

# Fetal Surgery for Spina Bifida

Spina bifida (myelomeningocele) is a birth defect that occurs when an area of the unborn baby's spine does not form properly in the womb, exposing a section of the spinal cord and spinal nerves. This results in damage to the nervous system. Most children with spina bifida experience major disabilities throughout their lifetime, including paralysis of the lower limbs, or the inability to walk; bowel and bladder control difficulties; brain abnormalities such as brain herniation with hydrocephalus, also known as Chiari II malformation; and learning disabilities.

Traditionally, infants with spina bifida have surgery shortly after birth to repair the spinal defect. Additional procedures after the baby is born are focused on treating the complications associated with spina bifida. These may include hydrocephalus, a buildup of fluid in the brain ("water on the brain") that requires surgical placement of a ventriculoperitoneal (VP) shunt to drain the excess fluid. Today, repairing the spina bifida before birth, otherwise known as maternal-fetal surgery, is considered an effective treatment option to potentially reduce the risk of these complications and improve the outcome in babies affected with spina bifida.

## The MOMS Trial

A randomized, controlled clinical trial, the Management of Myelomeningocele Study (MOMS), was conducted to compare the outcomes for two different treatments for spina bifida - open maternal-fetal surgery prior to birth versus surgical repair after birth. The trial found that infants who were treated with maternal-fetal surgery had better outcomes when compared to those who had their repair after birth. The results of the MOMS Trial have shown that maternal-fetal surgery is an option for the treatment of spina bifida for those patients who qualify based on certain maternal and fetal criteria.

In addition, the study results have provided critical information necessary for physicians to properly counsel patients about the risks and benefits of open maternal-fetal surgery. Ultimately, the study determined that closing the fetus' back early in pregnancy may allow some nerve function to be preserved, and can actually reverse certain aspects of this serious condition.

Some of the positive outcomes of the study include:

- Hindbrain herniation was seen less often in the fetal repair group (64 percent versus 96 percent).
- VP shunt placement was required in half as many babies if they had a fetal repair (40 percent versus 82 percent).
- Babies in the fetal repair group had better neurological performance than expected for their level of spina bifida.
- Nearly twice as many babies in the maternal-fetal surgery group walked independently at 30 months of age when compared to the babies repaired after delivery (42 percent versus 21 percent).

Some of the negative outcomes include:

- Maternal-fetal surgery patients were delivered three weeks earlier compared to normal term deliveries in the postnatal group, at approximately 34 weeks or six weeks prior to their due date.
- In addition, maternal-fetal surgery was associated with a higher rate of leaking of amniotic fluid (premature rupture of membranes) in 46 percent of cases, and thinning or separation of the uterine incision in 10 percent and 35 percent of cases, respectively.

## **The Fetal Spina Bifida Program**

The Fetal Center at Children's Memorial Hermann Hospital, with affiliated physicians from the faculty at the John P. and Kathrine G. McGovern Medical School at UTHealth, is dedicated to providing patients and families with a comprehensive, multidisciplinary consultation to educate them about the fetal diagnosis and provide information on available treatment options to help them make the best decision for their family. Educational materials, including an online video, are available to provide families with information about the fetal condition prior to the initial consultation. For many families, this may be the first opportunity to learn about the condition from spina bifida experts after their diagnosis.

Each patient referred to The Fetal Center is carefully evaluated by the affiliated team as a potential candidate for open maternal-fetal repair. All patients, regardless of whether they qualify for fetal repair, undergo extensive counseling with multidisciplinary experts in maternal-fetal surgery, fetal surgery and spina bifida. Over the span of two days, patients meet with the entire fetal spina bifida team, including specialists in:

- Maternal-fetal medicine
- Pediatric surgery
- Pediatric neurosurgery
- Genetic counseling
- Long-term spina bifida outcomes
- Neonatology
- Anesthesiology
- Social work
- Child Life services

### **Fetal Surgery Criteria**

Candidates are accepted for open maternal-fetal surgery based on the criteria set forth by the MOMS Trial. The risks and benefits to both mother and baby are considered in this process. Specific factors that exclude mother or baby from undergoing fetal surgery include, but are not limited to the following:

### **Fetal Exclusion Criteria**

- Variants of spina bifida that are not considered open neural tube defects
- A significant fetal condition not related to myelomeningocele
- Kyphosis, an exaggerated curving of >30 degrees of the fetal spine
- Pregnancy of twins, triplets or more
- Significant clubbing of the legs or evidence of existing paralysis

### **Maternal Exclusion Criteria**

- UPDATE: Morbid obesity (Body Mass Index  $\leq 40$ )
- Medical or personal reasons for withholding a patient from surgery or anesthesia
- Previous or planned incision on the cervix or documented history of a weak cervix
- A short cervix (less than 20 millimeters by vaginal ultrasound)
- Preterm labor in the current pregnancy
- History of spontaneous preterm delivery in previous pregnancies
- Bleeding in current pregnancy or placental abruption – a partial or full separation of the placenta from the uterus
- Red cell or platelet alloimmunization, a blood condition
- Insulin-dependent diabetes prior to pregnancy
- Abnormal anatomy of the uterus such as uterine fibroids
- Infection with HIV or hepatitis B or C
- Inability to adopt a life-style change of restrictive activity during the remaining portion of the pregnancy
- Inability to travel to The Fetal Center at Children's Memorial Hermann Hospital or to comply with follow-up care requirements



### Comprehensive consultation

Patients at The Fetal Center are guided through a variety of specialty examinations including, but not limited to:

- **Comprehensive fetal ultrasound** to confirm the diagnosis of spina bifida defect, characterize the severity of the condition and evaluate the pregnancy
- **Fetal MRI** to evaluate the fetal brain and spine to confirm the presence and severity of the Chiari II malformation and to screen for evidence of any other neurological abnormalities
- **Fetal echocardiogram** a comprehensive scan of the fetal heart, to eliminate suspicion of any problems with the heart, if needed
- **Amniocentesis** to confirm normal fetal chromosomes, if not previously performed for this pregnancy

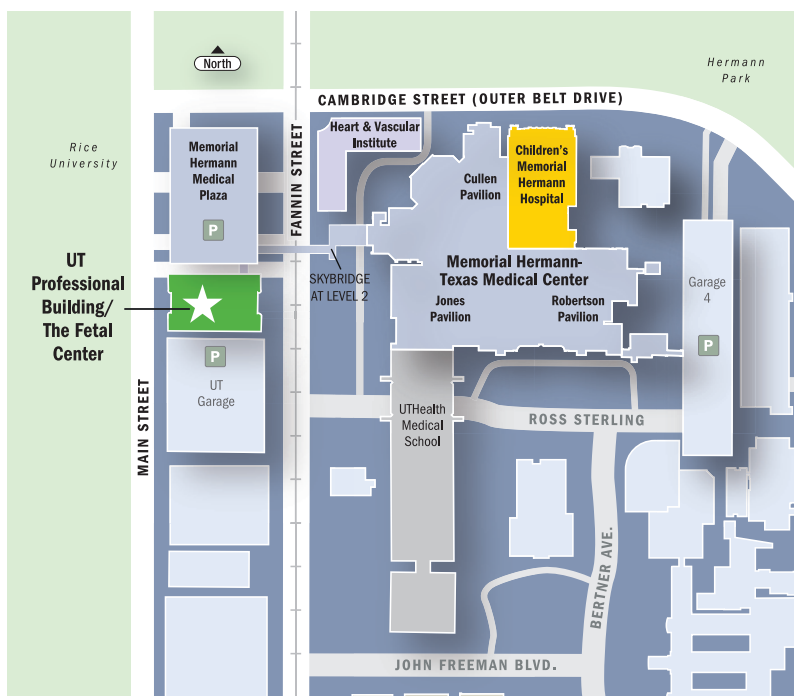
### Open Fetal Surgery for Spina Bifida Repair

Fetal repair of spina bifida requires a multidisciplinary team of experts. Although the operation is much like a cesarean section, the fetus is not removed from the uterus. An incision is made in the mother's abdomen and the uterus, just large enough for the spinal defect to be operated on. The spina bifida defect is surgically repaired by the affiliated pediatric neurosurgeon, much as it would be after the baby is born if the maternal-fetal surgery were not undertaken. After the procedure, the incisions in the mother are closed and the pregnancy is allowed to continue.

Patients usually stay in the hospital for five days after the surgery. Patients who live outside of Houston are asked to remain in town for two weeks. After this time they are released to the care of their referring perinatologist and obstetrician for weekly ultrasounds. Delivery by cesarean section at 37 weeks gestation is planned.

The care of the unborn patient with spina bifida does not end with fetal surgery. The Fetal Center has established a collaboration with Shriner's Hospital for Children - Houston, which boasts a world-renowned spina bifida program. Patients are encouraged to continue their long-term care at a dedicated spina bifida clinic in their area for continued treatment of symptoms.

Disclaimer: While the primary outcomes of the MOMS Trial are encouraging, these results were achieved at significant maternal and fetal risk to the fetal surgery group. It is important for any mother considering open fetal surgery to repair myelomeningocele that she understands the risks to her with the current pregnancy and all future pregnancies.



### Referrals

To refer a patient, call 832.325.7288 or toll free 1.888.818.4818.

**For more information and to view an educational video about spina bifida in English or Spanish, visit [childrensmemorialhermann.org/spina-bifida](http://childrensmemorialhermann.org/spina-bifida)**

### Location

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6410 Fannin, Suite 210  
Houston, TX 77030

Phone: 832.325.7288  
Toll free: 1.888.818.4818  
Fax: 713.383.1464

Email: [thefetalcenter@memorialhermann.org](mailto:thefetalcenter@memorialhermann.org)  
[childrensmemorialhermann.org/thefetalcenter](http://childrensmemorialhermann.org/thefetalcenter)

## Meet the Team

The affiliated multidisciplinary team at The Fetal Center includes expert fetal surgeons with extensive experience in fetal myelomeningocele (MMC) repair, including maternal-fetal medicine, pediatric surgery and pediatric neurosurgery specialists. Through collaboration with the Shriner's Hospital for Children – Houston, spina bifida patients are provided with access to the most comprehensive and state-of-the-art long-term care for children with spina bifida.

## Fetal Surgery

### **Michael W. Bebbington, M.D., M.H.Sc.**

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### **Kenneth J. Moise Jr., M.D.**

Professor, Division of Maternal-Fetal Medicine and Department of Pediatric Surgery, McGovern Medical School

### **KuoJen Tsao, M.D.**

Associate Professor, Department of Pediatric Surgery and Division of Maternal-Fetal Medicine, McGovern Medical School

## Pediatric Neurosurgery

### **Stephen Fletcher, D.O.**

Associate Professor, Pediatric Neurosurgery, McGovern Medical School

### **Manish Shah, M.D.**

Assistant Professor, Pediatric Neurosurgery, McGovern Medical School

### **David Sandberg, M.D.**

Chief of Pediatric Neurosurgery and Associate Professor, McGovern Medical School

## Long-Term Follow-up Care, Spina Bifida Clinic

### **Lynette J. Mazur, M.D., M.P.H.**

Pediatric Specialist at the Spina Bifida Clinic at Shriner's Hospital for Children – Houston and Professor of Pediatrics, McGovern Medical School

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