

Assessment of regional placental vascularity / perfusion using 3D power Doppler and the index "fractional moving blood volume"

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Objectives: To assess reproducibility and regional variability of quantified placental perfusion using 3D power Doppler and the index "fractional moving blood volume" (FMBV).

Methods: 20 pregnant women at 26-34 weeks gestation with normally grown biophysically well singleton pregnancies with anterior placentas had placental mapping data stored digitally from each of 4 placental quadrants. Each was imaged by 2 investigators, with 2 data sets per investigator per quadrant. In total 320 data sets were stored and 6480 data values were evaluated by 2 different observers. Power Doppler imaging of the placental cord insertion was performed to provide a value for standardization of FMBV. Vascularisation index (VI), Flow index (FI) and Vascularisation Flow index (VFI) were calculated from spherical regions-of-interest, to compare measurements within and between quadrants and between observers. Reproducibility was expressed using intra-class correlation (ICC) and coefficient of variation (C.o.V).

Results: 1. Multiple evaluation of the same data set by 1 observer ICC: 0.24-0.57 (VI); 0.33-0.78(FI); 0.12-0.48 (VFI)

2. Intra-observer ICC: 0.40-0.56 (VI); 0.40-0.72 (FI); 0.15-0.40 (VFI)

3. Inter-observer ICC: 0.43-0.53 (VI); 0.48-0.62 (FI); 0.21-0.39 (VFI)

4. Regional variability ICC: 0.45-0.51 (VI); 0.49-0.60 (FI); 0.25-0.37 (VFI)

5. Regional variability between all quadrants: mean C.o.V: 39.96% (VI); 12.02% (VFI); 45.49% (VFI)

6. In all analysed data FI showed least variability

Conclusions: There is insufficient evidence to support the meaning, reliability or reproducibility of VI, FI or VFI as tools to quantify placental perfusion despite multiple publications and journal submissions. Inaccuracy exists at multiple levels. Further investigation into placental perfusion and quantification, possibly using extended regions of interest or the whole placenta may lead to FMBV becoming a useful clinical tool.