



Prenatal Diagnosis and Fetal Therapy

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Many congenital defects of interest to pediatric surgeon can now be detected before birth. Although some inherited anatomical malformations may be specifically sought, most are identified incidentally during sonography performed for obstetric indications. Sometimes, the conditions that lead to prenatal diagnosis are associated with underlying fetal malformation (*polyhydramnios in gastrointestinal obstructions, and oligohydramnios in obstructive uropathies*). Prenatal diagnosis improves perinatal care and severe lesions, if detected early enough may lead to prenatal counseling and termination of pregnancy. Most correctable defects are best managed by maternal transport to an appropriate center and delivery near term; some may benefit from a change in the timing or mode of delivery. Finally, serial studies of affected fetus may help unravel the developmental pathophysiology of some surgically correctable lesions and thus lead to improved treatment before or after birth. It is important that surgeons familiar with the management of lesions after birth be involved in prenatal diagnosis, management and family counseling (1).

Prenatal Diagnosis Methods (2, 3)

A. Imaging techniques :

- Ultrasonography (USG).
- MRI including Echoplanar Imaging (EPI).
- CT Scan.
- Echocardiography including Color Doppler.

B. Genetic procedures :

- Amniocentesis : 14 weeks to term.
- Chorionic villus sampling : 10 weeks to term.
- Cordocentesis : 18 weeks to term.
- Serum α Fetoproteins.

Depending upon the results of these investigations, the nature of the congenital defect determines the perinatal management (2-4), some fetal deficiency states (*e. g. Erythroblastosis, pulmonary immaturity, endocrine deficiencies*) may be alleviated by prenatal medical treatment. Whereas, other conditions may require early correction after induced preterm (*e.g. obstructive hydronephrosis/hydrocephalus, large abdominal wall defects etc.*) or cesarean delivery (*e.g. conjoined twins, large sacrococcygeal teratoma etc.*). In some defects (*e.g. anencephaly, hydranencephaly etc.*) elective abortion may have to be done. For some anomalies (*e.g. G. I. obstructions*) which are detected in utero, but best corrected after term delivery at an appropriate center, the surgical intervention should be done as early as possible to avoid progressive ill effects of congenital anomaly.

Fetal Surgery

Although most prenatally diagnosed anatomic malformations are best managed by appropriate medical

and surgical therapy after maternal transport and delivery, a few simple anatomic abnormalities that have predictable devastating developmental consequences may require correction during birth (4). It has been made possible by experimental, basic and clinical research in field of Fetal Surgery from several potentially correctable fetal anomalies, in 1990s (1-4). Various congenital defects which require in utero intervention are listed in Table 1.

Table 1. Congenital Malformations that may require Open/Endoscopic Fetal Surgery

Malformation	Effect on Development	Fetal treatment
Urethral obstruction	Renal failure, Pulm. hypoplasia	Vesicostomy
CDH	Pulm. hypoplasia	CDH closure
SCT	A. V. Shunting Placentomegaly Hydrops fetalis	Excision of SCT
CCAM	Pulm. hypoplasia Hydrops fetalis	Excision of CCAM
NTDs	Neurodeficit	Coverage of NTDs
Conjoined twins	Twin - twin transfusion syndrome	Ligation of vessels

CDH = Congenital Diaphragmatic Hernia.

SCT = Sacrococcygeal Teratoma.

CCAM = Congenital Cystic Adenomatoid Malformations.

NTDs = Neural Tube Defects.

Video Endoscopic Fetal Surgery (FETENDO).

Preterm labour related to hysterotomy remains a major problem of fetal surgery. In recent years, the use of minimal invasive surgery has been advanced to fetal intervention i. e. Video endoscopic fetal surgery. FETENDO techniques obviate the need for a uterine incision and reduce the risk of preterm labour and hence fetal loss (5). The earlier technical obstacles to fetoscopic intervention have been overcome, including the techniques to fix the amniotic membranes, to perfuse the amniotic cavity with fluid rather than gas to provide

working place without compromising the fetoplacental circulation, and to position and stabilize the fetus. FETENDO techniques have been successfully applied experimentally to decompression of obstructive uropathies, establishment of chronic fetal vascular access, creation and repair of fetal cleft lip, and fetal tracheal occlusion with an internal plug (Fetendo plug) or an external tracheal clip (Fetendo clip). Percutaneous fetoscopic intervention has been applied clinically for diagnostic biopsies, division of placental vessels or ligation of umbilical cord in twin-twin transfusion syndrome and for fetal cystoscopy and urinary tract decompression (3).

Future of Fetal Intervention

Fetal surgical research has yielded advances in fetal biology with implications beyond fetal therapy. The serendipitous observation that fetal incisions heal without scarring has provided new insights into the biology of wound healing and stimulated efforts to mimic the fetal process postnatally. Fetal tissue seems to be biologically and immunologically superior for transplantation and gene therapy, and fetal immunological tolerance may allow a wide variety of inherited non surgical diseases to be cured by fetal hematopoietic stem cell transplantation.

References

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