Physicians frequently evaluate patients with paroxysmal non-epileptic spells. The differential diagnosis of these spells is summarized in Table 1. Common etiologies include syncope, staring, pseudoseizures, paroxysmal dyskinesia and sleep-related events. These diagnoses sometimes prove elusive, requiring either videorecording by the parents of events or formal EEG evaluation. Patients suffering recurrent episodes are often admitted for VEEG to determine if they are experiencing epileptic or non-epileptic spells. Such patients represent 15 to 20 percent of EEG admissions. A confounding finding is that 19 to 80 percent of patients with non-epileptic events may also have epileptic events.

Evaluation of such children and adolescents in an EMU usually results in a correct diagnosis, eliminating unnecessary use of anti-epileptic medications. The EMU is therefore an integral part of the comprehensive evaluation of patients with epilepsy and patients experiencing recurrent spells of undetermined origin.

References

By Jose L. Iglecias, MD, FACS

Pediatric Minimally Invasive Surgery: Laparoscopy and Thoracoscopy

Reports of minimally invasive surgery (MIS) in infants and children are found from the early 1970s and were largely confined to simple diagnostic procedures. The evolution of the field in pediatrics has been much slower compared to its advancement in adults. The modern era of pediatric laparoscopy began in the early 1990s with the adaptation of adult instruments to our younger patients for therapeutic procedures such as cholecystectomy.

Enthusiasm has grown worldwide in the pediatric surgical community over the past 20 years with the advent of many technological improvements, rendering laparoscopy and thoracoscopy safer and more available to our younger and smaller patients. Advancements in optics, video, lighting, microchips, miniaturization of “old” procedures using less invasive techniques, while fostering the development of more advanced procedures.

The commitment of time and resources to minimally invasive techniques during the early years is now benefitting infants and children worldwide. Specific benefits obviously depend on the specific procedure, but in general MIS allows better operative visualization, fewer postoperative adhesions and bowel obstructions (rare), decreased inflammatory response and postoperative pain (as reflected by lower narcotic requirement), improved postoperative pulmonary function, earlier return of bowel motility, shorter hospital stay, early return to prior activities and obvious

Table 1: Examples of Pediatric Minimally invasive Procedures

<table>
<thead>
<tr>
<th>Modality</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Laparoscopy</td>
<td>• Appendectomy</td>
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<tr>
<td>• Empyema debridement</td>
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<tr>
<td>• Lung biopsy</td>
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<td>Thoracoscopy</td>
<td>• Diaphragm plication</td>
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<tr>
<td>• Excision of mediastinal cysts or masses</td>
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<tr>
<td>• Sympathectomy</td>
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<tr>
<td>• Exposure for scoliosis</td>
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<tr>
<td>• Repair of pectus excavatum deformity</td>
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Epilepsy

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Figure 1: Grid and Strip Placement

(MRI), magnetic resonance spectroscopy (MRS), positron emission tomography (PET), and single photon emission computerized tomography (SPECT).

Patients undergoing epilepsy surgical evaluation also require admission to the EMU. After surgical placement of subdural grid and/or strip EEG electrodes (Figure 1), patients return to the EMU for VEEG monitoring to identify the epileptogenic zone. Provocative procedures and medication reduction can also be employed. Provocative procedures are different at this phase. Cortical mapping of eloquent cortex (language, motor, sensory, visual, etc.) and brain stimulation are common procedures performed in the EMU. Cortical mapping is accomplished utilizing direct current electrical current to the brain while the physician observes the patient for a clinical change. Verbal language and memory testing can be carried out at this time. Cortical stimulation utilizing direct electrical current to the brain can facilitate localization of the epileptogenic focus. Once the epileptic zone is identified and necessary mapping of eloquent cortex has been completed, patients return to the operating room for electrode removal and resection of the epileptogenic zone (Figure 2).

Figure 2: Post-resection

Physicians frequently evaluate patients with paroxysmal non-epileptic spells. The differential diagnosis of these spells is summarized in Table 1. Common etiologies include syncope, staring, pseudoseizures, paroxysmal dyskinesia and sleep-related events. These diagnoses sometimes prove elusive, requiring either videorecording by the parents of events or formal EEG evaluation. Patients suffering recurrent episodes are often admitted for VEEG to determine if they are experiencing epileptic or non-epileptic spells. Such patients represent 15 to 20 percent of EEG admissions. A confounding finding is that 19 to 80 percent of patients with non-epileptic events may also have epileptic events. Evaluation of such children and adolescents in an EMU usually results in a correct diagnosis, eliminating unnecessary use of anti-epileptic medications.

The EMU is therefore an integral part of the comprehensive evaluation of patients with epilepsy and patients experiencing recurrent spells of undetermined origin.

References
MINIMALLY INVASIVE

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cosmetic improvements. Today, most procedures traditionally performed using “open” techniques have been described employing minimally invasive techniques (Table 1). Only time will tell which MIS procedures become routine, but many are already proving a good alternative or have become the standard of care. Only some of the procedures with which we are helping infants and children on a routine basis are discussed here.

One of the earliest laparoscopic procedures attempted in children was evaluation of a possible contralateral inguinal hernia, an operation that has become much more accurate and easier to perform with the many technological improvements mentioned above. Using a 3.5 mm 70° or 120° telescope with a cannula placed through the hernia sac, an impalpable testicle can easily be examined and if present, demonstrated by minimally invasive resection of atrophic or dysgenic testes, or injury is eliminated compared to the risks posed by a negative open exploration.1,2

Given the excellent visualization demonstrated by minimally invasive hernia exploration, a natural extension of this procedure is for management of reflux. Studies employing minimally invasive techniques have been described to maximize cosmetic improvements. Today, most hernias are evaluated and resected laparoscopically with very high success. Three surgeons in the past, these patients underwent a staged approach which included a leveling colostomy above the transition zone of ganglion cells, followed a few months later by laparotomy for resection of the aganglionic segment and pull-through of normal colon to an anal anastomosis (usually taking down the colostomy at the same procedure). Now, there are two MIS solutions to this problem.

In select patients with classic anatomy, shorter segment disease and a good contrast enema, a primary pull-through and resection can be performed completely transanally. Biopsy to confirm the level is done as the bowel is pulled out. Alternatively, for patients with longer segment disease or unclear transition zones, the procedure can be staged laparoscopically with a seromuscular biopsy (Figure 4) of the likely ganglionic bowel to confirm the level of disease (and exclude total colon disease), followed by initial recto-sigmoid dissection laparoscopically and completion of the procedure transanally. Regardless of the procedure, an experienced pediatric pathologist is required to make important and conclusive diagnosis in this disease. Patients who undergo either of these primary pull-through techniques benefit from no colostomy (with its additional complications), earlier definitive repair, lower blood loss, earlier discharge from the hospital (two to five days shorter), less pain and fewer adhesions and bowel obstructions.3,4

One disadvantage of the primary pull-through may be a slightly increased incidence of enterocolitis in infants. This is generally easily managed with washouts and oral antibiotics; occasionally, hospital admission is required.

Extraperitoneal surgery is occasionally required in children with tumors, malignancies or hematologic disorders. Many of these abdominal MIS procedures such as splenectomy, adenectomy and nephrectomy also afford many of the benefits noted above. Removal of the larger solid organs is usually performed with the use of a laparoscopic bag into which the specimen is placed and morcellated as it is removed through the largest trocar site. (Figure 5)

Thoracic surgery has also benefited from the advances in MIS. Repair of pectus excavatum deformity has received much attention lately with the popularity of the Nuss technique. Traditional operations performed since the 1950s usually employ a long transverse thoracic incision, resection of the deformed cartilage, sternal osteotomy and various forms of internal fixation, which usually depended on a sternal bar. This standard procedure takes several hours, generates significant blood loss and results in a stiff, poorly compliant chest contributing to thoracic chondrodystrophy when applied to younger patients. Failure rates up to 36 percent were reported.

Minimally invasive techniques exploit the pliability and remodeling capacity of the pediatric thorax. This thorascopically-guided procedure involves using one small incision on each side of the chest, passing a precurved steel bar underneath the sternum at the level of maximal deformity and immediately correcting it. (Figure 6 A & B) The bar is generally left in place for two years to

Figure 3: Two infants following laparoscopic fundoplication (with G-button on the right infant). Note barely visible scars (arrows).
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cosmetic improvements. Today, most procedures traditionally performed using “open” techniques have been described employing minimally invasive techniques (Table 1). Only time will tell which MIS procedures become routine, but many are already proving a good alternative or have become the standard of care. Only some of the procedures with which we are helping infants and children on a routine basis are discussed here.

One of the earliest laparoscopic procedures attempted in children was a laparoscopic resection of atrophic or dysgenic testes, or possible staged orchidopexy procedures for very high testes. The potential for vessel or vas deferens injury is eliminated compared to the risks posed by a negative open exploration.1,2

Figure 1: Right-sided inguinal hernia (open internal ring). From the laparoscopic view.

One of the earliest laparoscopic procedures attempted in children was a laparoscopic resection of atrophic or dysgenic testes, or possible staged orchidopexy procedures for very high testes. The potential for vessel or vas deferens injury is eliminated compared to the risks posed by a negative open exploration.1,2

Given the excellent visualization demonstrated by minimally invasive hernia exploration, a natural extension of this procedure is for management of the impalpable testicle. Several techniques have been described to help diagnose and manage such childhood conditions as testicular atrophy, dysgenesis, or vanishing. Laparoscopy is a natural alternative to the open inguinal exploration. (Figure 2) After diagnosis, laparoscopy is used to perform definitive management, including orchidectomy, resection of atrophic or dysgenic testes, or possible staged orchidopexy procedures for very high testes.

One of the first advanced procedures to gain wide acceptance was laparoscopic fundoplication. Infants and children frequently require surgical intervention for severe gastroesophageal reflux and its complications when medical management fails. Reflux often exacerbates pulmonary conditions such as reactive airways disease or chronic lung disease. Fortunately, laparoscopic fundoplication offers an excellent alternative to the upper midline or left subcostal incisions. The benefits of laparoscopic surgery are available to both children and infants—even those weighing less than 3 kg.3 (Figure 3) Studies demonstrate less narcotic use, fewer pulmonary complications, much fewer postoperative bowel obstructions, lower overall costs and earlier discharge from the hospital (by one to three days). The overall complication rate is equivalent to the open technique and even operative costs are approaching parity (< $500) with improved technology, fewer disposable instruments and increasing experience.4,5

MIS has also significantly improved quality of life of patients suffering with Hirschsprung’s disease (congenital megacolon, aganglomosis). In the past, these patients underwent a staged approach which included a colostomy above the transition zone of ganglion cells, followed a few months later by laparotomy for resection of the aganglionic segment and pull-through of normal colon to an anal anastomosis (usually taking down the colostomy at the same procedure). Now, there are two MIS solutions to this problem.

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One disadvantage of the primary pull-through may be a slightly increased incidence of enterocolitis in infants. This is generally easily managed with washouts and oral antibiotics; occasionally, hospital admission is required.

Extirpative surgery is occasionally required in children with tumors, malignancies or hematologic disorders. Many of these abdominal MIS procedures such as splenectomy, adenolymphectomy and nephrectomy also afford many of the benefits noted above. Removal of the larger solid organs is usually performed with the use of a laparoscopic bag into which the specimen is placed and morcellated as it is removed through the largest trocar site. (Figure 5)

Figure 5: Teenager two weeks following laparoscopic resection of a symptomatic splenic cyst.

Thoracic surgery has also benefited from the advances in MIS. Repair of pectus excavatum deformity has received much attention lately with the popularity of the Nuss technique. Traditional operations performed since the 1950s usually employ a long transverse thoracic incision, resection of the deformed cartilage, sternal osteotomy and various forms of internal fixation, which usually depended on a sternal bar. This standard procedure takes several hours, generates significant blood loss and results in a stiff, poorly compliant chest contributing to thoracic chondrodysplasia when applied to younger patients. Failure rates up to 36 percent were reported.

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Figure 6: Neonate rectum following laparoscopic scrotal biopsy.
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Nuss procedure have been very good with over 10 years of follow-up: a 10 percent recurrence rate, minimal blood loss and normal chest compliance. Modifications of the technique have reduced the incidence of bar displacement to less than 6 percent.10

Many other thoracic procedures are amenable to these less invasive techniques. Mediastinal and pulmonary masses and cysts often prove excellent candidates for thoracoscopic resection or biopsy, avoiding the morbidity of open thoracotomy. Thoracoscopic debridement and drainage of the thick pleural peel and debris associated with thoracic empyema have shortened hospital stay, decreased the discomfort of prolonged chest tube drainage and minimized the likelihood of other invasive procedures.10

Complicated reconstructive endeavors such as repair of esophageal atresia are also advancing rapidly and are being performed by a few centers around the world; further refinement in technique and the use of robotic assistance will likely be needed to make this routine.

In summary, many pediatric surgical operations can be performed safely with minimally invasive techniques (laparoscopy, thoracoscopy). Patients benefit in many ways from these advances, including shorter hospital stays, less pain and earlier return of bowel function and normal activities. The cosmetic benefit, difficult to quantify, proves a very important factor in many of these children who have a long lifetime to carry their scars. Further advances in technology such as robotics and microchips, as well as the innovation of many pediatric surgical pioneers, promise to make the future of pediatric MIS exciting and fruitful.

References


By Donald Murphy, MD

Research in Infectious Diseases at Cook Children’s Medical Center

Cook Children’s department of Infectious Disease (ID) has recently expanded to better serve its growing population. Today, the department consists of medical director Mark Shelton, MD, Donald Murphy, MD, Suzanne Whitworth, MD, Lynne Eggert, MD, and Marc Manzole, MD. To keep abreast of innovative treatments and to assist in the approval of specific new protocols, the staff is active in a number of clinical trials.

Under the leadership of Dr. Mark Shelton, the Infectious Disease department at Cook Children’s Medical Center has actively pursued clinical research for the past 15 years. Foremost among the department’s activities has been accrual of infants and children for hepatitis treatment trials.

The department participated in the original International Pediatric Hepatitis Study of the late 1980s. Hepatitis B and Hepatitis C, important causes of infectious liver disease in children, have had no specific therapy. For Hepatitis B, trial data suggested that interferon-alpha alone can eliminate viral replication and eliminate Hepatitis B E antigenemia in 25 percent of treated children. The study, on which Cook Children’s Infectious Disease physicians were co-authors, also produced valuable information regarding the safety and efficacy of interferon, as well as predictive factors for Hepatitis B treatment. More recently, infant immunization has drastically reduced the incidence of childhood Hepatitis B. Hepatitis C, once a feared and untreatable disease, is becoming curable. Physicians with Cook Children’s Infectious Disease department have participated as co-authors in the International Pediatric Trials for Hepatitis C, investigating oral ribavirin and Interferon-alpha. Forty-six percent of treated children showed a sustained response (in press).

Another trial underway uses a form of interferon endowed with pharmacokinetic properties that permit once-weekly administration. It is expected that 60-90 percent of treated patients will achieve sustained response—depending on the strain of Hepatitis C. Cook Children’s Infectious Disease department is also the medical home for HIV-infected children of the Northwest Texas area, with patients participating in several pediatric HIV treatment trials over the last 10 years. The clinic was a part of the Pediatric AIDS Clinical Trials Group for several years until funding cuts made this impractical. At present, enrollment is open for a treatment with a new boosted protease inhibitor as a part of a potent combination of anti-viral medicines. Dr. Murphy is the lead investigator for Cook Children’s on this and recent studies. Glass-Smith Kline is the sponsor of this study.

The department also receives funding through state and federal grant sources, including federal Ryan White and Texas Department of Health state service’s grants. These funds help support a portion of the multi-faceted care these challenging