To cool or not to cool?

Beyond perinatal asphyxia

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Case presentation (1)

- Boy, PML 39 +2, BW 3680g
- Shoulder dystocia – vacuum extraction
- Double nuchal cord
- At birth: pale, hypotonia, bradycardia
- Neonatal stabilisation:
  - 1x 5 insufflation breaths -> recovery of bradycardia
  - Ventilation during 1 minute -> spontaneous breathing, no gasping
  - APGAR 3/4/4
- Umbilical pH: 7.04 – 7.08 / lactate: 11.5 mmol/L

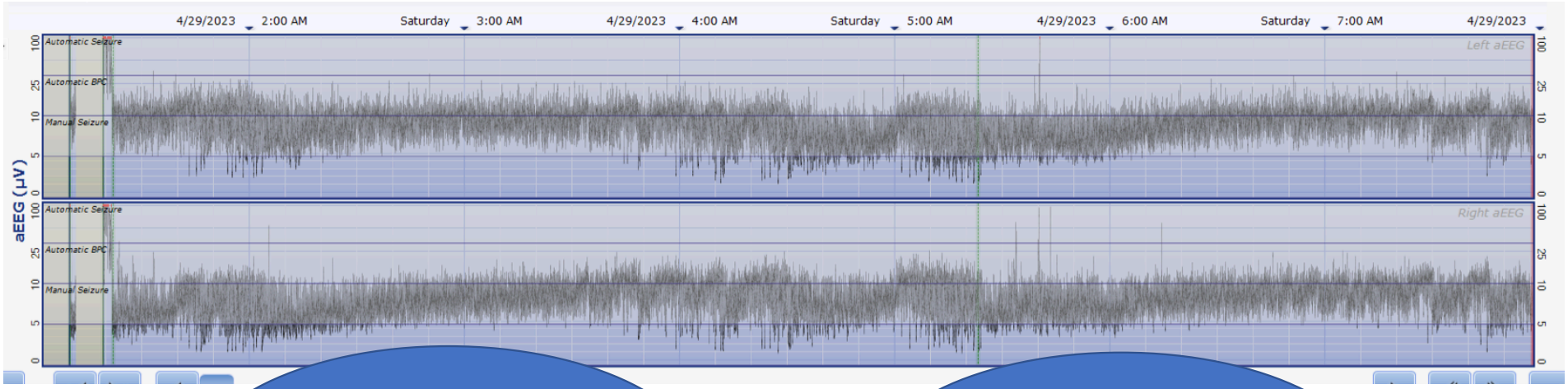
Case presentation (2)

- Thompson score 1h - 2h : 6

=> Transfer NICU for aEEG monitoring and therapeutic hypothermia if indicated

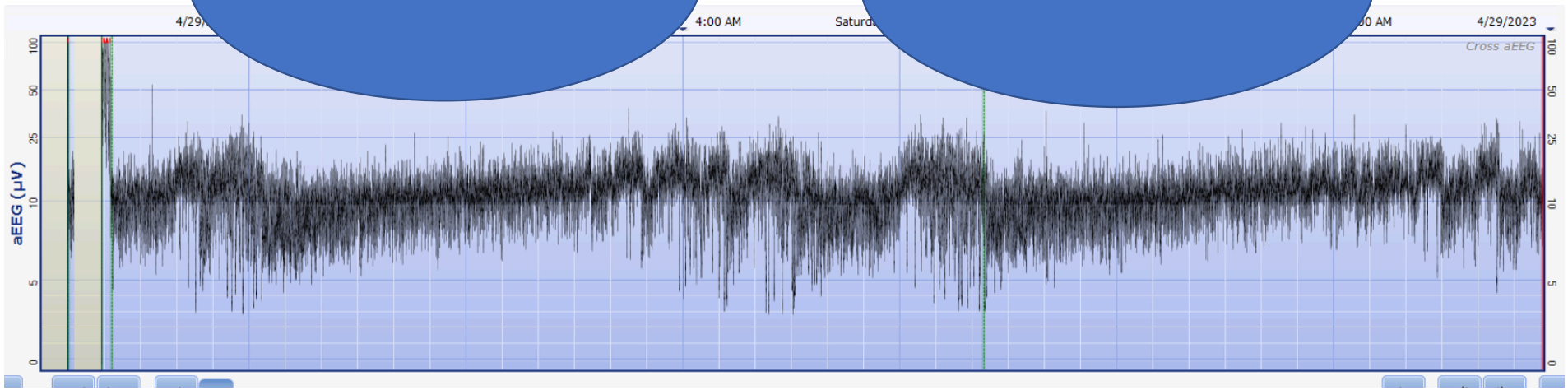
- Clinical examination at age 3-4h (prior to transfer)
  - Respiratory / hemodynamically stable
  - Reassuring neurological behaviour
  - Cephalohematoma
  - Congested face

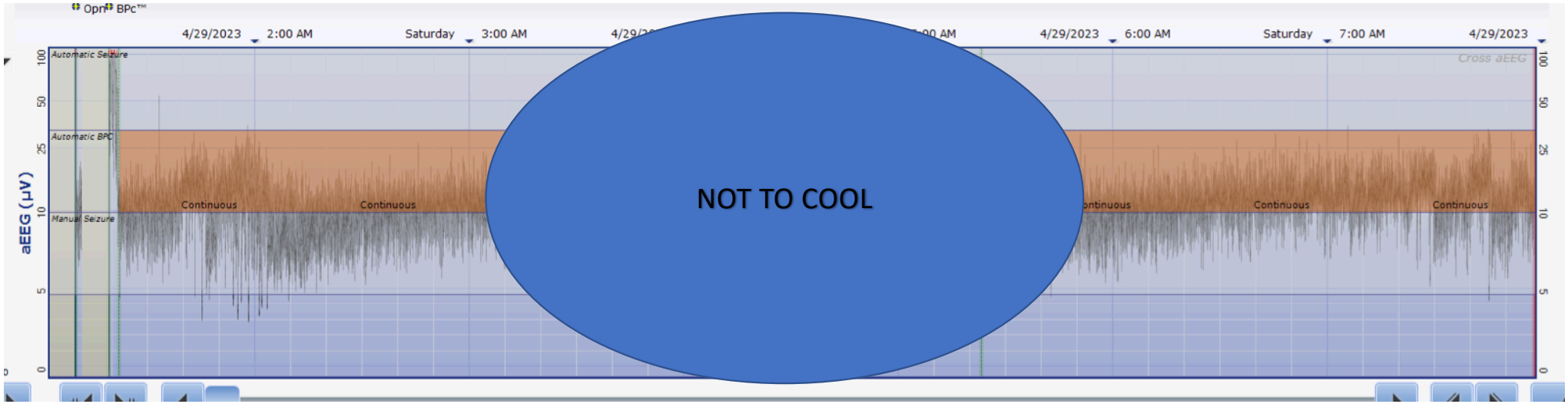
aEEG



To cool?

Not to cool?





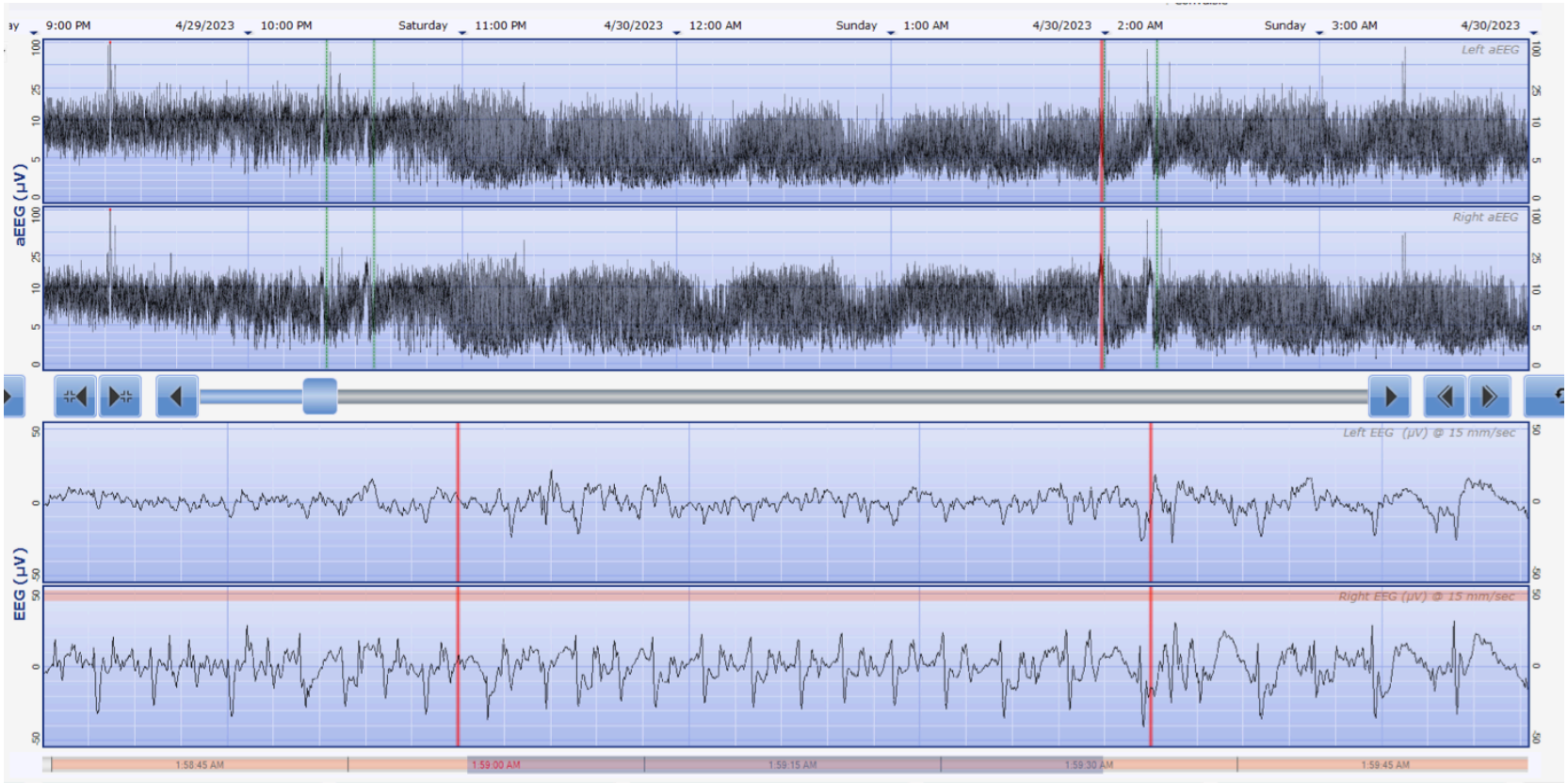
- No therapeutic hypothermia

- Everything goes well until …

Inclusion criteria total body cooling

- ✓ PML 36 weeks or more
- ✓ Perinatal asphyxia
  - Apgar 5 min: 4 (>5)
  - Lactate: 11,5 mmol/L (>10)
- ✗ Encephalopathy
  - Thompsonscore >7 OR
  - Discont low voltage or worse

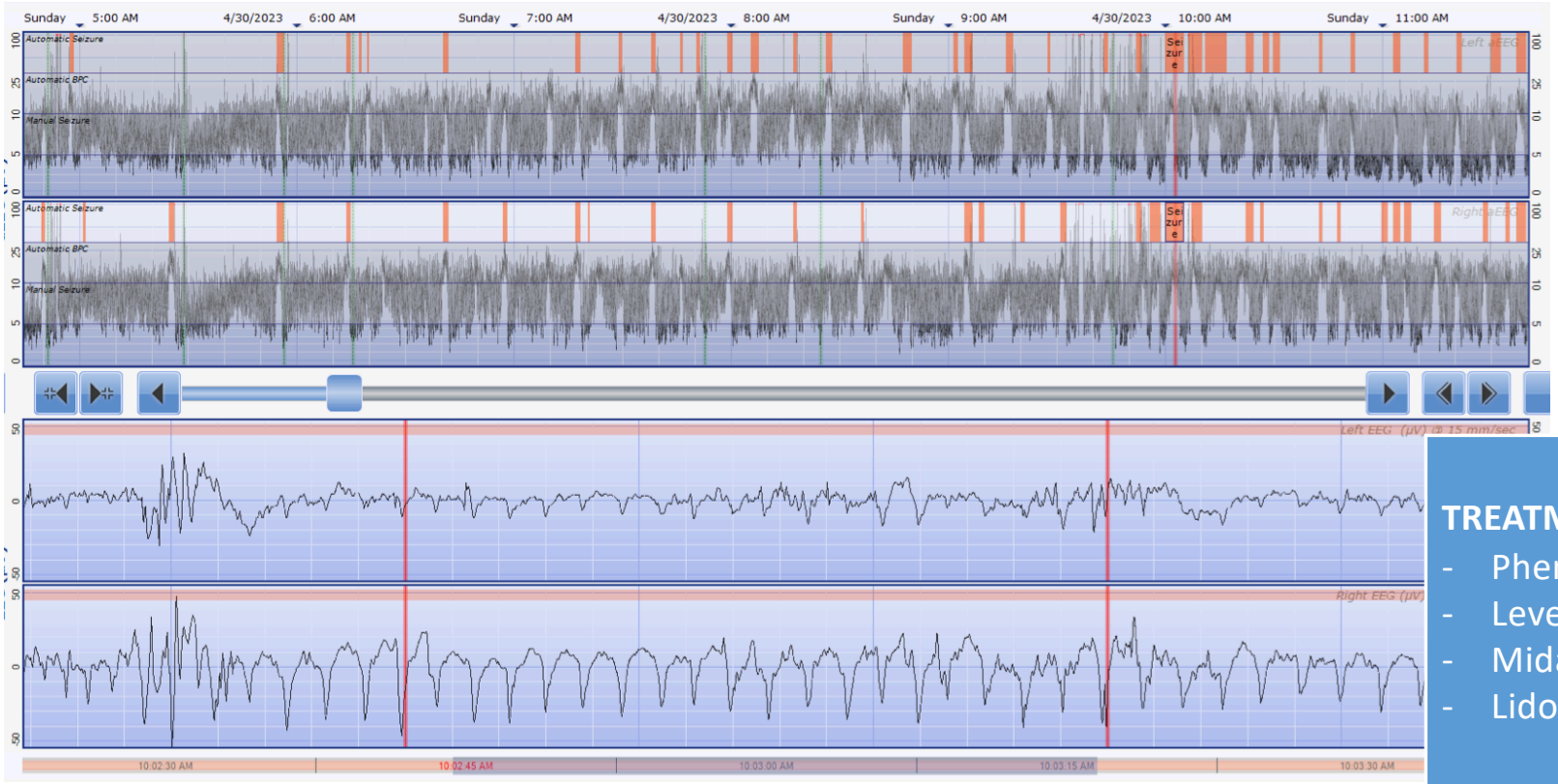
At the age of 27 h …



Clinical convulsions

- Apnea
- desaturation
- Hypertonic
- Stare

At the age of 27 h …



Clinical convulsions

- Apnea
- desaturation
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TREATMENT:

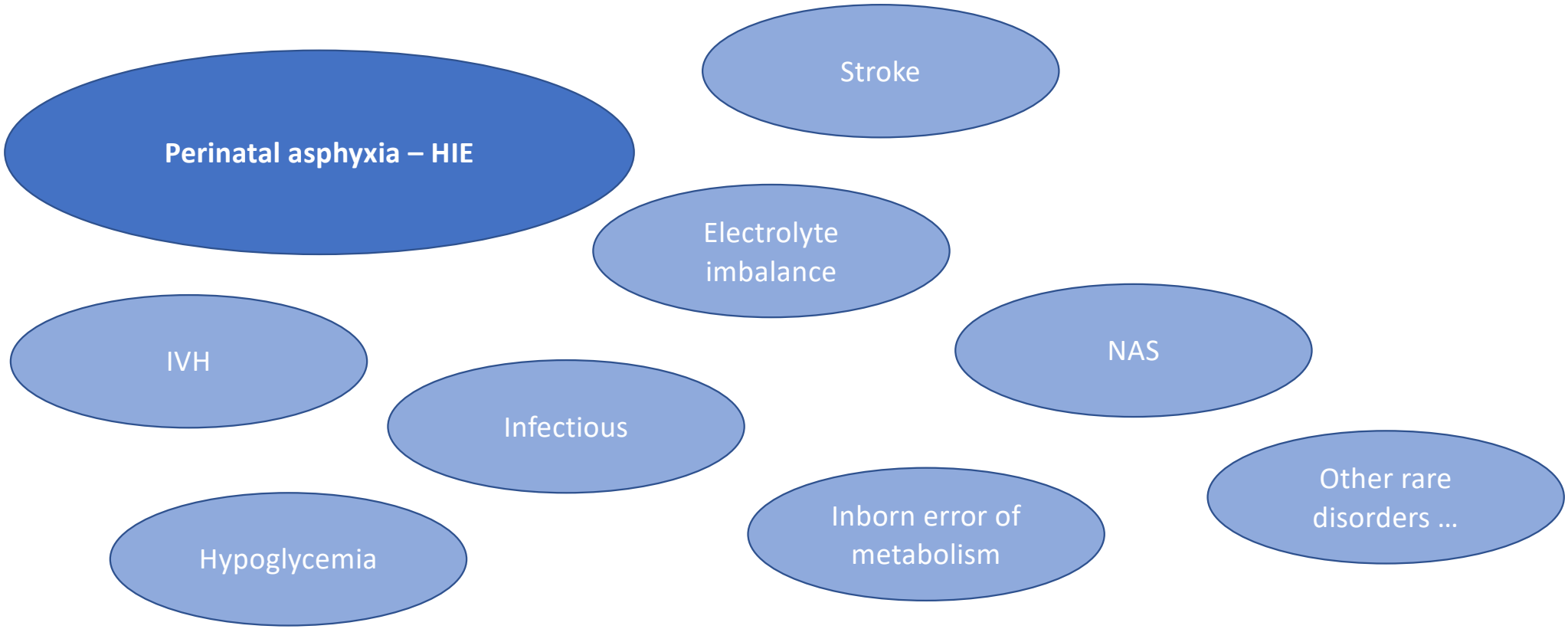
- Phenobarbital
- Levetiracetam
- Midazolam continuous infusion
- Lidocaine infusion

First thoughts

"it was significant perinatal asphyxia with HIE"

"we should have started total body cooling"

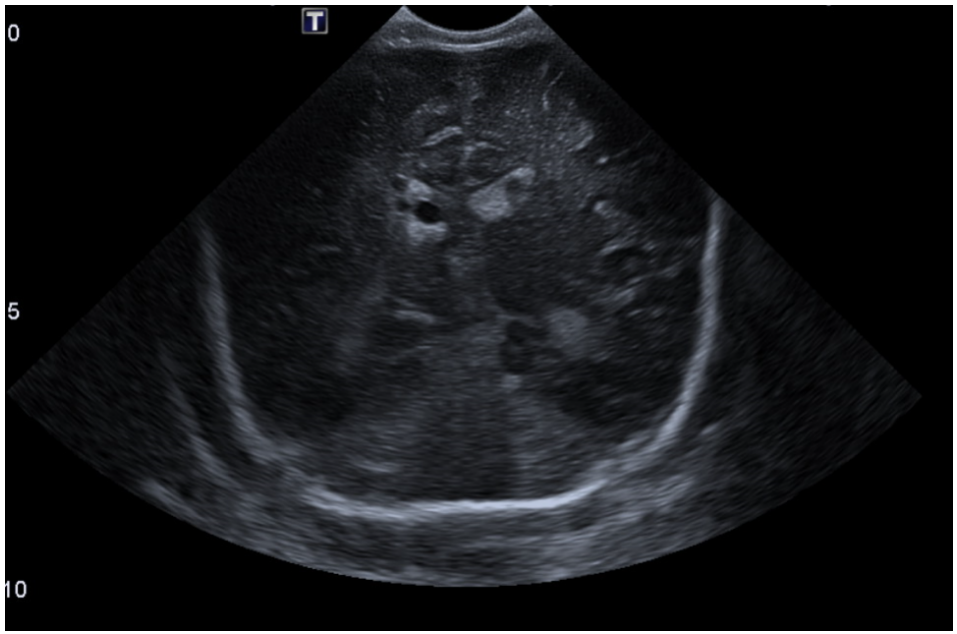
Differential diagnosis

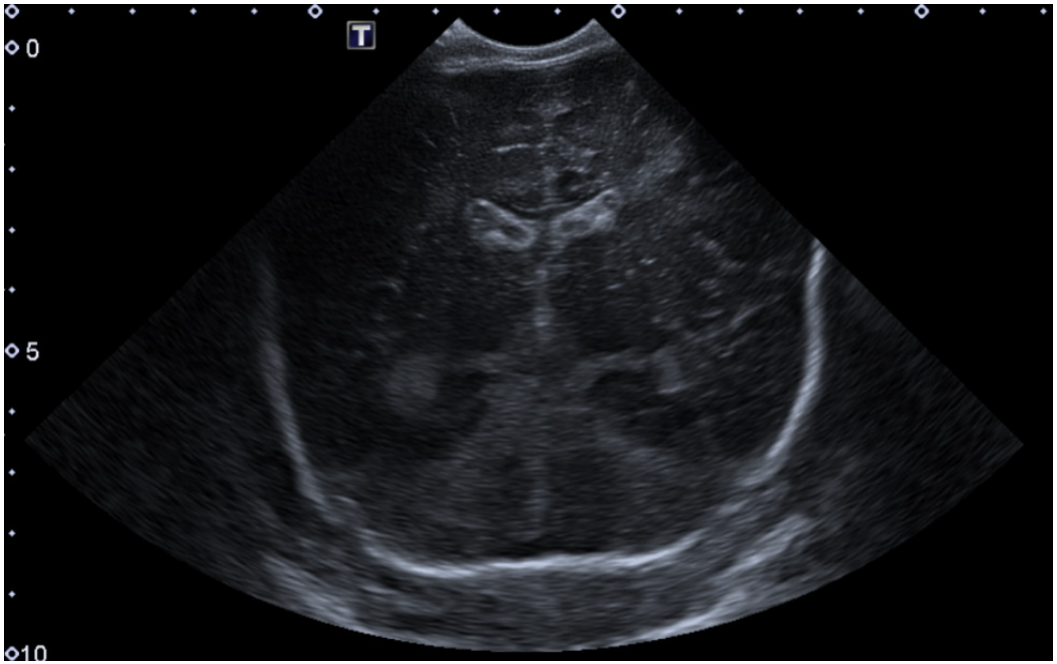


Diagnostic work-up: laboratory tests

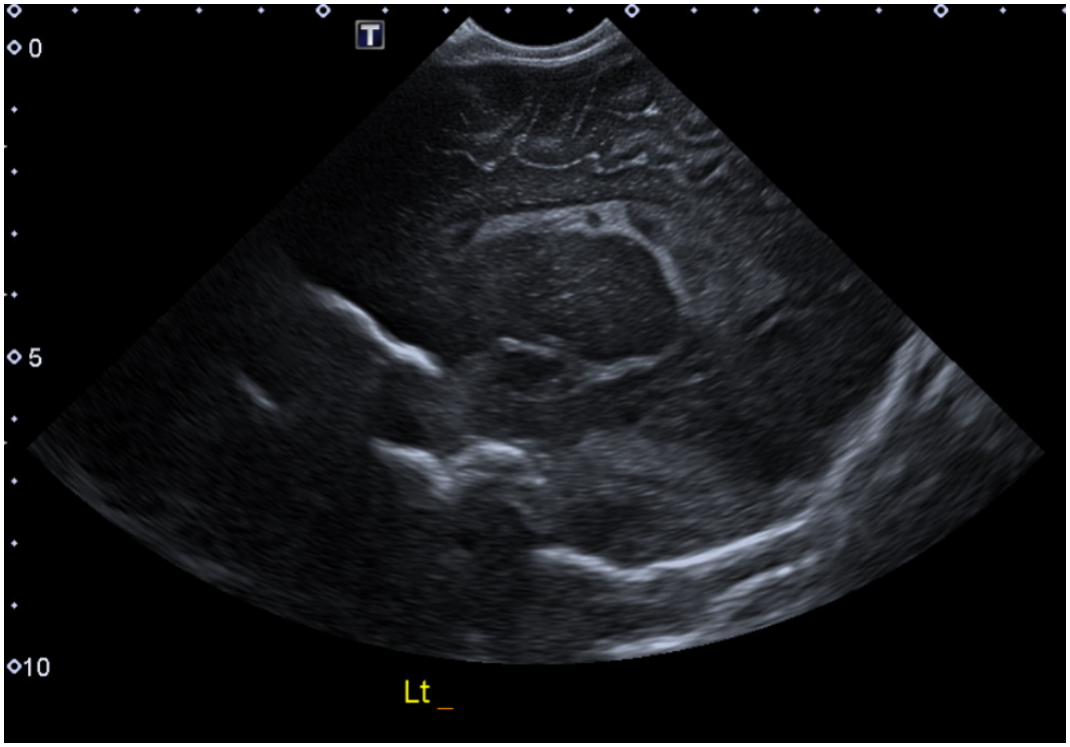
Basic tests	• Hb 17,2 g/dL • **Thrombopenia 75.000/µL** • CRP 16,2 mg/L • Na/K/Ca/Mg normal range • Blood sugar normal • **AST 391 U/L - ALT 91 U/L – CK 5131 U/L**
Blood culture	• Negative
Metabolic screening	• Ammonia normal • Amino acids: normal pattern • Organic acids urine: normal pattern • Acylcarnitine profile: normal pattern • Very long chaain fatty acids: normal pattern

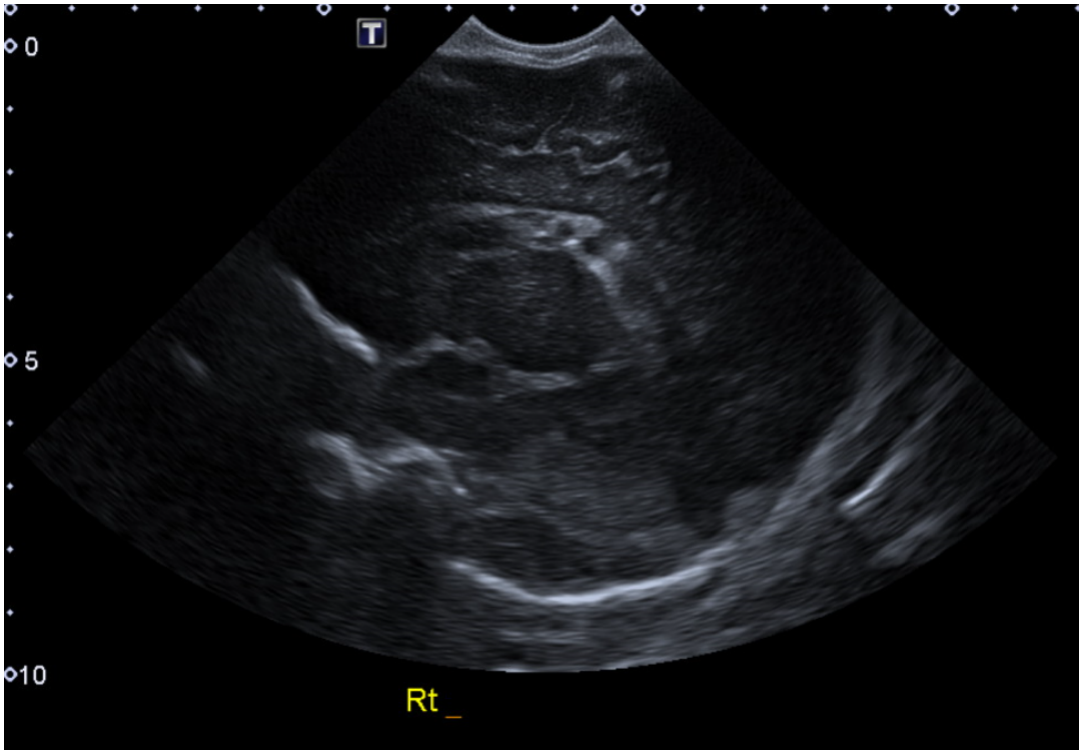
Diagnostic work-up: brain ultrasound





Diagnostic work-up: brain ultrasound



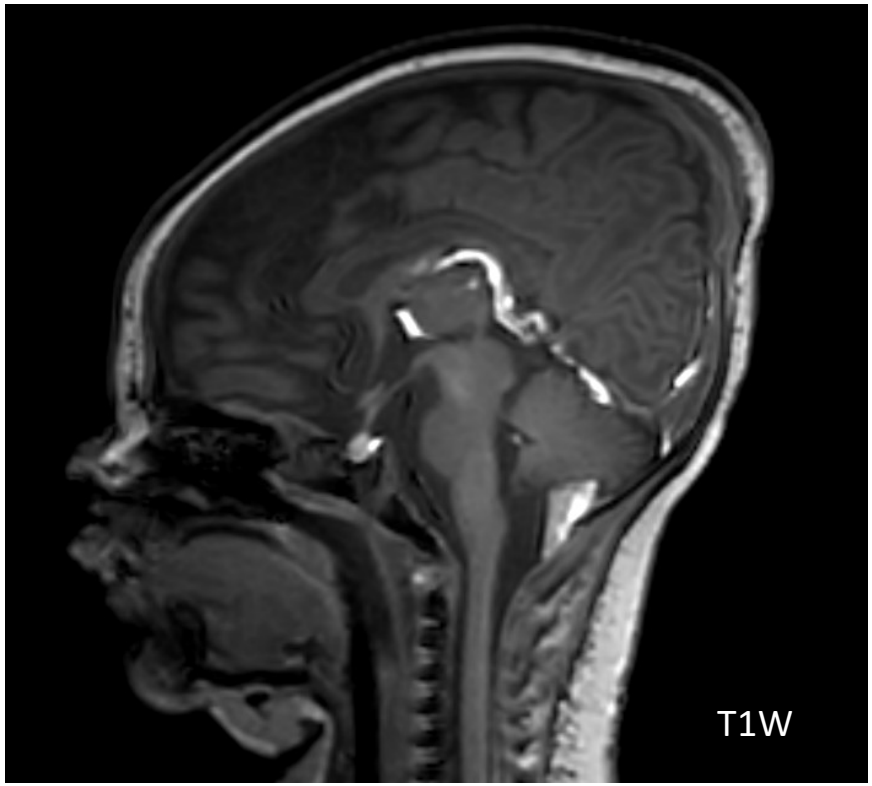


Diagnostic work-up: brain ultrasound

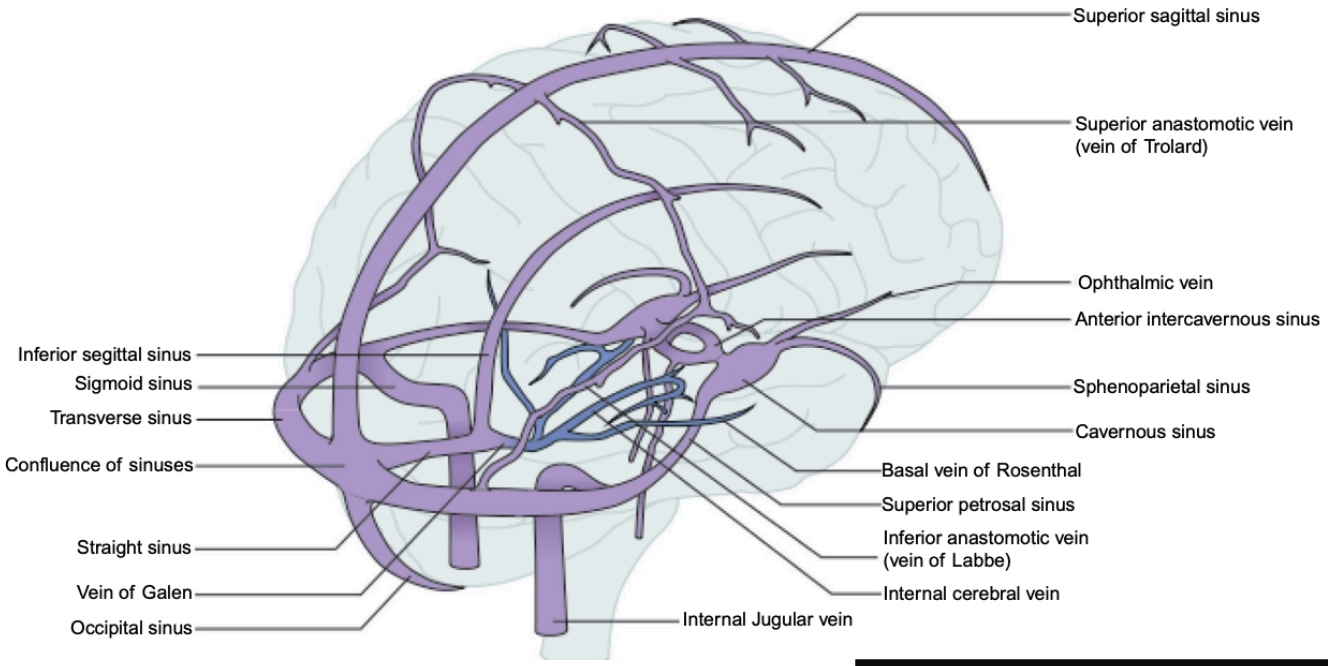
- Inhomogeneous choroid plexus
- Variation of normal with choroid cysts

- Intraventricular hemorrhage (with cystic alterations)
  - Perinatal asphyxia
  - Traumatic birth
  - Bleeding disorder – thrombocytopenia
  - Cerebral sinovenous thrombosis
  - AV-malformation

Brain MRI (D5)



Brain MRI



- Venous thrombosis
  - internal cerebral veins bilateral
  - vein of Galen
  - Sinus rectus (partial)

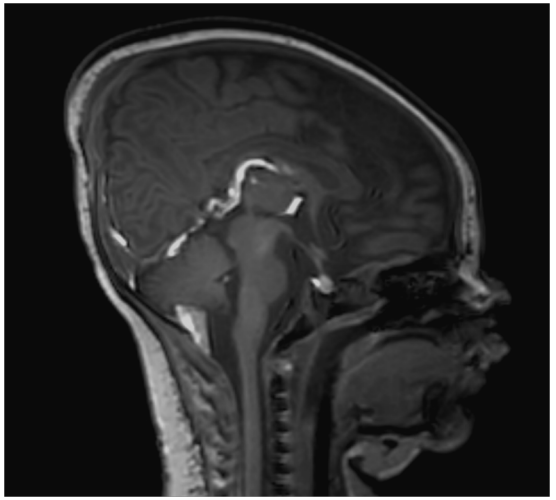


Figure. *Silvis SM, Aguiar de Sousa D, Ferro JM et al. 2017. Cerebral venous thrombosis. Nat Rev Neurol 13(9), 555-565.*

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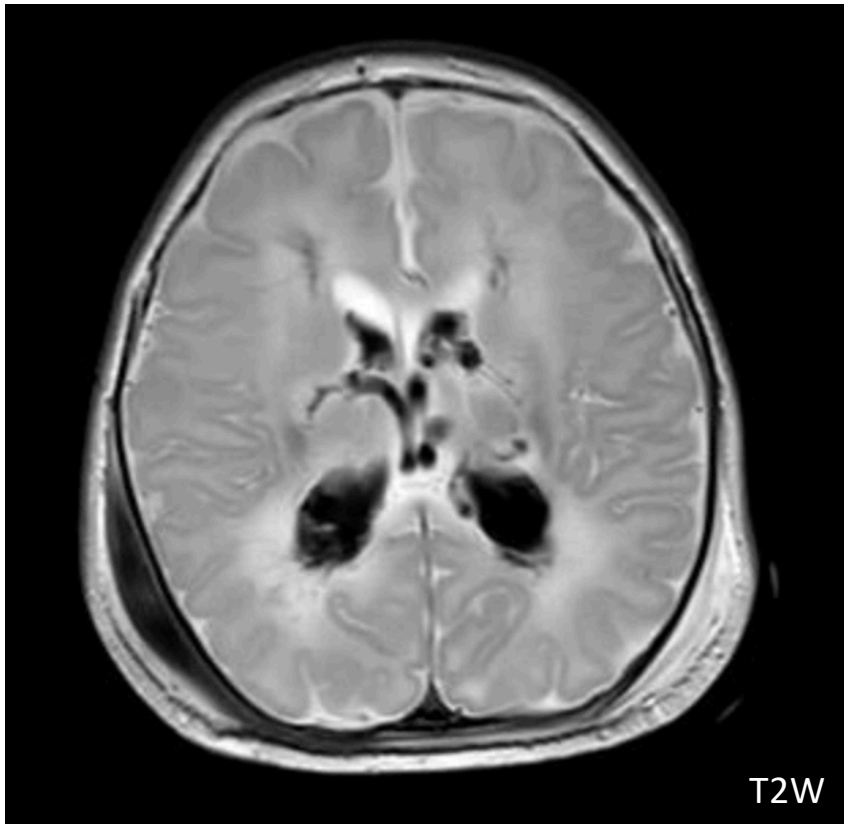

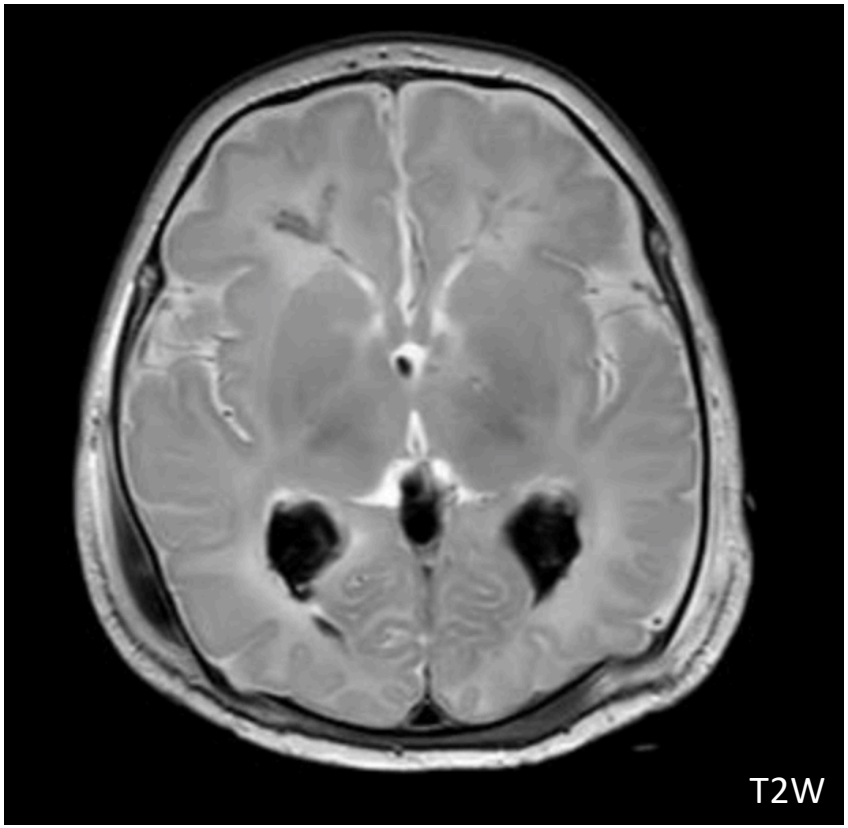

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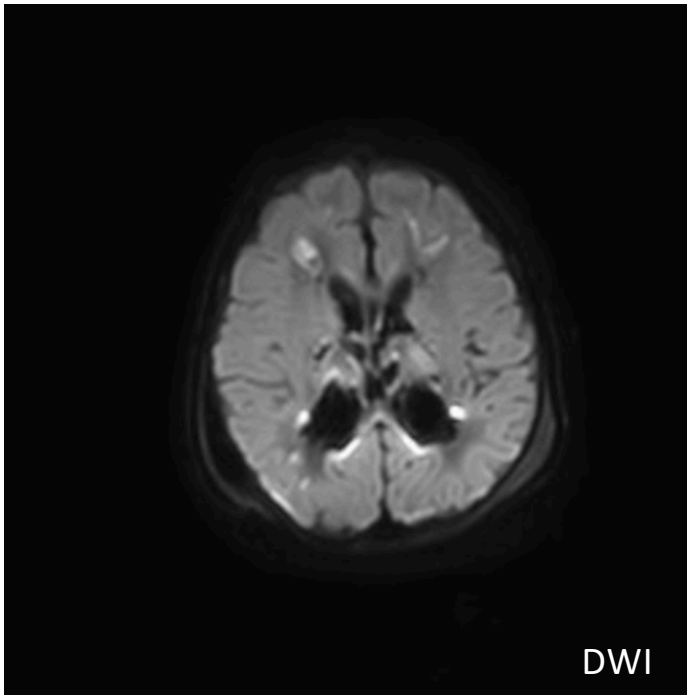
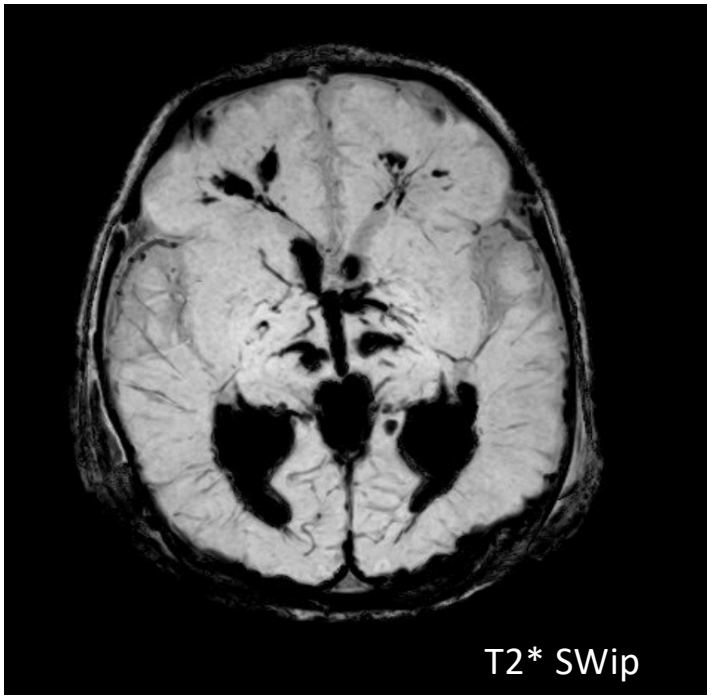
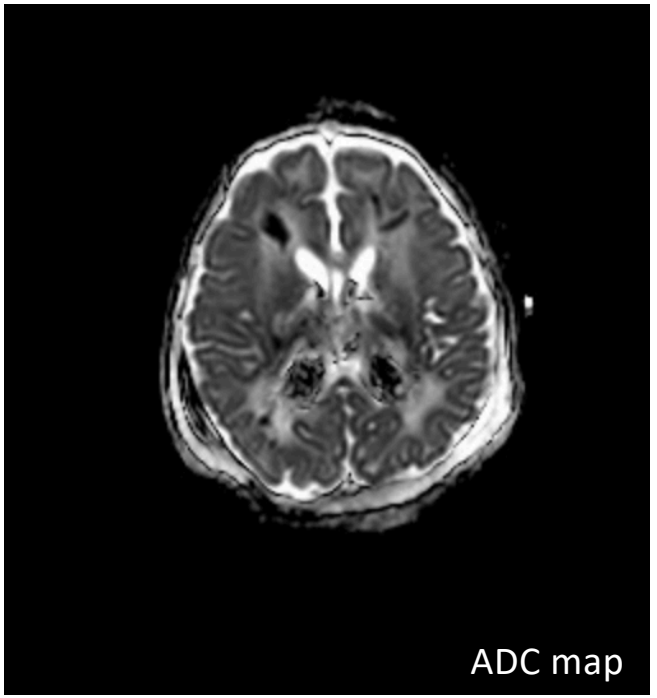
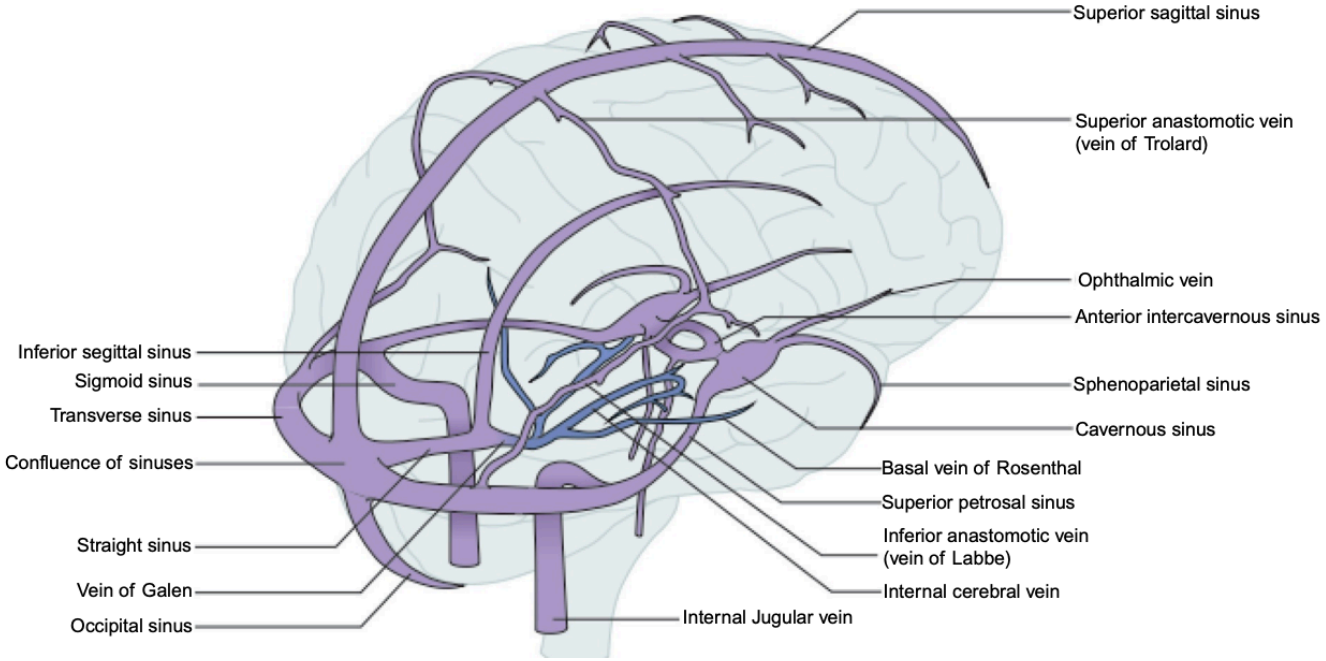






Brain MRI

- Venous thrombosis
  - bilateral internal cerebral vein
  - vein of Galen
  - Sinus rectus (partial)

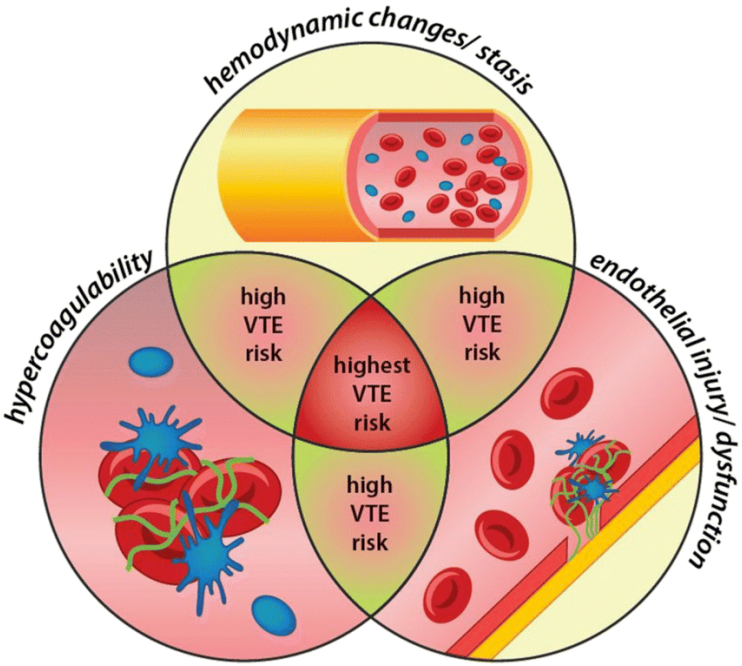


- Associated lesions
  - Congestion periventricular venules
  - Multiple small hemorrhagic lesions and venous infarction
  - Blood in lateral and third ventricles (IVH)
- No typical signs of hypoxic-ischemic insult

Figure. *Silvis SM, Aguiar de Sousa D, Ferro JM et al. 2017. Cerebral venous thrombosis. Nat Rev Neurol 13(9), 555-565.*

Neonatal cerebral sinovenous thrombosis

- 2,6-12/100.000 term neonates per year
- Symptoms:
  - Seizures
  - Encephalopathy
- 50% presentation in first 48 hours
- Risk factors – Virchow's triad



Neonatal cerebral sinovenous thrombosis
Risk factors

Maternal

- Preeclampsia
- Diabetes

Perinatal

- **Complicated delivery**
- **Perinatal asphyxia**
- **Umbilical cord abnormalities**

Neonatal

- Sepsis/meningitis
- Prematurity
- Dehydration
- Thrombophilia
- Total body cooling

And now?

Diagnostic work-up	Treatment	Prognosis
• Prothrombotic risk factors: normal	• **Supportive** • Anticoagulant therapy • Antiplatelet therapy	• 40-80% poor outcome • Spectrum of neurological complications

Controversial

Evolution of the case

- Succesful weaning of anticonvulsive medications
  - Only Levetiracetam maintenance treatment (normal EEG)

- Partial tube feeding at discharge
- Reassuring neurological examination at discharge

- No tube feeding anymore
- Seems to develop normal for now
- Long-term neurological follow-up

Take home message

- Neonatal CSVT
  - Association with perinatal asphyxia
  - Similar symptoms as HIE (timing may be different)

- Importance of brain US: IVH in term neonate > think about CSVT

- Anticoagulant therapy stays controversial – case by case decision

Thank you for your attention!
Questions?