Fetal Surgery Continues to Advance

Repairing birth defects in the womb. Inserting a tiny laser into the mother's uterus to seal off an abnormal blood flow and save fetal twins. Advancing the science that may allow doctors to deliver cells or DNA to treat sickle cell anemia and other genetic diseases before birth.

These are examples of the still-emerging field of fetal surgery. “Fetal surgery is a unique field in maternal-fetal medicine,” said pediatric surgeon N. Scott Adzick, M.D., medical director of the Center for Fetal Diagnosis and Treatment (CFDT) at The Children's Hospital of Philadelphia. “Detecting birth defects prenatally has allowed physicians to provide better perinatal care,” said Adzick, “but many of these babies were already too sick for us to treat them successfully after they were born. This dilemma led to the development of fetal surgery.”

“Some of the fetal anomalies we treat are so rare that a physician may encounter them only once or twice in a career,” continued Adzick, who is surgeon-in-chief at Children's Hospital. “However, as prenatal diagnosis continues to improve, along with surgical techniques and tools of molecular biology, we have an expanded range of conditions for which we may devise ways to intervene before birth with clear benefits.”

The CFDT, which marks its 15th anniversary this year, is one of a handful of programs worldwide to offer a full range of fetal procedures. Since the center opened in 1995, more than 10,000 parents have used its services, from all 50 U.S. states and from 46 other countries.

Open fetal surgery involves cutting into the mother's abdomen and uterus in order to operate on the fetus. In his article on open fetal surgery, Adzick uses sophisticated imaging technologies to assess patients referred to the center, the only such facility that includes a Special Delivery Unit for mothers carrying babies with known birth defects.

Fetal surgeries with life-threatening defects include lung masses, which may compress the developing heart, leading to heart failure, and sacrococcygeal teratomas, large tumors attached to the fetus's tailbone, which can lead to heart failure or a fatal hemorrhage before birth. Fetal surgery, he adds, places special demands on caregivers to ensure safety for two patients – the mother and the fetus.

Adzick is also an authority on open spina bifida, referred to as myelomeningocele. A defect in which part of the spinal cord remains unprotected by skin and tissue, often resulting in hydrocephalus, mental retardation, bowel and bladder problems, and lifelong paralysis. While usually non-lethal, it is a relatively common cause of major disability, affecting one in 2,000 live births.

To repair a myelomeningocele, fetal surgeons shield the developing spinal cord by closing the defect with the fetus's own tissue. Definitive results of outcomes after fetal surgery are expected from a randomized clinical trial sponsored by the National Institutes of Health.

Another application of fetal surgery is for twin-twin transfusion syndrome, occurring in 10 to 15 percent of identical twins. In this condition, one fetus grows at the expense of its twin because of abnormal blood vessel connections in their shared placenta. Michael Bebbington, M.D., of the CFDT, reviews current therapies for this condition, noting that the scientific evidence favors selective laser photocoagulation. In this procedure, using a viewing instrument called a fetoscope, the fetal surgeon employs a laser to seal off the blood vessels that carry hazardous blood flow between the two fetuses.

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