



Superselective vascular surgery of rectum and sigmoid colon

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Preoperative preparation and exploration

Preoperative preparation

The preparation of laparoscopic surgery is similar with open surgery: (I) treat hypoproteinemia and anemia; (II) cure the electrolyte disturbances, and gastrointestinal decompression of pyloric obstruction patients; (III) soft semi-liquid diet 2 days before surgery and liquid diet 1 day before surgery; (IV) bowel preparation; (V) apply the stomach tube or nasal feeding tube preoperatively; (VI) skin preparation.

Indications

Superselective vascular surgery of rectum and sigmoid colon could be applied on diseases of rectum and sigmoid colon, benign diseases like diverticulitis and segmental Crohn's disease, unresectable polyp by colonoscope, and malignant diseases like colorectal cancer, colorectal endocrine tumors and GIST.

Contraindications

Absolute contraindications: patients with incurable bad body condition, severe organ dysfunction and laparoscopic contraindication. Patients with severe septicopyemia, coagulopathy, gestational colon tumor, wide abdominal and lymphatic metastasis, settled tumor or tumor invasion to small intestine and wide abdominal adhesions that could not be resolved laparoscopically are also excluded. Relative contraindications: obvious bleeding trend, tumor size >6 cm, tumor with or without severe adjacent invasion, severe abdominal adhesions, severe obesity, emergent colorectal cancer surgery and cardiopulmonary dysfunction.

Surgical appliance

Conventional appliances

These appliances include camera and display system, insufflators, flushing and suction device, and video and image storage devices as well as laparoscopic instruments such as Trocar and forceps.

Special appliances

These appliances include ultrasound knife, Ligasure high-energy electric knife, unipolar electrocoagulation device, all kinds of gastrointestinal anastomosis staplers and circular staplers.

Methods of operation

Body position

The optimal body position should be improved lithotomy position. The legs are settled horizontally.

The operator stand on the right side of the patient, while first assistant on the left and the scope-holder on the operator's left side. Monitor stands near patient's feet. Another monitor would be needed at the head side when dissociating the spleen area.

Location of trocar

At present we use the 5-hole method. The scopic hole is located at the lower edge of navel and the 10–12 cm trocar as the observation hole. This spot is used in almost all laparoscopic surgeries and it brings less disturbance to the operator. For the old and fat patients, the peritoneum is relatively immobile, which makes it easier to operate and puncture. Ensure the secondary injury by the trocar after inserting the scope. Then modify the trocar to the optimal

position through the hole at the end of the trocar. The shorter the celiac part of the trocar is, the more convenient the operation would be.

Use Mcburney points as the operating holes and penetrate them with 12 cm-trocars while the air pressure is 1.6–1.87 kPa. Adjust the operator's assistant operating hole according to the intraperitoneal situation. The holes for operator and assistants are basically on the left side of patient's abdomen. To avoid being interrupted by each other, the distance of each hole should be more than 5–6 cm.

With regard to female patients, a suture through the abdominal wall could be used to pull the uterus up to expose the pelvic cavity clearly.

Surgical procedure

The operating path is an inside-out and bottom-up and middle processing way. The following principles should be obeyed in tumor surgeries: (I) tumor principle—vein ligation before tumor management, avoiding pressing and touching tumor, incisional margin >10 cm away from tumor, water flushing, and incision protection; (II) rectal cancer total mesorectal excision (TME)—keeping the completeness of the mesentery to prevent the tumor cells falling off; (III) R0 resection. According to the tumor location and the intestine part that needs to be resected, the blood vessel that should be preserved varies. For the tumor located at the middle and lower part of rectum, the descending colon artery should be preserved. For the tumor in the descending colon, the superior rectal artery should be preserved. Next the mentioned two situations will be discussed.

Tumor at the middle and lower part of rectum

After abdominal expedition, generally, sigmoid colon mesentery should be debonded to make it easier for the assistant to pull up the sigmoid colon. Ligate the colon that is 10 cm from the tumor with galloon.

(I) Medial sigmoid colon dissociation

Cut open the medial sigmoid colon mesentery. The assistant uses one hand to pull the rectum to front side with bowel forceps, while the other hand pulls the mesentery, in which the superior rectal artery lays, to front and upper side. The operator at the meantime holds the posterior peritoneum of the sigmoid colon to keep the colon intense. Cut open the mesentery to the Toldt's space.

(II) Expand the Toldt's space

Then the assistant keeps the tension of the mesentery, while the operator carefully expands the Toldt's space. The completeness of left part of colon mesentery and prerenal fascia should be ensured to avoid injuring inferior mesenteric plexus and ureter and reproductive blood vessels. Left colon mesentery can be dissociated up to pancreas, and out to left colon sulcus. Key point for assistants: keep the tension of the mesentery, lift the rectum and the inferior mesenteric vascular pedicle.

(III) Expose the inferior mesenteric artery and nerves

The gray superior hypogastric plexus can be seen at the intersection of two common iliac arteries. Dissociate the mesentery along the surface of the plexus and abdominal aorta to inferior mesenteric arterial root. Perform resection of lymph node and adipose tissue of the area. Vascularize the inferior mesenteric artery or perform VLND. Then dissociate the blood vessels from proximal to distal. Pay attention to the left colon artery which lays at the inferior mesenteric arterial root. Protect it and the inferior mesenteric vein. Open the peritoneum of both sides of sigmoid colon and rectum along the Toldt's space and protect the ureter.

The assistant lifts up the rectum and bares 2–3 sigmoid colic vessels then finally bares the superior rectal artery. Protect concomitant the inferior mesenteric vein. Dissociate the sigmoid colic and descending colic mesentery and separate the Toldt's space to duodenojejunal flexure and left colic sulcus. Expose the inferior mesenteric vein by the lower side of pancreas. Separate the left Toldt's space to splenic flexure of colon and expose the space below the mesentery. Cut off the inferior mesenteric vein and then the descending colic mesentery. Resect left colic mesentery and lymphoid and adipose tissue around the inferior mesenteric artery. Choose to preserve left colic vessels or superior rectal vessels as required. Intrathecal or extrathecal lymph node resection can be selected according to the relation of lymph nodes and vessels.

Key points for operators: when performing the vascularized lymph node resection of inferior mesenteric vessels, we suggest opening the vagina vasorum with separating pliers left handed from near to distal end. Don't touch the vessels with ultrasound knife for too long and avoid heat injury. Preserving the left colic vessels may increase the tension of anastomotic stoma. So we need to

dissociate the Toldt's space towards tail of pancreas and cut off descending colic mesentery by the lower side of pancreas so that the descending colon could fall down to pelvic cavity. Dissociate splenic flexure and distal transverse colon if necessary.

Key points for assistants: when the operator dissociates the inferior mesenteric artery, the assistant should change the holding spot flexibly and keep the tension neither too intense nor too loose because neither brings benefit to the surgery.

Key point for scope holder: be skillful, flexible and use multi-angle observation.

Radical prostatectomy of descending-sigmoid junction colon cancer

Dissociate the posterolateral part of descending colon, sigmoid colon and upper rectum.

- (I) Descending and sigmoid colon posterolateral dissociation: draw the sigmoid colic mesentery to the right, turn the sigmoid colon around. Separate the mesentery from the back to right, then go up to the splenic flexure level.
- (II) Upper rectum posterolateral dissociation: go into the loose connective tissue behind the upper rectal mesentery from sacral promontory level. Expand to postrectal spatia. Then expand the peritoneal incisions to the upper rectum level. According to the tumor's location, continue the organ expedition, separate loose connective tissue under direct vision. Keep the completeness of mesorectum. Open the subperitoneal fascia in the way of total mesorectal excision, and enter the loose connective tissue then dissociate to the lateral rectal ligaments. Protect the sacral plexus. Cut open the peritoneal reflection, separate the Denovilliers fascia. Cut off both collateral ligaments and sacral rectal ligaments to levator ani level. The mesorectum then is dissociated completely.

Bare the upper rectal bowel, and remove the resected specimen

Bare the bowel with the ultrasound knife. Cut off the bowel with Endo-GIA Stapler through the 12 mm operating hole.

Key point for operator: cooperate with the assistant to make the mesorectum intense with the left hand and use the right hand to hold the ultrasound knife to cut the

mesentery. Touch the bowel with non-working surface of the knife to avoid injuring it.

Key point for assistant: it is of great importance to keep the tension of the mesentery. Grab the proximal bowel with the left forceps, and pull the mesentery to cephalic and dorsal way to make flat the mesentery.

Removal of the specimen: according to the tumor location select the transabdominal anastomosis with mini incision or perianum anastomosis. Make sure that the end of the cut-off bowel is >10 cm from the tumor. The distance of sigmoid colic cancer and upper rectal cancer to the cut-off end should be more than 5 cm while middle or lower rectal cancer more than 2 cm.

Attentions

- (I) The judgment to the anatomic spaces and path selection is clearer and more accurate intraoperatively. Identification and protection of pelvic plexus is more definite. The rectal mesentery can be more completely cut off by the ultrasound knife. All of these make it accord with the TME principles. The operator must have excellent surgical experience and laparoscopic operating skills, especially the skill of vessel dissociation with ultrasound knife.
- (II) Identification of inferior mesenteric artery: find the aorta abdominalis first. When the sigmoid colic mesentery is lifted by the assistant the inferior mesenteric artery can be seen to angulate with the aorta abdominalis. From this spot the inferior mesenteric artery is easier to be separated. When skeletonizing vessel, the assistant should adjust the dragging direction. Lift up the inferior mesenteric vessels then the scope holder change the angle of the scope. The assistant should drag the Inferior mesenteric vessels to the pelvic cavity to make it easier for the operator to dissociate the vessels.
- (III) Identify the anatomical layers. After opening the peritoneum, go along the Toldt's space then enter the loose space between the proper fascia of rectum and parietal pelvic fascia. Separate the anterior rectum between Denonvillier fascia and seminal vesicle. Make sure the mesorectum cut off completely.
- (IV) The assist by the assistants is also important. First assistant should not only help expose the operating area but also make the bowel or mesentery intense.

The scope holder should fully use the 30-degree visual angle, especially in the narrow pelvic cavity. Repeatedly adjust the visual field when dealing with the rectum.

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