

Evaluating the Prognostic Value of Fetal Magnetic Resonance Imaging Measures on Postnatal Pulmonary Outcomes in the Setting of Omphalocele

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Background/Objective: Omphalocele is a disorder of fetal abdominal development with increased risk for respiratory complications after birth secondary to pulmonary hypoplasia. While fetal magnetic resonance imaging (MRI) derived observed-to-expected total fetal lung volume (O/E-TFLV) has been established as an effective measure for prognosticating outcomes in other congenital disorders, it is not well understood whether this measure or others applies to patients with omphalocele. This study aims to assess the ability of fetal MRI measures to predict lung-related morbidity and perinatal outcomes in fetuses with omphalocele.

Methods: A retrospective review of fetal MRIs from 2016 to 2024 was performed, identifying 36 patients at 20-34 weeks gestation with omphalocele which were confirmed at birth. Omphalocele defect volume and MRI-derived fetal lung volumes, including O/E-NFLV and lung volume to head circumference ratio (LVHC), were compared with postnatal outcomes. A Mann-Whitney U test was used to evaluate the predictive value of each measure, along with a stepwise regression model for the outcomes of survival, intubation, and discharge with oxygen support.

Results: Both O/E-NFLV and LVHC measures predicted mortality, need for intubation, discharge with oxygen support, and tracheostomy placement with statistical significance ($p < 0.05$). LVHC was the best predictor for mortality and discharge with oxygen support, with a LVHC < 0.067 (AUC 0.905) predicting mortality and LVHC < 0.116 (AUC 0.828) predicting need for oxygen at discharge. A percent extra-abdominal liver greater than 29.32% (AUC 0.803) was the best predictor for intubation.

Conclusion: This study demonstrated O/E-NFLV and LVHC as effective measures for prognosticating survival and need for postnatal respiratory support in the setting of omphalocele. With this information, fetal MRI can be used to improve the preparation of families and medical teams for necessary postnatal care.