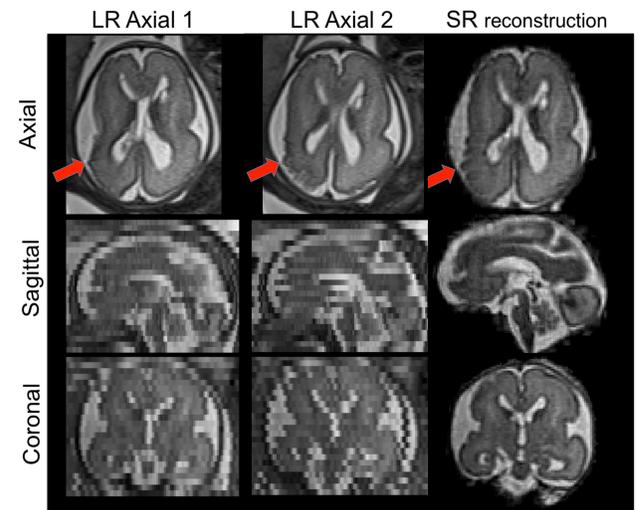


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BACKGROUND & AIMS

- Magnetic Resonance Imaging (MRI) is a key technique for the early diagnosis of fetal brain abnormalities¹
- Qualitative analysis of fetal brain MRI is based on thick 2D T2-weighted images (T2WI)
- Super-resolution (SR) tools are now available to reconstruct 3D high-resolution (HR) motion free volume²
- Our in-house pipeline has been **integrated to the clinical environment** at Lausanne University Hospital⁴ within the **syngo.via Frontier** Siemens Healthineers platform
- **Aim:** to **evaluate the true clinical relevance of fetal SR reconstruction** techniques in clinical workflows



Patient polymicrogyria better depicted on the SR reconstruction

MATERIALS & DATA

Cohort

- 47 fetal brain MRI: 32 normal and 15 pathological cases
- 18 to 36 weeks of gestation (GW), mean 27.6 +/-4.4 weeks

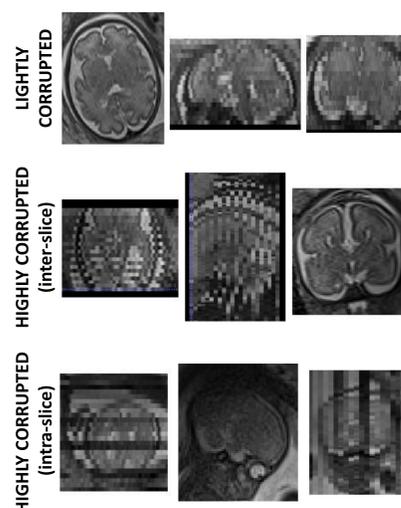
Imaging

- Orthogonal HASTE-T2WI
- 1.5T (93.7% of subjects) or 3T
- 1.125 mm in-plane isotropic resolution; 3 to 5 mm slice thickness
- MIAL Super-Resolution toolkit^{3,4} with direct access to the PACS
- Input: 3 to 11 series (in average 6)
- Output: 1.125mm isotropic resolution

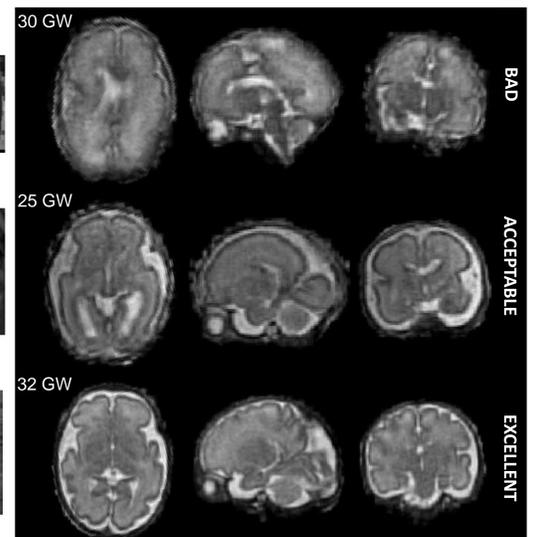
Assessment

- Motion index: tracking of the centroid of the brain mask across the slices
- Image quality index: measure based on the compressibility of series⁵
- 3 experts: 2 experienced pediatric radiologists, 1 image analysis engineer
- 3 levels: bad, acceptable, excellent

Low-resolution motion-corrupted HASTE-T2WI



3D high-resolution motion-free reconstruction

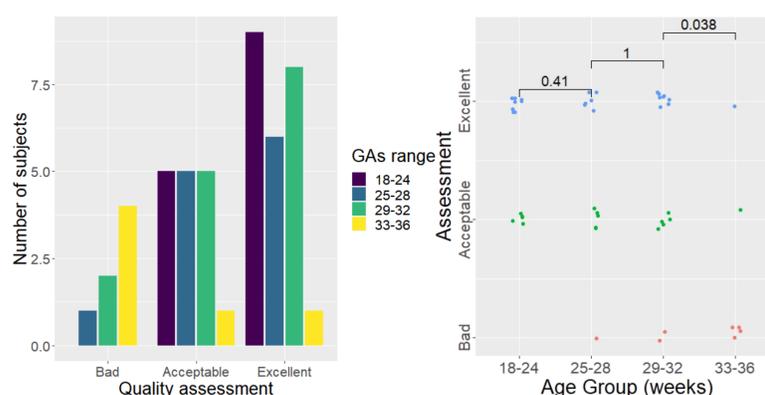


RESULTS

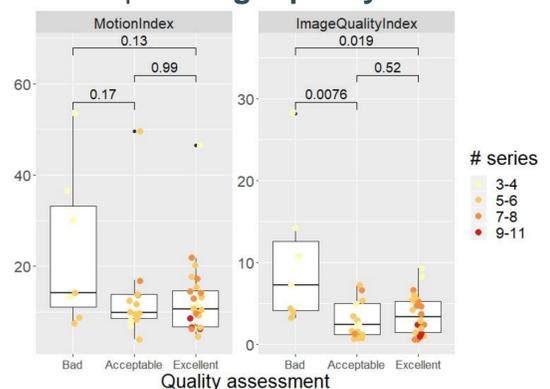
SR quality consensus: 85% of excellent and acceptable reconstruction, with high inter-rater reliability



Gestational age range: 33 to 36 weeks fetuses' show weaker SR reconstruction quality



Level of motion does not significantly impact on SR quality, while input **image quality** does



CONCLUSION

- 85% of SR reconstruction can be used for diagnosis purposes
- High level of motion can be compensated in the reconstruction process

REFERENCES: [1] N.J. Girard et al., *Imaging in Medicine* 2012; [2] S. Tourbier et al., *NeuroImage* 2015; [3] Docker: <https://github.com/Medical-Image-Analysis-Laboratory/mialsuperresolutiontoolkit>; [4] MeVisLab: <https://github.com/pdeman/mevislabFetalMRI>; [5] B. Kainz et al., *IEEE Transactions on Medical Imaging* 2015;

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