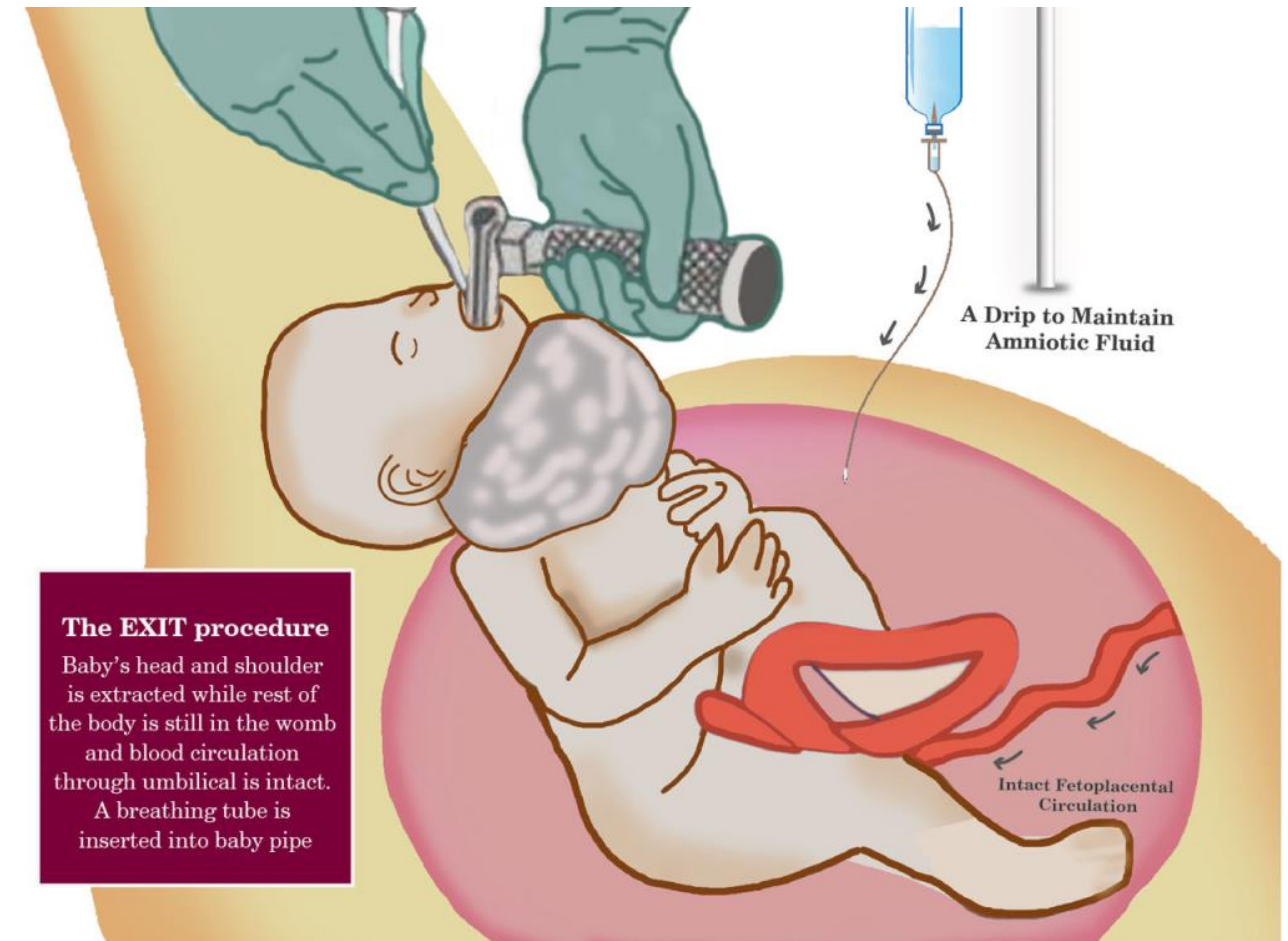


The EXIT Procedure: Considerations for the Obstetric Anesthesiologist

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Introduction

- The ex-utero intrapartum therapy, or EXIT, procedure is one in which the fetal head and shoulders are delivered to manage airway anomalies while using placental perfusion to maintain oxygenation.
- Requires multidisciplinary planning for both mother and baby, including:
 - Maternal fetal medicine, obstetric anesthesiology, circulator and surgical technician for mother
 - Neonatal anesthesiology, pediatric surgery and ENT, NICU, circulator, and surgical technician; as well as possible pediatric CVTS and ECMO specialist for baby.



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Case Presentation

- 34-year-old G2P1A0 presented at 36 weeks gestation for EXIT procedure
 - Severe micrognathia on 19-week anatomic survey
 - Genetic workup via amniocentesis was positive for Nager Syndrome, which is associated with acrofacial dysostosis
 - 30-week fetal MRI with jaw index of 18 suggestive of severe micrognathia with associated cleft palate, glossoptosis, severely narrowed but not obliterated oropharynx
- Intraprocedure
 - GETA: intubated with aspiration precautions
 - Sevo maintained at **MAC > 2.0 with nitroglycerin to maintain uterine relaxation**
 - Phenylephrine gtt for blood pressure support
 - Fetal anesthesia achieved with IM fentanyl and vecuronium, and then airway was secured via nasal intubation by pedi anesthesia and ENT
 - Fetal delivery followed by reversal of uterine relaxation with lower MAC, nitrous, oxytocin bolus

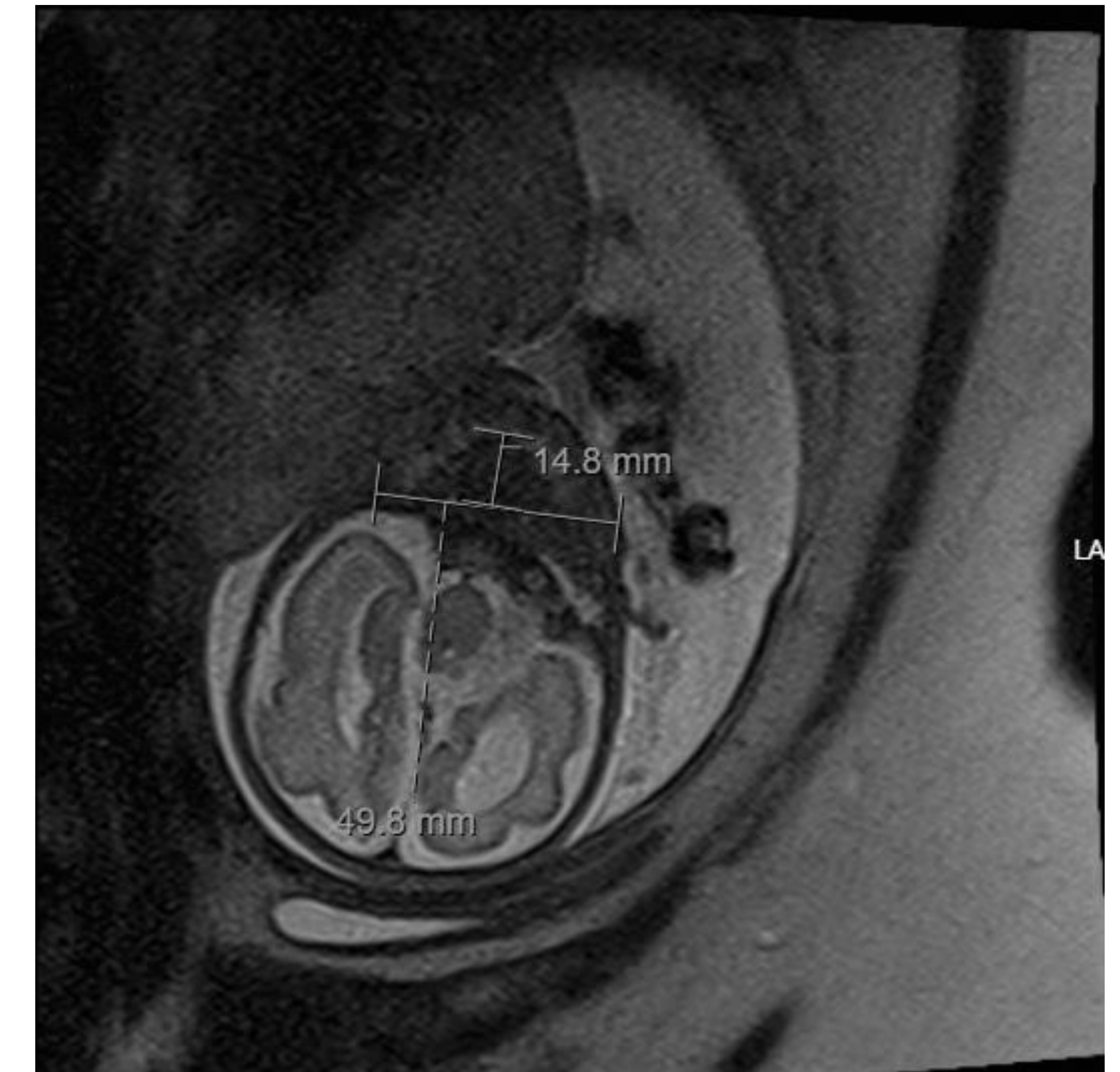


Figure 1. Fetal MRI demonstrating a jaw index of 18. The jaw index is measured by AP mandibular distance/biparietal distance * 100, and an index of <23 is 100% sensitive and 98% specific for micrognathia

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EXIT PROCEDURE GUIDE	
Goal: provide profound uterine relaxation while maintaining uteroplacental perfusion until fetal airway is secured, with rapid reversal to promote contraction of uterus	
ACCESS/ LINES	2 large bore PIVs Pre-induction arterial line with ultrasound guidance and lidocaine Foley for goal-directed fluid management and bladder decompression
PREMEDICATION	Aspiration prophylaxis: consider bicitra, reglan, zofran 2g cefazolin; 3g if ≥120kg; gentamycin and clindamycin if penicillin allergy Discuss redosing abx with OB team after 1500ml EBL
ANESTHETIC CHOICE	GETA with true RSI – propofol, succinylcholine, cricoid pressure, 6.5 ETT, difficult airway equipment in room (glidescope, bougie, LMA) Position left uterine displacement to relieve aortocaval compression Ramp for optimum sniffing position if obese Fentanyl, versed, dilaudid as needed after delivery OGT, temperature probe, bair hugger
UTERINE RELAXATION	2-3 MAC of inhaled anesthetic to provide maximum uterine muscle relaxation and prevent early detachment/delivery of placenta Rocuronium to provide fully relaxed operating conditions Nitroglycerin bolus (100mcg) followed by infusion (0.5-1mcg/kg/min) given at least 1-2 minutes prior to hysterotomy Ask surgeon for a 5- and 2-minute warning and to assess uterine tone prior to hysterotomy to ensure maximal relaxation
MATERNAL HEMODYNAMICS	Phenylephrine infusion to start after GETA induction as needed to maintain maternal MAP within 10-20% of baseline PRN phenylephrine/ephedrine/norepinephrine boluses Available pressors in the room in case needed (dilute epi, norepinephrine)
ATONY REVERSAL POST- DELIVERY	½ MAC + nitrous oxide after cord clamped to reverse and prevent atony Oxytocin first line uterotonic, consider 1g TXA at onset of hemorrhage Determine hemabate/methergine contraindications prior to case start
PPH	Blood in the OR prior to surgery start – 4 PRBCs, 4 FFP Send baseline ABG/CBC/coags/fibrinogen Monitor H/H with frequent ABGs, consider TEG/ROTEM Low threshold to activate MTP and/or call for rapid infuser (Level I/Belmont) Calcium replacement if transfusing, use ABGs to guide
TEAM	MFM attending and fellow, OB resident, OB Anesthesia attending and fellow, Anesthesia resident, circulating OR nurse, NICU attending and fellow, Pediatric Anesthesia attending, Pediatric ENT attending

Hannah White Burcham, MD

Discussion

- In this EXIT procedure, the team was able to secure a difficult airway without compromising fetal oxygenation and the uterus remained highly relaxed with a total quantitative blood loss of less than 300ml.
- The EXIT offers life-saving interventions but carries high risk of complications including hemorrhage and fetal complications, and thus requires **diligent and extensive multidisciplinary planning** across many disciplines.
- For the anesthesiologist, the primary **goal is to achieve profound uterine relaxation** so that uteroplacental circulation is maintained, while also ensuring maternal hemodynamic stability ¹.
 - With regards to anesthetic technique, general endotracheal anesthesia is most utilized, as it allows for quickly reversible and titratable uterine relaxation with sevoflurane.
 - Use of neuraxial anesthesia has been reported but is less favorable hemodynamically and can be stressful for an awake parturient ².

1. Marwan, A. and T. M. Crombleholme (2006). "The EXIT procedure: principles, pitfalls, and progress." Seminars in Pediatric Surgery 15(2): 107–115.
2. Kumar, K., C. Miron and S. I. Singh (2019). "Maternal anesthesia for EXIT procedure: A systematic review of literature." J Anaesthesiol Clin Pharmacol 35(1): 19–24.