Fetoscopic Myelomeningocele Repair Technique

- 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
- Impact of Prenatal Repair for Fetal Myelomeningocele on Gastrointestinal Function
- Fetoscopic Robotic Open Spina Bifida Treatment (FROST): A Preclinical Feasibility and Learning Curve Study
- Outcomes Following Fetoscopic Repair of Myelomeningocele: A Prospective Single-Center Experience
- Fetoscopic Myelomeningocele (MMC) Repair: Evolution of the Technique and a Call for Standardization
- Two-dimensional Speckle Tracking Echocardiography and Fetal Cardiac Performance During Fetoscopic Repair of Myelomeningocele
- Fetoscopic repair of open spina bifida between 26 0/7 and 27 6/7 gestational weeks and postnatal cerebrospinal fluid diversion

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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 MMC repair and variations in technique (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].

1. Indications

- Diagnosed open MMC (typically at 19–26 weeks of gestation).
- Herniation of neural elements without skin coverage.
- No associated genetic abnormalities or severe maternal conditions.
- Adequate amniotic fluid levels and normal placental positioning.

2. Preoperative Considerations

- Detailed fetal MRI and ultrasound assessment.
- Counseling about maternal and fetal risks.
- Maternal anesthesia plan (general or regional).
- Preoperative antibiotics and tocolysis to prevent preterm labor.

3. Surgical Technique

A. Maternal Preparation

1. Under general anesthesia, the maternal abdomen is sterilized.
2. A laparotomy is performed to access the uterus.
3. Uterine relaxants are administered to optimize exposure.

B. Uterine Entry and Trocar Placement

1. A fetoscopic approach uses a carbon dioxide (CO_2) or fluid-filled environment.
2. Two to three small uterine ports are inserted under ultrasound guidance.
3. Fetoscopes and instruments are introduced through these ports.

C. Myelomeningocele Closure

- **Neural Plaque Release:**
    1. The exposed spinal cord is carefully separated from surrounding tissue.
    2. Neural placode repositioned into the spinal canal.
- **Dural and Myofascial Repair:**
    1. A dural patch or primary closure of the dura is performed to protect neural elements.
    2. Myofascial flaps are mobilized and sutured over the defect.
- **Skin Closure:**
    1. If feasible, primary skin closure is achieved.
    2. If inadequate skin coverage exists, an amniotic patch or biological dressing is used.

4. Postoperative Care

- Maternal monitoring for contractions, infection, or uterine dehiscence.
- Prolonged bed rest and tocolytics to delay labor.
- Regular fetal ultrasounds to assess neurological status and amniotic fluid levels.
- Delivery planned via cesarean section at around 37 weeks.

5. Outcomes and Considerations

- **Neurological Benefits:** Reduced need for postnatal shunting for hydrocephalus and improved motor function.
- **Maternal Risks:** Preterm labor, uterine rupture, and placental dysfunction.

- **Comparison to Open Fetal Surgery:** Lower maternal morbidity but slightly higher risk of fetal membrane rupture.

Fetoscopic MMC repair is a promising alternative to traditional open fetal surgery, balancing maternal safety with improved fetal outcomes.

1)
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.