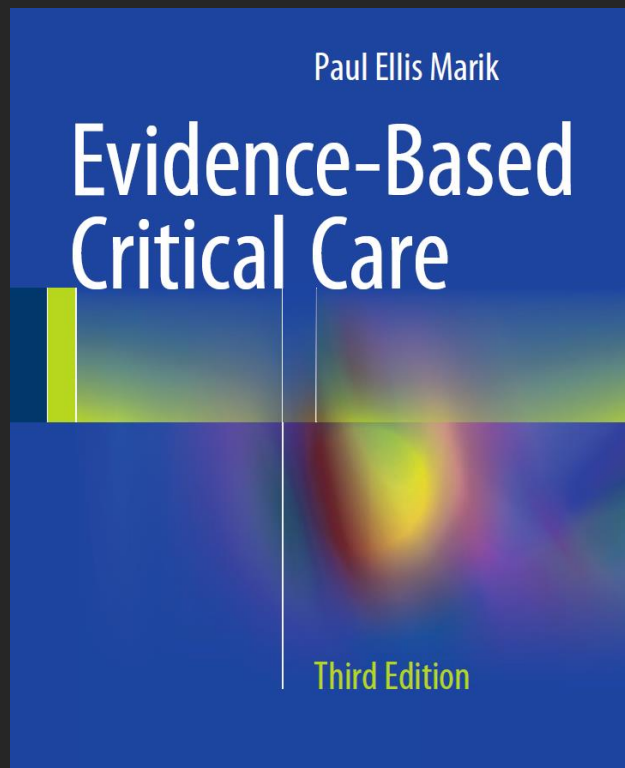




# Můj první den... ...na neurochirurgické JIP

Jakub Kletečka, KARIM FN a LF UK Plzeň

# Výbava pro začátek...



## Chapter 5 House Officers Guidelines 1: Housekeeping

### Jak dělat vizitu na jednotce intenzivní péče

**Matějovič Martin**

1. interní klinika, Univerzita Karlova v Praze, Lékařská fakulta v Plzni a Fakultní nemocnice Plzeň

*Crit Care Med.* 2009 Jul;37(7):2326-7

*Anest. intenziv. Med.*, 23, 2012, č. 3, s. 129-132

Table 1. Components of “FAST HUGS BID”

FAST HUGS BID

F	Feeding
A	Analgesia
S	Sedation
T	Thromboembolic prophylaxis
H	Head of bed elevation
U	Ulcer (stress) prophylaxis
G	Glycemic control
S	Spontaneous breathing trial
B	Bowel regimen
I	Indwelling catheter removal
D	De-escalation of antibiotics

Crit Care Med. 2009 Jul;37(7):2326-7

Anest. Intensive Care Crit Care Med. 2009 Jul;37(7):2326-7

# Kdo tam na mě čeká?

TBI – kontuze, difuzní axonální poranění,  
traumatické hemoragie

Poranění splachnokrania a baze lební

Krvácení – SDH, EDH, ICH

SAH

Pooperační stavy – supratentoriální tumory,  
výkony v zadní jámě, cévní operace, AVM,  
angiointervence...

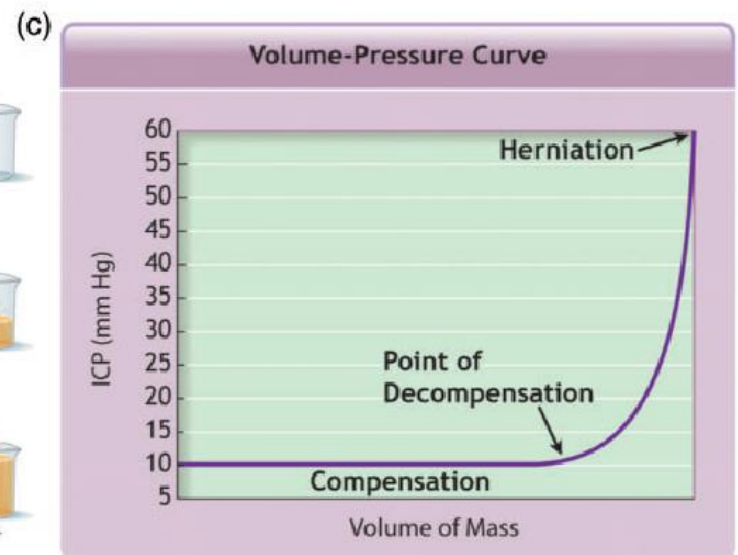
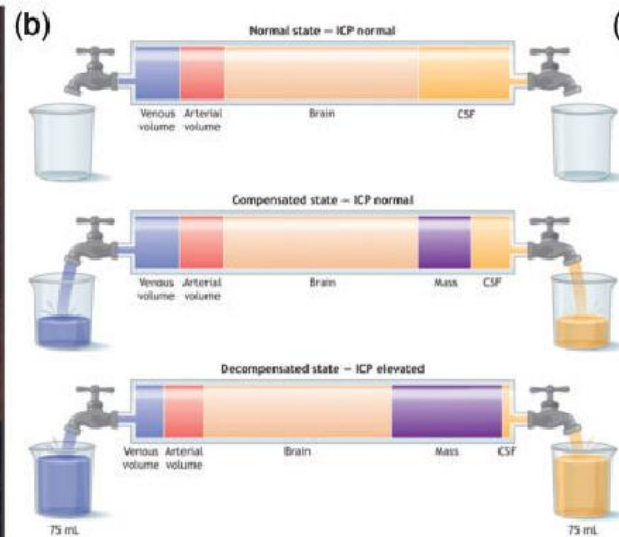
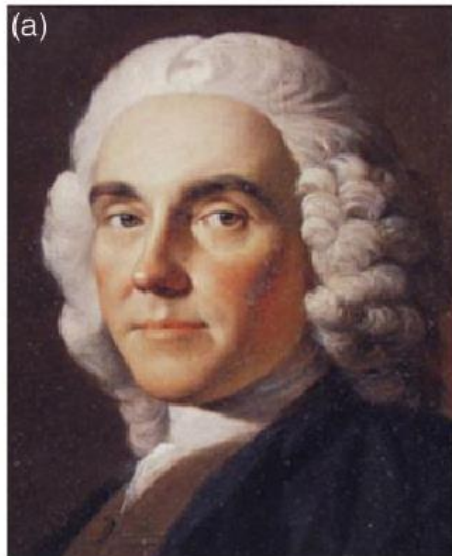
Traumata páteře a míchy

...a možná neuroinfekce, ischemické ikty...



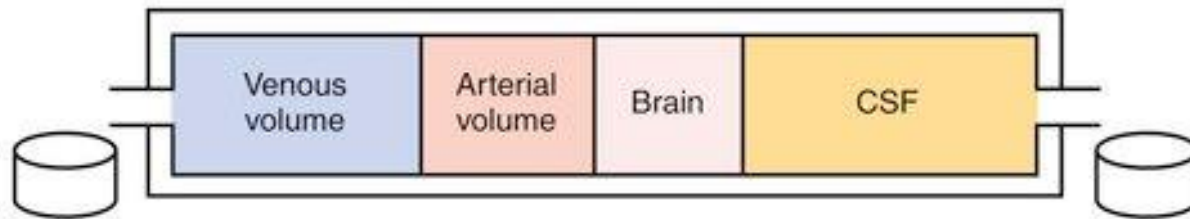
Co je dobré vědět předem?

# Monro-Kellie

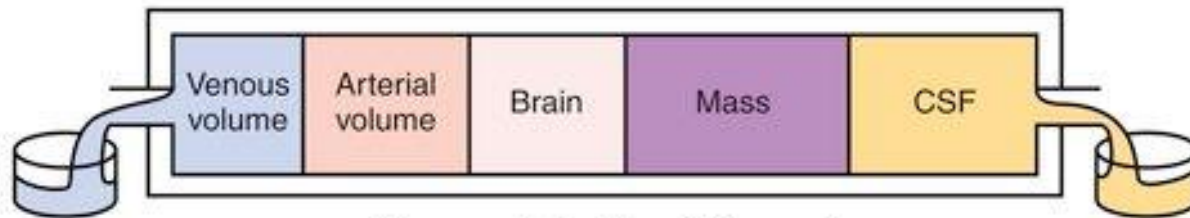


# Monro-Kellie

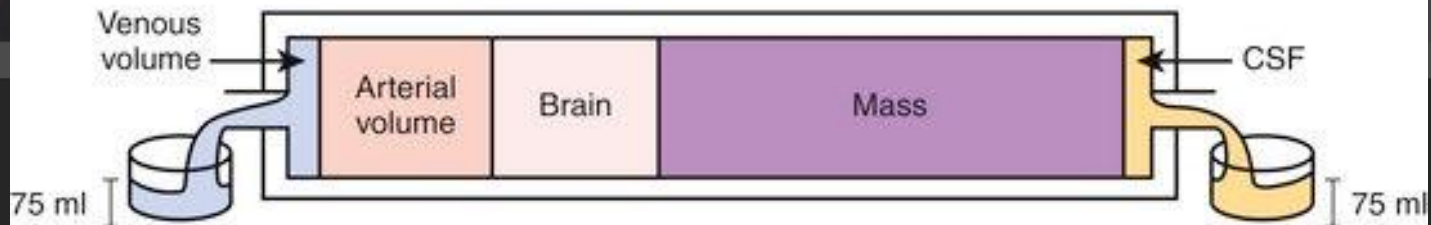
## INTRACRANIAL COMPENSATION FOR EXPANDING MASS



Normal state - ICP normal



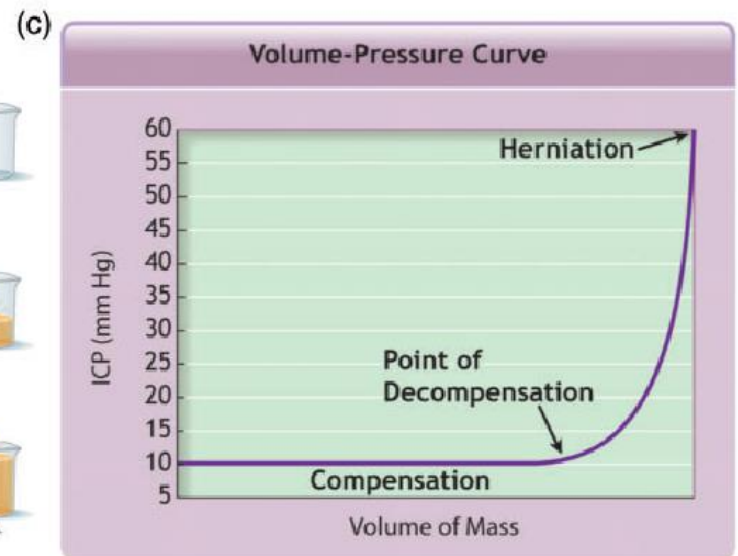
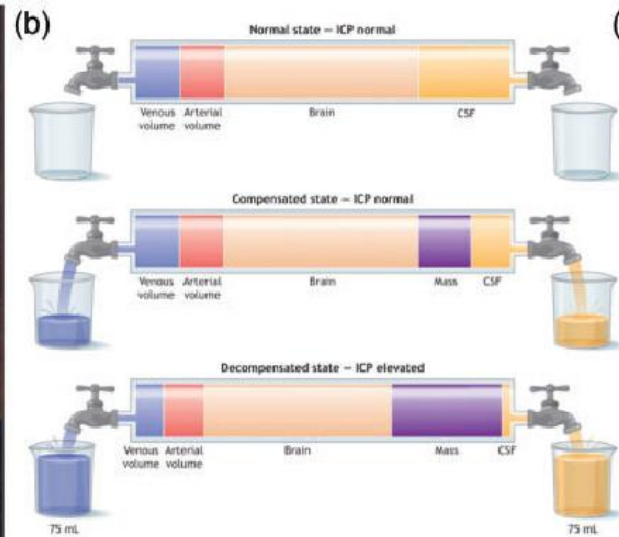
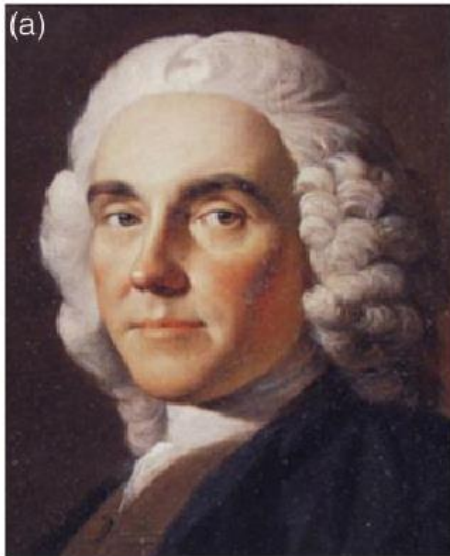
Compensated state - ICP normal



Uncompensated state - ICP elevated

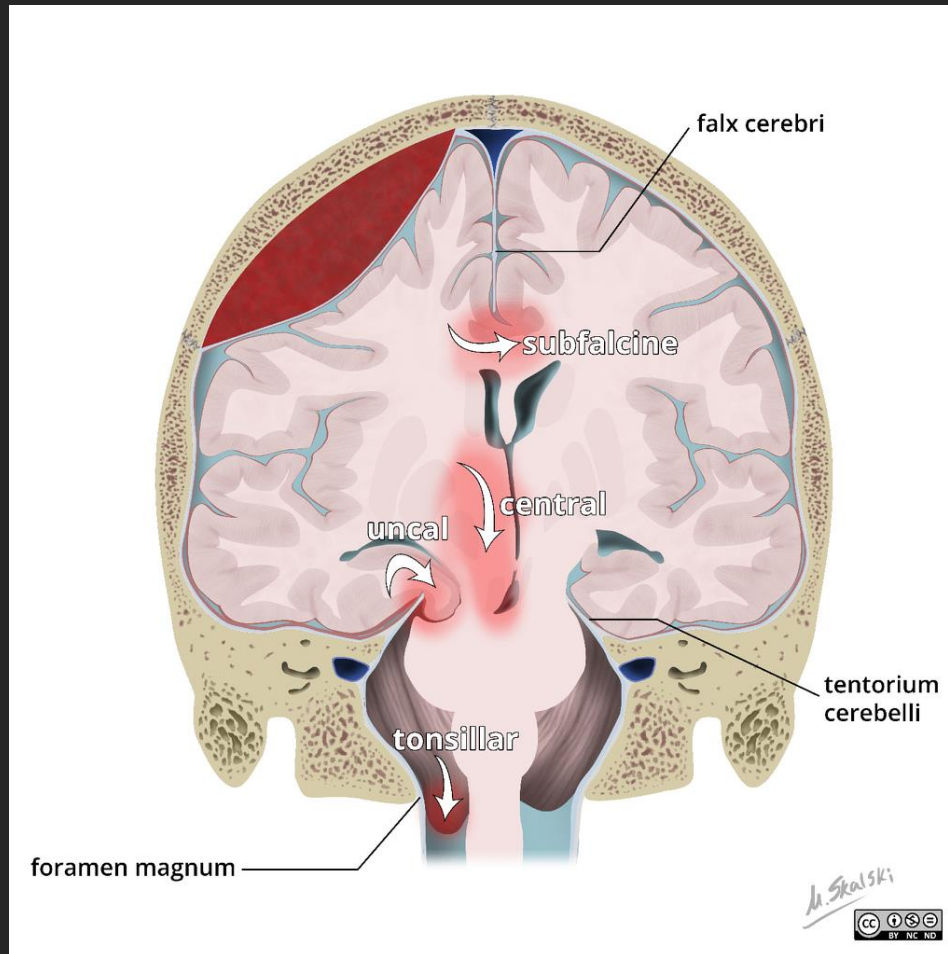


# Monro-Kellie

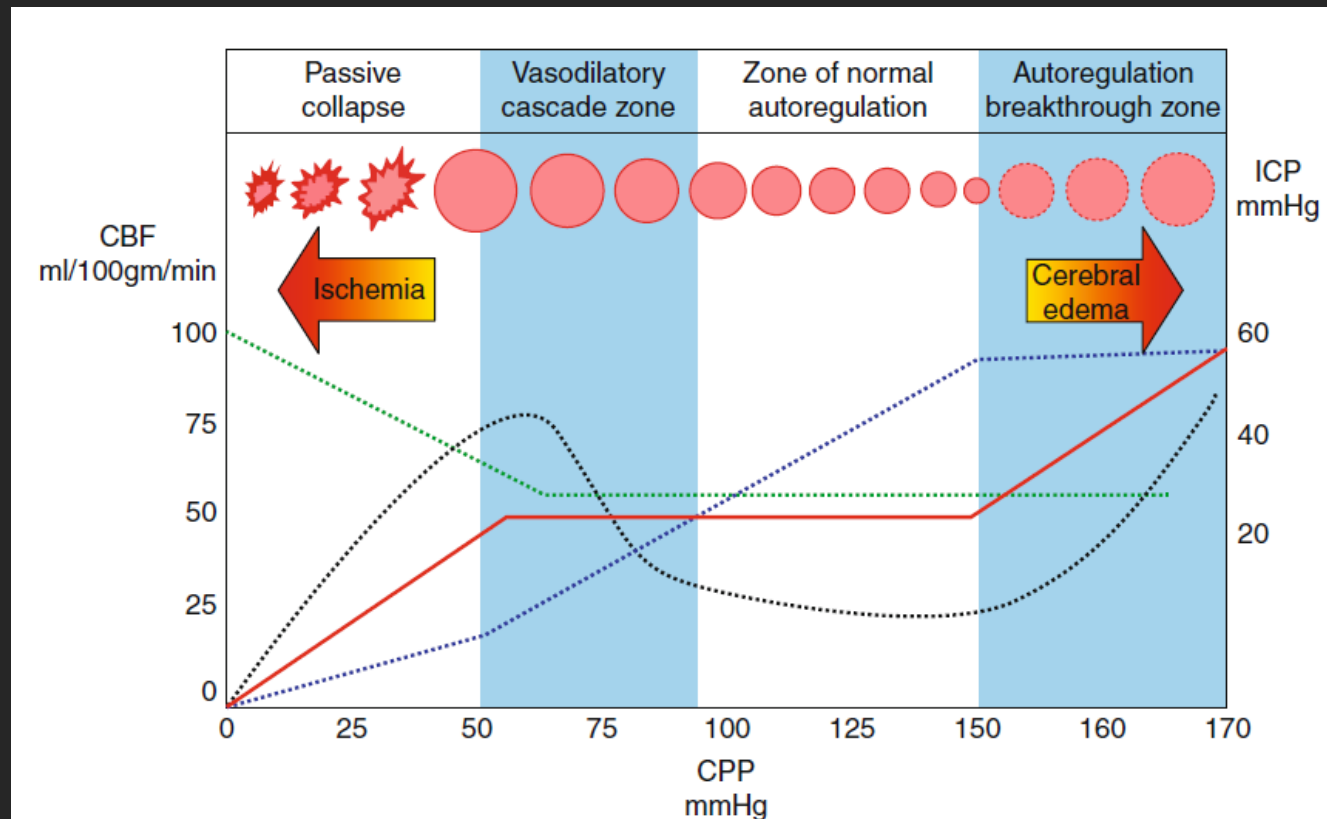




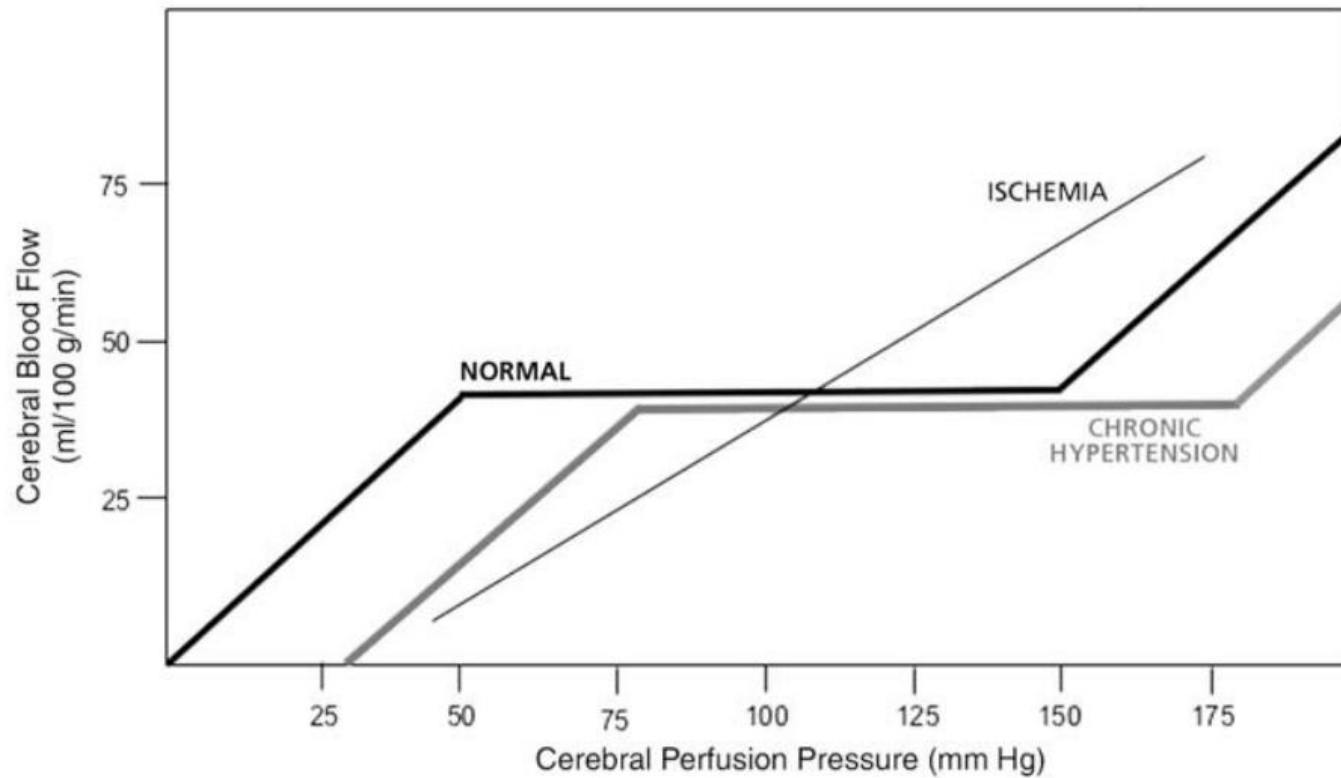
# Herniace



# Autoregulate

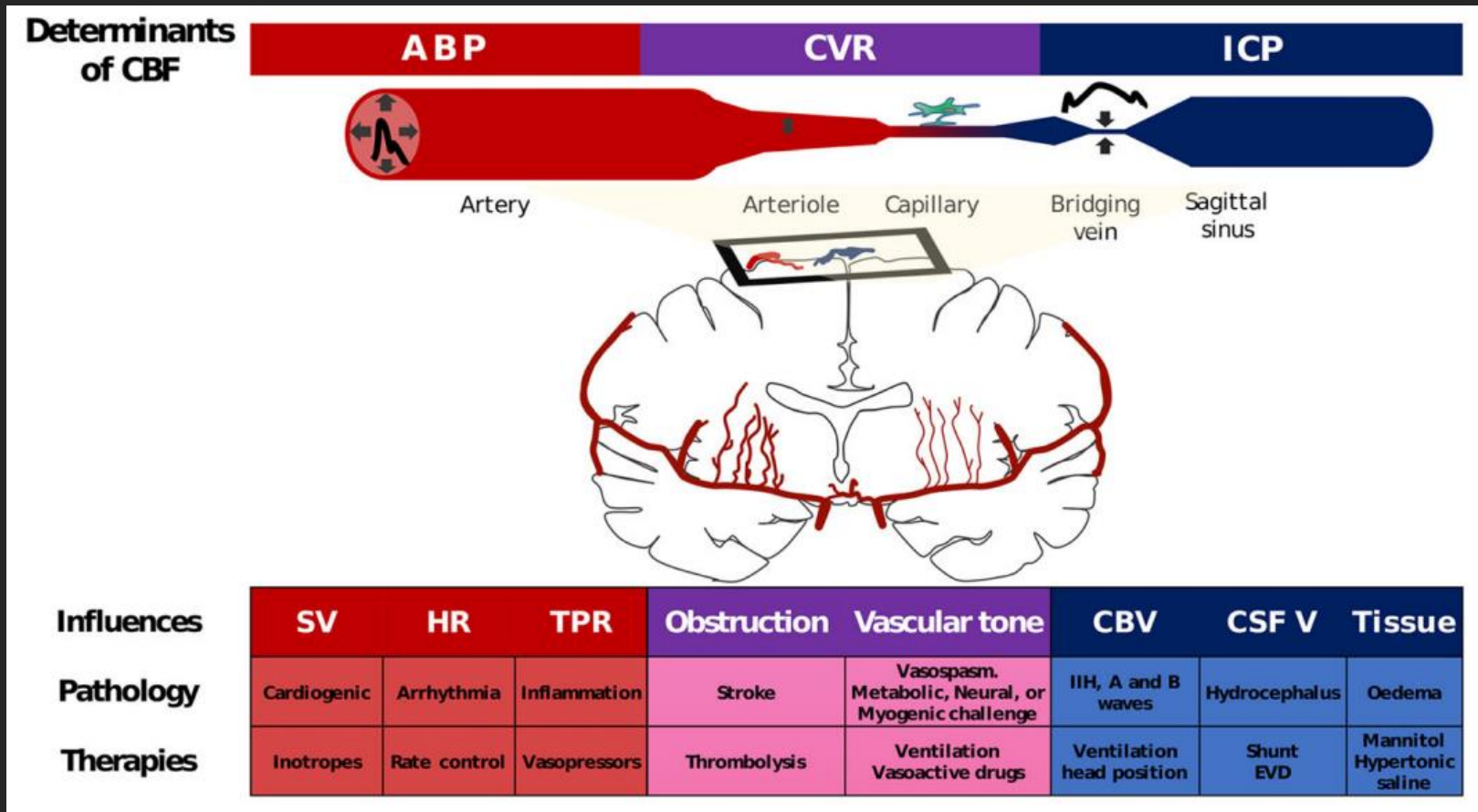


# Autoregulate



$$\text{CPP} = \text{MAP} - \text{ICP}$$

# Cerebral blood flow



# Sekundární postižení mozku

krevní tlak

intrakraniální tlak

$pO_2$

$pCO_2$

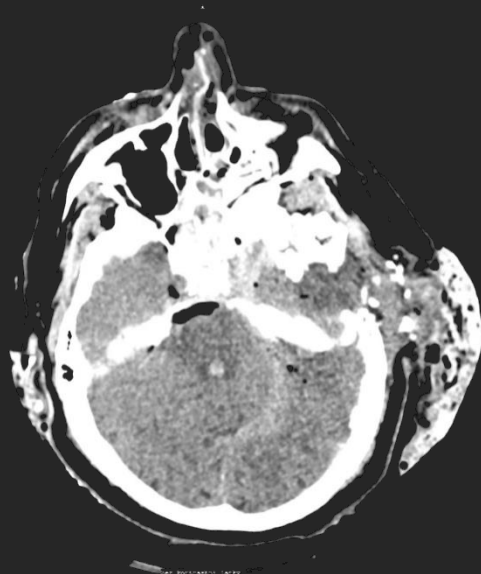
glykémie

teplota

vazospasmy

infekce

...



# Tlakové cíle

Summary of Blood Pressure Management in Selected Neurological Emergencies			
Condition	Target (mmHg)	Recommended medications	<sup>a</sup> Level of evidence
<i>Acute ischemic stroke</i>			
Outside t-PA window			
<sup>b</sup> Most cases	BP $\leq$ 220/120 (option no limit)	Labetalol, esmolol, or nicardipine IV	II
		Candesartan PO	I
Fluctuating deficit or large DWI-PWI mismatch	Consider induced hypertension up to 20–25% baseline MAP elevation	Phenylephrine, dopamine, or norepinephrine IV, follow with midodrine or fludricortisone PO	III
IV thrombolysis	BP $\leq$ 185/110 before and $\leq$ 180/105 after t-PA	Labetalol, esmolol, or nicardipine IV	II
<i>Intracerebral hemorrhage</i>			
Acute phase	MAP $\leq$ 130	Labetalol, esmolol, or nicardipine IV	III
Post-craniotomy	MAP $\leq$ 100	Labetalol, esmolol, or nicardipine IV	III
<i>Subarachnoid hemorrhage</i>			
All cases for 21 days	Avoid SBP $\leq$ 100	Nimodipine 60 mg PO every 4 h	I
Pre-repair	SBP $\leq$ 160	Labetalol, esmolol, or nicardipine IV	III
Symptomatic vasospasm	Raise SBP to maximum 200–220	Phenylephrine, dopamine, or norepinephrine IV	II
<i>Severe traumatic brain injury</i>			
Acute phase (pre-ICP monitor)	SBP $\geq$ 90 (option MAP $\geq$ 90)	Phenylephrine, dopamine, or norepinephrine IV	II
ICU phase (post ICP monitor)	CPP $\geq$ 60	Phenylephrine, dopamine, or norepinephrine IV	II
	CPP $\leq$ 90	Labetalol, esmolol, or nicardipine IV	III
<i>Traumatic spinal cord injury</i>			
For the first 7 days	SBP $\geq$ 90 (option MAP $\geq$ 90)	Phenylephrine, dopamine, or norepinephrine IV	II
<i>Spinal cord infarction</i>			
Within several hours of onset	MAP $\geq$ 95 and lumbar drain to maintain CSF pressure $\leq$ 10 cm	Phenylephrine, dopamine, or norepinephrine IV	III
<i>Hypertensive encephalopathy</i>			
Within 1 h	Lower MAP by 20–25% or DBP to $\leq$ 110 (whichever is higher)	Labetalol, esmolol, or nicardipine IV	II
<i>Eclampsia</i>			
All cases	Maintain 105 $\leq$ MAAP $\leq$ 125	MgSO <sub>4</sub> 2g/hour IV	I
		Labetalol, esmolol, or nicardipine IV	III



# Klinické vyšetření

Vědomí

Kognitivní funkce

Zornice

Hybnost bulbů

Kmenové reflexy

Dechový vzorec

Hybnost

Čití

Bolest

**EYE RESPONSE**

- 4 = Eyelids open or opened, tracking or blinking to command
- 3 = Eyelids open but not to tracking
- 2 = Eyelids closed but opens to loud voice
- 1 = Eyelids closed but opens to pain
- 0 = Eyelids remain closed with pain stimuli

**MOTOR RESPONSE**

- 4 = Thumbs up, fist, or peace sign
- 3 = Localizing to pain
- 2 = Flexion response to pain
- 1 = Extension response
- 0 = No response to pain or generalized Myoclonus status

**BRAINSTEM REFLEXES**

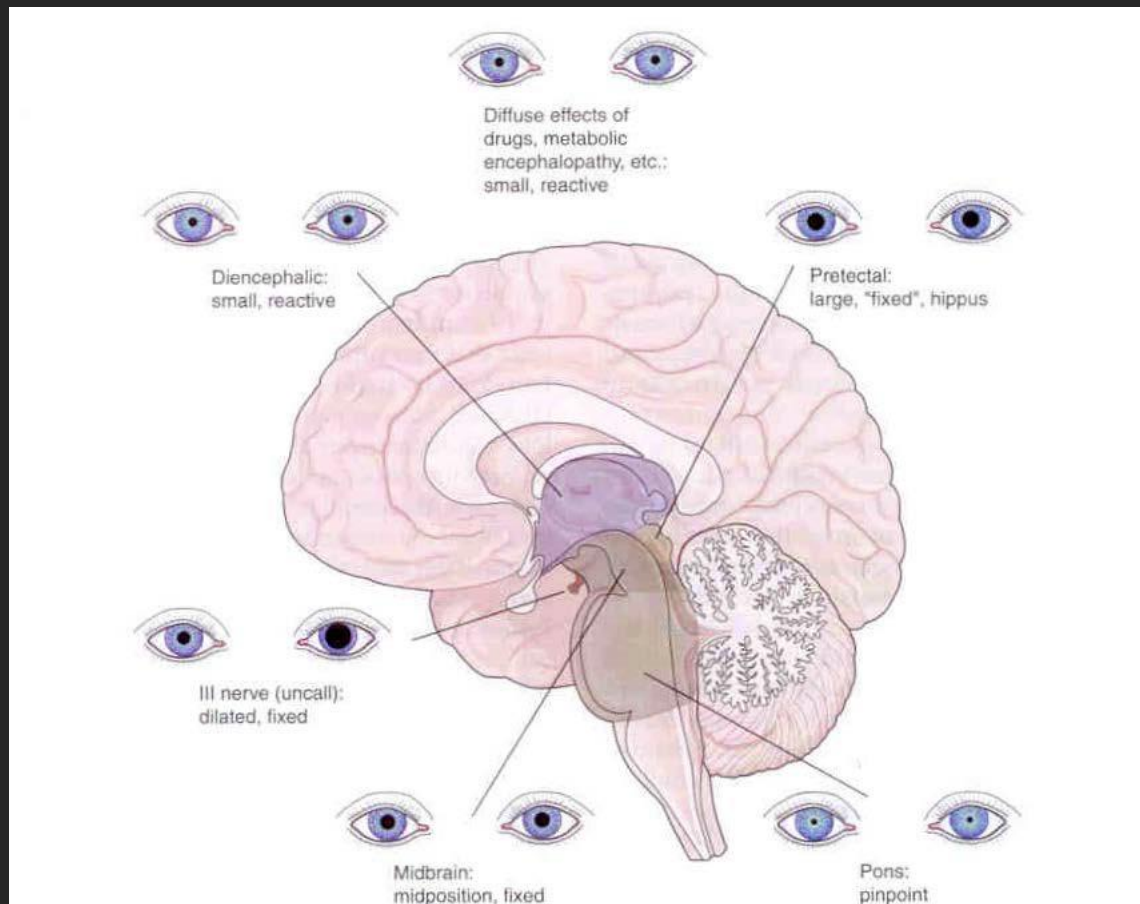
- 4 = Pupil and corneal reflexes present
- 3 = One pupil wide and fixed
- 2 = Pupil or corneal reflexes absent
- 1 = Pupil and corneal reflexes absent
- 0 = Absent pupil, corneal, or cough reflex

**RESPIRATION**

- 4 = Regular breathing pattern
- 3 = Cheyne-Stokes breathing pattern
- 2 = Irregular breathing
- 1 = Triggers ventilator or breathes above ventilator rate
- 0 = Apnea or breathes at ventilator rate

D.E. O'NEILL 2005  
EC174021-005-1

# Klinické vyšetření



# Skórovací systémy

TISS body	GCS, Apache II	ISS + TRISS	SOFA	RAMSAY	NIHSS	Delirium a stav vědomí	Výkony a komplikace
-----------	----------------	-------------	------	--------	-------	------------------------	---------------------

  
**NIH Stroke Scale**

Vědomí	<input type="text"/>
Otázky (pacient dotázán na měsíc a svůj věk)	<input type="text"/>
Příkazy (otevřít a zavřít oči, sevřít a uvolnit neparetickou ruku)	<input type="text"/>
Schopnost sledovat očima (horizontální pohyb očí)	<input type="text"/>
Zorné pole	<input type="text"/>
Obrna n. VII (vycenit zuby, nakrčit čelo, zavřít oči)	<input type="text"/>
Motorická odpověď horních končetin	<input type="text"/>
Motorická odpověď dolních končetin	<input type="text"/>
Ataxie na končetinách (prst - nos, pata - koleno)	<input type="text"/>
Senzorická funkce - hmat	<input type="text"/>
Řeč - afasie	<input type="text"/>
Řeč - dysartrie	<input type="text"/>
Neglect syndrom a fenomén extinkce	<input type="text"/>

Total Stroke Scale

  
**Hunt-Hess**

<input type="text"/>	Hunt - Hess <input type="text"/>
----------------------	----------------------------------

  
**WFNS SAH klasifikace**

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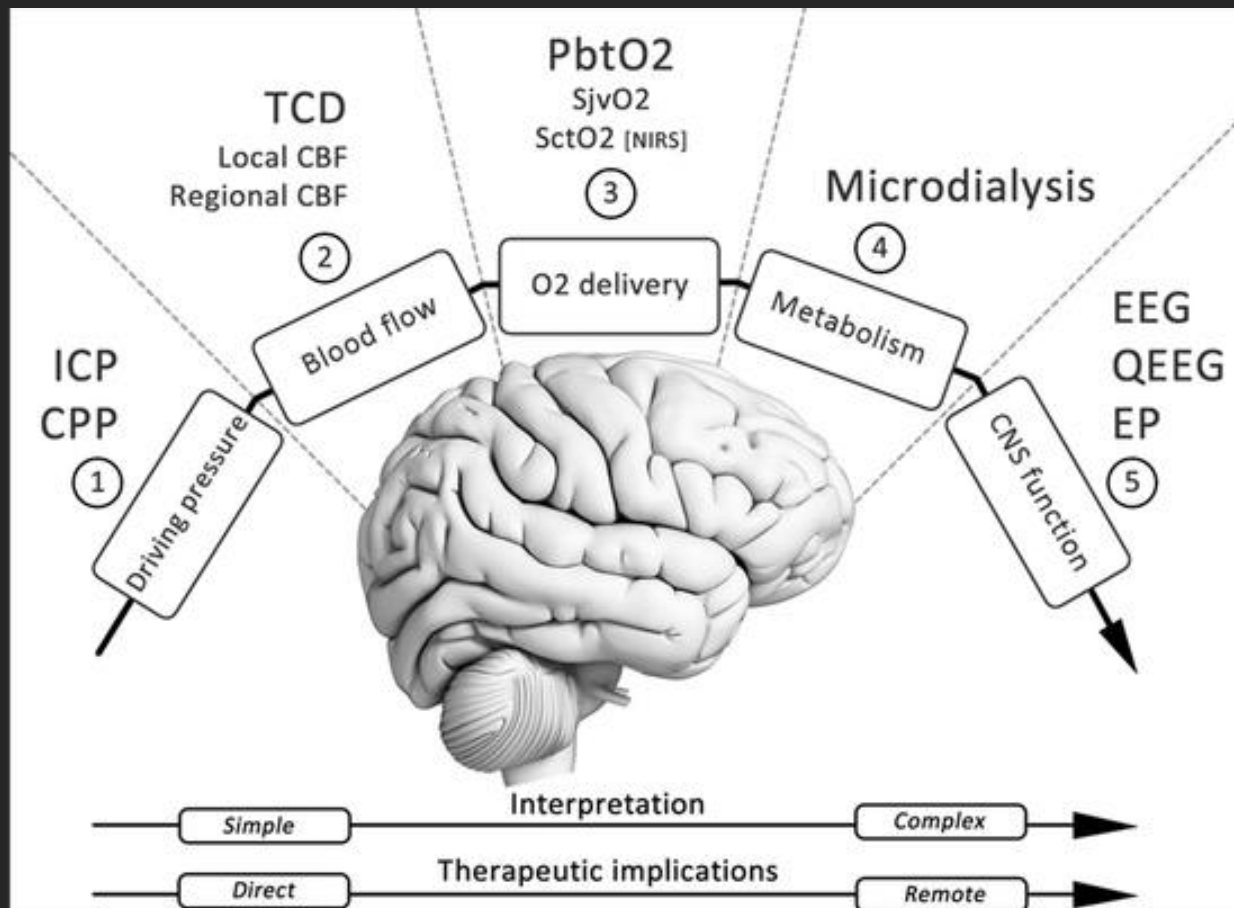
  
**Fisherova klasifikace CT SAH vs Vasospasm**

<input type="text"/>	CT SAH vs Vasospasm <input type="text"/>
----------------------	--

  
**Rankin Scale**

<input type="text"/>	Rankin Scale <input type="text"/>
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# Multimodální monitorace



# Multimodální monitorace

PbtO<sub>2</sub>

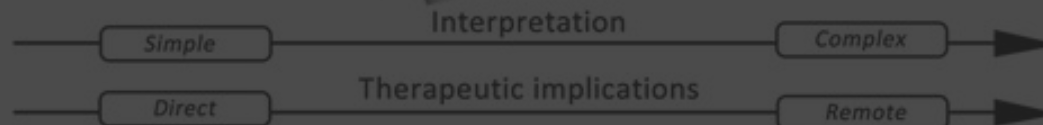
Intensive Care Med (2014) 40:1189–1209  
DOI 10.1007/s00134-014-3369-6

CONFERENCE REPORTS AND EXPERT PANEL

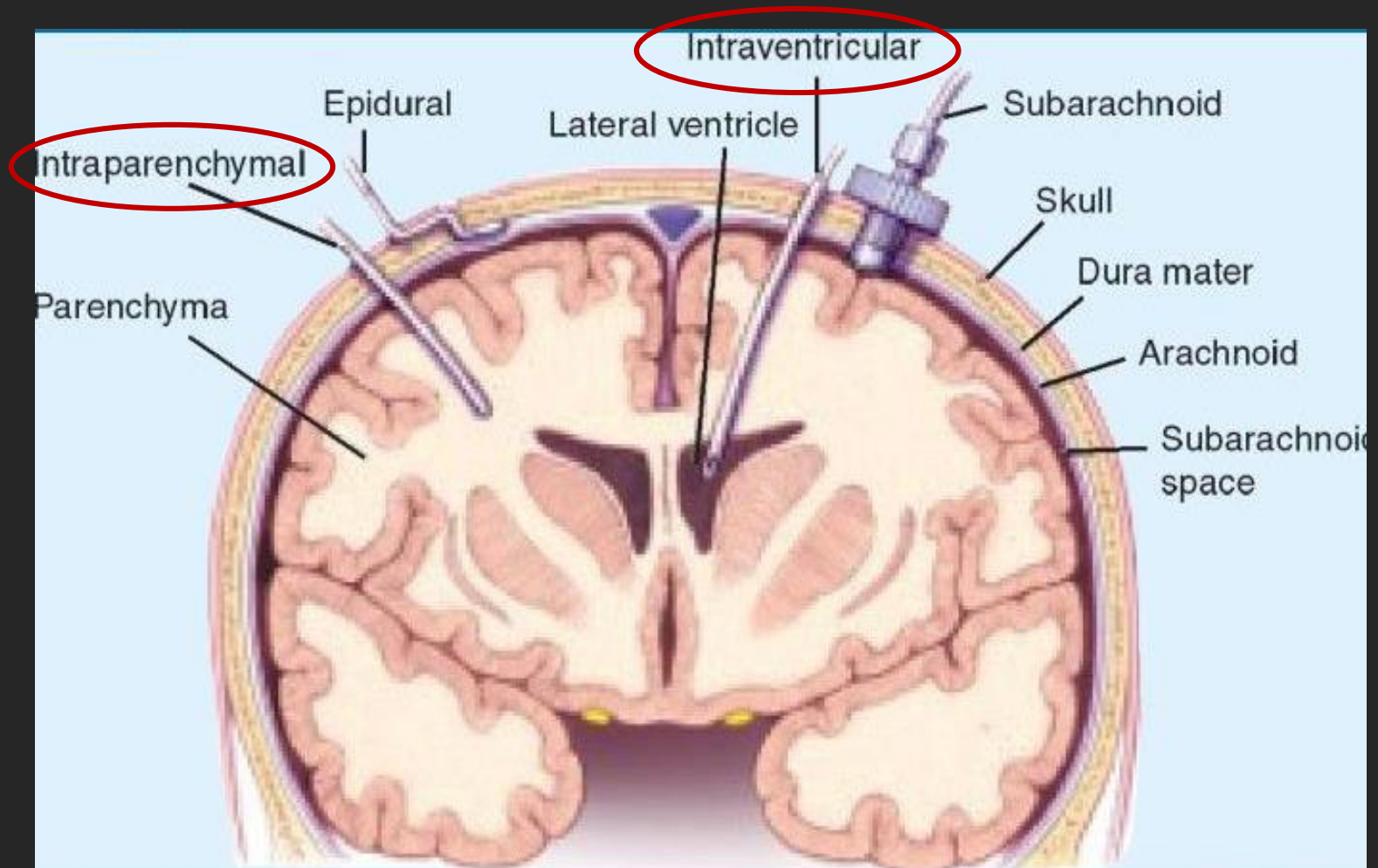
Peter Le Roux  
David K. Menon  
Giuseppe Citerio  
Paul Vespa  
Mary Kay Bader  
Gretchen M. Brophy  
Michael N. Diringer  
Nino Stocchetti  
Walter Videtta  
Rocco Armonda  
Neeraj Badjatia  
Julian Böesel

## **Consensus summary statement of the International Multidisciplinary Consensus Conference on Multimodality Monitoring in Neurocritical Care**

**A statement for healthcare professionals from the  
Neurocritical Care Society and the European Society  
of Intensive Care Medicine**

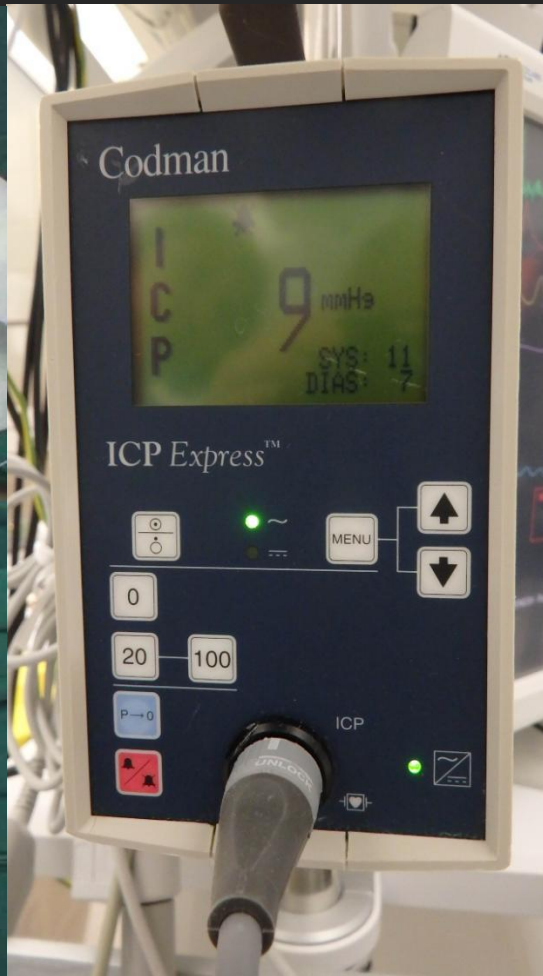
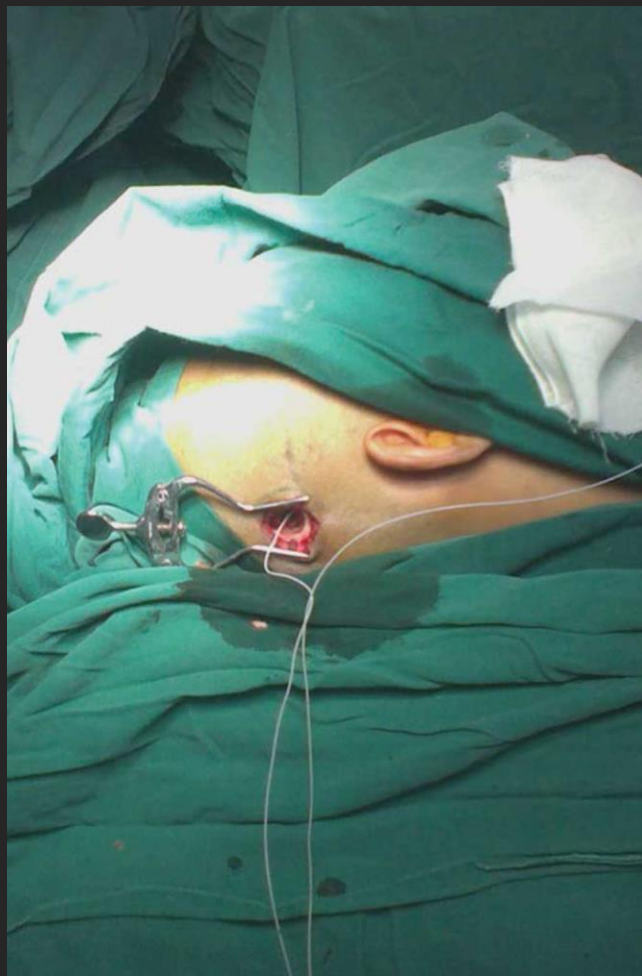


# ICP



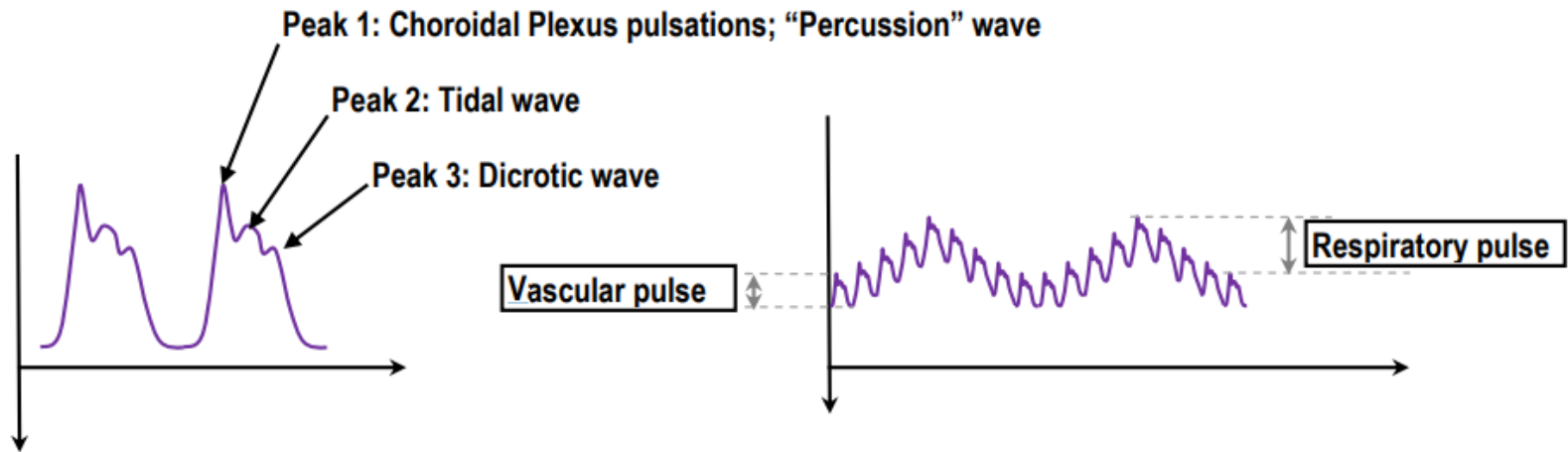


# ICP

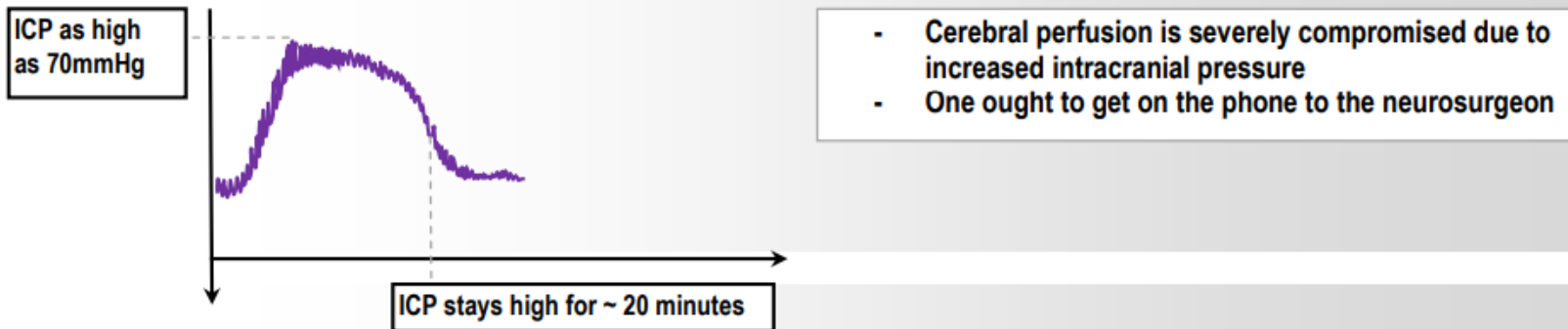




# ICP



## "A" waves, or plateau waves:

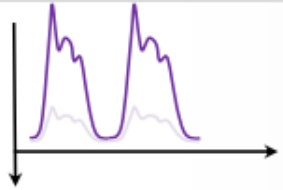


### My ICP trace is flat



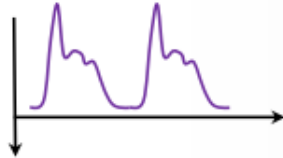
- Your EVD is clogged or kinked.
- Your patient has died.

### Increased (or decreased) amplitude of all waves (unchanged waveform components)



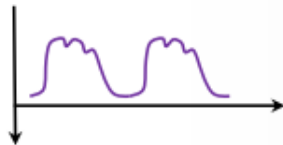
- Increasing CSF volume (or decreased);
- if you drain off a large volume of CSF, the waveform won't change shape, but it will decrease in amplitude.
- This will also happen in a patient with a missing bone flap

### Prominent P1 wave



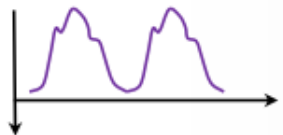
- The systolic BP is too high
- The ICP trace looks a lot like the art line trace

### Diminished P1 wave



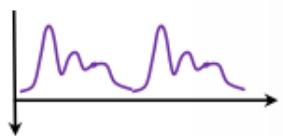
- If the systolic BP is too low P1 decreases and eventually disappears, leaving only P2.
- P2 and P3 are not changed by this

### Prominent P2 wave



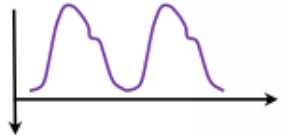
- The mass lesion is increasing in volume
- This trace means the intracranial compliance has decreased; you can also get this with an inspiratory breath hold (as ICP will also rise)
- 

### Diminished P2 and P3 waves



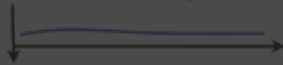
- This happens in a hyperventilated patient

### Rounded ICP Waveform



- ICP is critically high

## My ICP trace is flat

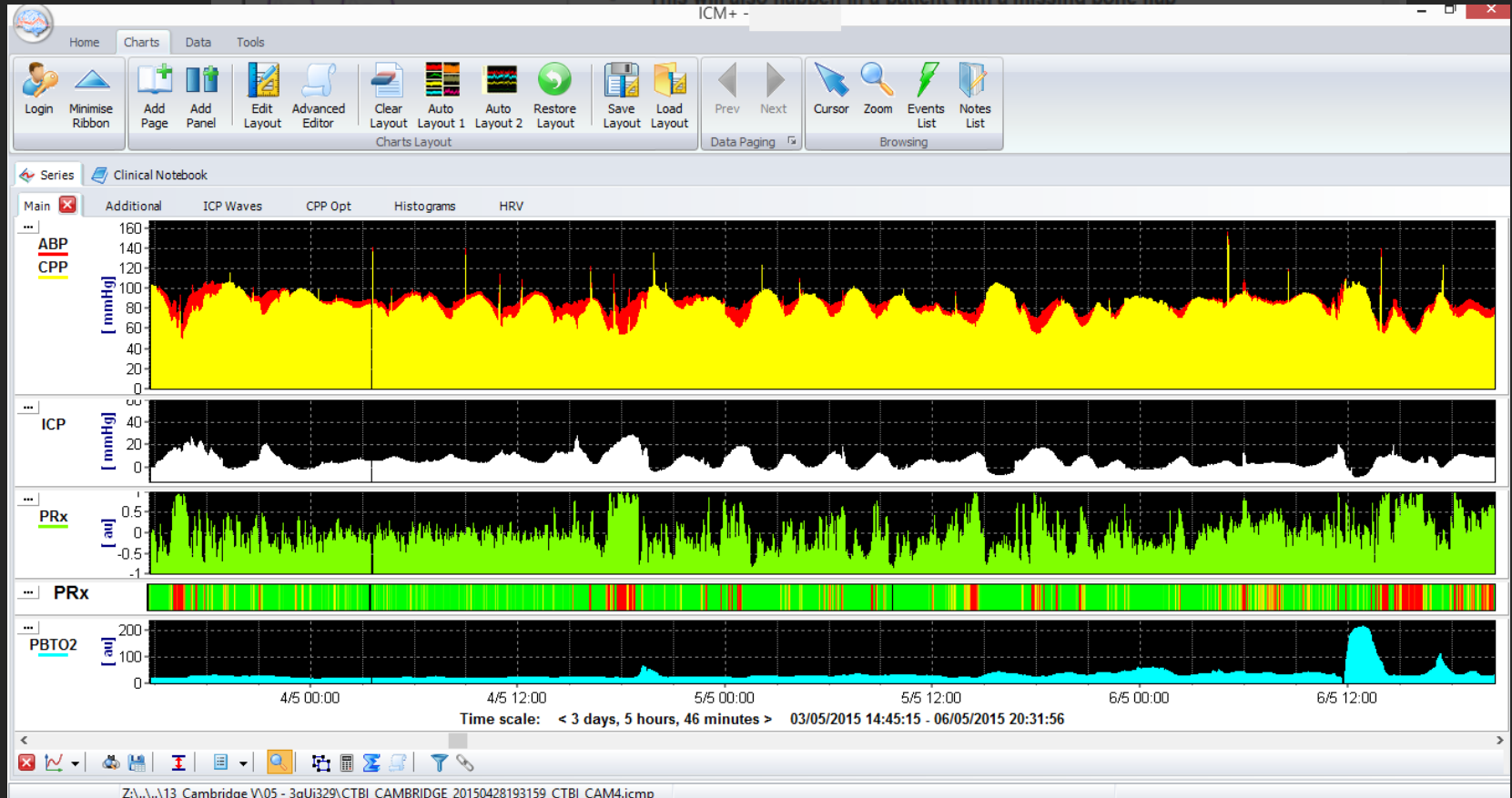


- Your EVD is clogged or kinked.
- Your patient has died.

## Increased (or decreased) amplitude of all waves (unchanged waveform components)



- Increasing CSF volume (or decreased);
- if you drain off a large volume of CSF, the waveform won't change shape, but it will decrease in amplitude.
- This will also happen in a patient with a missing bone flap

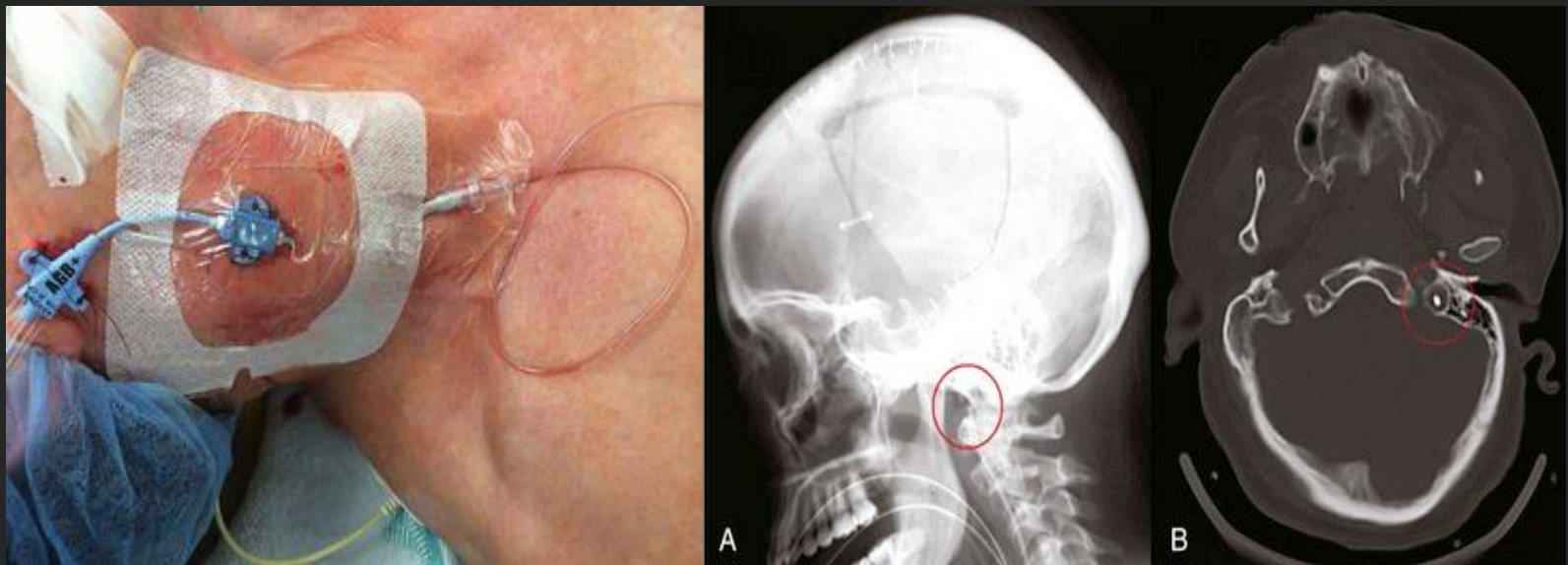


## Rounded ICP Waveform

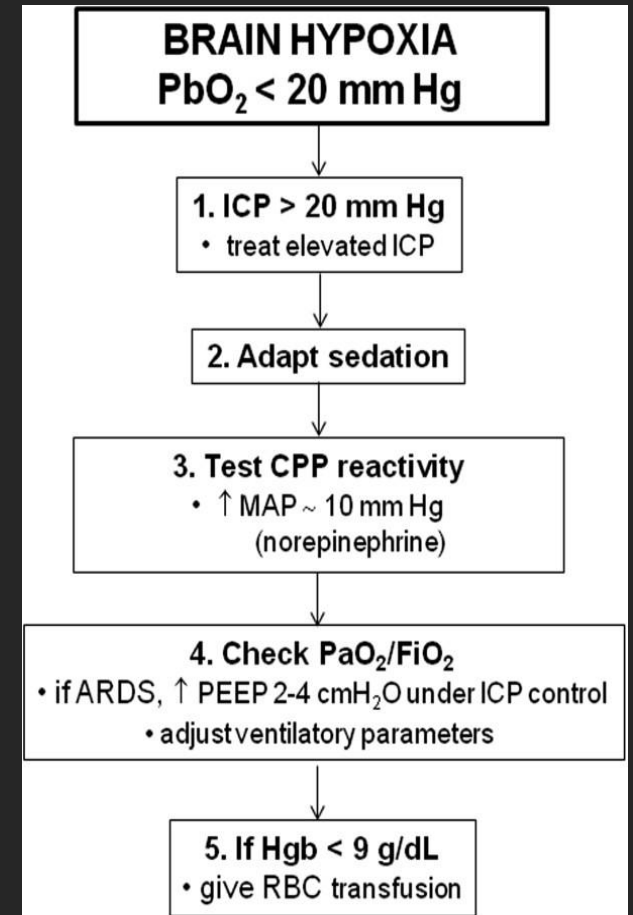


- ICP is critically high

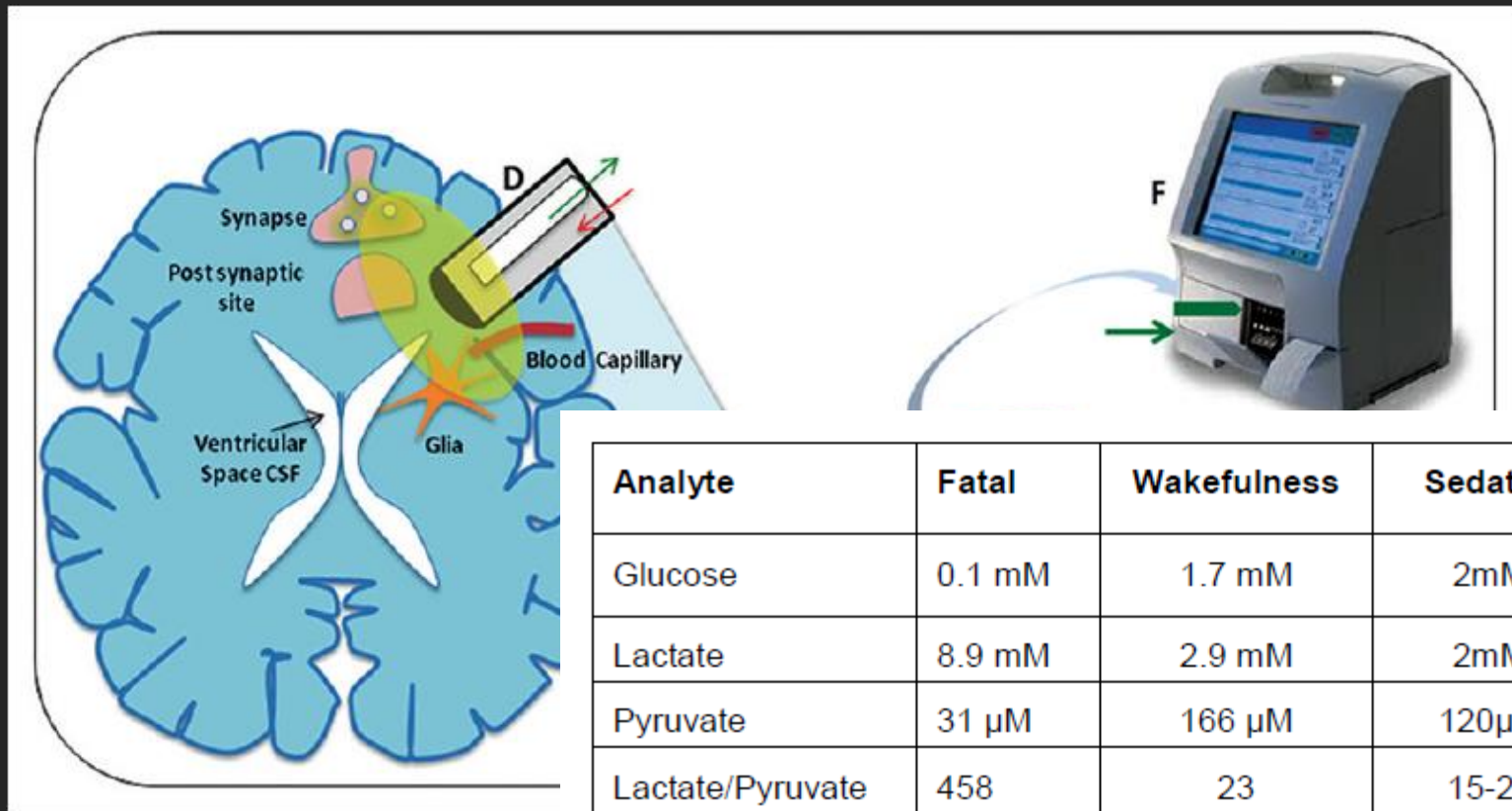
SjO<sub>2</sub>



PbtO<sub>2</sub>

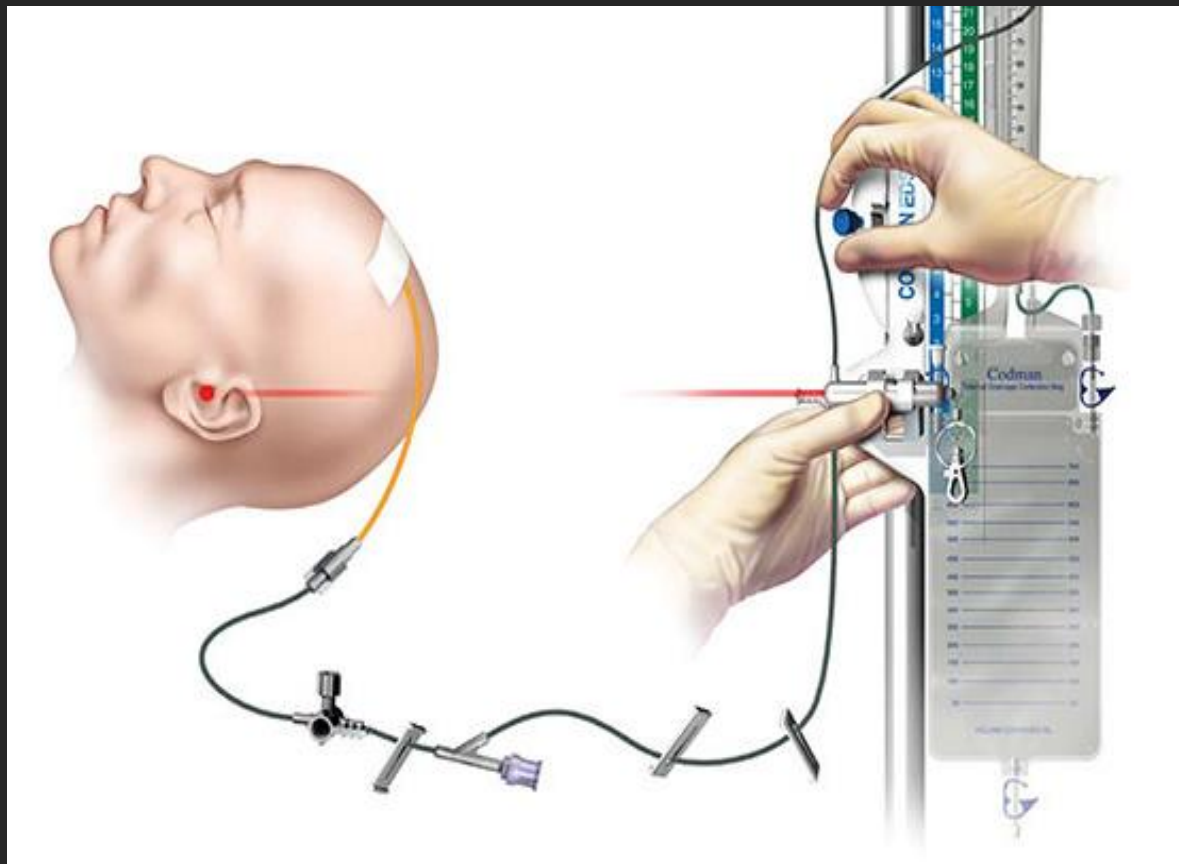
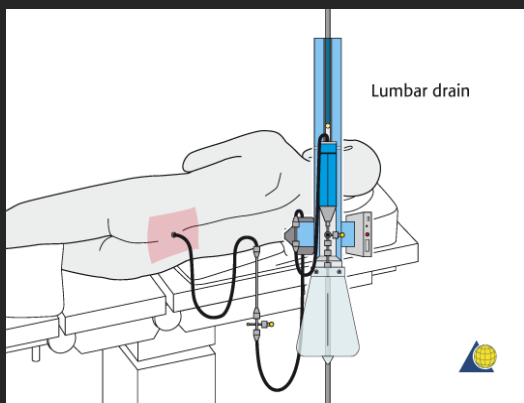
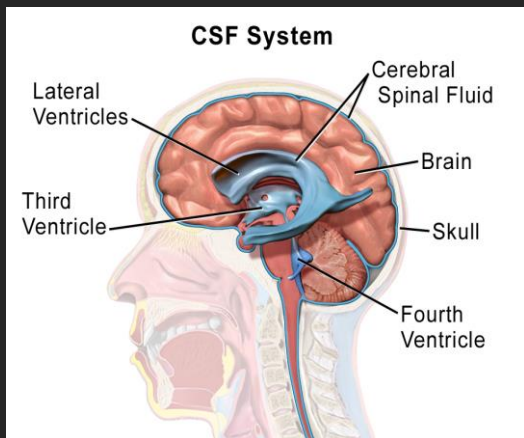


# Mikrodialýza



Analyte	Fatal	Wakefulness	Sedated
Glucose	0.1 mM	1.7 mM	2mM
Lactate	8.9 mM	2.9 mM	2mM
Pyruvate	31 $\mu$ M	166 $\mu$ M	120 $\mu$ M
Lactate/Pyruvate	458	23	15-20
Glycerol	573 $\mu$ M	82 $\mu$ M	20-50mM
Glutamate	381 $\mu$ M	16 $\mu$ M	10 $\mu$ M

# Komorová a lumbální drenáž





# Terapie nitrolební hypertenze

Poloha

Sedace

Osmoterapie

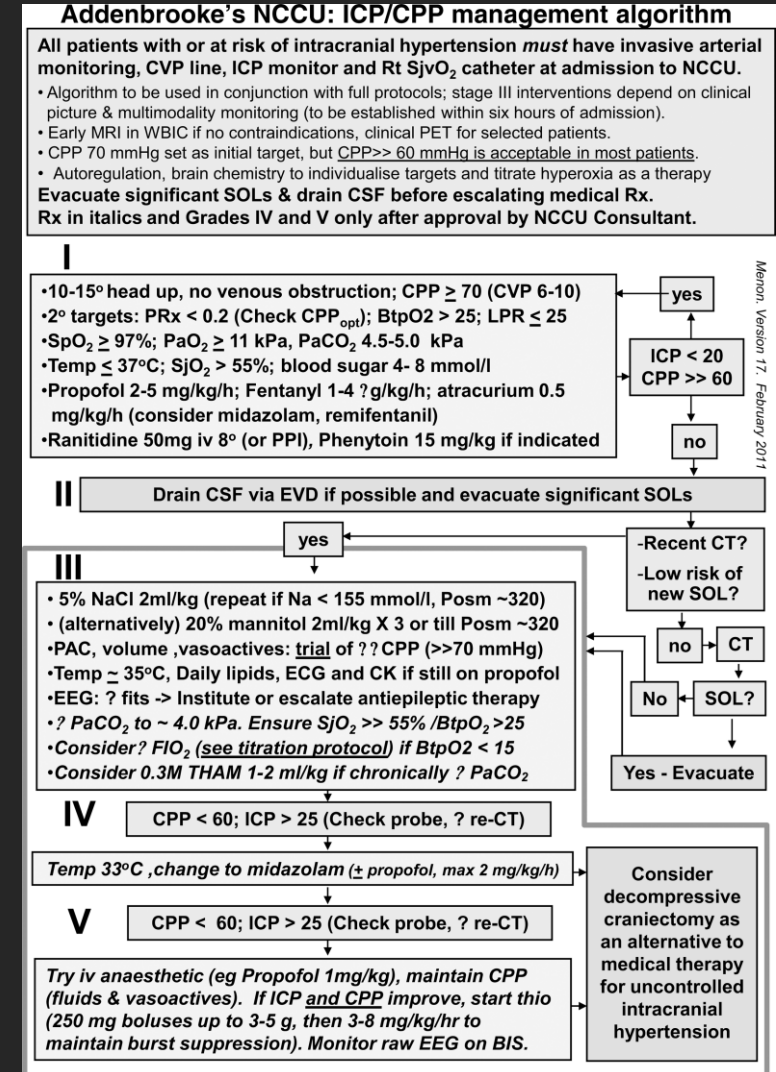
Ventilace

Teplota

Drenáž

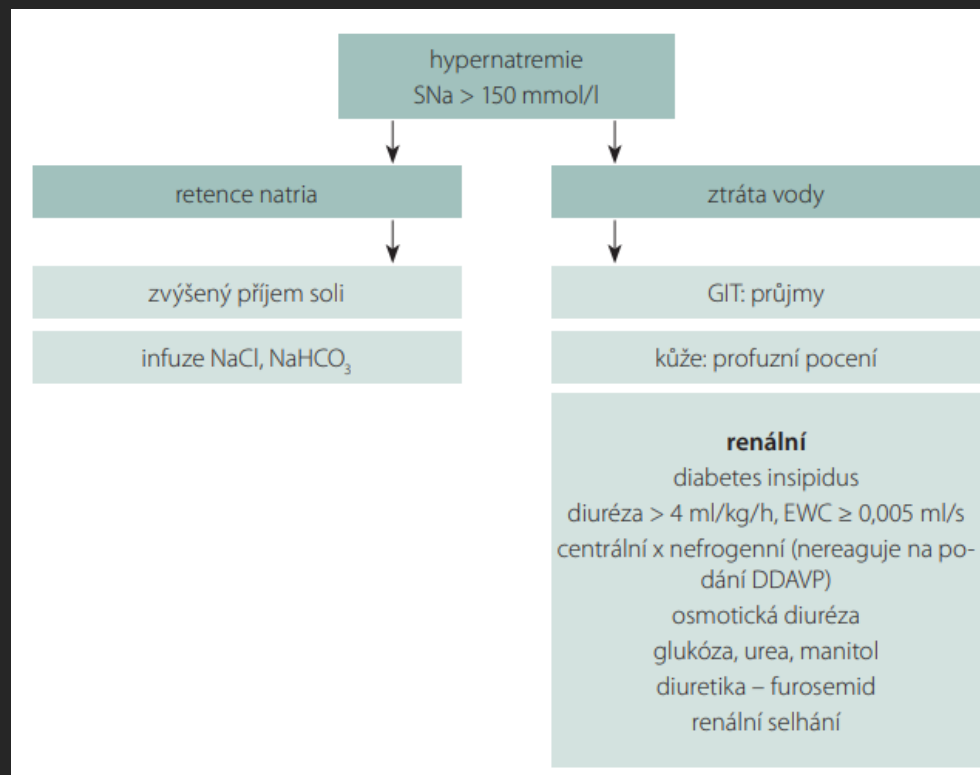
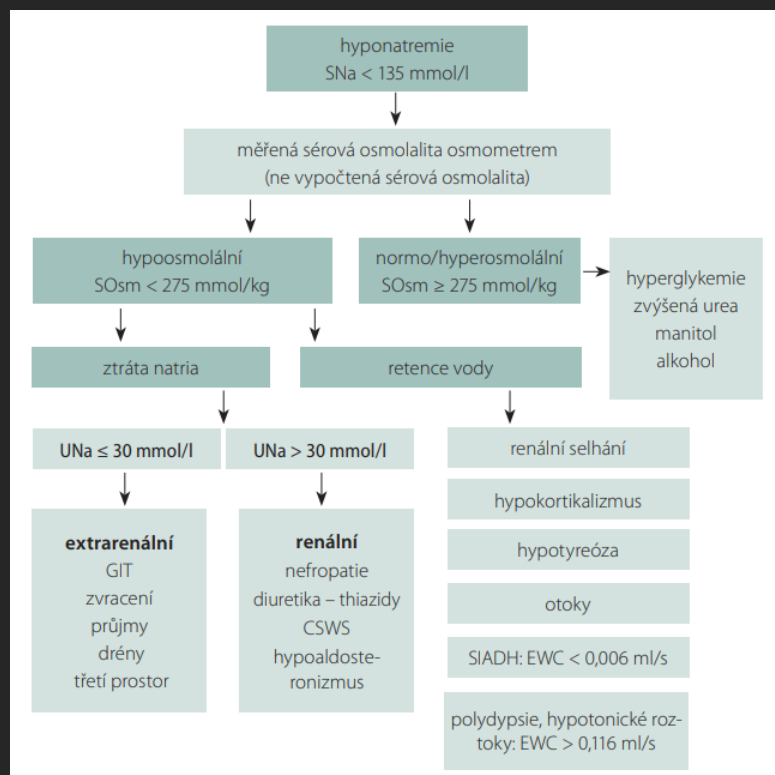
Dekomprese

...a co kortikoidy?

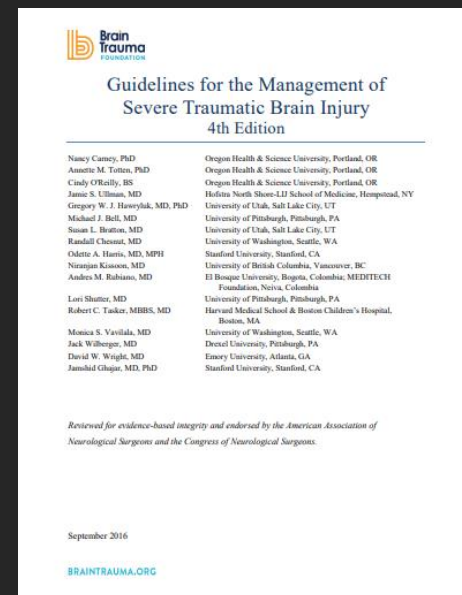
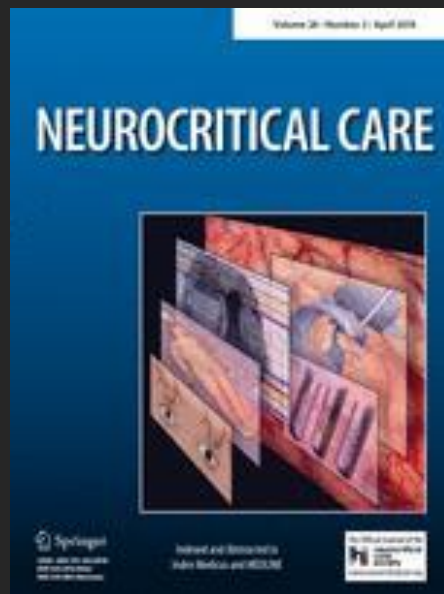
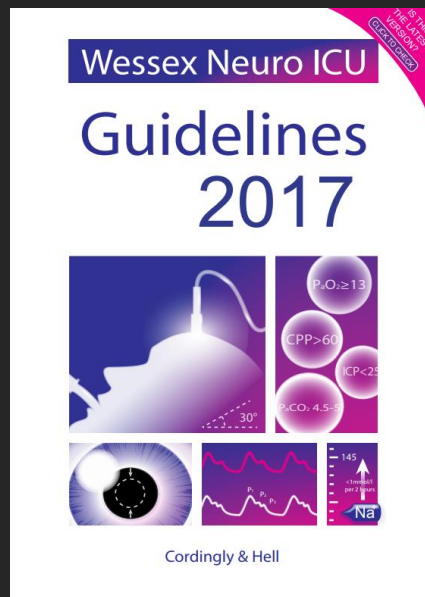


# Poruchy regulace vody a iontů

## diabetes insipidus × SIADH × CSWS



# Kam dál?



Neurocrit Care . Volume 27, Issue 1 Supplement, September 2017

[www.neuroicu.org.uk](http://www.neuroicu.org.uk)

[braintrauma.org](http://braintrauma.org)

děkuji za pozornost

[jakub@kletecka.cz](mailto:jakub@kletecka.cz)

