

# Fetal Therapy:

## Yesterday, Today, and Tomorrow



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# Disclosures

- No financial disclosures

# Objectives

- Brief history of fetal therapy
- Review of the indications for fetal therapy
- Discuss various fetal therapies currently available
- Address maternal risks and benefits of procedure— today and tomorrow
- Address fetal (and subsequently neonatal) risks and benefits of interventions—today and tomorrow

# Yesterday:

## History of Fetal Therapies

### ■ 1963

- First successful in utero treatment of fetal disease
- Liley transfused blood into abdomen of hydropic fetus with anemia caused by severe Rh sensitization

### ■ 1982

- Dr. Michael Harrison performed the first open fetal surgery

**Completely changed way of thinking and promoted concept of fetus as a patient**

# Today:

## What is required for fetal therapy?

- Understanding impact of fetal intervention on neonatal outcome
- Knowing short term and long term impact on maternal health
- Multidisciplinary approach for both mother and fetus
- Recognition of emotional issues involved for patient and entire family

# Types of Procedures Performed

- Administration of medications (through mom, into amniotic fluid, or directly to fetus)
- Blood transfusions to fetus
- Shunt Placements
- Ultrasound guided radiofrequency ablation
- Needle guided fetal therapies (to open heart valves)
- Fetoscopic endotracheal occlusion (FETO)
- Laparoscopic fetal surgeries (Laser for TTTS)
- EXIT Procedures (specialized Cesarean)
- Open fetal surgery

<b>Procedure</b>	<b>Approach</b>	<b>Disease</b>	<b>U of M?</b>
Laser ablation vessels	Fetoscopic	TTTS	Yes
Radiofrequency ablation	Fetoscopic	TTTS/anomaly/ TRAP	Yes
EXIT	Open	Airway Obs	Yes
Thoracic shunt	Percutaneous	Hydrothorax	Yes
Lobectomy	Open	CCAM	Yes
Teratoma resection	Open	Teratoma	Yes
Vesicoamniotic shunt	Percutaneous	Bladder outlet obstruction	Yes
Atrial septostomy	Percutaneous	HLHS with restrictive ASD	Yes
Aortic valvuloplasty	Percutaneous	Critical AS	Yes
EXIT to ECMO	Open	CDH	Yes
Myelomeningocele closure	Open	NTD	Yes
Amniotic band release	Fetoscopic	ABS	Yes
Tracheal occlusion (FETO)	Fetoscopic	CDH	YES

# Cordocentesis & Intrauterine fetal blood transfusions

- Completely changed prognosis for alloimmunization and improved for other conditions
- Complication rate of 1% increases to 3-4% if transfusion occurs versus just sampling



# Fetal Supraventricular Tachycardia

- Algorithm for management of fetal tachycardias
- Weighing risks and benefits of maternal administration of medications
  - Digoxin
  - Flecainide
  - Sotalol
- Co management with Pediatric Cardiology

# Percutaneous Approach/Procedures

- Outpatient procedures
- Used to relieve obstructions or drain fluid
  - Thoracentesis
  - Vesicocentesis
- Most commonly performed: shunts
  - 2-4% risk of complications

# Primary hydrothorax

- 1:12,000 pregnancies
- More common with a genetic abnormality (eg Trisomy 21 or Turner)
- Thoracentesis
  - Testing
    - Genetic, Cell count and differential, Culture
  - Immediate follow up
  - Recurrent: counsel on thoracoamniotic shunt placement

# Another Percutaneous procedure:

## Opening up critical heart blockages

- Critical aortic stenosis
  - can offer procedure to improve outcome
  - Without successful procedure, 25% chance of death in first year of life
  - 30% chance it will work
  - 5% risk of complications causing fetal complications like bleeding or demise
- HLHS, intact atrial septum
  - Atrial septostomy with stent placement

# Diamniotic/Monochorionic twins: unique complications

- Unequal placental sharing → Selective intrauterine growth restriction (IUGR)
- Twin Twin Transfusion syndrome (TTTS)
- Twin Anemia Polycythemia Sequence (TAPS)
- Twin reversed Arterial Perfusion (TRAP)

# Twin Twin Transfusion Syndrome

- 15% of all monochorionic twins
- If untreated, nearly 90- 100% mortality of one or both fetuses
- Importance of ultrasounds every other week starting at 16 weeks with MFM

# Fetoscopic Laser ablation of the communicating vessels

- 50-60% take home two liveborn babies
- 70-80% take home one liveborn baby
- 30% complications
  - PPROM
  - Preterm delivery
- Residual risk for neurologic injury

# Reasons for open surgery

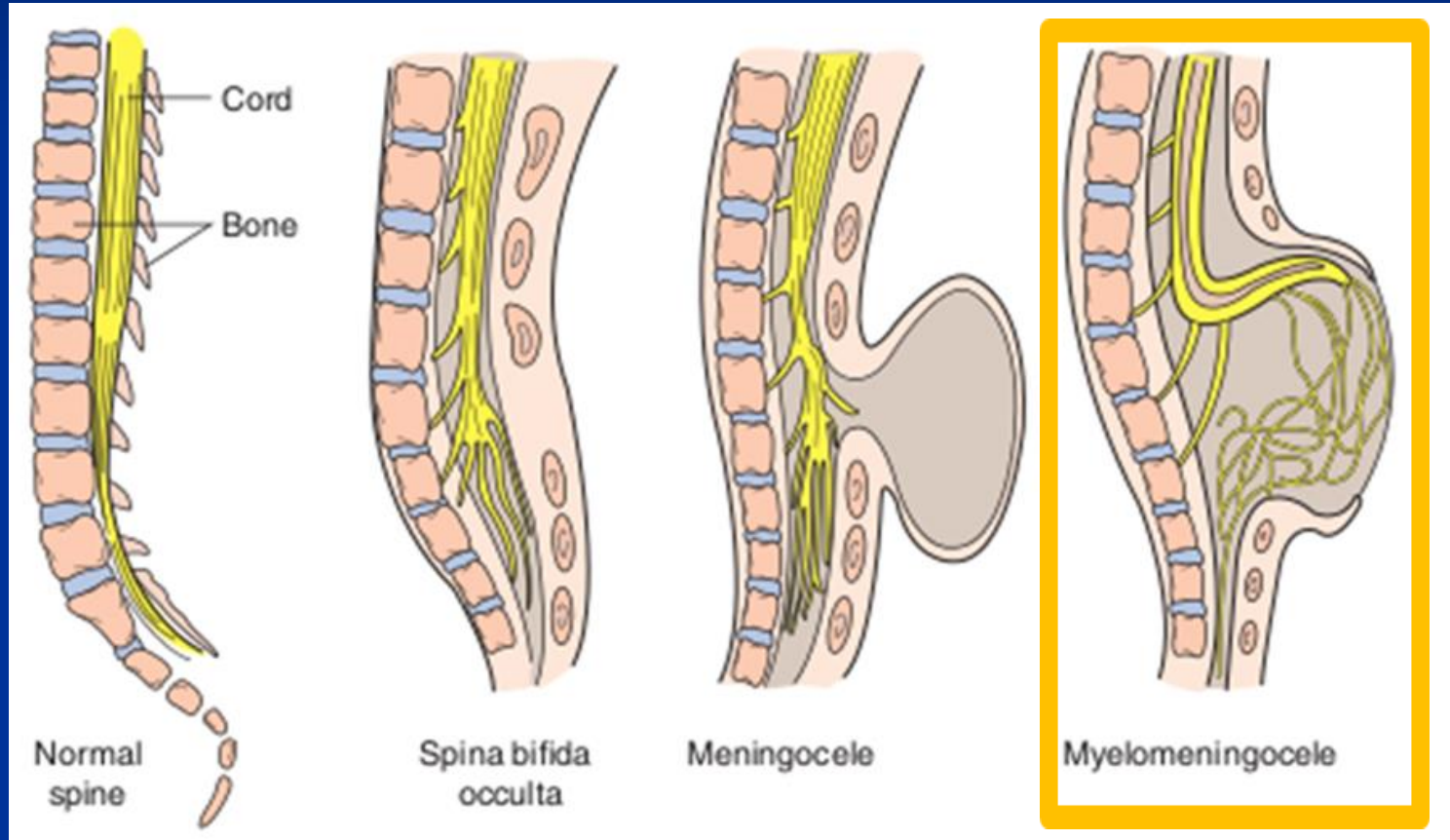
- Originally to improve outcome in conditions where expected neonatal death without treatment
- Expanded to treatment for spina bifida which is not a lethal condition



# Open Fetal Surgery

- Maternal implications
- Fetal implications
- Neonatal implications

# Neural Tube Defects



# MOMS trial

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### A Randomized Trial of Prenatal versus Postnatal Repair of Myelomeningocele

N. Scott Adzick, M.D., Elizabeth A. Thom, Ph.D., Catherine Y. Spong, M.D., John W. Brock III, M.D.,  
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MOMS...Management of Myelomeningocele Study

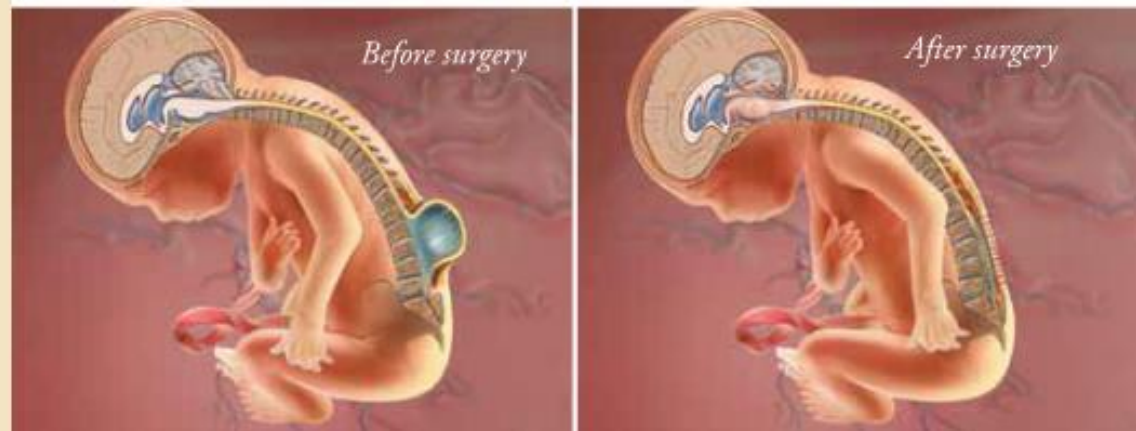
# Rationale for Fetal MMC Surgery

Spinal cord damage is progressive during gestation. Fetal MMC surgery may prevent further damage and reverse the hindbrain herniation feature of the Arnold-Chiari II malformation.

Results of Management of Myelomeningocele Study (MOMS)\* showing outcomes after prenatal repair vs. postnatal repair:

- Reduced need for ventricular shunting at 12 months of age (40% of prenatal surgery group, compared to 83% of postnatal surgery group)
- Reduced incidence or severity of neurologic effects, e.g., impaired motor and sensory function of legs
- Improved ambulation at 30 months of age
- Reversal of hindbrain herniation component of Arnold-Chiari II malformation

\*N. Scott Adzick, M.D., et al., "A Randomized Trial of Prenatal versus Postnatal Repair of Myelomeningocele," *N Engl J Med*. 2011 Mar 17;364(11):993-1004. Epub 2011 Feb 9.



# Other open fetal surgeries

- Progressively worsening fetal status that will prohibit survival if delivered in current state
  - Sacrococcygeal teratoma with hydrops
  - Space occupying chest lesions
    - That will prohibit oxygenation at birth
- Fetal abnormality that will compromise airway once delivered
  - Congenital high airway obstruction
  - Neck/facial mass

Thank you!!