The Use of Ultrasound in Fetal Surgery

Linda M. Hopkins, MD[a], Vickie A. Feldstein, MD[b,*]

KEYWORDS

• Fetal surgery • Ultrasound • Fetal anomalies • Fetal MRI
• Fetoscopy

Ultrasound (US) has been instrumental in the development of fetal diagnosis, intervention, and treatment and remains the cornerstone in identifying the need for and guiding appropriate fetal surgery. Before surgery, precise determination of the correct diagnosis is pivotal in directing possible interventions, and in utero US remains the sole method of evaluation in many conditions. Once a diagnosis is established, sonography can reveal additional findings and can provide important prognostic information. This information can be used to characterize the condition better, predict outcome, and help to guide families weighing options regarding pregnancy management and physicians determining the potential benefits of fetal intervention. When fetal surgery is pursued, real-time intraoperative US guidance assists in the technical aspects of the procedure and in fetal monitoring. After surgery, US is performed to assess the fetal response to the intervention, identify any procedural complications, and continue to monitor fetal growth and well-being.

Because the indications for and types of fetal intervention have increased over the past few years, this article includes sections covering the types and indications for fetal surgery. Further details about the role of US are presented for each specific fetal condition considered.

HYSTEROTOMY

With the development of successful minimally invasive techniques for fetal surgery, the role and frequency of open hysterotomy, with inherent higher maternal and fetal risk, have decreased. Currently, at the authors' institution, the few fetal indications for hysterotomy include prenatal repair of myelomeningocele (**Fig. 1**) and surgical resection of a large congenital cystic adenomatoid malformation (CCAM) (**Fig. 2**) or of a large sacrococcygeal teratoma (SCT) associated with fetal hydrops. Before

[a] Division of Perinatal Medicine and Genetics, University of California, San Francisco, 350 Parnassus Avenue, Suite 810, Campus Box 0705, San Francisco, CA 94143, USA
[b] Department of Radiology, University of California, San Francisco, Box 0628, San Francisco, CA 94143–0628, USA
* Corresponding author.
E-mail address: hopkinsl@obgyn.ucsf.edu (L.M. Hopkins).

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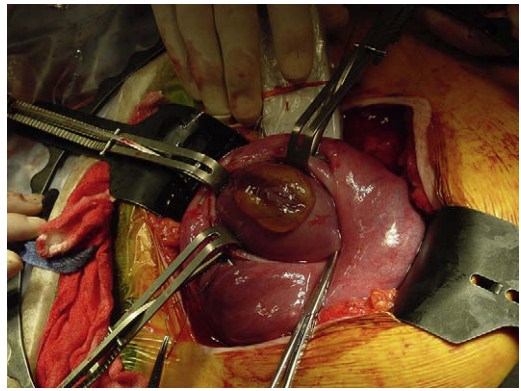

Fig. 1. Intraoperative view during hysterotomy with fetal exposure for myelomeningocele repair.

hysterotomy, targeted US evaluation includes confirmation of the suspected fetal diagnosis and detection of possible associated hydrops; determination of size, extent, or severity of the lesion; measurement of baseline cervical length; and documentation of placental location.

Open hysterotomy is usually performed under general anesthesia. Intraoperative US is used to establish the fetal position and lie. Laparotomy is performed, and surgical exposure of the uterus is accomplished. With a sterile cover applied, a linear-array transducer is placed directly on the uterine surface. The placental edge is identified and carefully "mapped." A uterine incision can then be made, avoiding the placenta

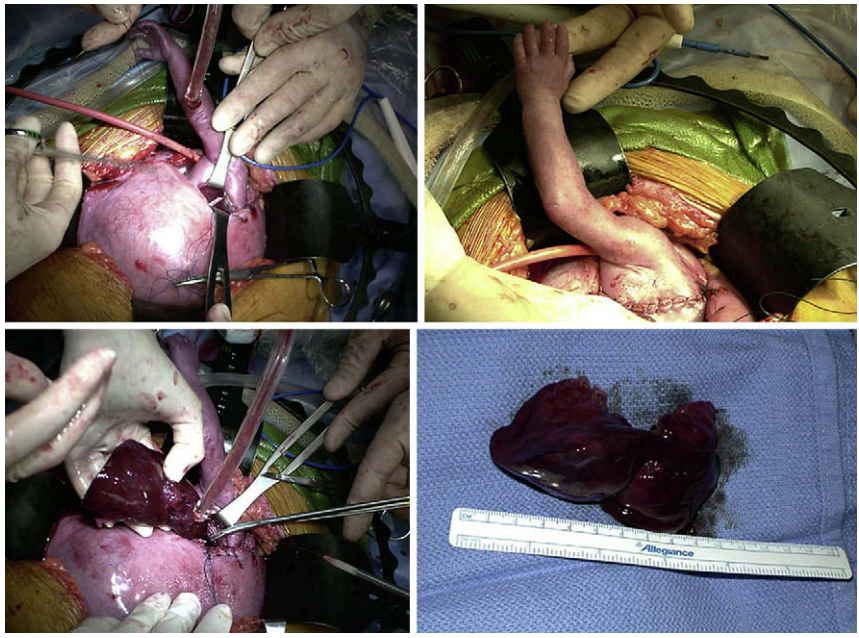

Fig. 2. Images from open fetal surgery with thoracotomy and resection of CCAM.