Maternal Fetoscopic Myelomeningocele Repair Complications

- Benefits and complications of fetal and postnatal surgery for open spina bifida: systematic review and proportional meta-analysis
- Safety and Effectiveness of Fetal Myelomeningocele Repair: Case Series Analysis Using an Exteriorized Uterus and a Fetoscopic Approach
- Outcomes Following Fetoscopic Repair of Myelomeningocele: A Prospective Single-Center Experience
- Fetoscopic Myelomeningocele (MMC) Repair: Evolution of the Technique and a Call for Standardization
- Proof of concept testing of a vascular closure device for use in fetal surgery
- Should We Stitch-Close the Fetoscopic Percutaneous Access? A Case-Series of Laparotomy to Trans-Amniotic Membrane Suturing for Intrauterine Port Placement in Fetoscopic Surgery for Twins
- Perforation of cavum septi pellucidi in open spina bifida and need for hydrocephalus treatment by 1 year of age
- Implication of chromosomal microarray analysis prior to in-utero repair of fetal open neural tube defect

Fetal surgery has made significant strides over the past 40 years, facilitated by advances in technology and imaging modalities enabling the diagnosis and treatment of a congenital anomaly in utero. The MOMS trial, a multicenter randomized controlled trial, established open fetal myelomeningocele repair as the gold standard for improving neurological outcomes compared to postnatal repair. However, this approach is associated with increased Maternal Fetoscopic Myelomeningocele Repair Complications and preterm birth due to hysterotomy, prompting the exploration of minimally invasive alternatives. Due to the lack of an existing randomized control trial with Fetoscopic Myelomeningocele Repair Technique and variations (percutaneous versus laparotomy/transuterine access, different trocar configurations, closure methods, and patch applications) among different fetal centers, more studies are needed to optimize this approach as an alternative to the standard of care. Cruz et al. from the Nationwide Children's Hospital, Columbus, propose to assess the basic tenets of open fetal MMC repair and to establish guiding principles for a fetoscopic approach that could prove to be equivalent or superior to open fetal MMC repair in maternal and fetal outcomes and lead to clinical implementation [1)].

Fetoscopic myelomeningocele (MMC) repair is a minimally invasive alternative to open fetal surgery for spina bifida repair, aimed at reducing morbidity while maintaining the benefits of in-utero closure. However, this approach is associated with its own set of maternal and fetal complications.

Maternal Complications 1. **Premature Rupture of Membranes (PROM)**: One of the most common complications, occurring in a significant percentage of cases (up to 30-50%), leading to preterm labor and delivery. 2. **Preterm Labor and Preterm Birth**: The procedure increases the risk of preterm delivery, with many neonates being born before 34 weeks of gestation. 3. **Chorioamniotic Membrane Separation**: The insertion of trocars and carbon dioxide insufflation can lead to separation of the amniotic and chorionic membranes, which may predispose to preterm rupture and labor. 4. **Amniotic Fluid Leakage**: Caused by trocar insertion, this can lead to oligohydramnios and fetal compression syndromes. 5. **Uterine Dehiscence and Rupture**: A

significant risk, especially in subsequent pregnancies, requiring close monitoring and cesarean delivery in future gestations. 6. **Placental Abruption**: Trauma from the fetoscopic procedure may contribute to partial or complete placental separation. 7. **Intraoperative and Postoperative Bleeding**: Risks include placental or uterine injury. 8. **Infection (Chorioamnionitis, Endometritis, Sepsis)**: Although rare, intra-amniotic infection can be a severe complication. 9. **Pulmonary Edema**: Linked to maternal fluid overload during anesthesia. 10. **Tocolytic Side Effects**: Tocolytics used to prevent preterm labor can cause maternal tachycardia, hypotension, or arrhythmias.

Fetal Complications 1. **Preterm Birth and Its Consequences**: The most frequent and significant fetal complication, leading to risks such as respiratory distress syndrome, necrotizing enterocolitis, and intraventricular hemorrhage. 2. **Fetal Demise**: Rare but can occur due to complications like umbilical cord compression, preterm labor, or placental insufficiency. 3. **Iatrogenic Preterm Premature Rupture of Membranes (PPROM)**: Leading to increased risks of infection, pulmonary hypoplasia, and limb contractures. 4. **Intrauterine Growth Restriction (IUGR)**: Related to uteroplacental insufficiency. 5. **Pulmonary Hypoplasia**: Secondary to prolonged oligohydramnios. 6. **Cord Complications**: Risk of umbilical cord entanglement or compression due to changes in intra-amniotic pressure. 7. **Residual or Recurrent Spinal Cord Tethering**: Postnatal evaluation may still reveal tethering, necessitating neurosurgical intervention. 8. **Neurological Deficits**: Despite successful in-utero repair, some infants may still have significant motor or cognitive impairment. 9. **Fetoscopic Port Site Hernias**: Reported in some cases postnatally.

Comparison to Open Fetal Surgery - **Lower maternal morbidity**: Reduced uterine scar complications compared to open fetal MMC repair. - **Higher risk of membrane complications**: Increased PROM and chorioamniotic separation. - **Reduced risk of uterine rupture in future pregnancies**: Unlike open surgery, which requires a classical hysterotomy, fetoscopic repair is less invasive but still necessitates cesarean delivery for subsequent births.

Fetoscopic MMC repair represents a promising advance in fetal surgery, offering benefits over open repair, but requires careful patient selection and close perinatal monitoring to mitigate complications.

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Cruz SM, Hameedi S, Sbragia L, Ogunleye O, Diefenbach K, Isaacs AM, Etchegaray A, Olutoye OO. Fetoscopic Myelomeningocele (MMC) Repair: Evolution of the Technique and a Call for Standardization. J Clin Med. 2025 Feb 20;14(5):1402. doi: 10.3390/jcm14051402. PMID: 40094785.