

Cranial Ultrasound and MRI in Preterm Infants

with PAIS and CSVT: A Retrospective Case Series



Nerea Laura Keller · Master's Thesis, University of Zurich, 2025 · Neonatal Intensive Care Unit, USZ

AIM

1. Identification of preterm infants with perinatal arterial ischemic stroke (PAIS) or sinovenous thrombosis (CSVT) within the framework of the PICASSO (Preterm Infants, CSVT And Arterial Stroke Study: Clinical Factors and Outcome) study.
2. Diagnostic modalities cUS and MRI, establishing diagnosis and assessment of treatment indication.

METHODS

Design Retrospective case series within the multicenter PICASSO study.

Population Preterm infants <36 weeks with PAIS or CSVT, USZ NICU 2014–2024 (ICD-10 search: G08, I63.-, I64, I67.6, P52.-).

Patient Identification & Review ICD-10–based search in electronic medical records; discharge summaries and imaging screened to confirm diagnosis. Central review by local neonatologist + two LUMC experts (S. Steggerda, L. de Vries).

Clinical Symptoms Recorded within 24 h prior to diagnosis: seizures (suspected/EEG-confirmed), motor agitation, apnea, sepsis-like presentation.

Imaging Modalities

cUS Anterior Fontanel, Mastoid Fontanel, Posterior Fontanel, Transtemporal windows + Doppler

MRI T1w, T2w, DWI, SWI, MP-RAGE, TOF-MRA / MRV

Analysis Descriptive statistics (R v4.3.0, Excel v16.89.1); diagnostic yield, timing, and clinical impact assessed.

Results

4 / 5

PAIS detected first on cUS

2 / 4

CSVT detected first on cUS

100%

CSVT in transverse sinus

8 / 9

clinically silent or non-specific symptoms

KEY FINDINGS

Cohort Of **455** neonates with cerebrovascular events, **9** fulfilled inclusion criteria:
→ **PAIS n = 5** (median GA 29 4/7 wks)
→ **CSVT n = 4** (median GA 23 2/7 wks)

Initial detection cUS: **4 PAIS** + **2 CSVT** diagnosed bedside. MRI: **+1 PAIS** (DWI), **+2 CSVT** (incidental, other indications).

Localisation **PAIS**: 2 extended MCA, 3 perforator strokes **CSVT**: all right transverse sinus

MRI added value DWI confirmed acute large **PAIS** (1 case); MRI further revealed white matter tract involvement (internal capsule) and an additional contralateral cystic lesion in perforator territory missed on cUS

Clinical presentation Only 1 of 9 infants presented with focal seizures:
8 had no or only non-specific symptoms.

Treatment decision **PAIS**: supportive management. **CSVT**: heparin in 1/4 (late onset sepsis + meningitis); 3/4 conservative (serial imaging showed no propagation / recanalization / patent collaterals)

cUS

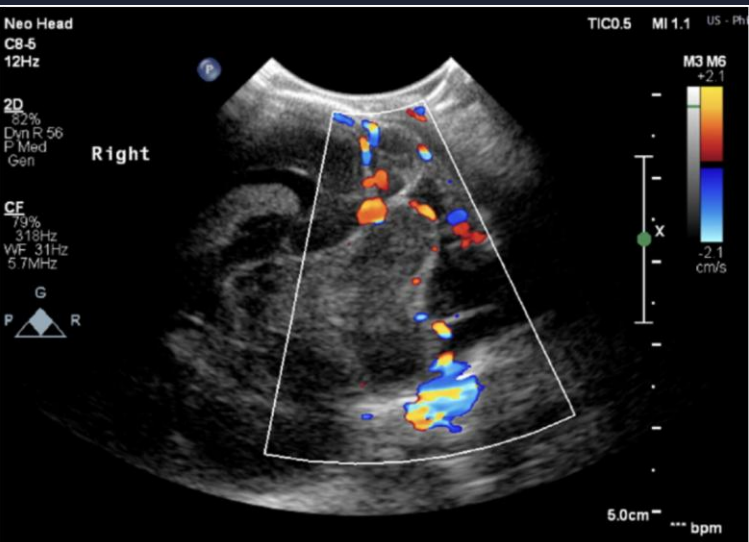
PAIS:

AF view + CCD: Heubner Artery

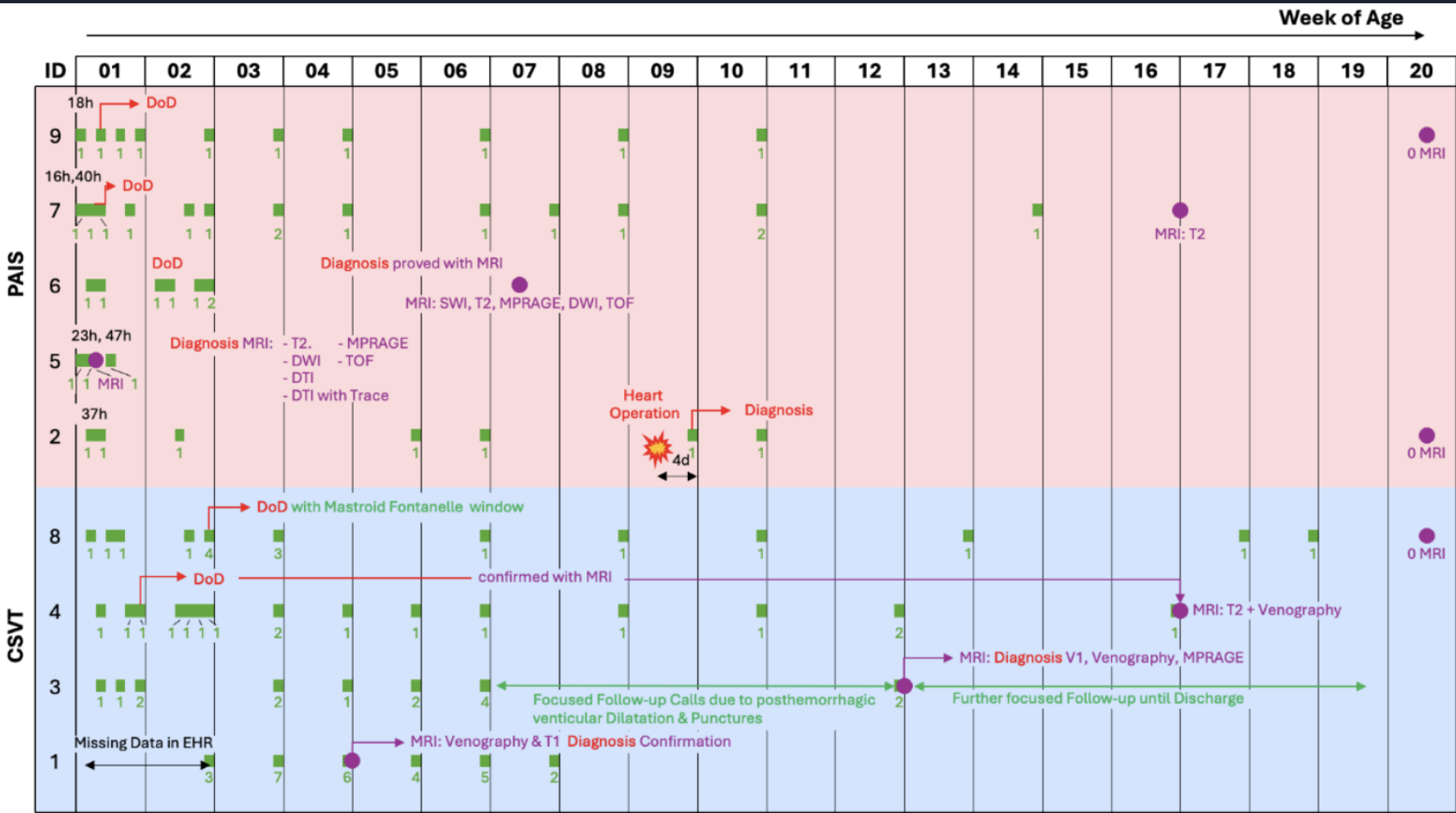


CSVT:

MF view + CCD: right transverse sinus



Timing of Diagnosis



Keys: PAIS = Perinatal Arterial Ischemic Stroke CSVT = Cerebral Sinovenous Thrombosis cUS = cranial Ultrasound MRI = Magnetic Resonance Imaging DoD = Day of Diagnosis
EHR = Electronic Health Record x = Number of Examination

Strengths & Limitations

Cranial Ultrasound (cUS)

STRENGTHS

- Rapid bedside detection: no transport, no sedation.
- Real-time hemodynamic evaluation via Doppler (luxury perfusion, venous flow).
- Mastoid fontanel window improved CSVT detection in transverse sinuses missed on anterior views.

LIMITATIONS

- Operator dependency.
- Low white-gray-matter contrast.
- Cannot reliably visualize structures such as the PLIC.

Magnetic Resonance Imaging (MRI)

STRENGTHS

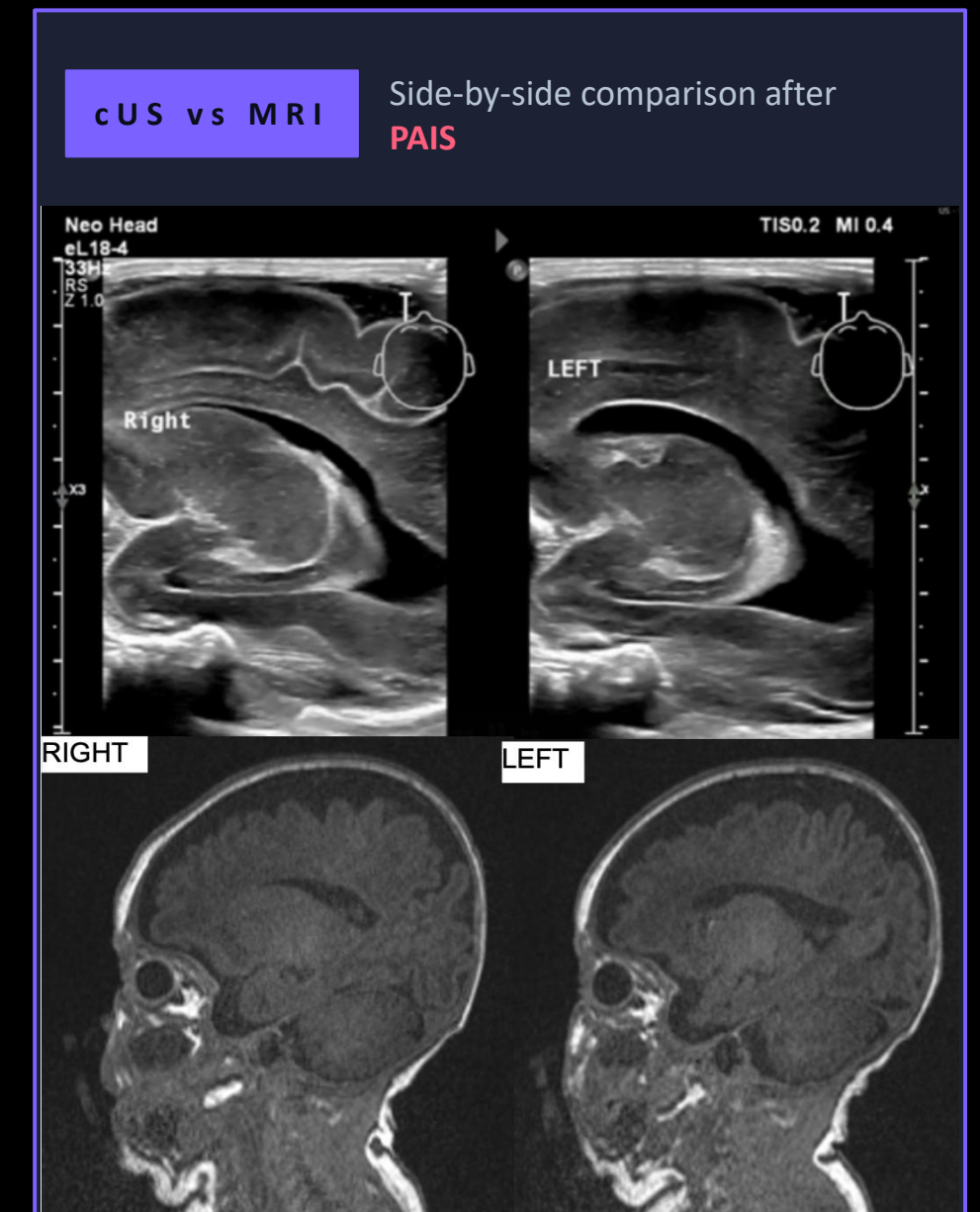
- Detailed anatomical and prognostic information.
- PLIC involvement: key prognostic marker.
- Early infarct characterization via DWI.

LIMITATIONS

- Ressource-consuming (transport, sedation, MRI compatible incubator).
- Less suitable for serial screening of unstable preterm infants.

CONCLUSION

cUS is the bedside screening tool for cerebrovascular events in preterm infants, particularly with routine use of the mastoid fontanel, though it remains operator-dependent. MRI complements cUS when structural detail or treatment decisions justify the risks and effort of transport.



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Master's Thesis · University of Zurich · 2025

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STUDY CONTEXT

PICASSO Study

Preterm Infants, CSVt and Arterial Stroke Study: Clinical
Factors and Outcome