



Utility of 3-dimensional modeling in prenatally diagnosed large fetal neck mass

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Introduction

Prenatally diagnosed large fetal neck mass requires multidisciplinary consultation and evaluation of perinatal treatment options. The decision to perform Ex-utero Intrapartum Treatment (EXIT) is based on risk-benefit assessment for both the infant and mother. Though fetal ultrasound and MRI assist with operative planning, a three-dimensional anatomic model offers improved anatomic visualization and prenatal patient counseling.

Methods

Multiple surveillance ultrasound exams between gestational weeks 16 and 32, plus fetal MRI at 29 3/7 weeks were performed for fetal evaluation. A 3-dimensional model was printed (Form 3 and 3L, clear resin, Formlabs) incorporating fetal MRI (Ax SSFSE TE 100 DL and Cor SSFSE Brain DL) and using Mimics Medical and 3-matic Medical software (Materialise).

Results

A left multicystic neck mass measuring 2.1x1.8x1.5cm was diagnosed at 16/7 weeks gestation in a G8P2416. Fetal MRI performed at 29 3/7 weeks showed an exophytic mixed solid-cystic cervicofacial mass, 10.3 x 9.4 x 10.6 cm arising from the left mandible, concerning for a teratoma. Prior to delivery, the model was used to educate and counsel the family regarding the complex clinical situation and the reasoning for delivery via EXIT followed by mass resection. Additionally, the model demonstrated tracheal narrowing and oropharyngeal compression, supporting airway intervention planning (Figure 1). The fetus was delivered at 32 3/7 weeks via EXIT to intubation using rigid bronchoscopy. Duration of time on placental support was 12 minutes. On day of life 5, the patient underwent resection of the cervical mass. Pathology revealed an immature teratoma, histologic grade 3 without yolk sac elements, and negative regional lymph nodes. The patient was discharged home from NICU at two months of life and is doing well at follow up.

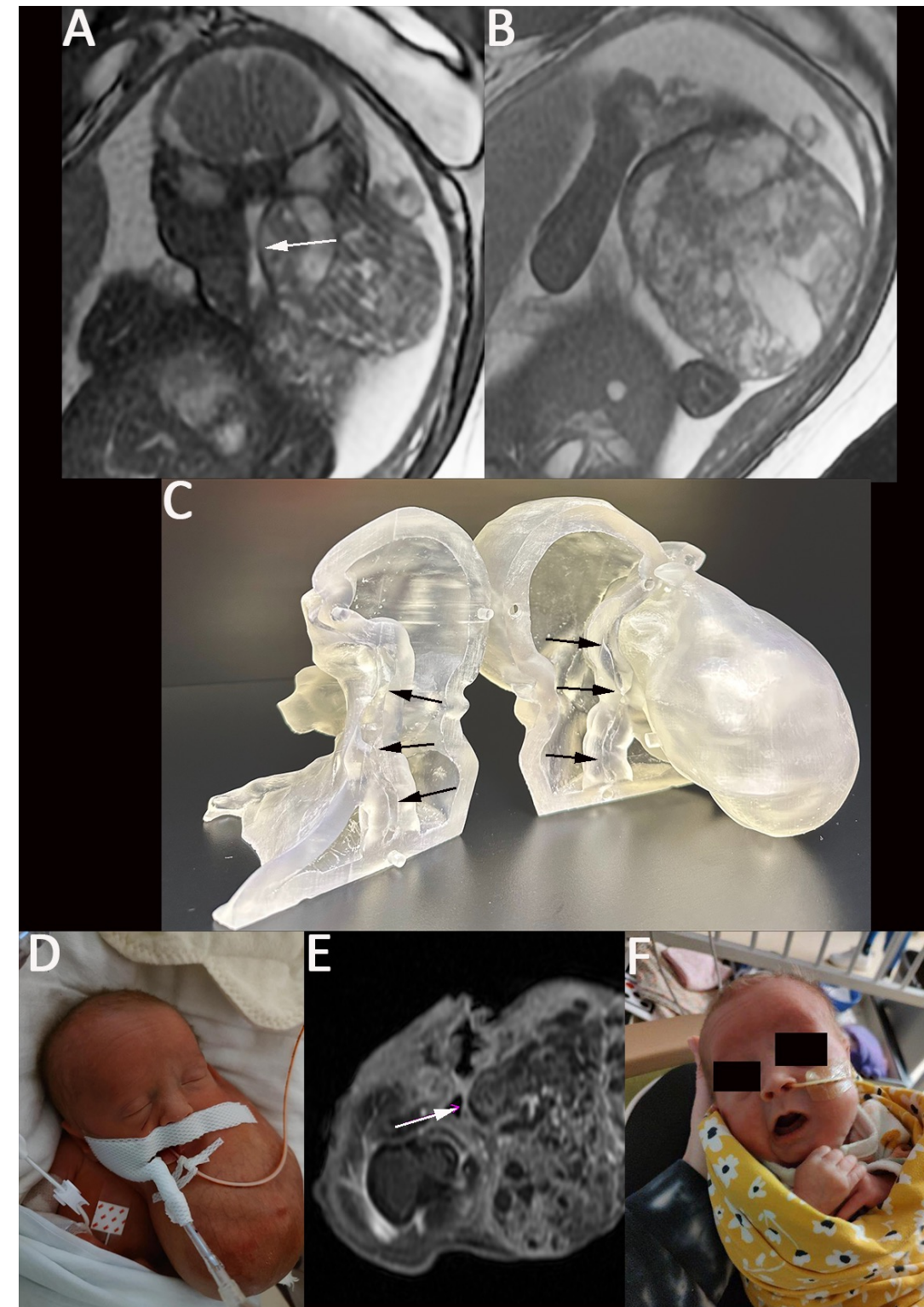


Figure 1: Fetal MRI T2-weighted single-shot fast-spin echo coronal (A) and axial (B) show large fetal cervical mixed solid and cystic mass, closely approximating or involving the left pharynx wall with airway narrowing (arrow, A). 3D print (C), fabricated as an assembly, shows the removable bulk of the mass, as well as internal structures allowing clear visualization of the narrowed airway (black arrows). Postnatal delivery photo of infant (D) shows proportion of teratoma to the infant's head. Postnatal MRI T1-weighted post-contrast axial image (E) redemonstrates the tumor adjacent to pharynx (arrow). Postsurgical image of the infant one week postoperatively (F) shows minimal distortion of left cheek and neck.

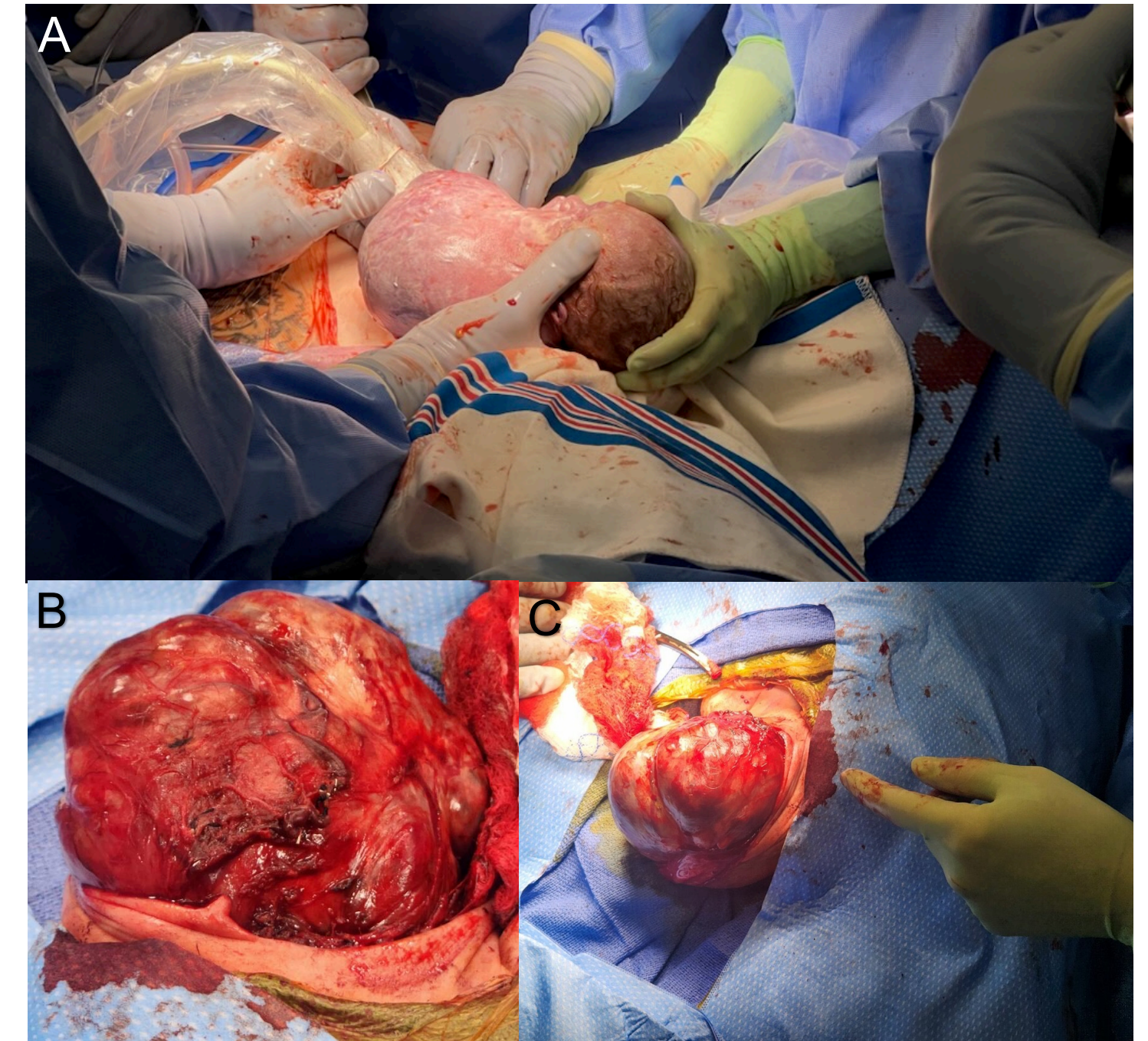


Figure 2: At 32 3/7 weeks, the fetus was delivered via EXIT to intubation with a multi-disciplinary team including maternal fetal medicine, pediatric ENT, and pediatric surgery (A). On day of life 5, the infant underwent resection of the large cervical mass (B, C).

Discussion

Three-dimensional fetal modeling facilitates perinatal airway needs assessment, patient counseling, delivery, and postnatal management.

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