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Fetal brain volumes and long-term neurodevelopmental outcomes

Katorza E, Halevy J, Ziv-Baran T
Sheba Medical Center, Ramat Gan, Israel

Objective

This study compared the long-term neurodevelopmental outcome of intrauterine growth restricted (IUGR) fetuses and apparently healthy fetuses. Furthermore, it investigated the correlation of MRI measured fetal brain volumetrics with long-term neurodevelopmental outcome, among IUGR and apparently healthy fetuses.

Methods

A historical cohort study at a single tertiary referral medical center during 6 years period, of fetuses diagnosed with IUGR due to placental insufficiency, and apparently healthy fetuses, who had fetal brain MRI scan. The volumes of the supratentorial brain region, both hemispheres and the cerebellum were measured by 3D MRI semi-automated volume measurements. The cerebellum to supratentorial volumes ratio (CER/ST) was calculated. Volumes were plotted on normal growth curves. 17 IUGR fetuses, and 53 apparently healthy fetuses adhered to participate in the VABS-II questionnaire, evaluating neurodevelopmental outcome.

Results

70 patients (mean age at conducting VABS-II questionnaire 4.4±2.1 years, 38 males) were evaluated. Among fetuses born in a gestational age of 36 weeks or later, IUGR fetuses demonstrated a significantly larger number of abnormal results in the VABS-II communication domain ($p=0.049$). No significant differences were found in other domains or in overall neurodevelopmental outcome. The CER/ST ratio correlated with the overall neurodevelopmental outcome of the total study population ($r=.40$, $p<.001$), and of the IUGR group separately ($\rho=.58$, $p=.016$).

Conclusion

CER/ST ratio measured in fetal MR imaging was found to be correlated with long term neurodevelopmental outcome. This ratio is of possible significance in linking fetal MR volumetrics and neurodevelopmental outcome. This may aid in interpreting results of fetal MRI and in future clinical decision making.