



Techniques of laparoscopic total proctocolectomy and ileal pouch anal anastomosis patients with ulcerative colitis

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Abstract: The incidence of ulcerative colitis (UC) is increasing in adults and children worldwide. Despite the advances in drug therapy, surgery is also an important treatment. Total proctocolectomy (TPC) with ileal pouch anal anastomosis (IPAA) is the gold standard surgical treatment of UC since its introduction in 1978 by Parks and Nicholls. Laparoscopic TPC with IPAA, as a new approach for UC patients, has been applied and demonstrated to be feasible and safe. Similar to many other laparoscopic surgeries, laparoscopic TPC with IPAA benefits the patients with better outcomes in terms of cosmesis, pain and early recovery, especially in young patients. As for the surgeons, laparoscopy can provide a broad field of vision, which facilitates the surgery in the deep pelvic as well as with less tissue damage. In general, the surgery involves total colectomy, rectal dissection, pouch creation and anastomosis of pouch to the anal canal.

Keywords: Laparoscopic surgery; techniques; total proctocolectomy (TPC); ileal pouch anal anastomosis (IPAA); ulcerative colitis (UC)

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Introduction

Ulcerative colitis (UC) is a chronic inflammatory disease that occurs in the colonic and rectal mucosa. Most patients with UC can be effectively managed medically. However, up to 15% to 30% of patients eventually require surgery. Choosing the right timing for surgery is critical to UC patients. The delay in surgery may lead to a deterioration in the physical reserve and aggravate the condition of the patient's malnutrition, resulting in complicated postoperative outcomes.

Total proctocolectomy (TPC) with ileal pouch anal anastomosis (IPAA) was firstly introduced by Parks and Nicholls (1) in the late 1970s and it is now widely recognized the gold standard surgical treatment for most UC patients requiring surgery. It was initially described with an "S" pouch and a "J" configuration was subsequently introduced by Utsonomiya (1,2). Both were described with a handsewn anastomosis to the dentate line after mucosectomy of the rectal cuff. Over the next decade,

multiple variations including J, S, H, and W pouches were evaluated. Because of the easy construction and efficiency of evacuation, the J configuration was subsequently accepted as the preferred technique (3). Over the past decade, improvements in surgical techniques and the accumulation of surgical experience have effectively improved the clinical outcome of patients who underwent ileal-pouch anastomosis (4). IPAA surgery is widely used by surgeons, mainly because of its acceptable morbidity and quite low mortality rates, respectively, 19–27% and 0.2–0.4%. In addition, the quality of life is almost the same as the healthy people (5).

The emergence of laparoscopic IPAA is a great advance in the surgical treatment for the UC patients. In 1992, Peters firstly performed IPAA surgery laparoscopically on UC patients (6). However, due to the complex course of chronic diseases, chronic malnutrition, intestinal fragility and other factors, the surgeon thought that laparoscopic surgery is not good choice at the beginning. Moreover, the surgeons did not have enough laparoscopic colon surgery

experience and suitable equipment such as stapling device. In addition, laparoscopic IPAA is technically challenging. With the subsequent accumulation of surgical experience and the emergence of dedicated laparoscopic surgical equipment, laparoscopic IPAA surgery is gradually being carried out widely.

Indications for surgery

For patients who required TPC-IPAA surgery, surgical indications between laparoscopic and open IPAA do not differ too much. Usually, uncontrolled bleeding, perforation, and malignancy are the absolute indications of surgery for UC. Moreover, the following situations can also be considered for surgery: severe UC that is refractory to medical treatment, toxic megacolon, uncontrolled symptoms, and situation that continuous medical treatment is impossible due to side effects (7).

Use of laparoscopic IPAA should be carefully considered if the patient is in any of the following situations: previous surgery with large abdominal incisions; emergency situations (i.e., toxic megacolon, perforation, or fulminant UC) (8).

Operative strategy

There are three choices for IPAA surgery which contains one-, two- and three-stage procedure. For those who have a favorable physical condition, one- or two-stage surgery is generally chosen (9). When patients are in poor general conditions, a three-stage procedure would be the better choice.

One-stage procedure includes pouch construction and no diverting ileostomy. For two-stage procedure, restorative proctocolectomy with IPAA and a protective ileostomy are performed in the first stage and then closing the ileostomy after 3–6 months (depending on the patient's specific circumstances) in the second stage. For three-stage procedure, a total colectomy with end ileostomy are performed in the first stage; subsequently a restorative proctectomy with IPAA and diverting loop ileostomy are performed after 3–6 months; finally, the ileostomy is reversed in the third stage.

Preoperative preparation

In order to develop the optimal treatment plan, preoperative multidisciplinary discussion will help to adjust the patient status and medication before and after

surgery. A preconceived plan of the surgery should be made before surgery, based on preoperative evaluation, history, endoscopic findings, and radiologic studies but not on the operative findings.

The nutritional status of patients should be optimized prior to surgery. Moreover, anemia, low albumin should be corrected and the infection should be well controlled. Mechanical bowel preparation is used as deemed clinically appropriate. Although preoperative stoma marking seems insignificant, it is extremely important for patients in their postoperative care. The surgeons should keep in mind that the stoma is an important trail of this operation for the patients. A good stoma position should be easy to care and improve the quality of life for patients. Before surgery, prophylactic broad-spectrum antibiotics are given by intravenous injection.

Procedure

Patient position

Patient is placed in a position of Trendelenburg with low lithotomy. The arms are wrapped and tucked to the sides of the body; in order to minimize traction injury to brachial plexus, padded supports are applied to the shoulders. Legs are put in Allen stirrups and the thighs are level with the abdomen in order to prevent the peroneal nerves from injury.

Port placement

The surgical approach using standard laparoscopic techniques requires initial creation of pneumoperitoneum, generally at 12 to 14 mmHg. There are several ways for the port placement during the surgery (8,10,11). One method described by Luca Stocchi (12) from the Cleveland Clinic shows that they usually choose four ports. The first one is at the site of supraumbilical midline and pneumoperitoneum is established through this port. Then a 5-mm port is inserted in the position of left lower quadrant or the left interclavicular line along the transverse umbilical line. A 12-mm port is inserted in the right lower quadrant or the right interclavicular line along the transverse umbilical line. And the last 12-mm port is situated on 2 to 3 fingerbreadths cephalad to the pubic bone and 2 cm to the right of the midline. Most of the laparoscopic rectal dissection is through the latter port, and it is also used to place the endostapler for transection at the anorectal ring if there is a

total proctocolectomy (TPC) at once.

Operative steps

The technical requirements are very high in laparoscopic TPC-IPAA. The technical requirements and norms for mobilization of colon and rectal are as strict as that in radical surgery for colorectal cancer. The surgery can be divided into three parts in general. The first part is total abdominal colectomy. Then rectal dissection together with ileal-pouch anal anastomosis would be the next part. Finally, the ileostomy is performed.

Total abdominal colectomy

When it comes to total colectomy, the rectum, the whole colon, and terminal ileum need to be carefully and fully mobilized. In this part, here is a main trick that you should make your best to preserve the right and ileocolic vessels as well as the right marginal vascular arcade that later gives help to the division of the superior mesenteric vessels.

It can be divided into two parts which contains right transverse and right colonic mobilization and left transverse and left colonic mobilization. The operation begins at the level of the middle part of the transverse mesocolon, in contact with the transverse colon. For the purpose of preserving the right colic and terminal ileal vessels, it should be careful not to damage the network of marginal arteries, which will vascularize the right colon. In this way, it is possible to gain a better lengthening of the terminal small bowel with a preserved vascularization. The network of marginal arteries has been preserved to the ileocecal junction. A mobilization is carried out by dividing posterior attachments of the cecum after ileal division. And then the attachments of the ascending colon and hepatic flexure are divided.

The division of the transverse mesocolon is following. At the level of its mesenteric border, a distance should be stayed from the transverse colon. Since the pancreas is located posteriorly, meticulous care should be taken to prevent it from incidental injury. Preserve the greater omentum and free from its attachments to the transverse colon through dividing the colo-omental ligament. The intervention continues towards the left and finally in contact with the left transverse colon. Once the surgeons have changed their position and are to the patient's right, using the trocars located in the right iliac fossa and in the right flank. According to left colectomy principles, the

descending colon is freed from its lateral attachments. The mesocolon is then divided in contact with the colon.

Next step is freeing the descending colon. Using a medial posterior approach to divide lateral attachments of the descending mesocolon. The sigmoid colon is then reached and division of the sigmoid mesocolon can begin. In this time, the surgical operation should keep away from the aorta and the iliac vessels. This also allows to stay away from the nerve plexus. Because UC is a benign disease, it is unnecessary to perform an oncological resection which would include the lymph nodes.

Rectal dissection accompanied with IPAA

Once the sigmoid mesocolon has been divided, the pelvis is exposed. And then it moves to the rectal dissection. Usually, it is performed in contact with the rectal wall. The anatomical planes are progressively cleared by applying traction and counter-traction. As contact is maintained with the rectal wall, it can be observed. The dissection should be continued away from pelvic walls and nerve plexuses, thus avoiding plexus injuries and genitourinary disorders as much as possible.

The dissection's inferior limit is controlled and it could stop at the level of the pelvic floor. A gastrointestinal anastomosis (GIA) linear stapler device is applied to the lower rectum. It is not an oncological procedure, but a procedure close to the rectal wall so as to preserve the posterior portion of the mesorectum which will be used as a bed for the future reservoir. A division is performed at the level of the terminal small bowel.

After mobilization of entire colorectum, the specimen is carefully extracted from the abdominal cavity through a 5-cm ventral midline incision. The distal ileum is brought out for a sufficient length and used for the construction of the pouch.

The division of colon and rectum differs from that in colorectal cancer. Since UC is a benign disease, it is not necessary to remove a large area of mesentery which contains the lymphatic structures. Furthermore, it is not appropriate for the surgeon to excise the parietal peritoneum widely when in division of the rectum. Because there is a potential injury in sympathetic and parasympathetic nerves, it is suggested that the posterior rectal dissection should be performed between the rectal wall and the mesentery, or at least through the mesorectum. The presacral nerves and the sympathetic innervation to the pelvic viscera would be avoided by this maneuver. The

intact nerves are especially important for men. Erection is a parasympathetically mediated response that is transmitted through the nervi erigentes. The injury of the two nerves would have adverse impact on impotence and ejaculation. The injury of the nerves can be prevented by careful intraoperative identification.

A tension-free anastomosis is important for successful pouch surgery. There are several methods to gain enough length of intestine apart from mobilizing the small bowel mesentery to the third part of the duodenum near superior mesenteric artery. Another viable way is ligating the ileocolic vessels at the origin of the superior mesenteric artery. The technique described by Kirat which seems a useful way to estimate the tension of the anastomosis by grasping the apex of the pouch and pulling down to the anastomosis level to simulate the IPAA and evaluate the tension (13). In addition, several horizontal incisions of mesenteric anterior and posterior of superior mesenteric artery by translumination can be made to gain some extra length, particularly for those whose previous surgery lead to adhesions or fibrosis of the peritoneum. All methods can be used for a tension-free anastomosis.

There are several types of pouch, including J, S, or W type. Because of the good functional outcomes and its easy construction, the J-pouch is the first choice for most surgeons (13). Usually, the terminal small intestine with a length of 30 to 40 cm is used for constructing the J-pouch. The selective ileum is placed in two parallel segments, and each one is about 15 to 20 cm long. Then longitudinally cut the intestine with a 1.5 cm incision at the pouch apex. The two segments of the ileum are stitched together by side-side anastomosis with two cartridges of linear stapler (75 or 100 mm) which is put into the intestinal cavity through previous enterotomy at the pouch apex. Subsequently the closure of blind loop of the J-pouch is finished by a linear stapler, and it is generally reinforced by continuous sutures. It is necessary to check whether suture line bleeding is present and hemostasis is ensured. Finally, the normal saline is used to test the integrity of the pouch.

The pouch is then placed back to the abdomen and makes sure the small bowel in a correct orientation. The ileal pouch-anal anastomosis should be finished without torsion and free of tension. Finally, ensure that there is no leak by an air test.

Construction of loop ileostomy

When the operation is performed for UC, the small intestine is spared. The surgeons should make the best to

preserve the full length of the small bowel in UC patients. Some people think that although the distal 2 to 3 cm of ileum is resected, it has no influence on absorption, while Neal found that even proper resection of ileum may lead to adverse results that the peristalsis of small bowel is accelerated and the absorption of nutrients is impaired, so as the water and electrolytes (14).

As with sigmoid colostomy, it is better to have a very large opening than a small one. To avoid torsion of the distal ileum on itself, some anchoring would be required. A few sutures placed from the serosa of the ileum and its mesentery to the parietal peritoneum may be also helpful. When ileostomy is completed, then abdomen is closed in layers.

Postoperative management

Once the bowel function returns, the patient can start clear liquid diet. Bladder catheter is usually removed five days after surgery. When the intestinal function is restored, the drainage tube can be removed. Since the patient can get out of bed for free activities and the ileostomy is normal, he or she could be discharged from the hospital. Sutures are removed about 1 week after surgery if no wound infection develops.

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Footnote

Conflicts of Interest: The author has completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/jxym.2017.04.07>). The author has no conflicts of interest to declare.

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