Traditionally, large incisions have been considered necessary for adequate surgical exposure. However, these wounds frequently result in significant perioperative stress and postoperative pain and morbidity, not to mention poor cosmesis. The concept of avoiding large incisions to perform invasive surgery forms the basis for the revolution of minimally invasive surgery (MIS).

With advances in microchip technology and microinstrumentation and the development of sophisticated video equipment with supreme optics, the stage was set for the rapid development of MIS in the form of intercavitary endoscopic surgery in adults. The first significant MIS performed in adults was laparoscopic cholecystectomy.

MINIMALLY INVASIVE SURGERY IN CHILDREN

The need to develop endoscopic techniques, as well as other factors, delayed the use of MIS in children. MIS demands that the surgeon acquire not only an entirely new set of surgical skills, but often requires an entirely different way of thinking about common pediatric surgical problems. Depth perception and tactile sensation required during endoscopic procedures necessitate major changes in operative technique. The operative choreography of MIS often deviates from the routine fixed in the mind of the pediatric surgeons from years of traditional training. Increasingly however, reports in the literature are documenting the safety, efficacy and cost effectiveness of MIS in children and are fueling a rapid evolution in instrumentation and the performance of such procedures.

THE EMPHASIS ON MIS

MIS in children is a focus of the pediatric surgery program at the University of Chicago Children’s Hospital (UCCH). At the present time, the number of minimally invasive procedures being performed at UCCH is growing rapidly. Current practice techniques are:

Laparoscopy
- Nissen fundoplication
- Stretta
- Appendectomy
- Pyloromyotomy
- Cholecystectomy
- Splenectomy
- Bowel resection (inflammatory bowel disease)
- Congenital anomalies (Hirschsprung’s disease, abdominal mass, etc.)

Thoracoscopy
- Lung resection
- Thymectomy
- Mediastinal mass biopsy
- Decortication
- Pectus excavatum (Nuss repair)

Miscellaneous
- Trauma laparoscopy
- Nephrectomy
- Liver biopsy
- Intussusception
- Facial plastics

ADVANTAGES OF MINIMALLY INVASIVE SURGERY

The potential advantages of MIS, when compared with open surgery in children, are illustrated in three typical diagnoses treated at UCCH — pyloric stenosis, gastroesophageal reflux disease and pectus excavatum.

Pyloric Stenosis

In infants with pyloric stenosis, laparoscopic pyloromyotomy is performed through three puncture wounds (approximately 2 mm in length each) in the upper abdomen. The pylorus is incised sharply with a sheathed blade, and the pyloric muscle is then carefully split and spread along the length of the hypertrophic pylorus. Children typically are discharged the following day, with complete resolution of symptoms. Cosmesis is excellent (FIGURE 1b) and can be compared with that of an open pyloromyotomy (FIGURE 1a).

Gastroesophageal Reflux Disease

Pathological gastroesophageal reflux in infants and children is occurring in almost epidemic proportions. In cases of severe gastroesophageal reflux disease that are refractory to medical therapy, almost all pediatric surgeons perform fundoplication as the surgical treatment of choice. The operation traditionally has been performed via

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laparotomy (long midline or subcostal incision). At UCCH, fundoplication is performed laparoscopically via five small (5 mm) puncture sites and typically is completed in less than one hour (FIGURE 2). The child often is discharged by postoperative day one or two, with minimal morbidity. Compared with the open procedure (laparotomy), perioperative morbidity (consisting of incisional pain and related complications such as atelectasis or pneumonia) appears to decrease. Results in preventing gastroesophageal reflux disease thus far have been excellent.

**Pectus Excavatum**

Also known as funnel chest, pectus excavatum is a congenital malformation of the anterior chest characterized by a posterior curvature of the body of the sternum. In severe cases, this defect mandates surgical correction for reasons that range from purely cosmetic concerns to pulmonary compromise secondary to restrictive lung disease. Traditional surgical repair involves raising of pectoral flaps, gross resection of costal cartilages, and osteotomy (cracking) of the involved sternum. At UCCH, the pectus defect is treated via MIS using a modification of a technique in which a sternal bar is placed via thoracoscopic guidance under the sternum to appropriately correct the defect, avoiding disruption of native cartilage and musculature mandated by traditional repair.

Cosmesis and patient satisfaction have been excellent.

**THE FUTURE OF MIS**

As more pediatric surgeons become involved in performing MIS in children, the application of these techniques will expand. Advances in technology also will improve the ability to apply the principle of minimal invasion to even more highly sophisticated pediatric surgery. At UCCH, we are investigating the use of robotics to help us perform even more difficult minimally invasive surgical procedures. It is safe to say that MIS is of significant benefit to children. The reduction in pain, wound complications and length of stay, combined with improved cosmesis, fuels the drive at UCCH to further improve techniques.

**FIGURE 1.** — Children who have undergone laparoscopic pyloromyotomy typically are discharged the following day, with complete resolution of symptoms. Cosmesis is excellent (b) and can be compared with that of an open pyloromyotomy (a).

**FIGURE 2.** — Repairing the defective esophageal valve using laparoscopic Nissen fundoplication (left). Following the procedure the patient has almost no scarring (right).

**A SPECIAL WELCOME**

The faculty and staff are happy to welcome Loretto Glynn, MD, Assistant Professor of Surgery. Dr. Glynn comes to the University of Chicago from Loyola Medical Center.

Dr. Glynn received her medical degree from Rush Medical College. She attended the University of Illinois for postgraduate medical education, including an internship and residency in general surgery and a fellowship in pediatric critical care and ECMO. She completed a fellowship in surgical critical care at the University of North Carolina and a fellowship in pediatric surgery at Children's Mercy Hospital in Kansas City.

Dr. Glynn is board certified in general surgery, critical care and pediatric surgery.

The pediatric surgery staff includes from left to right: Loretto Glynn, MD, Assistant Professor, ECMO Director; Christopher Speaker, RN, Nurse Associate; Mindy Statter, MD, Assistant Professor, Trauma Director; Beth Zimmermann, APN, Clinical Nurse Specialist; Mary Pat Olson, RN, Trauma Coordinator; Donald C. Liu, MD, PhD, Associate Professor, Chief, Pediatric Surgery, and Surgeon-In-Chief, UCCH.