

Stomach Volume Evaluation on Fetal MRI and its use in Prenatal Identification of Esophageal Atresia

Aditya Phadnis¹, Monica Forbes-Amrhein²

¹Indiana University School of Medicine; ²Indiana University School of Medicine, Department of Radiology & Imaging Sciences

Swallowing of amniotic fluid alters the volume of the fetal stomach; therefore an abnormal fetal stomach size can be indicative of pathology. Previous studies have used linear measurements on ultrasound to approximate stomach sizes. Fetal magnetic resonance imaging (MRI) allows for volumetric measurement of the stomach. The objective of this study was to develop a library of normal fetal stomach volumes on MRI at each gestational age. We also sought to measure stomach volumes of fetuses with esophageal atresia and compare to normal volumes at similar gestation ages (GA).

A retrospective review of fetal MRIs from patients 20-38 weeks GA was conducted. Exclusion criteria for the controls included any impairment that would impede swallowing or alter stomach sizes. Patients with esophageal atresia were identified and postnatal records were reviewed to confirm the diagnosis. The stomach volume was measured on T2-weighted imaging using Phillips Intellispace software. The stomach volumes of the controls at each GA were compared using one-way ANOVA with Games-Howell Post-Hoc ($p < 0.05$). The stomach volume in esophageal atresia was compared to controls using a T-test ($p < 0.001$).

185 control studies, 10 at each week of gestation, and 8 patients with esophageal atresia were included. For normal fetuses, there was a trend of increased stomach size and broadened standard deviation with increasing GA. No significant difference was found between any two sequential weeks, however the difference in second and third trimester volumes was significant ($p < 0.001$). The patients with esophageal atresia had significantly smaller stomach volumes compared to control patients of the same GA range ($p < 0.001$).

This pilot study established reference values for fetal stomach volume, which was found to increase with GA. The stomach volume is significantly smaller in patients with esophageal atresia. Thus, esophageal atresia can be identified prenatally, allowing for delivery at an appropriate acuity NICU and early intervention.