Brigham and Women's Hospital
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HARVARD MEDICAL SCHOOL

Assessing Cranial Ultrasound Findings in Relation to NICU Term Equivalent MRI

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Background

- Brigham and Women's Hospital Neonatal Intensive Care Unit (NICU) began using the Embrace scanner, a 1-Tesla (1T), in-unit MRI clinically in March of 2020.
- We identified a cohort of preterm infants <32 weeks with a cranial ultrasound (cUS) that preceded a term equivalent age (TEA) MRI on the 1T scanner
- TEA MRI was obtained for clinical purposes primarily for:
  - Extremely preterm infants born at < 28 weeks gestational age
  - Very preterm infants (born at GA < 32 weeks) with additional risk factors:
    - Any intraventricular hemorrhage
    - Any structural abnormality, including ventriculomegaly
    - Any white matter injury (WMI)

Objective

The aim of the study is to compare the most recent cUS findings in preterm infants to their term equivalent 1T MRI to assess for novel findings on term equivalent 1T MRI.

Methods

- Retrospective study of infants <32 weeks gestational age who underwent cUS followed by a 1T brain MRI between December 2021 and May 2024
- On average, the cUS preceded the 1T MRI by 33 days
- MRIs were done for clinical purposes (per BWH clinical practice guidelines)
- Both cUS and 1T MRI were clinically read by radiologists and neuroradiologists and verified by investigators

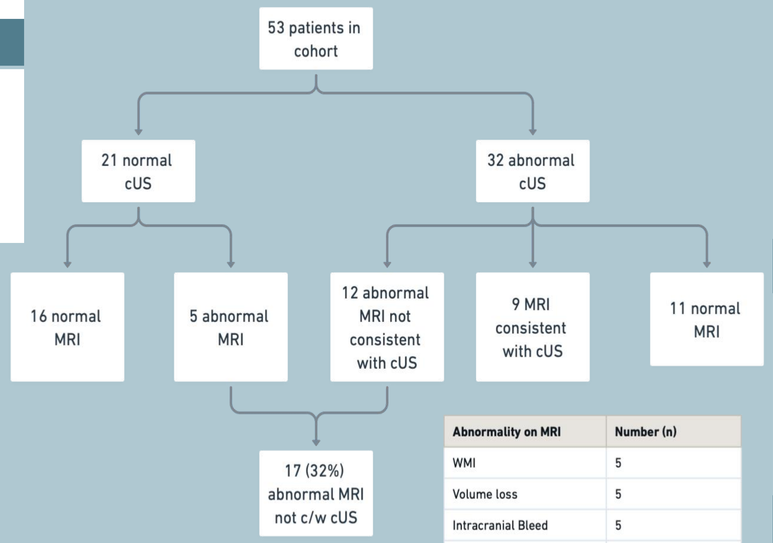




Results

- A cohort of 53 preterm infants included in the study
  - 21 had a normal cUS
    - 16 had a normal term MRI
    - 5 had an abnormal term MRI with findings not visualized on cUS
  - 32 had an abnormal cUS
    - 9 had a cUS consistent with (c/w) their term MRI
    - 12 had an abnormal MRI with findings not c/w cUS
    - 11 had a normal MRI
  - In total there were 17 babies (32%) that had abnormalities on term brain MRI that were not c/w cUS finding
    - 17 babies: 5 had volume loss, 2 polymicrogyria (PMG), 5 WMI, and 5 intracranial bleed with 1 germinal matrix hemorrhage, 1 parenchymal, 2 cerebellar hemorrhage and 1 new IVH.

Figure 1: Neuroimaging results



Abnormality on MRI	Number (n)
WMI	5
Volume loss	5
Intracranial Bleed	5
PMG	2

Figure 2: cUS vs 1T TEA MRI

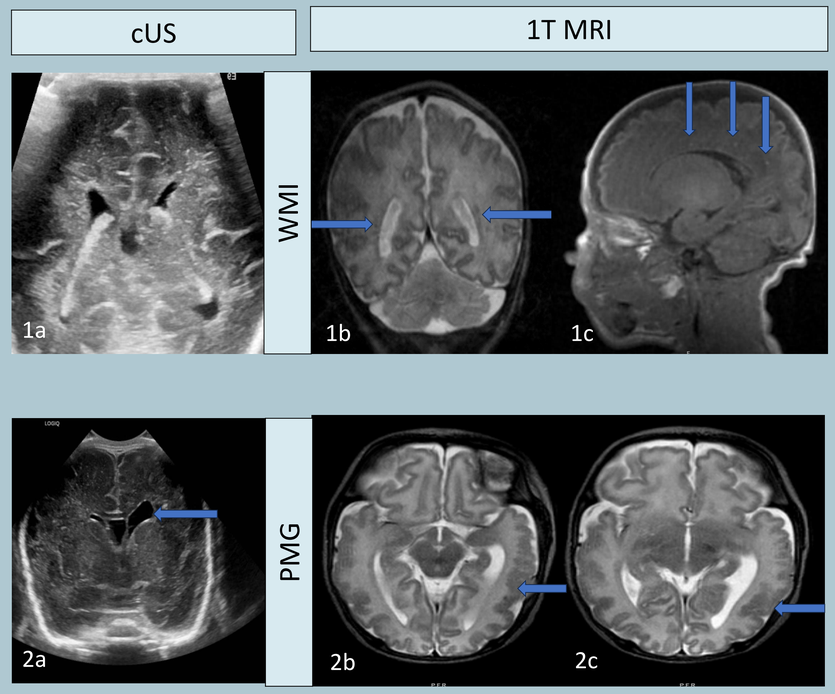


Figure 1a (cUS) Former 30 weeks 1 day gestational age (GA) infant at 31 weeks 6 days post menstrual age (PMA) reported as normal **1b (coronal T2)** MRI 36 weeks 4 days PMA shows punctate WMI shown as areas of hypointensity **1c (sagittal T1)** WMI shown as areas of hyperintensity

2a (cUS) Former 26 week 5 day GA infant at 35 weeks 2 days PMA with asymmetric prominence of left lateral ventricle **2b, 2c (axial T2)** term MRI at 40 weeks 1 day showing diffuse PMG in temporal, frontal and parietal lobes

Discussion and Conclusions

- In-NICU MRI provides valuable insights into brain abnormalities in preterm infants that are often undetectable on cUS.
- 32% of babies had abnormalities on TEA MRI that were not c/w cUS finding
- The most prevalent findings seen on TEA MRI were WMI, intracranial hemorrhages and volume loss.
- The advantages of an in-unit feed-and-wrap MRI is that it avoids sedation, radiation exposure and leaving the NICU
- Term equivalent age MRI adds valuable diagnostic information for assessing brain injury in preterm infants compared to cUS alone.
- Our results support offering TEA MRI as an important neuroimaging option for this vulnerable preterm population

References

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