The Influence of Laparoscopy on the Management of Pediatric Colorectal Disorders

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The application of laparoscopic assisted techniques to infants and children with colon diseases needing surgical therapy has led to dramatic improvements in perioperative morbidity. The colon lends itself to laparoscopic approaches due to its excellent collateral blood supply, ease of mobilization, the potential for removing specimens transanally and the use of transanal stapled anastomoses. This paper describes the author's experience with laparoscopic assisted procedures for intussusception, Hirschsprung's disease, inflammatory bowel disease, and high imperforate anus.

Reduction of Intussusception

Intussusception is usually diagnosed and treated by contrast enemas. Surgical reduction is necessary in 15-40% of the cases. Laparoscopy provides a minimally invasive method for evaluating the completion of reduction when in doubt and for reducing the intussusception when the contrast enema has failed. Laparoscopic reduction should not be attempted if the child is seriously ill or has signs or symptoms of perforation.

Three trocar sites are used to explore and reduce the ileocolic intussusception (Fig. 1). The intussusception is identified. Reduction is accomplished by gentle compression just distal to the intussusception.

Frequently, countertraction on the small bowel is needed to obtain complete reduction of the intussusception. If a gangrenous segment of bowel is identified or if the intussusception is irreducible, a small vertical incision is made in the umbilicus or right lower quadrant to complete the necessary surgical procedure using an open technique. As skill is acquired, the bowel resection can be performed laparoscopically with the specimen removed in a bag through a small umbilical incision. The anastomosis may also be completed laparoscopically using a combination of sutures and staples. Eight cases of ileocolic intussusception have been treated so far and all have been reduced without open surgery. No complications have been seen in these patients.

Colon Pull-through for Hirschsprung's Disease

The laparoscopic assisted colon pull-through for Hirschsprung's disease was developed about six years ago and is performed in a single-stage. Three ports are usually used; a fourth suprapubic retractor is optional (Fig. 2). The transition zone is initially identified by seromuscular biopsies obtained laparoscopically. The colon is grasped and scissors are used to create a tangential biopsy specimen. A single suture closes the biopsy site and clearly marks the biopsy location. The intra-abdominal aganglionic colon is devascularized very close to the colon and rectum down to a point just below the peritoneal reflection. A colon pedicle preserving the marginal artery is fashioned
endoscopically. The remainder of the rectal mobilization is performed transanally using an endorectal sleeve technique. Six to eight traction sutures are used to evert the anus and expose the rectum. The rectal mucosa is incised 10-20 mm's above the dentate line. Fine silk traction sutures are placed in the mucosal edge to expose the submucosal dissection plane. The dissection proceeds until the internal perirectal dissection has been reached. The dissection planes are joined by dividing the muscle sleeve circumferentially. The intact rectum and colon is pulled out through the anus to a point 10-20 cms proximal to the ganglionic transition zone. The anastomosis is performed transanally 1 cm above the dentate line.

This procedure may be performed without the laparoscopic assist. The advantages of the laparoscopic assist include 1) biopsy confirmation of ganglion cells above the transition zone prior to performing the "committed" endorectal dissection, 2) an easier endorectal dissection because the intraperitoneal ganglionic segment is already mobilized, 3) a more definitive end-point for the endorectal dissection with less retraction of the anal sphincter mechanism, and 4) greater flexibility if an open procedure becomes necessary.

The author has recently evaluated the outcome of primary laparoscopic pull-through in eighty patients with Hirschsprung's disease performed at six pediatric surgery centers over the past five years. Most of the children were operated immediately after the diagnosis was made by suction rectal biopsy. The age at operation was three days to 96 months. The average length of operation was 2.7 hours. Only one patient required a perioperative blood transfusion. Most of the patients passed stool and flatus within 24-hours of surgery. The average time for discharge after surgery was 3.7 days. One of the patients required subsequent diversion for enterocolitis. All 80 patients are currently alive and well. Most of the children are too young to evaluate for fecal continence, but 18 of the older children are continent.

Proctocolectomy with J-Pouch for Inflammatory Bowel Disease

Total proctocolectomy with J-pouch pull-through can also be performed laparoscopically. The initial dissection is performed as for Hirschsprung's disease except that the entire colon is mobilized laparoscopically. Dividing the mesocolon close to the colon with the ultrasonic scalpel is quick and bloodless. The endorectal dissection is performed in a fashion similar to the...
dissection for Hirschsprung's disease. The entire mobilized colon is then pulled out through the anus. A J-pouch is developed laparoscopically using tacking sutures to line up the pouch intraperitoneally. The apex of the J-pouch is pulled down through the endorectal sleeve. An opening is made in the apex of the pouch and an anastomosis is formed between the mucosa of the J-pouch and the transitional epithelium of the rectum just above the dentate line. The pouch is created by transanal application of a 10 cm GIA stapler under laparoscopic surveillance (Fig. 3). The redundant portion of the spur is excised laparoscopically using an endoscopic gastrointestinal stapler. The ileal specimen is removed in a specimen bag. Patients on high doses of steroids are diverted with a proximal loop ileostomy. Frequent liquid stooling may occur for 2-4 months and is managed with dietary manipulation and loperamide hydrochloride. Discharge 3-5 days after surgery is the usual rule. We have performed ten total colectomies for ulcerative colitis with excellent early and long-term results. Two patients developed a minor wound infection and one developed a partial bowel obstruction at the protective ileostomy site.

High Imperforate Anus

Infants with high imperforate anus have been classically treated in three stages with an initial diverting colostomy, subsequent posterior sagittal anorectoplasty followed three to six months later by colostomy closure. There are obvious advantages to an approach that would allow a single stage procedure in the neonatal period. The author has treated eight infants with high imperforate anus using a laparoscopic assisted approach. Multiple stages were utilized but the technique can also be performed in a single stage in infancy.

Three ports are usually sufficient for this operation (Fig. 4). The bladder is decompressed by a catheter. The bladder may be retracted by a stitch, if necessary. The rectum is mobilized beginning posteriorly and proceeding laterally. The fistula can be well visualized laparoscopically and is clipped when
Because the anal canal is sensitive, the child is more likely to develop continence.

Eight patients have been treated with multi-stage laparoscopic assisted colon pull-through for imperforate anus with excellent early results. None of the patients are old enough to evaluate for continence.

Laparoscopic assisted surgery for colon disease appears to dramatically reduce perioperative morbidity and recovery time. The techniques are quickly learned for surgeons experienced in endoscopic surgical procedures.

**Selected References**


