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# Sůl nad zlato ? – metabolické postižení CNS



**ÚVN**  
ÚSTŘEDNÍ VOJENSKÁ NEMOCNICE  
Vojenská fakultní nemocnice Praha

# Kazuistika - Anamnéza

- Muž \* 1971
  - 5-6 10<sup>o</sup> denně
  - Kuřák
  - aSDH – NCH 2011
  - VCHGD, 2x perforace
  - Anamnesticky epilepsie, aktuálně bez terapie
  - Šedý zákal
  - Léčil se s „plícemi“
  - FA: o

# Kazuistika – NO & status presens

- 4 M únava
  - 1 T kašel a rýma (únor/březen)
  - 5 dnů PN
  - 24 hodin bezvědomí (somnia GCS 14>7)
- &
- GCS 7
  - OTI/UPV, žluté sputum +++, SpO<sub>2</sub> 100%
  - SR 84/min., TK 140/80, laktát 2.3 mmol/l
    - 36,5°C, dehydratace, koncentrovaná moč
    - Hematom na levém oku, oděrky na hlavě

# Kazuistika – laboratorní vyšetření

- Leukocyty 13 tisíc, CRP 43, PCT 2,29
- Hb 126 g/l, Hct 36%
- Urea 1.14 mmol/l, Kreatinin 46  $\mu$ mol/l
- AST 3,6, ALT 8,16, GMT 5,87
- P 0,91
- Albumin 24, prealbumin 0,05
- Na 97 mmol/l, Cl 57 mmol/l
- OSM 214

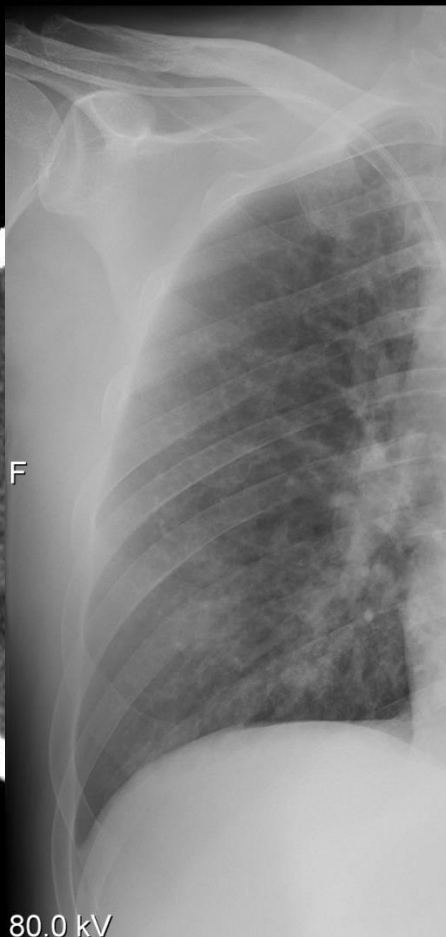
# Kazuistika – zobrazovací metody

CT/202/32  
Axial  
BRAIN AXL 3.0, iDose  
BRAIN



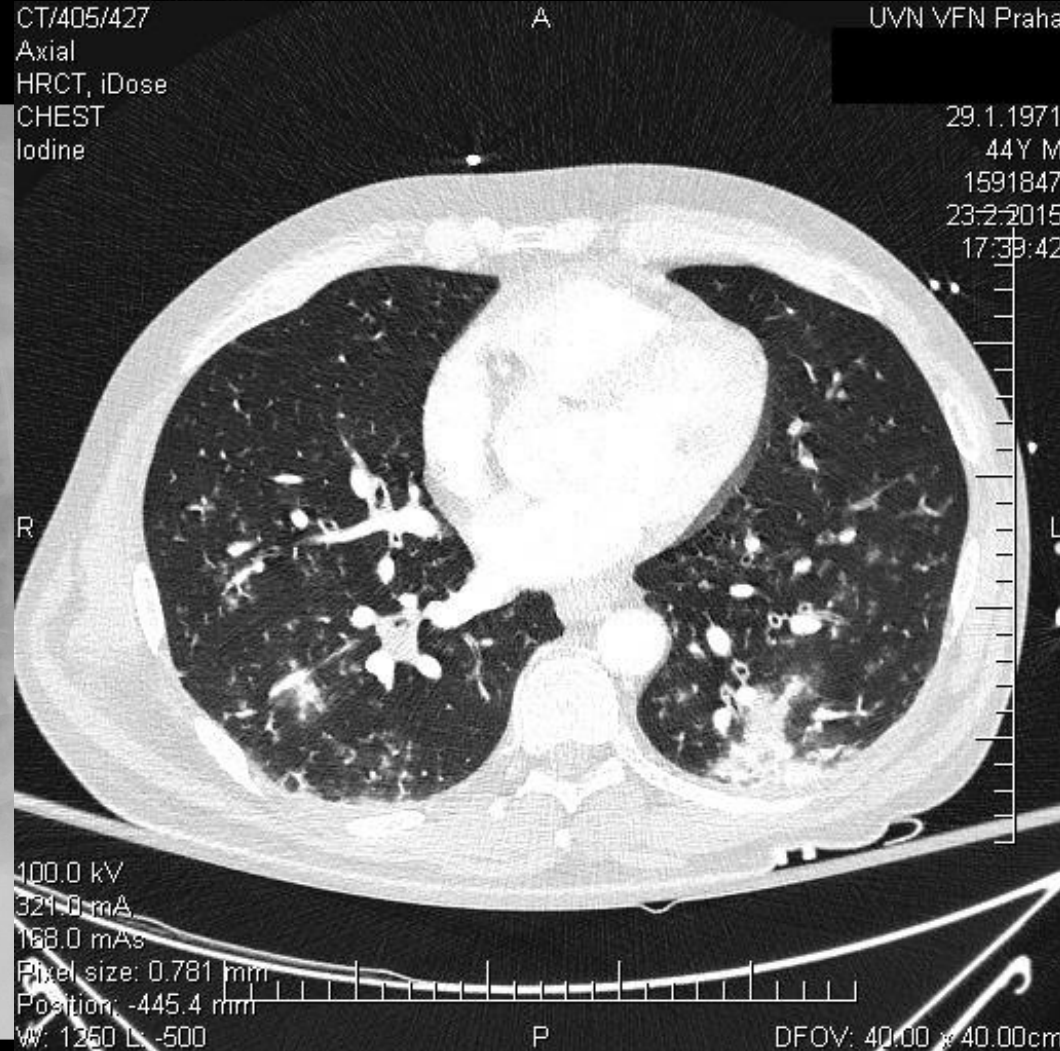
120.0 kV  
635.0 mAs  
356.0 mAs  
Pixel size: 0.672 mm  
Position: 40.1 mm  
W: 80 L: 40

CR/1/1  
AP  
CHEST



80.0 kV  
3.0 mAs  
Pixel size: 0.125 mm  
W: 4096 L: 2048

CT/405/427  
Axial  
HRCT, iDose  
CHEST  
Iodine



100.0 kV  
321.0 mAs  
168.0 mAs  
Pixel size: 0.781 mm  
Position: -445.4 mm  
W: 1250 L: -500

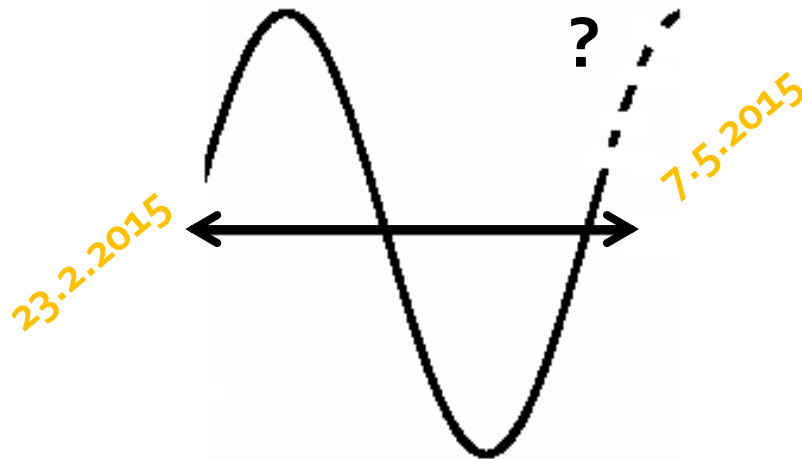
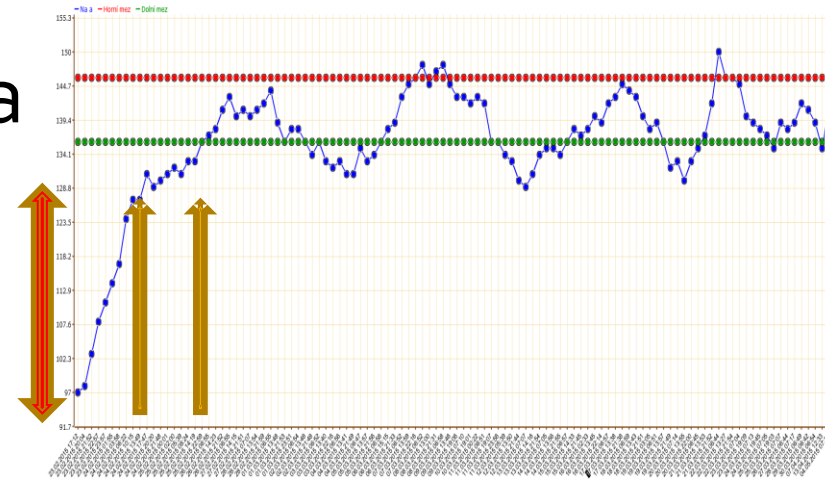
UVN VFN Praha

29.1.1971  
44Y M  
1591847  
23-2-2015  
17:39:42

DFOV: 40.00 x 40.00 cm

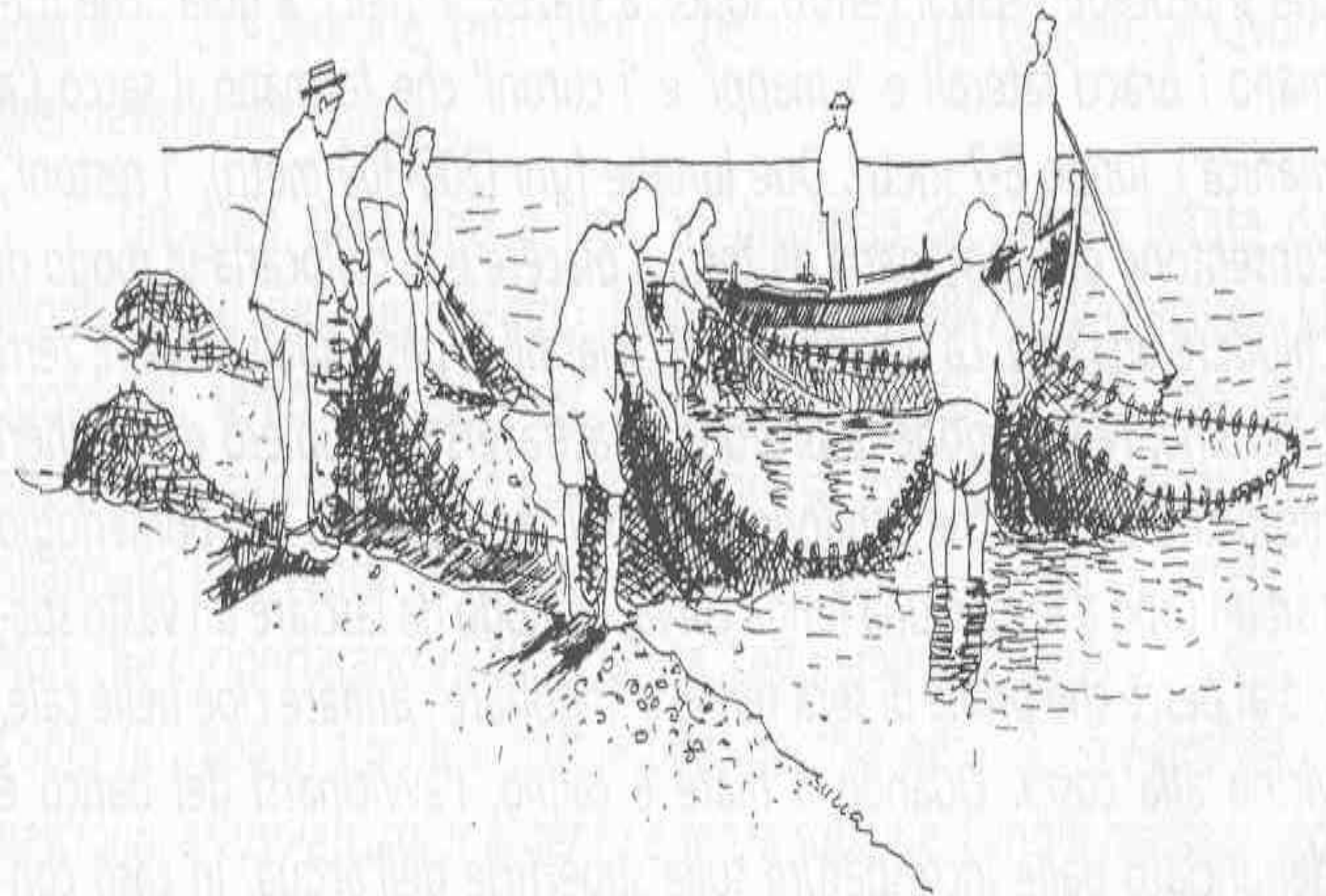
# Kazuistika – průběh léčby

- Rehydratace, substituce Na
- Neurologicky





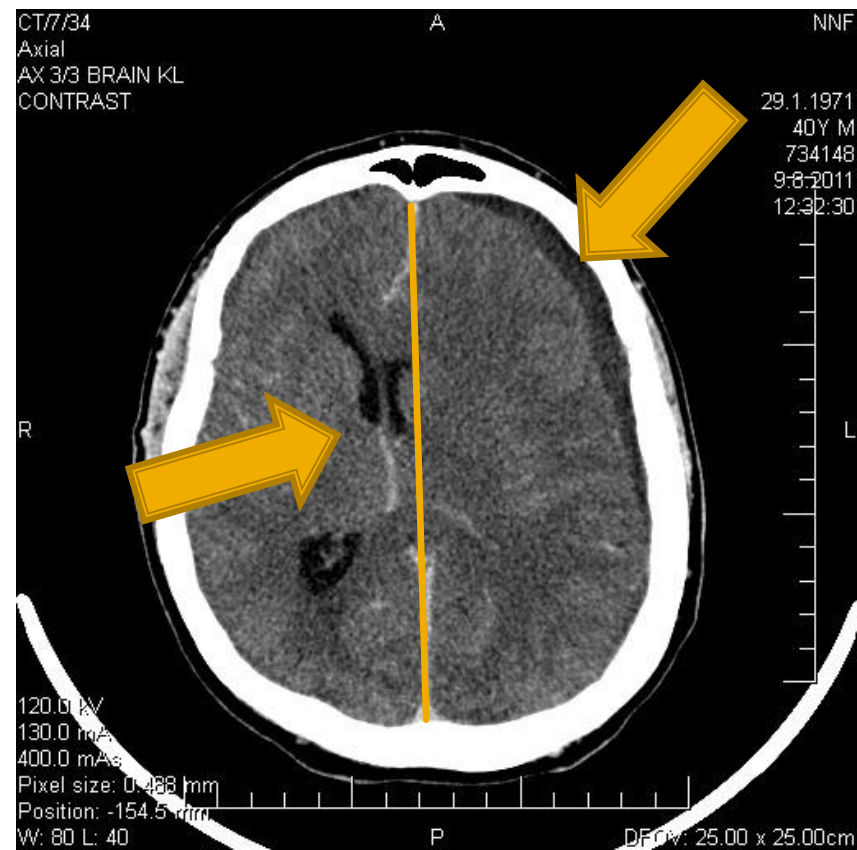






# Kazuistika – diagnostický závěr

- Hypoosmolární dehydratace
- Respirační infekce/aspirace/ "chřipka"
- CSWS
  - Úraz hlavy, 2011 + 2015 ?
  - U-Na  $40 > 560$
  - Na<sub>2011</sub> 116 mmol/l



# Kazuistika – diagnostický závěr II

+

- Osmotický demyelinizační syndrom

# Osmotický demyelinizační syndrom

- ADAMS RD : Central pontine myelinolysis: a hitherto undescribed disease occurring in alcoholic and malnourished patientsAMA

Arch Neurol Psychiatry 1959 Feb;81(2):154-72

- 4 alkoholici s rychlou korekcí OSM

Central pontine and extrapontine myelinolysis: a systematic review

T. D. Singh, J. E. Fugate and A. A. Rabinstein

*Department of Neurology, Mayo Clinic, Rochester, MN, USA*

1959 -2013

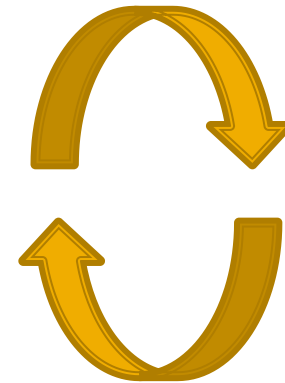
*European Journal of Neurology* 2014, **21**: 1443-1450

**REVIEW ARTICLE**

# Etiologie

- **Alkoholici**
- **OLTx**
- **Rychlé přesuny osmolarity**
  - Na
  - K
  - P
  - Glykemie
- **RF & Hemodialýza**
- Hyperemesis gravidarum
- Anorexia nervosa
- Morbus Wilson
- Popáleniny
- SLE

....



# Predispozice

	Liver transplantation ( <i>n</i> = 59)		Other ( <i>n</i> = 482)	
	<i>n</i>	%	<i>n</i>	%
Age, year, mean	44.6		51.4	
Male sex	31	77.5	238	53.7
Sodium <120 mmol/l	2	3.7	149	56.2
Sodium 121–135 mmol/l	34	63	59	22.3
Sodium >135 mmol/l	12	22.2	57	21.5

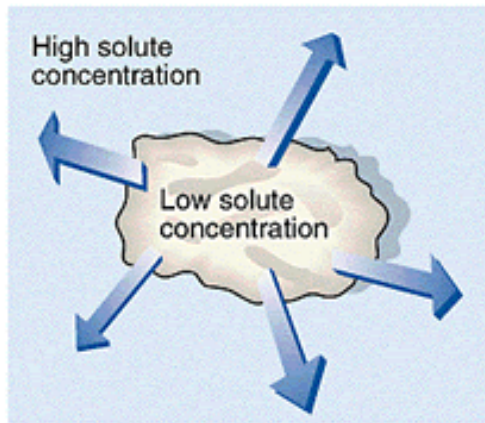
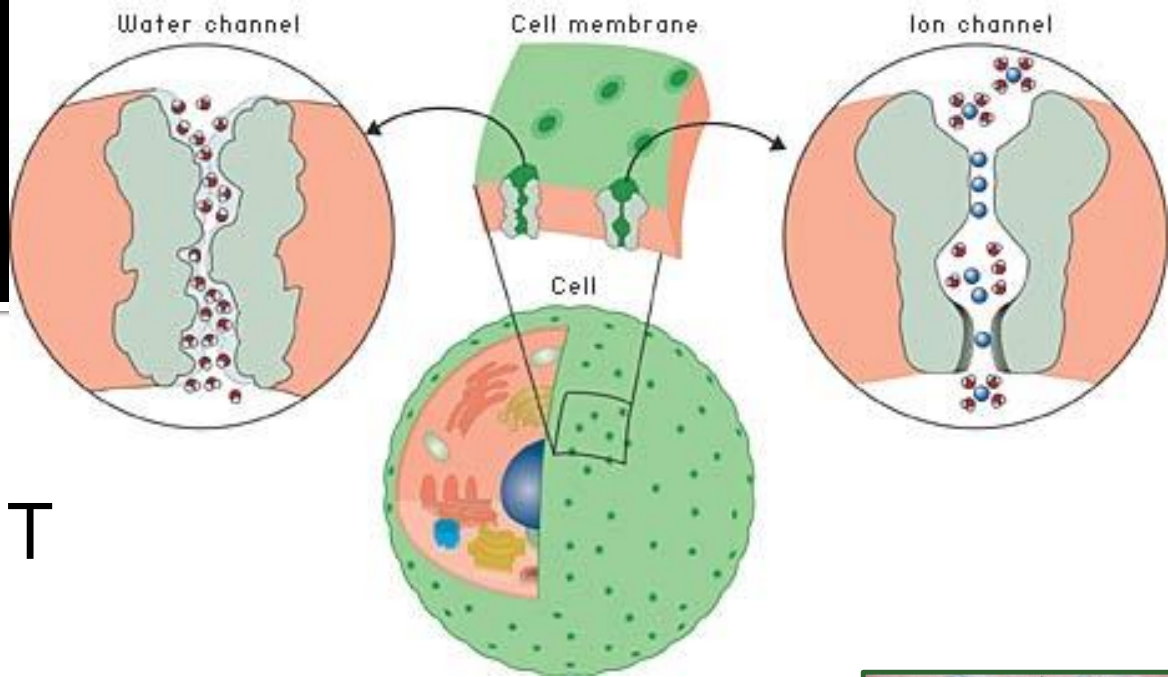
## Associated comorbidities

Alcoholism	4	6.8	280	58.1
Cirrhosis	18	30.5	58	12
Malnutrition	0	0	73	15.1
Renal failure	8	13.6	43	8.9
Burns	0	0	10	2.1
Neoplasm	0	0	34	7.1

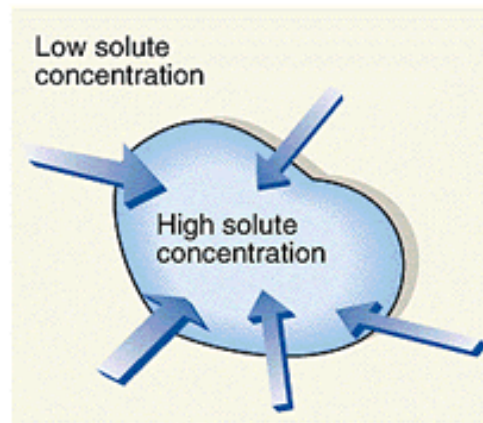


# Patogeneze

- Taurin TauT
- Myoinositol SMIT

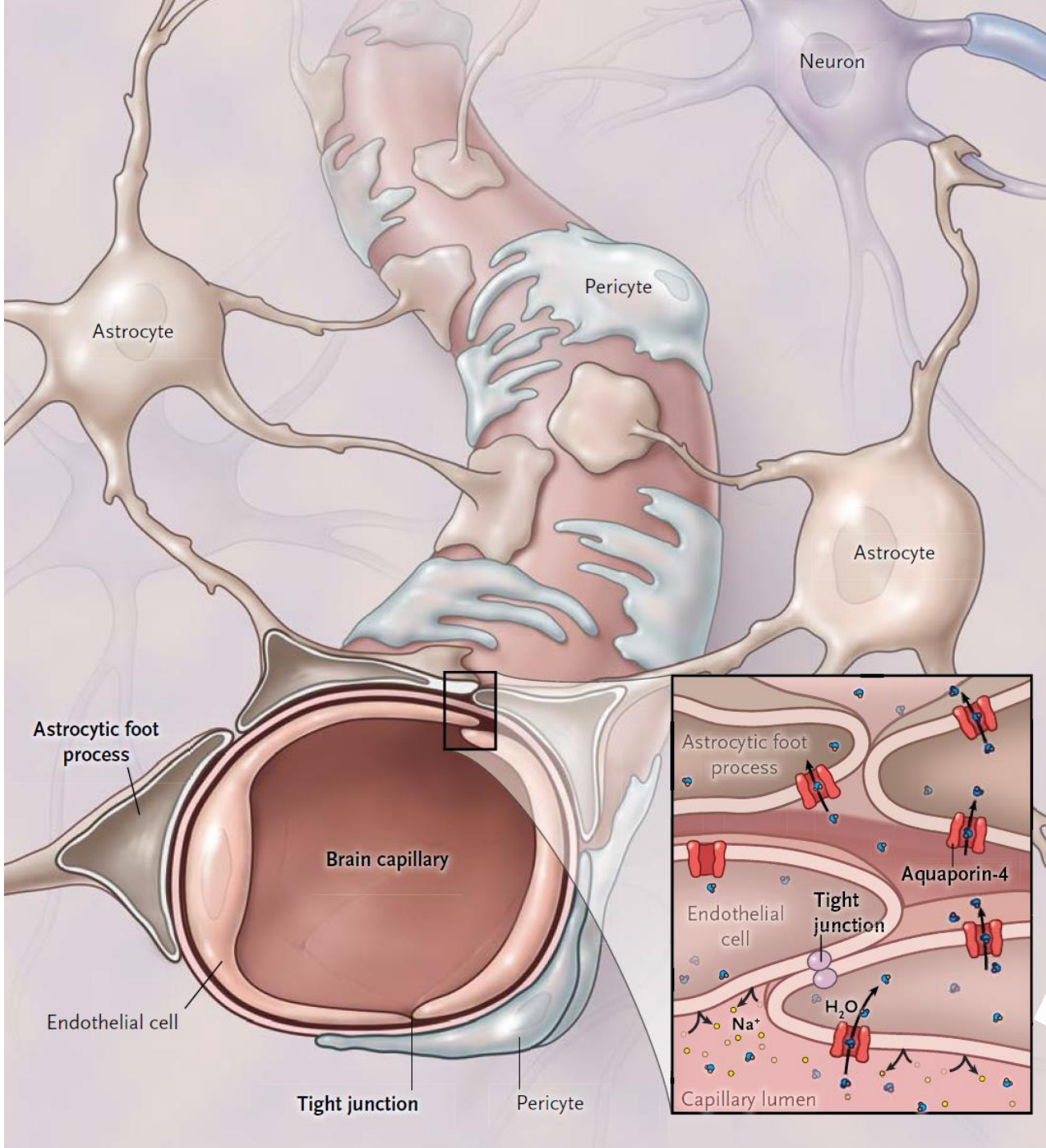


(a)



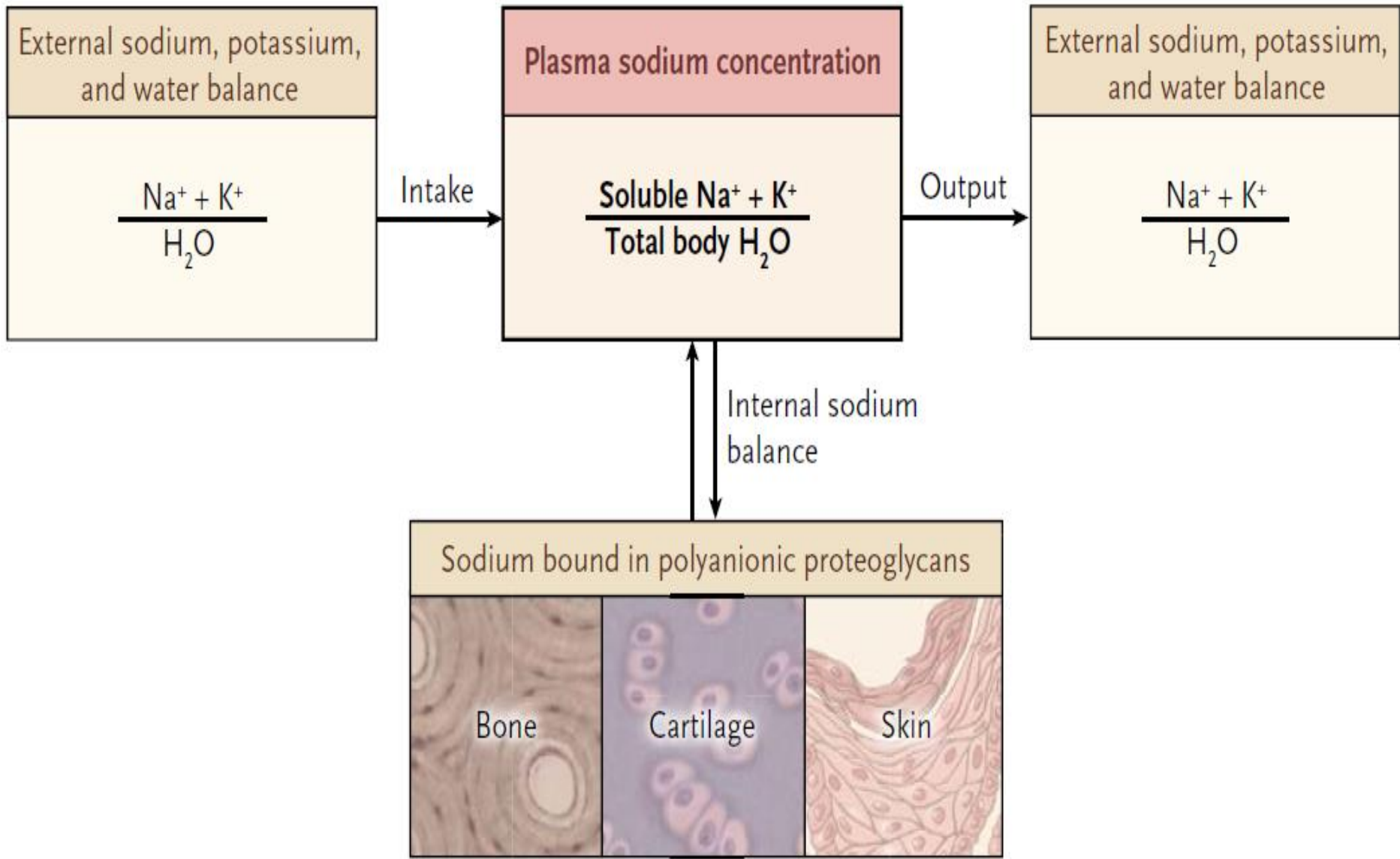
(b)



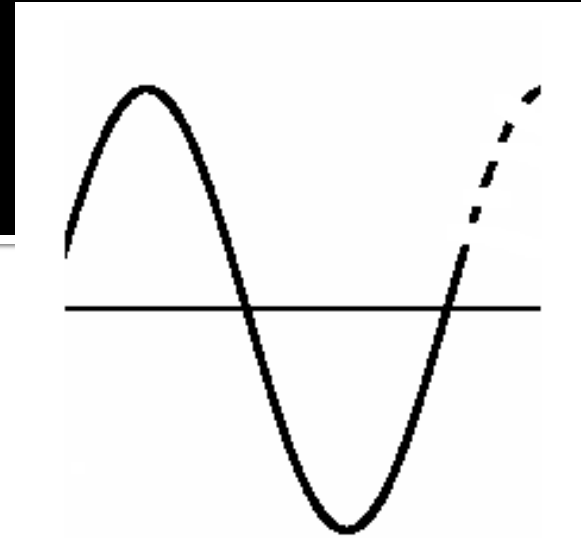


N ENGL J MED 372:1 NEJM.ORG JANUARY 1, 2015





# Klinika



- Neurologie
  - Bezvědomí
  - Kvadruparéza
  - Křeče
  - Locked-in ??

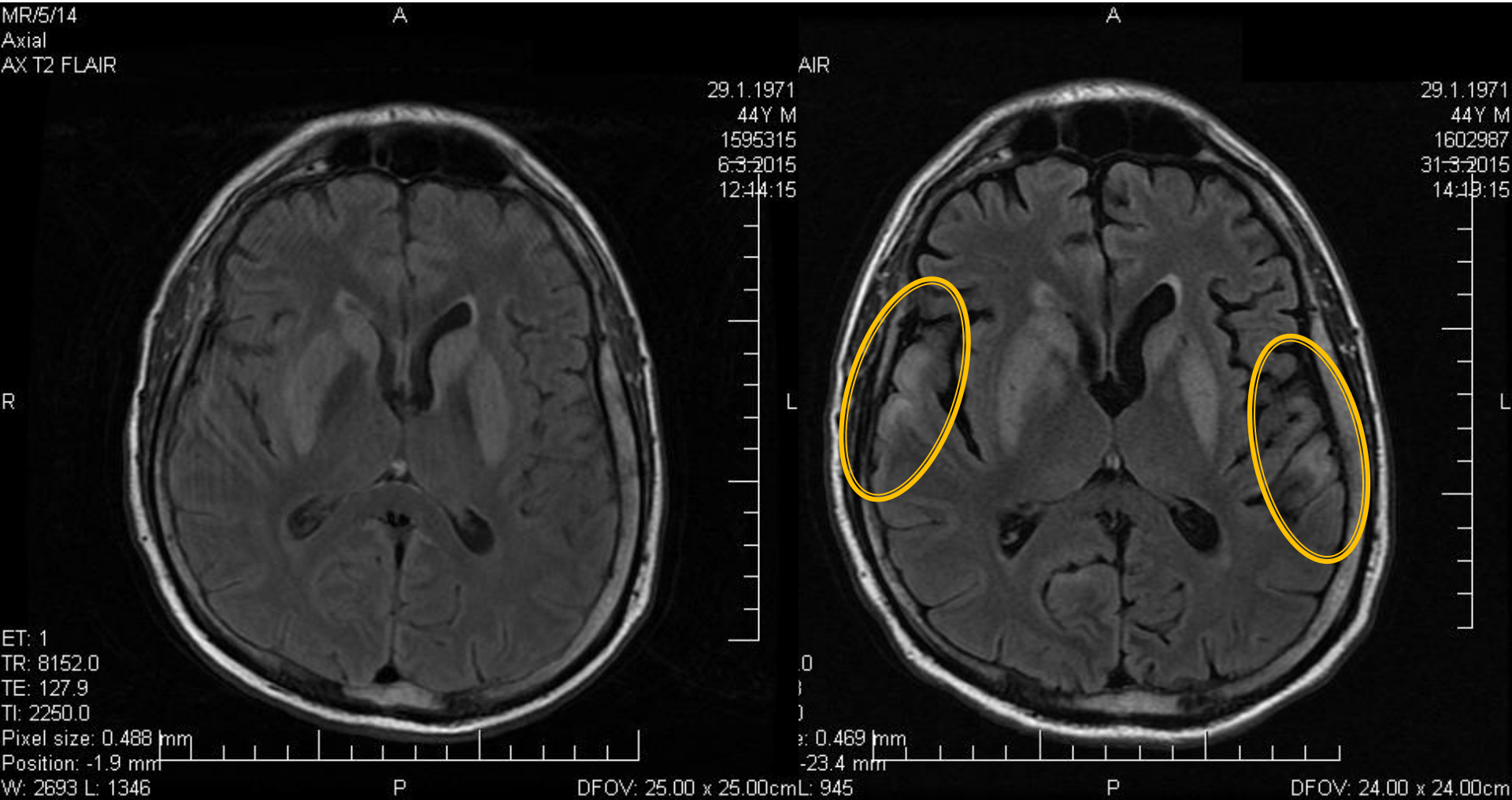
Clinical presentation	Liver transplantation ( <i>n</i> = 59)		Other ( <i>n</i> = 482)	
	<i>n</i>	%	<i>n</i>	%
Encephalopathy	19	61.3	146	34.4
Seizures	15	48.4	71	16.7
Paresis	9	29	98	23.1
Dysarthria	1	3.2	35	8.2
Ataxia	1	3.2	53	12.5
Oculomotor abnormalities	3	9.7	32	7.5
Coma	2	6.5	50	11.8



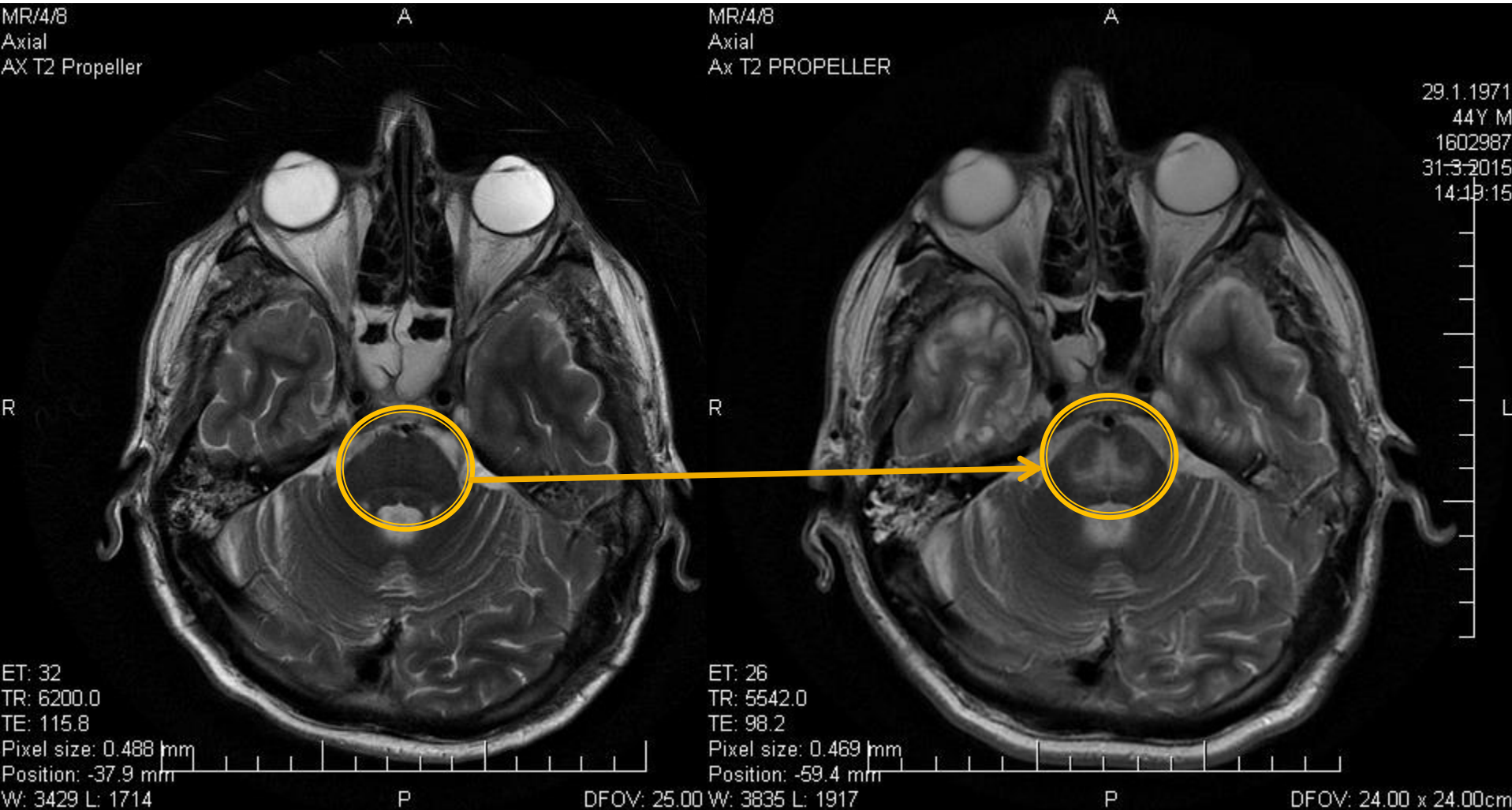
# Vyšetření

- Zobrazovací metody
- Elektrofyzilogie
- Bio(nekro)psie

# MRI extrapontinní



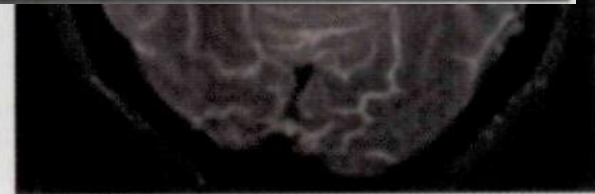
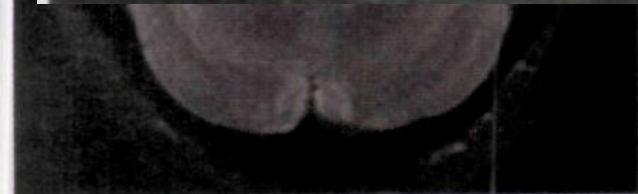
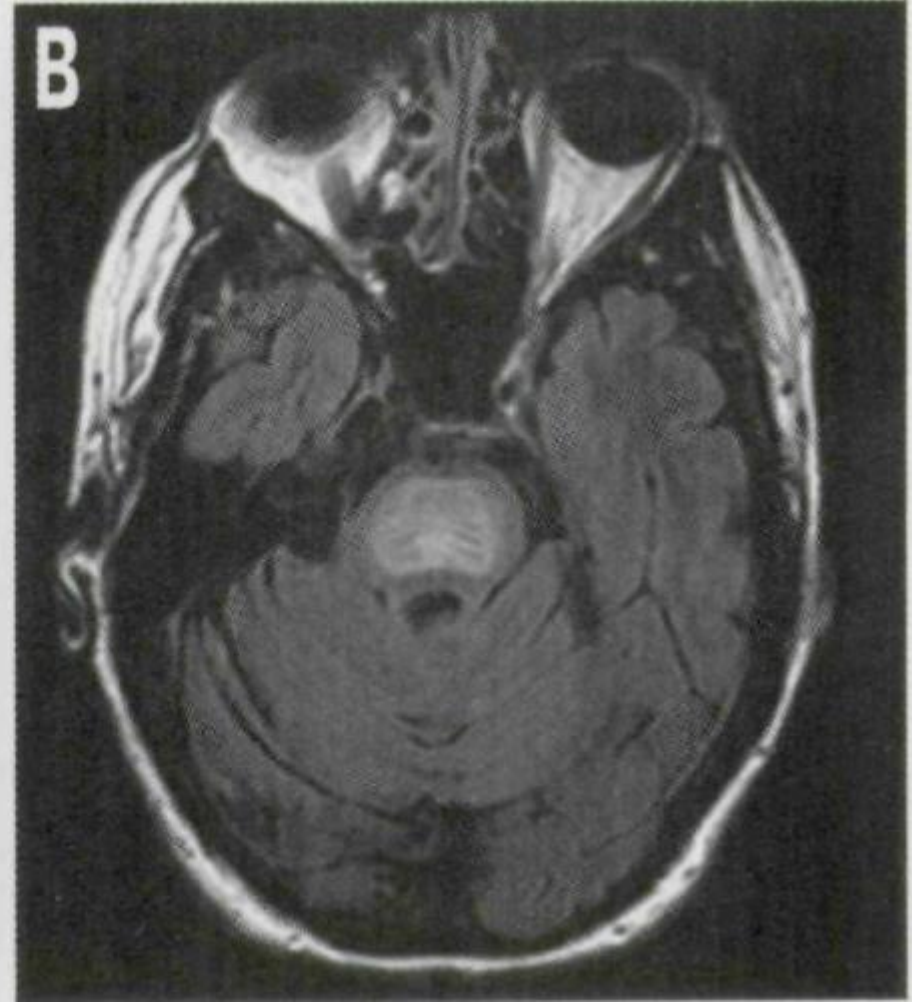
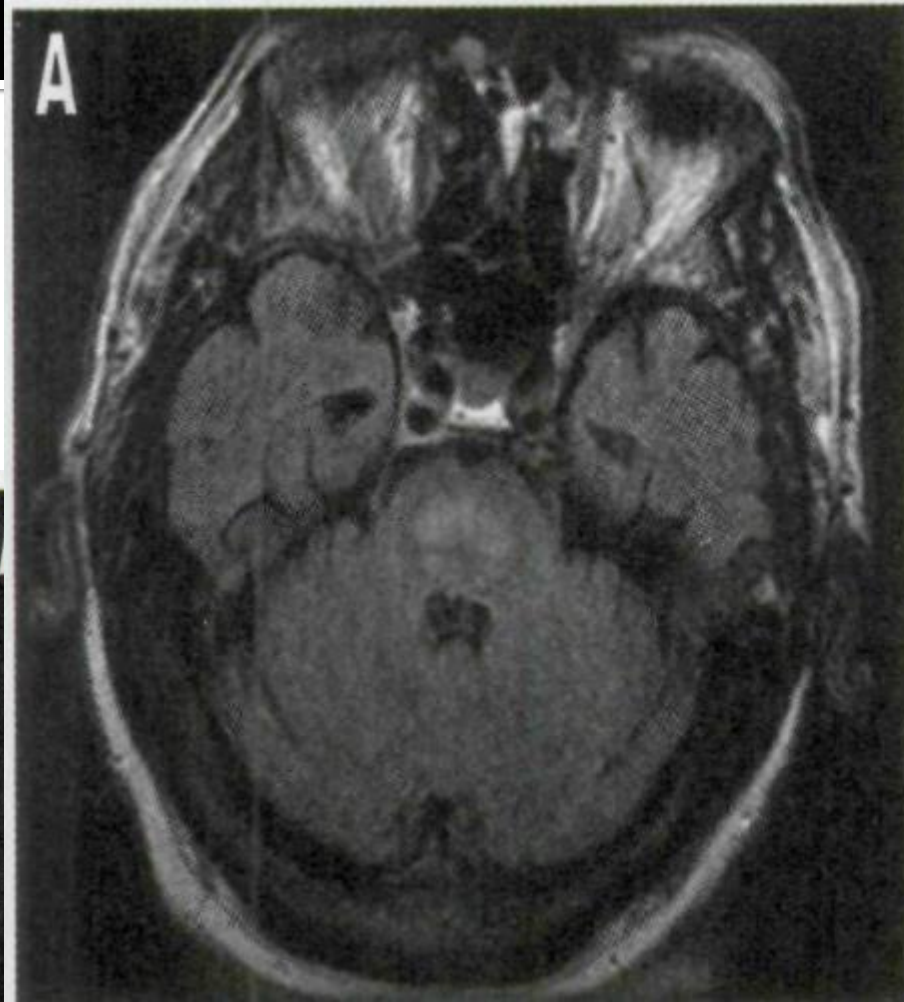
# MRI pontinní



- Centrální pontinní myelinolýza
- Extrapontinní myelinolýza

Lesion location	Liver transplantation ( <i>n</i> = 59)		Other ( <i>n</i> = 482)	
	<i>n</i>	%	<i>n</i>	%
CPM only	46	78	287	58.9
EPM only	4	6.8	48	9.9
Both CPM and EPM	9	15.3	152	31.2

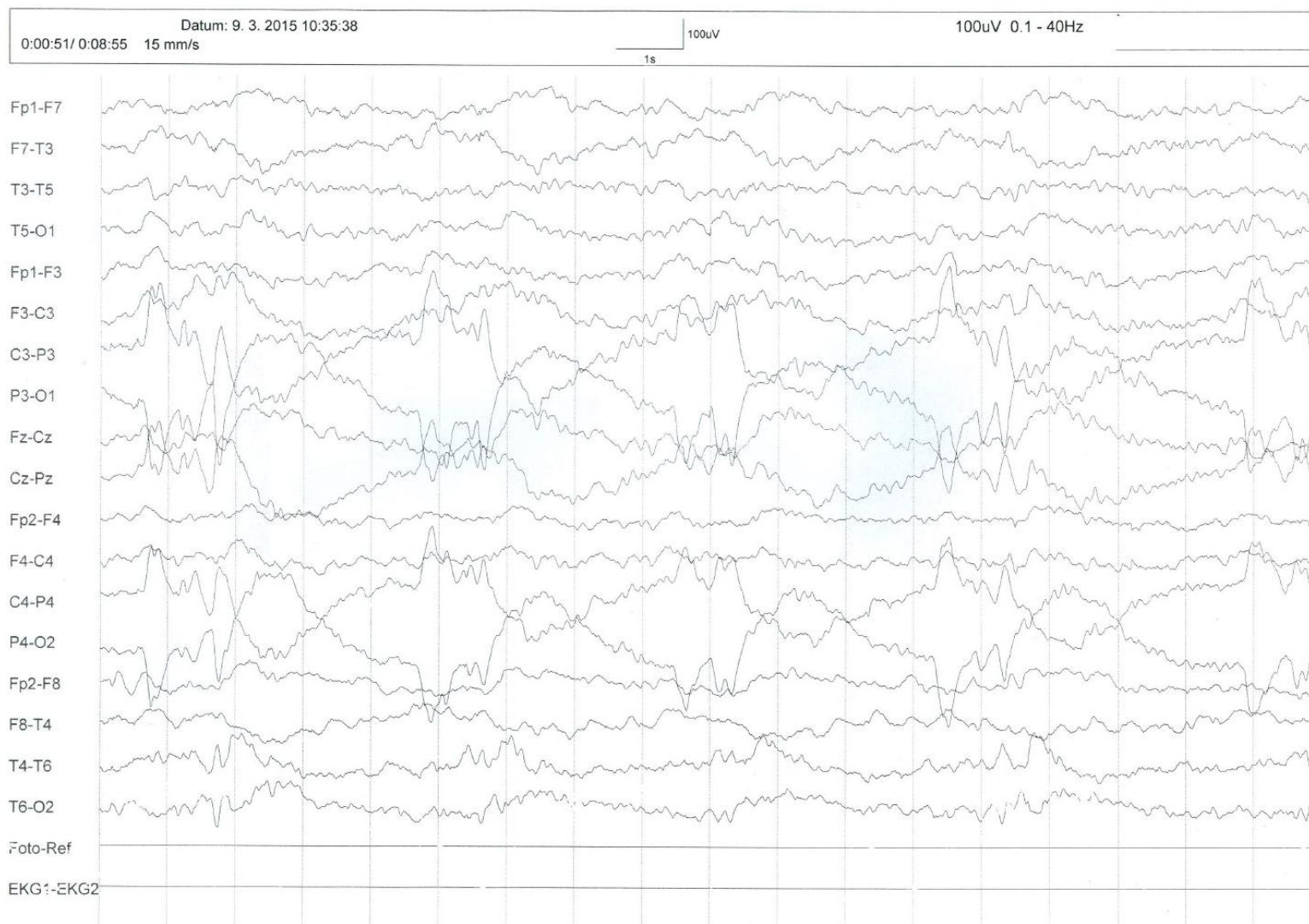
# Clinical and Radiologic Correlations of Central Pontine Myelinolysis Syndrome





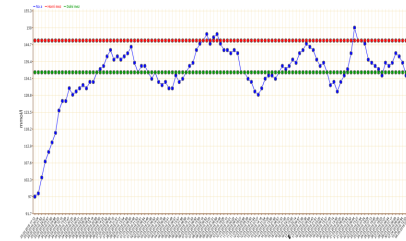
# EEG

**Nález:** Závěr: generalizované zpomalení v pásmu theta, areaktivní graf. Nález svědčí pro difuzní encefalopatické změny. Epileptiformní grafoelementy nezaachyceny. Oproti minulému vyšetření bez vývoje.



# Léčba hyponatremie

## ■ Substitute Na



**Table 1.** Treatment and Limits of Correction of Severe Hyponatremia.\*

Duration	Related Behavior or Condition	Clinical Features	Initial Therapeutic Goal	Limit of Correction and Management of Overcorrection
Several hours	Self-induced water intoxication associated with psychosis, running in marathons, use of 3,4-methylenedioxy-methamphetamine (MDMA, or “ecstasy”)	Headache, delirium, vomiting, seizures, coma, neurogenic pulmonary edema, brain swelling with risk of fatal herniation	100-ml bolus of 3% saline three times as needed for severe symptoms; increase plasma sodium concentration by 4–6 mmol/liter in first 6 hr	Excessive correction not known to be harmful
1–2 days	Postoperative hyponatremia, especially in women and children; hyponatremia associated with intracranial disease	Headache, delirium, vomiting, seizures, coma, neurogenic pulmonary edema, brain swelling with risk of fatal herniation	100-ml bolus of 3% saline three times as needed for severe symptoms; increase plasma sodium concentration by 4–6 mmol/liter in first 6 hr	Avoid increasing plasma sodium concentration by >10 mmol/liter/day
Unknown or ≥2 days	Conditions associated with high risk of the osmotic demyelination syndrome (plasma sodium concentration, 105 mmol/liter or less; hypokalemia, alcoholism, malnutrition, liver disease)†	Malaise, fatigue, confusion, cramps, falls, 10% incidence of seizures with plasma sodium concentration <110 mmol/liter, minimal brain swelling, and no risk of herniation	Extra caution indicated for conditions associated with high risk of osmotic demyelination syndrome; 100- ml bolus of 3% saline if needed for seizures; increase plasma sodium concentration by 4–6 mmol/liter in first 24 hr	Avoid increasing plasma sodium concentration by >8 mmol/liter/day; consider lowering again if limit is exceeded, especially in patients with high risk of the osmotic demyelination syndrome

# Th?

## Plasma exchange successfully treats central pontine myelinolysis after acute hypernatremia from intravenous sodium bicarbonate therapy

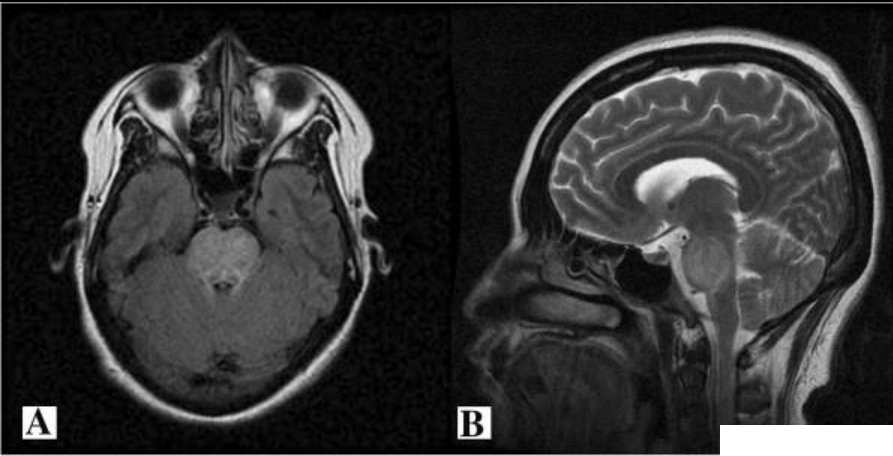
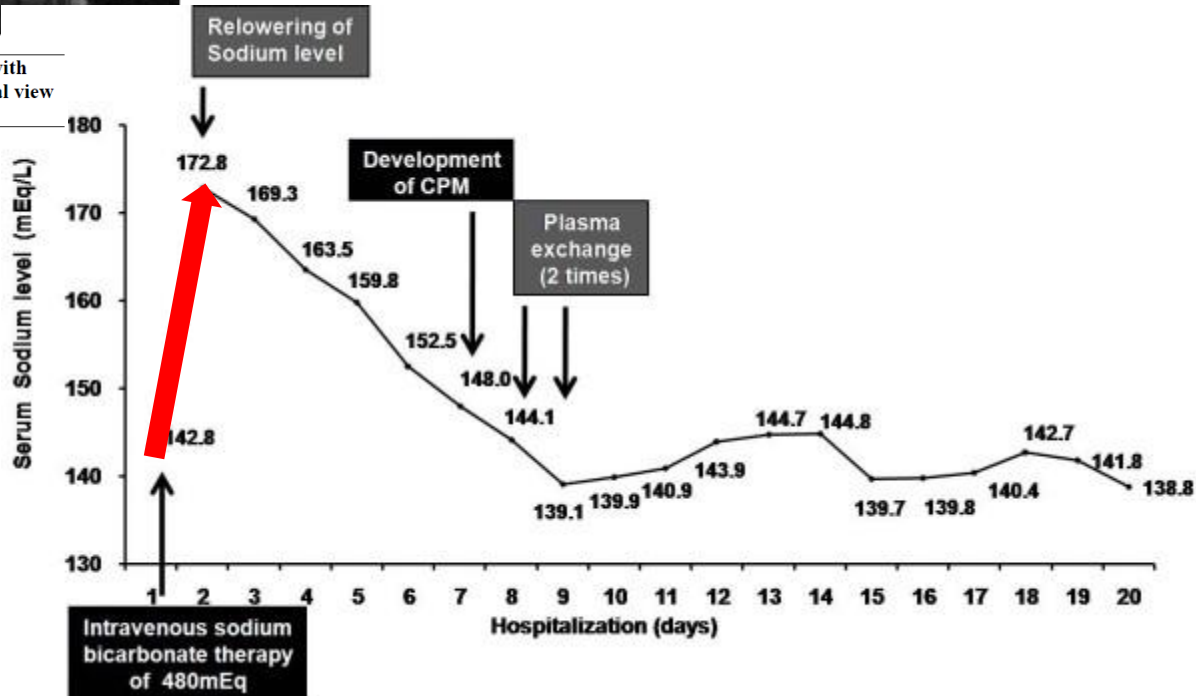


Figure 2 MRI of the brain revealed symmetric, high-intensity signal in the pons with sparing of the peripheral portion, suggesting central pontine myelinolysis (A, axial view and B, sagittal view).

*BMC Nephrology* 2014, 15:56

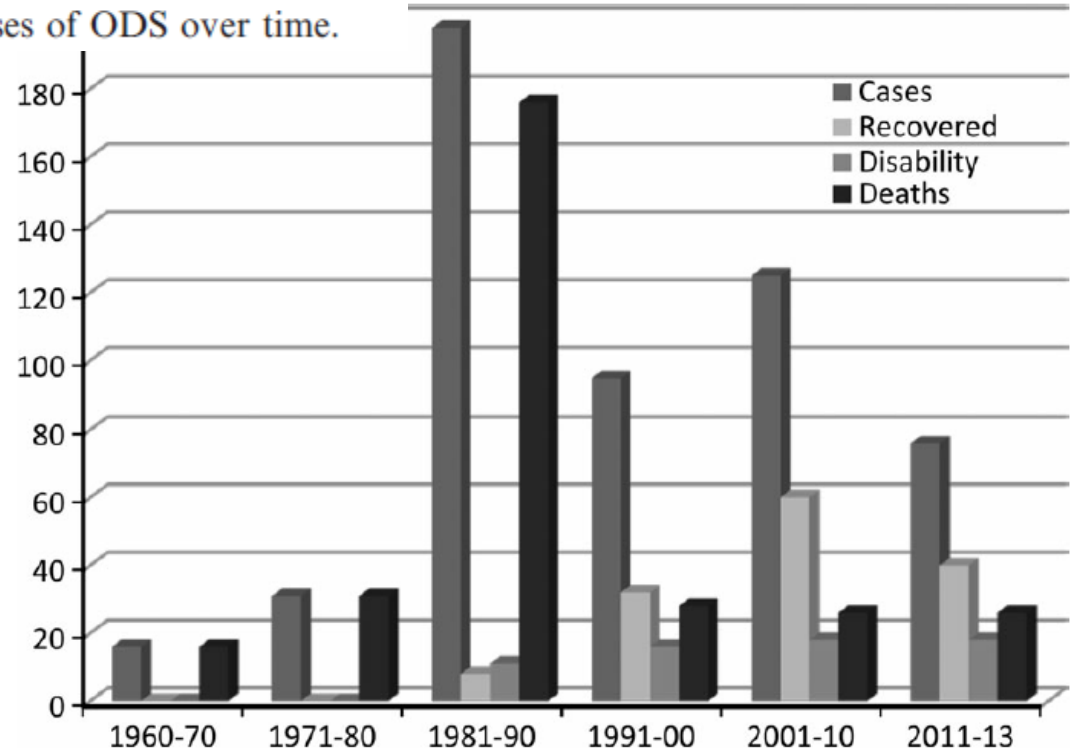
142.8 mEq/L → 172.8 mEq/L

■ Adiuretin



# Prognóza

Figure 1 Distribution of outcomes in published cases of ODS over time.



- GCS
- Odvyknut
- Fixoval
- Polykal
  
- Vegativní stav +
- Vývoj

Clinical outcome*	Liver transplantation (n = 59)		Other (n = 482)	
	n	%	n	%
Death	13	41.9	54	22.6
Disability	11	35.5	52	21.8
Recovery	7	22.6	133	55.6





Moc-li pak ?

Přiměřeně !!