Serial measurements of amniotic fluid volume in normal singleton pregnancies – an ongoing MRI and ultrasound study

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Objective

To describe amniotic fluid volume (AFV) longitudinally in normal singleton pregnancies using MRI.

Methods

Prospective, longitudinal study of normal pregnancies examined every fourth week by magnetic resonance imaging (MRI) and ultrasound (US) from gestational week 16 until delivery. US measurements were single vertical deepest pocket (SVDP) from week 16 and additionally amniotic fluid index (AFI) from week 22 performed by fetal medicine experts. MRI was performed within 24 hours on a Siemens 1. 5 Tesla system with a 3-dimensional high-resolution sequence covering the whole uterus. Sequence scan time was 14 seconds, repeated up to 20 times depending on fetal movement. Fetal volume and AFV excluding the umbilical cord were measured by manual segmentation of all MRI slices every 2 mm through the entire uterus in axial, coronal and sagittal planes using a threshold and filling technique in Mimics (Materialise, Belgium). Correlation between MRI and US measurements was calculated using Pearson's r.

Results

By April 2016, twelve participants have been included and five have completed the study. A total number of 59 MRI as well as US scans have been performed with AFI measured in 38 of the US scans. Fetal volumes by MRI showed growth curves with little variation and strong correlation to birth volumes calculated from birth weight (r=0. 94). AFVs by MRI showed volumes increasing up to 400-800 ml in second trimester. In third trimester, AFVs varied between 250-1100 ml with individual patterns of AFV changes. We found a positive correlation between AFV and SVDP (r=0. 52) and between AFV and AFI (r=0. 50).

Conclusion

AFV can be measured using MRI from gestational week 16. This quantitative measurement may be more accurate than the proxy measurements obtained by US.