Pediatric Laparoscopic Ileal Cystoplasty: Complete Intracorporeal Surgical Technique

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INTRODUCTION Despite the widespread introduction of laparoscopy in pediatric urology, many reconstructive procedures, such as augmentation cystoplasty, are still performed in an open fashion because of the perceived intricacy and demanding nature. Because we continue to introduce advanced laparoscopic skills into the care of children, we describe our technique for complete intracorporeal laparoscopic enterocystoplasty in a pediatric patient.

TECHNICAL CONSIDERATIONS The key elements of the procedure include a thorough preoperative mechanical bowel preparation; cystoscopic evaluation and placement of externalized ureteral stents; transperitoneal placement of three radially dilating trocars (one large enough to allow advancement of a laparoscopic stapler); the selection and measurement of a 20-cm ileum segment with sufficient mobility; the development of the perivesical space and lateral attachments, followed by a generous cystotomy; isolation of the bowel segment and side-to-side anastomosis using endoscopic staplers; intracorporeal irrigation of the segment followed by antimesenteric detubularization; temporary stabilization of the bowel segments using percutaneous traction sutures, allowing the avoidance of extra trocars in children with limited intraabdominal space; intracorporeal suturing of the detubularized bowel into a U-shaped configuration; fixation of the ileal patch to the bladder, followed by watertight anastomosis with running sutures; irrigation and placement of a closed suction drain in the pelvis; and cystography 4 to 6 weeks postoperatively.

CONCLUSIONS Pure laparoscopic enterocystoplasty in children is an advanced procedure that is technically demanding. Although it appears feasible and provides a minimally invasive option to bladder augmentation, its equivalency or superiority over laparoscopic assisted or conventional open techniques remains to be demonstrated. UROLOGY 69: 977–981, 2007. © 2007 Elsevier Inc.

Due in part to the steep learning curve and relative paucity of cases, pure laparoscopic or robotic-assisted reconstructive lower urinary tract surgery has been slowly introduced into pediatric urologic practice.[1,2] In demanding reconstructive bladder interventions, the initial laparoscopic experience has been characterized by using it as an assistant tool for parts of the procedure. Similarly, to achieve the transition toward complete laparoscopic procedures, our approach to upper tract procedures has been bridged by laparoscopic assisted interventions.[3]

In selected cases, augmentation enterocystoplasty is a well-described effective procedure that results in increased low-pressure storage bladder capacity. Even though it is more commonly performed in children with neurologic impairment (ie, spinal dysraphism), occasional patients with intact sensation can benefit from the procedure. This selected population represents a particular circumstance in which improved analgesia and a quicker return to ambulation, coupled with cosmetic benefit, support attempting a minimally invasive approach.

Following the basis for successful laparoscopic reconstruction presented in previous reports,[4–7] we have introduced modifications specifically developed for pediatric cases to achieve full intracorporeal reconstruction. The present description is based on the case of a 9-year-old girl who developed a low-capacity, poorly compliant bladder after multiple surgical interventions trying to correct bilateral vesicoureteral reflux. Despite high suspicion for a neurologic problem, the evaluation, which included lumbosacral magnetic resonance imaging, failed to disclose any specific defects. Regardless of anticholinergic use and intermittent catheterization, the child developed chronic renal insufficiency and radiologic evidence of bilateral upper tract deterioration. The urodynamic evaluation demonstrated a very small bladder capacity with a high detrusor leak point pressure and poor compliance. After disclosure of the treatment options, the family consented to laparoscopic augmentation cystoplasty. In this report, we present our three-port access, complete transperitoneal, ileal cystoplasty tech-

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nique, commenting on the steps followed during the surgical intervention, as well as the potential risks and benefits compared with traditional surgical reconstruction.

SURGICAL TECHNIQUE

Preoperative Considerations

Because the bowel segment is irrigated and opened in situ, a poorly prepared bowel places the patient at increased risk of a large intraperitoneal spill, with its potential serious consequences; thus, full mechanical and antibiotic bowel preparation is imperative. Even though a recent report has suggested that bowel preparation is unnecessary for cystoplasty in children,[8] our policy for laparoscopic procedures involving bowel is to reduce the bacterial load as much as possible according to the current standards of care.

Key Surgical Technique Steps

After induction, the patient is briefly placed in the lithotomy position and undergoes cystoscopy to evaluate the bladder anatomy and rule out any unexpected pathologic features. The ureters are cannulated with external ureteral stents for easy intraoperative identification. After removal of the cystoscope, a large-bore Foley catheter (relative to the patient's age and aiming at a snug fit against the urethral wall to decrease leakage) is inserted and placed to gravity, along with the previously mentioned stents.

For the remainder of the procedure, the child is placed supine with the legs slightly apart, providing access to the urethra should the need arise. Port placement is accomplished with the configuration shown in Figure 1. In brief, a 12-mm trocar is inserted at the umbilicus. After achieving adequate intraperitoneal pressure, a 5-mm and 12-mm trocar are inserted in the upper quadrants on either side at the mid-axillary level. Apart from the pneumoperitoneum, pneumovesicum (through the Foley catheter, using a separate insufflator) can be obtained and kept at similar pressures throughout the laparoscopic part of the procedure. This optional dual insufflation, as previously described by Hsu and Shortliffe,[9] allows for distension of the bladder that persists despite opening the mucosa during the dissection and has been very useful in cases of laparoscopic Mitrofanoff catheterizable channel creation at our institution.

At multiple points during the procedure, transabdominal fixating sutures are advanced percutaneously. These sutures are placed through the abdominal wall and the structure of interest, a process that can be accomplished with the Carter-Thomason device (Inlet Medical, Eden Prairie, Minn), a Keith needle, or a large-bore Angiocath (Becton, Dickinson, Franklin Lakes, NJ) through which a basket or suture loop can be advanced to retrieve an intracorporeally placed suture. This relatively simple maneuver keeps the tension, secures the anatomic structure of interest, and has the advantages of easy relocation, depending on changes in the angle of dissection, as well as allowing the surgeon to complete the procedure with fewer trocars. Furthermore, because the need for an assistant to help with positioning and exposing structures during the case is not necessary, the use of these anchoring sutures provides a greater degree of movement, not only inside the abdominal cavity, but also around the patient, an important consideration in pediatric patients.

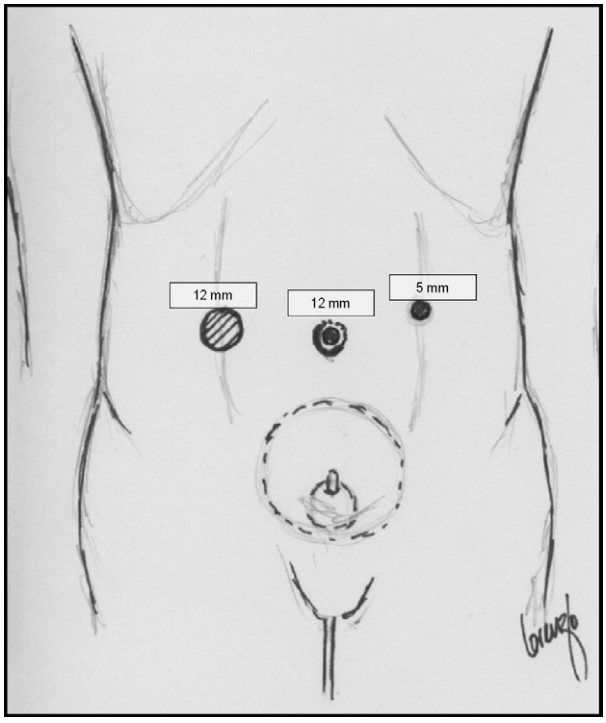

Figure 1. Port placement configuration.

After inspection of the peritoneal cavity and takedown of adhesions, if present, the segment of bowel is selected. Attention should be paid to the loop's distance from the ileocecal valve and the mobility of its mesentery, which should allow for tension-free advancement toward the pelvis. To estimate the distances appropriately, a premeasured 10-cm vessel loop segment is used. The points of excision are demarcated by placement of transserosal sutures of different lengths, providing an easy visual aid to identify these points (ie, a long suture indicates proximal and a short suture, distal). The mesenteric windows are then developed with the assistance of laparoscopic scissors, the Ligasure Lap device (Valleylab, Division of Tyco Healthcare Group, Boulder, Colo), or the laparoscopic Harmonic Scalpel coagulating shears (Ethicon Endo-Surgery, Cincinnati, Ohio). As shown in the video, this dissection is carried toward the origin of the mesentery, creating enough space for the stapling device and providing enough mobility to restore bowel continuity. The segments of bowel are transected with endoscopic gastrointestinal anastomosis staplers (Endo-GIA, U.S. Surgical, Division of Tyco Healthcare Group, Norwalk, Conn). Subsequently, a side-to side anastomo-