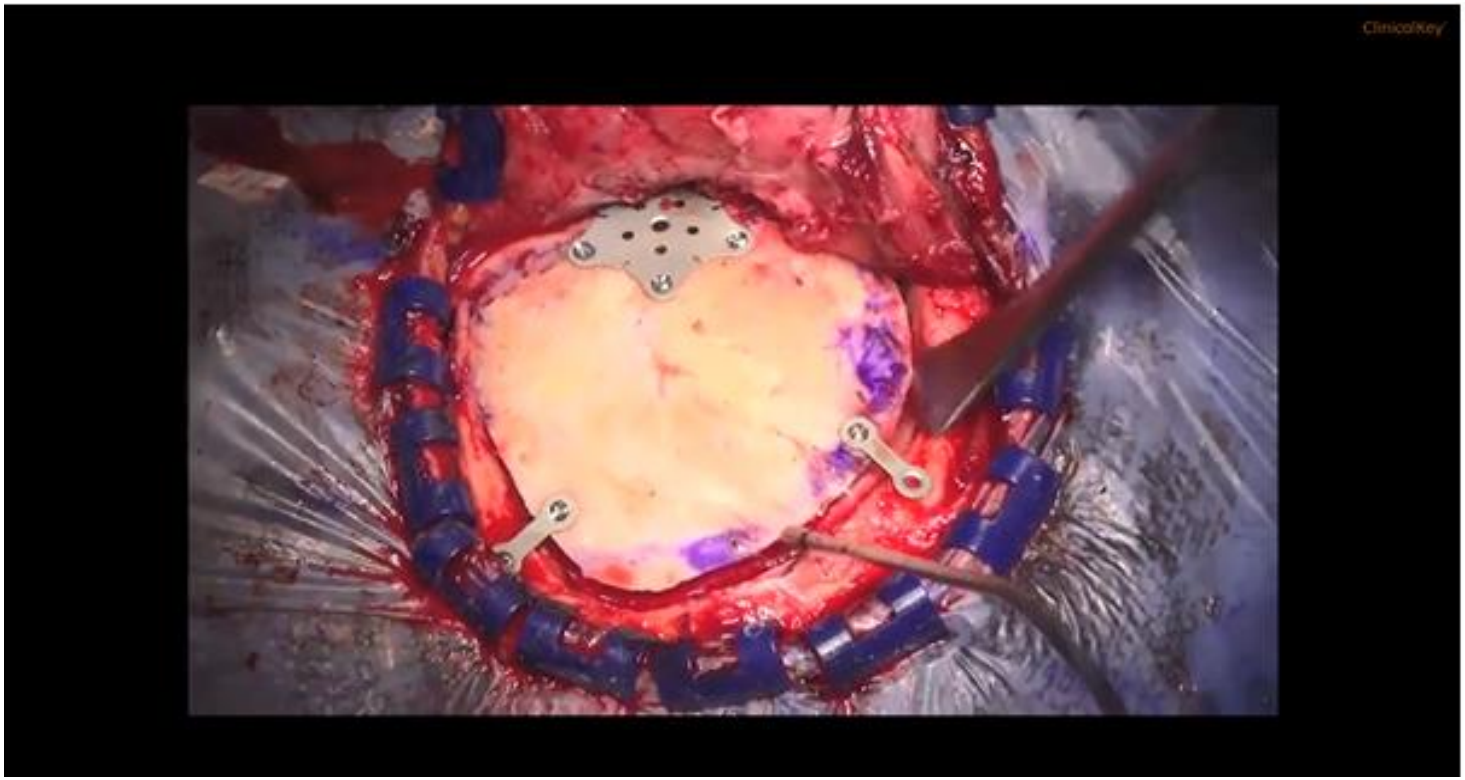


VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

Wiedereinsetzen Knochendeckel



VIDEO

Trans-Sulcal Versus Transcortical Resection of Subcortical Metastases

Video Atlas of Neurosurgery.

Wundverschluss - Fertig

PONV

- Inzidenz von PONV nach Kraniotomien bis zu 50 %
- Genaue Risikoeinschätzung
- Grosszügige Prophylaxe & Propofolanwendung
- Günstig: Viele Patienten erhalten schon präoperative Steroide

Latz B, Mordhorst C, Kerz T, Schmidt A, Schneider A, Wisser G, Werner C, Engelhard K (2011) Postoperative nausea and vomiting in patients after craniotomy: incidence and risk factors. J Neurosurg 114:491–496

Extubation (wenn immer möglich…)

- Sanft aus Remifentanil-Schlaf mit wiedererlangten Schutzreflexen und adäquater Reaktion auf Ansprechen.
- Neurologische Beurteilung rasch möglich (Pupillen, Bewegung Extremitäten etc.)

National geographic

Extubation (eher nicht wenn…)

- Lange Operationszeiten in Extremlagerung
- Hoher Flüssigkeitsbedarf (Ödeme Pharynxbereich, Zungenschwellung)
- Hypothermie
- SHT mit vorbestehend tiefem GCS

Schmerztherapie

Über 50 % der Patienten haben während der ersten 24 h nach Kraniotomie Schmerzstärken mit einem Wert von mehr als 3 auf der visuellen Analogskala.

Grund: Ungenügende Schmerztherapie aus Angst vor opioidbedingten Komplikationen (v.a. Hypopnoe).

Achtung: Schlechte Akutschmerztherapie korreliert mit der Chronifizierung des Schmerzes nach einem Jahr.

Mordhorst C, Latz B, Kerz T, Wisser G, Schmidt A, Schneider A, Jahn-Eimermacher A, Werner C, Engelhard K (2010) Prospective assessment of postoperative pain after craniotomy. J Neurosurg Anesthesiol 22:202–206

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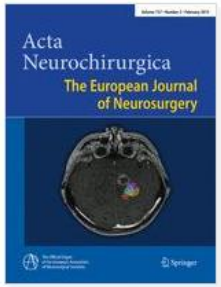


Vermutung wird bestätigt…

Acta Neurochir (2015) 157:235–240
DOI 10.1007/s00701-014-2286-3

CLINICAL ARTICLE - BRAIN TUMORS

Is duration of surgery a risk factor for extracranial complications and surgical site infections after intracranial tumor operations?

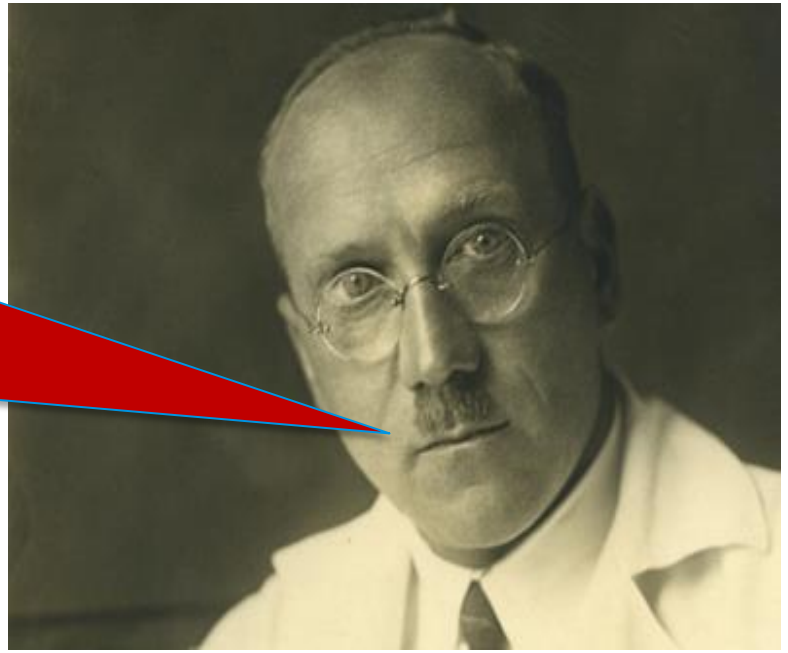
Arthur Golebiowski · Christina Drewes · Sasha Gulati · Asgeir Store Jakola · Ole Solheim

Methods Retrospective review of 1,000 consecutive patients who underwent planned surgery for intracranial tumors at a single institution. Complications within 30 days of surgery were registered.

Conclusion Duration of surgery together with comorbidity and acquired neurological deficits is an independent risk factor for extracranial complications after brain tumor surgery. Duration of surgery is also associated with surgical site infections. Knowledge about the potential harm of slow surgery should be of interest to neurosurgeons when deciding on various surgical approaches, surgical tools or providing training. Also if acquiring ethical approval or informed consent in technical research projects, the risks associated with prolonging brain surgery should be considered. Special consideration should be warranted in patients with significant comorbidity, planned long surgery and higher risk of acquiring neurological deficits after surgery.

Urologisch- / ophthalmologischer Ansatz gilt nicht…

**«Wer im Bett liegen kann,
kann auch auf dem OP-Tisch liegen»**



dhm.de

Faz.net

Was ist schwierig in der Neuroanästhesie?

https://www.semanticscholar.org/paper/Cranioplasty%3A-indications-and-advances.-Goldstein-Paliga/4ceb55b7c33716a70c3fdf87fbd0162c953d8e89/figure/4

Alle verdienen viel

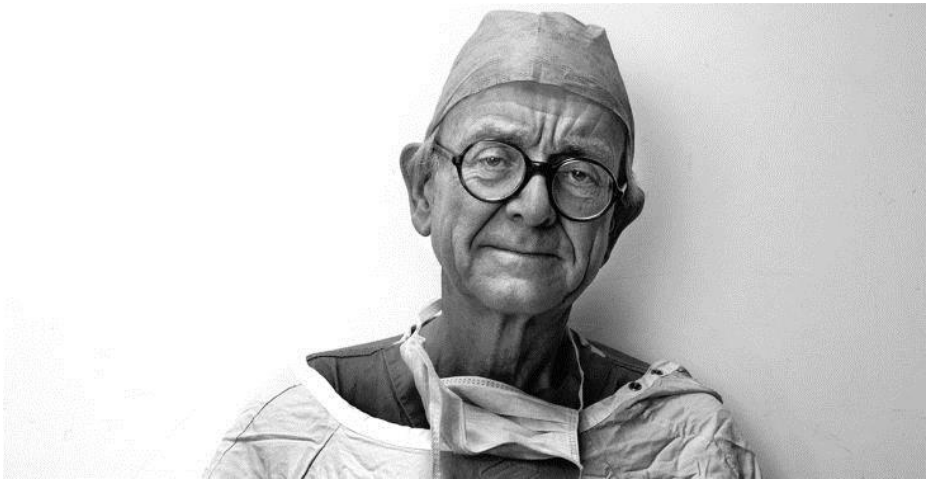
Empathie….

ksa.ch

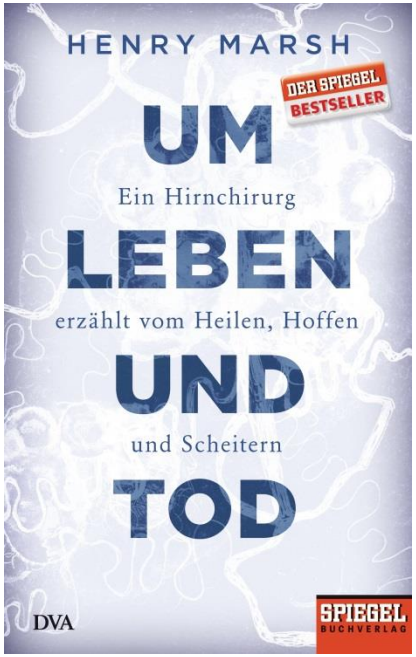
Privatarchiv

Press24.net

Literaturempfehlung:
Hilft sich in die Psyche eines Neurochirurgen einzufühlen

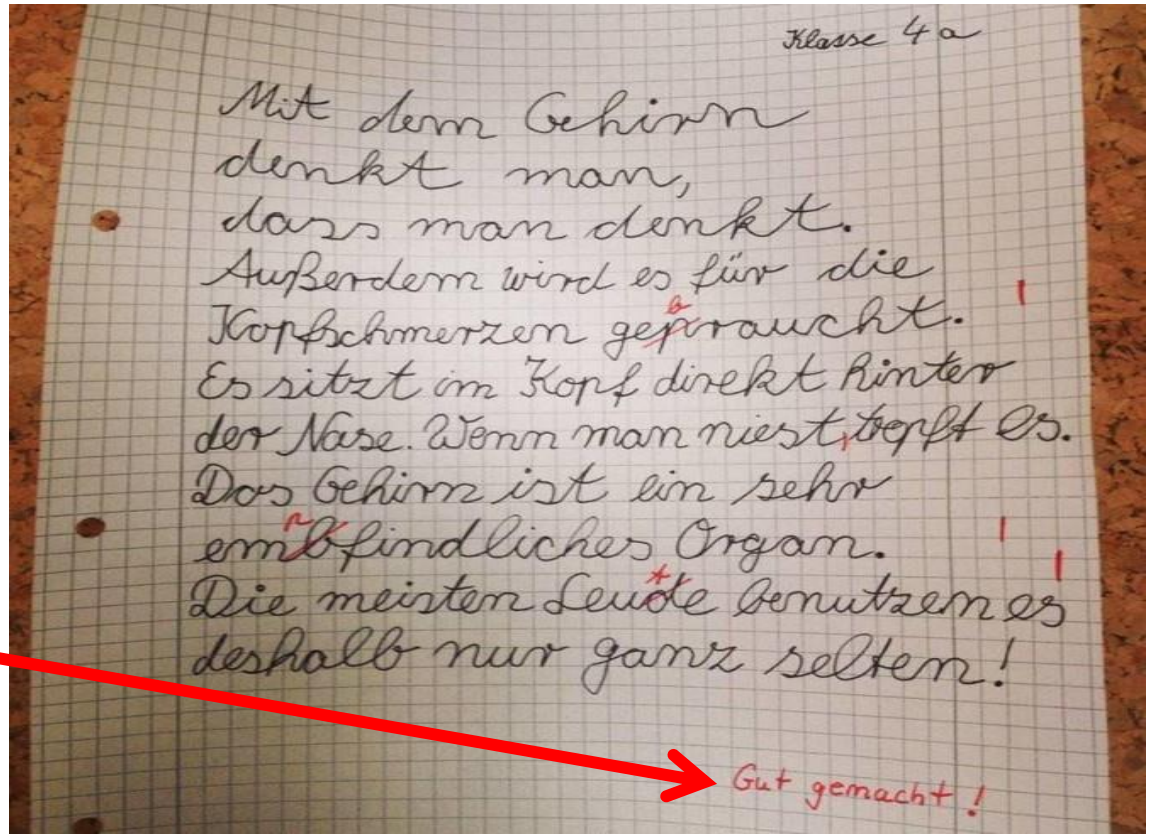


Weeklyfilet.com



«Jeder Neurochirurg hat seinen persönlichen Friedhof ….»

Take home message



debeste.de

Danke und einen schönen Tag.

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