Measurement of Sylvian fissure angles at 18-30 weeks’ gestation

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Objective
To (i) evaluate the development of Sylvian fissures by measurements of the right and left Sylvian fissure angles during normal pregnancy at 18-30 weeks’ gestation; and (ii) examine the intra-observer and inter-observer repeatability of the measurements of the right and left Sylvian fissure angles.

Methods
This was a prospective cross-sectional study of 422 women with singleton pregnancy attending an ultrasound-based research clinic between March 2017 and December 2017. The entry criteria for the study were appropriately grown live fetus with no suspected structural and chromosomal defects between 18+0 and 30+6 weeks’ gestation. Coronal plane of the fetal brain was obtained through transvaginal 3D volume multiplanar imaging. For the measurement of the right and left Sylvian fissure angles, the coronal view was visualized as a single image from the three orthogonal views. The angles were drawn between a horizontal reference line (0 degree) and two lines drawn along the right and left upper sides of the Sylvian fissures. The right and left Sylvian fissure angles formed by these three lines were measured. Intra and inter-observer repeatability of the Sylvian fissure angles were assessed by Bland Altman plots. Reference equations were constructed for right and left Sylvian fissure angles for gestational age (GA) and head circumference (HC) by the Generalised Additive Models for Location Scale and Shape package.

Results
There was a significant negative polynomial association between the Sylvian fissure angles with GA and HC. The Sylvian fissure angle crosses the reference line (zero) at 25. 4 weeks’ gestation on the right side and at 25 weeks’ gestation on the left side; however, the angle crosses the reference line at around 23 cm HC on both sides. Z-score difference between the right and left smoothed percentiles of the Sylvian fissure angles indicated that median, 10th and 90th smoothed percentiles were closest and almost identical for the HC based reference but not the gestational reference. The intra-class correlation (95% confidence interval) of the right and left Sylvian fissure angles between the two sonographers was near perfect at 0. 993 (0. 988-0. 996) and 0. 991 (0. 985-0. 995), respectively. In Bland-Altman analysis, the mean difference between sonographer A and B in right Sylvian fissure angle was 0. 4 degree (95% CI -10. 2 to 10. 1) and in left Sylvian fissure angle was 1. 0 degree (95% CI -9. 6 to 11. 6).

Conclusion
The assessment of the Sylvian fissure angles is highly reproducible. The Sylvian fissure angle reference charts will aid evaluation of the development of the Sylvian fissures as a screening tool as part of a routine fetal neurosonogram at 18-24 weeks’ gestation and serve as a monitoring tool at 28-30 weeks’ gestation, in evaluation for the need of expert assessment to rule out neuronal migrational disorders.