Laparoscopic Low Anterior Rectal Resection with Diverting Loop Ileostomy

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Giulio Giambartolomei, David Gutierrez, Andrea M. Petrucci, and Giovanna Dasilva

Preference Card

- Laparoscopic camera, 10 mm, 30°
- Atraumatic 5 laparoscopic graspers, anvil grasper, and scissor
- Laparoscopic vessel sealer
- Laparoscopic hook electrocautery
- Laparoscopic 10 mm articulating linear stapler (60 mm)
- Circular stapler 28–33 mm
- Hasson blunt trocar
- Trocars to have available (1 × 10 mm, 2–3 × 5 mm)
- Purse string clamp
- Carter-Thomason suture passer
- Ileostomy rod and stoma appliance
- Flexible sigmoidoscope
- Laparoscopic suction/irrigation device
- Sutures
  - 2.0/3.0 polyglactin or catgut
  - 3.0 polydioxanone
  - 4.0 polyglecaprone
  - Skin stapler or 4.0 absorbable sutures for skin closure
  - 0 polypropylene with a straight needle

Patient Positioning/Operating Room Setup

- Modified lithotomy position with legs in stirrups to provide easy access to perineal region, thighs are flexed. Patient's buttock slightly off the lower edge of the bed to allow access to the rectum (see Fig. 13.1).
- Both arms tucked, patient secured on a bean bag and taped to the operating room table.
- Prep and drape both legs, the underbuttock area, and the abdomen.
- Surgeon to patient's right.
- Camera assistant initially to the patient's left for port placement and then will go to the surgeon's left.
- Assistant between the legs.
- Scrub nurse to surgeon's right, at the patient's feet (see Fig. 13.2).
- Monitor positioned on patient's left side, feet level, and another one by patient's left shoulder/head.

Nodal Points

Type of Incision/Port Locations

- Insert Veress needle in the left upper quadrant or an infra-umbilical Hasson trocar.
- Create pneumoperitoneum to 15 mmHg.
- 5–10 mm trocar right upper quadrant, midclavicular line.
- 10 mm trocar right lower quadrant, midclavicular line (see Fig. 13.1).
- Additional 5–10 mm trocar left flank/left lower quadrant if needed.

Approach

- Place patient in the "left side up" and Trendelenburg position. This is key to dislodge the small intestine out of the pelvis and to expose the correct dissection planes.
- *Lateral-to-medial approach:* begins with lateral mobilization of the descending colon, dissecting along the left paracolic gutter on the white line of Toldt.
- *Medial-to-lateral approach:* begins with identification and ligation of vascular pedicle and ends with lateral dissection of the descending colon.

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R. J. Rosenthal et al. (eds.), *Mental Conditioning to Perform Common Operations in General Surgery Training*,
https://doi.org/10.1007/978-3-319-91164-9_16

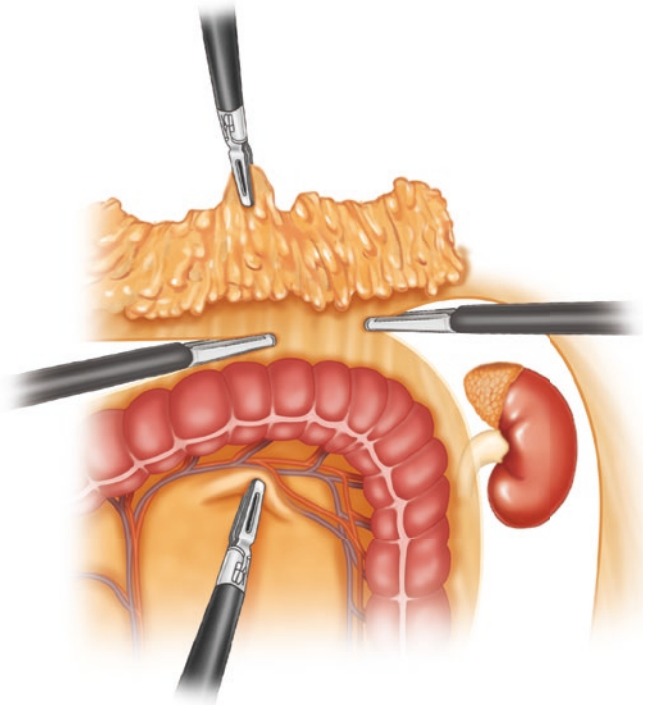

Fig. 16.1 Splenic flexure and transverse colon mobilization

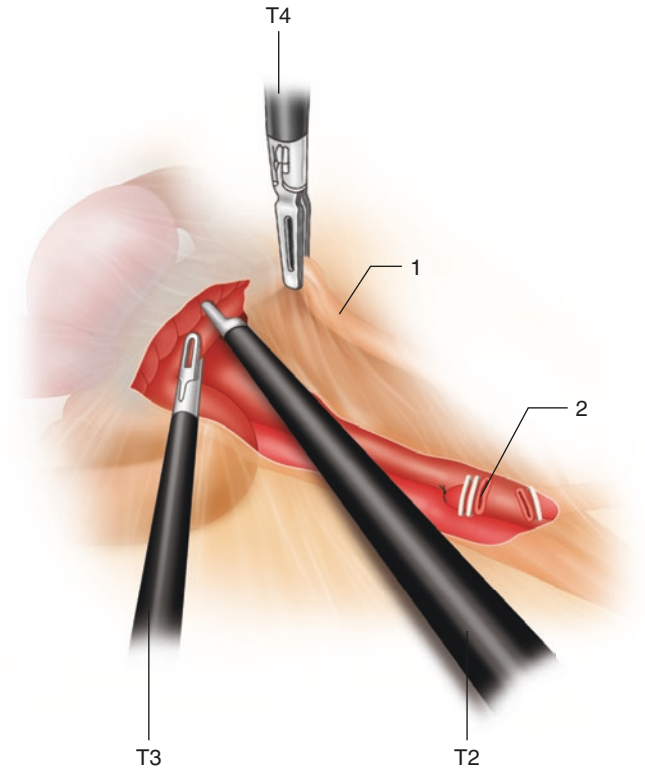

Fig. 16.2 Inferior mesenteric vein ligation

Dissection Step

Lateral-to-Medial Approach (See Fig. 13.4)

- Proximal mobilization is carried laterally along the white line of Toldt.
- Mobilize the splenic flexure by transecting the splenocolic ligaments using a vessel sealing device (Fig. 16.1).
- Care taken not to injure the spleen or the tail of the pancreas.
- Patient placed in the reverse Trendelenburg position.
- Camera assistant now to the surgeon's right side.
- Enter the lesser sac by dividing the gastrocolic ligament until the area of the lateral mobilization is reached.
- Prepare for pelvic dissection once splenic flexure is mobilized.
- Place patient in "left side up" and Trendelenburg position.
- Identify the left ureter within the retroperitoneum.
- Score the medial side of the mesocolon starting at the level of the sacral promontory.
- Identify and isolate the inferior mesenteric artery (preaortic plane) and vein (lateral to ligament of Treitz) at their origin, and ligate them using a vessel sealer only after the left ureter has been identified and confirmed to be out of the ligation plane (Fig. 16.2).
- After vessel ligation, enter the avascular presacral plane (this areolar/avascular plane is entered by starting the dissection at the level of the sacral promontory, moving caudally behind the mesorectum).
- Dissect posterior to the mesorectum with an energy device along presacral fascia taking care not to injure the superior hypogastric nerves.
- Complete lateral and anterior dissection (Fig. 16.3), sparing the inferior hypogastric and pelvic splanchnic nerve bundles. These pelvic nerve plexi run laterally and anteriorly along the Denonvilliers fascia in males and along the rectovaginal fascia in females.
- Distal anatomical landmark for complete mesorectal excision are the levator ani muscles.

Medial-to-Lateral Approach (Fig. 16.4)

- Score the mesentery at the level of the sacral promontory, moving toward to the inferior mesenteric artery (IMA).
- Ligate the IMA after identification of the left ureter and gonadal vessels.
- Continue blunt dissection in the avascular plane, elevating the mesentery off of the retroperitoneum.
- Identify and ligate the Inferior mesenteric vein.
- Complete the mobilization with the lateral dissection.

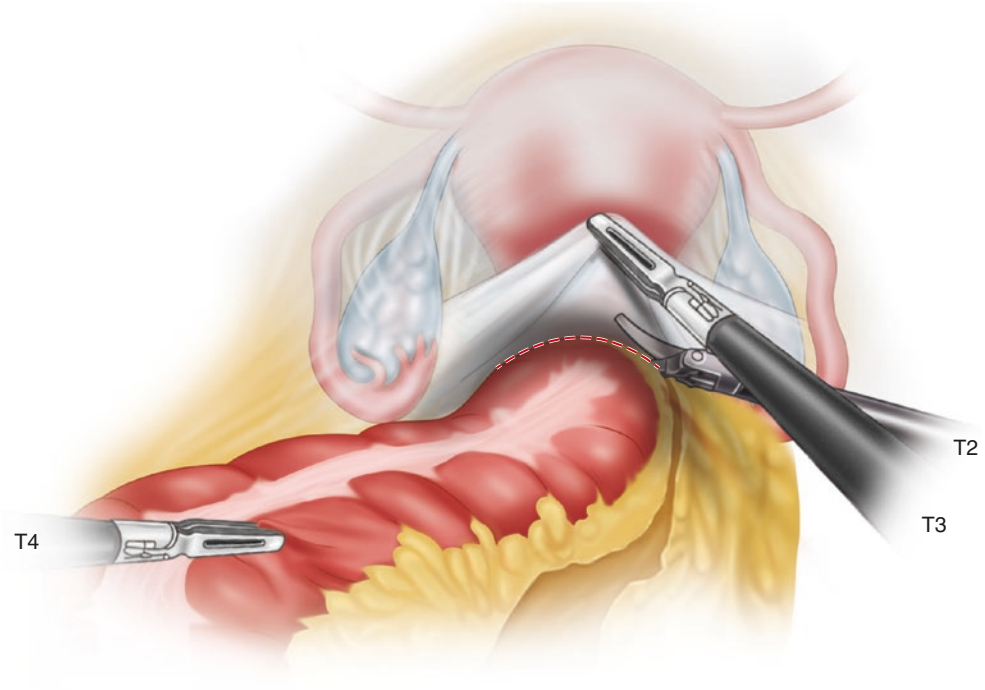

Fig. 16.3 Peritoneal reflection incision

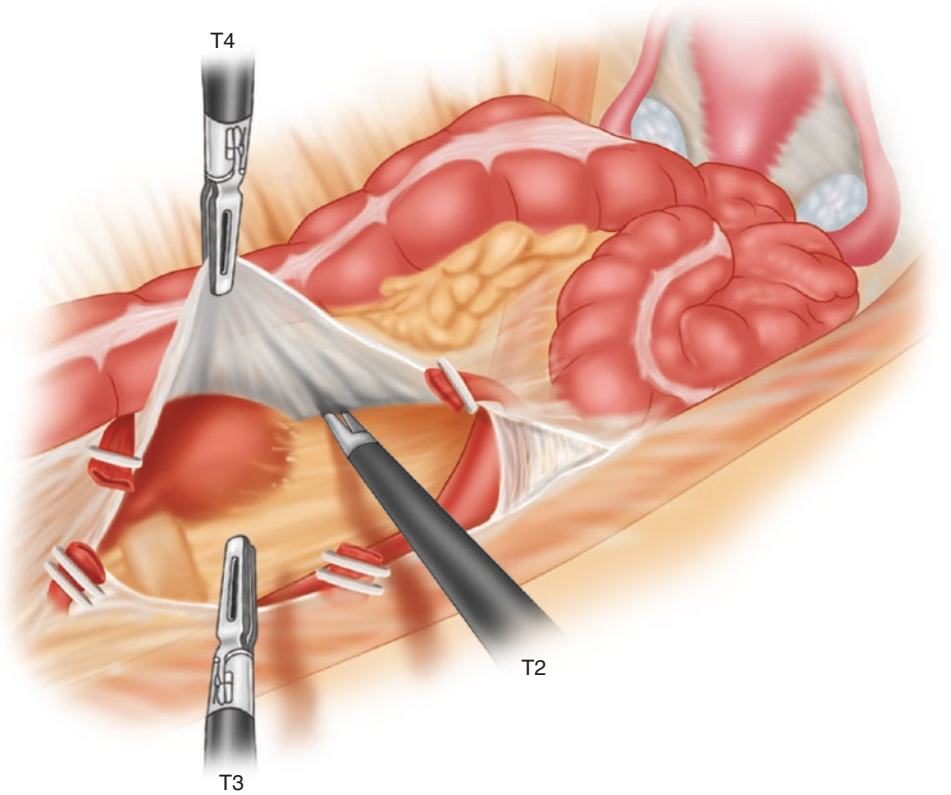

Fig. 16.4 Medial-to-lateral descending colon mobilization

- Splenic flexure mobilization as described above.
- Pelvic dissection as described above.

Resection Step

- Distal margin/point of transection of the rectum is chosen (at least 1 cm distal margin for low to mid rectal tumors and 5 cm for high rectal tumors) using a laparoscopic linear stapler (Fig. 16.5).
- Divide the mesosigmoid colon using an energy device to the left of the inferior mesenteric artery stalk.
- Grasp the distal transected rectum with an atraumatic bowel grasper.
- Create a skin incision for specimen extraction either midline/periumbilical or Pfannenstiel (surgeon preference).
- Insert wound protector.

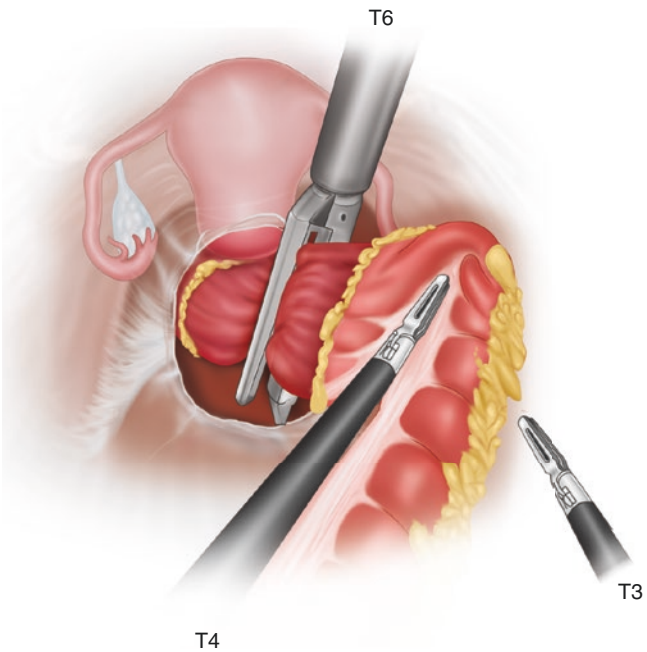

Fig. 16.5 Transection of the rectum

- Exteriorize the descending/sigmoid colon and rectum.
- Proximal point of transection chosen and clamped using a purse string clamp (>5 cm from lesion).
- Thread a 0 polypropylene on a straight cutting needle through the clamp to create purse string.
- Transect colon with scalpel along the purse string clamp.
- Send specimen to pathology.

Reconstruction Stage

- Insert the anvil of the circular stapler.
- Tie purse string snuggly around the shaft of the anvil.
- Return the bowel into the abdomen and insert wound protector and cover to prepare for insufflation and pneumoperitoneum.
- Perform a colorectal or coloanal end-to-end anastomosis using a circular stapler, after ensuring proper orientation of the mesocolon (Fig. 16.6).
- Perform an air leak test (Fig. 16.7) using a flexible or rigid sigmoidoscope after the proximal colon has been clamped with an atraumatic grasper.
- Visualize the anastomosis and check for hemostasis at the same time.
- Create a diverting loop ileostomy. See "Ileostomy Creation and Closure" chapter (Chap. 21) for detailed steps.

Pearls and Pitfalls

- Key is to dissect the rectum along the "holy plane" to respect the surrounding important structures.
- Air leak test by submerging the anastomosis while insufflating air transanally is advised.
- Ureteric stents are advised for patients with predicted difficult anatomy or with significant intra-abdominal inflammation or locally advanced colonic malignancy.

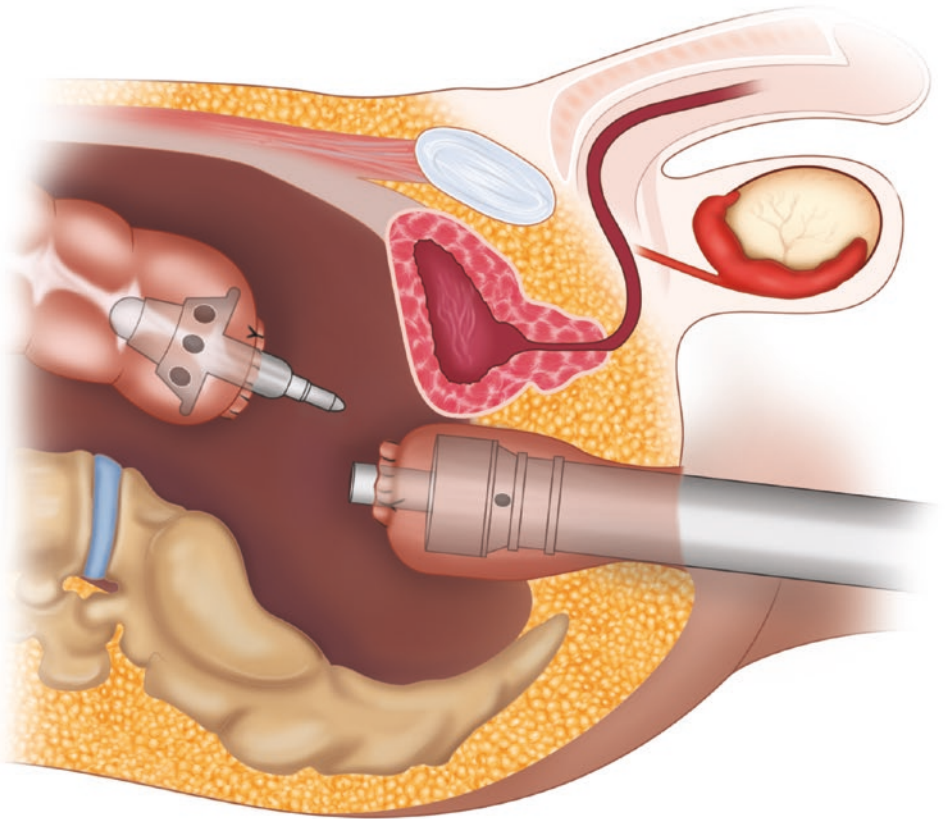

Fig. 16.6 Air leak test of the anastomosis

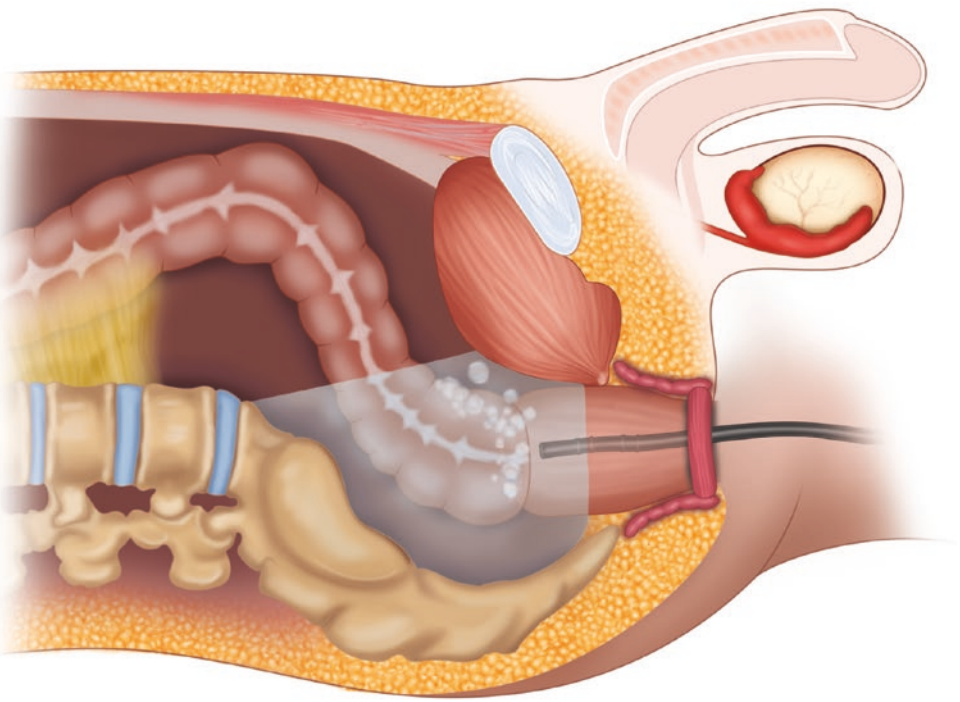

Fig. 16.7 Transanal end-to-end anastomosis

Access Reader Checklist Appendix

☑ READER CHECKLIST
Laparoscopic Low Anterior Rectal Resection with Diverting Loop Ileostomy

✓ PREFERENCE CARD

►**Instruments**
__Laparoscopic camera, 10mm, 30 degrees
__Atraumatic 5 laparoscopic graspers, anvil grasper and scissor
__Laparoscopic vessel sealer
__Laparoscopic hook electrocautery
__Laparoscopic 10mm articulating linear stapler (60mm)
__Circular stapler 28-33mm
__Hasson blunt trocar
__Trocars to have available (1x10mm, 2-3x5mm)
__Purse string clamp
__Carter-Thomason suture passer
__Ileostomy rod and stoma appliance
__Flexible sigmoidoscope
__Laparoscopic suction/irrigation device

►Sutures
__2.0/3.0 polyglactin or catgut
__3.0 polydioxanone
__4.0 polyglecaprone
__Skin stapler or 4-0 non-absorbable sutures for skin closure
__0 polypropylene with a straight needle

✓ PATIENT POSITIONING/ OPERATING ROOM SETUP

►Patient Positioning
__Modified lithotomy position with legs in stirrups to provide easy access to perineal region, thighs flexed.
__Patient's buttock slightly off lower edge of bed to allow access to rectum
__Both arms tucked, patient secured on beanbag and taped to operating room table
__Prep and drape both legs, under buttock area and abdomen

►Operating Room Setup
__Surgeon to patient's right
__Camera assistant initially to patient's left for port placement, then will go to surgeon's left
__Assistant between legs
__Scrub nurse to surgeon's right, at patient's feet
__Monitor positioned on patient's left side, feet level and another by patient's left shoulder/head

✓ NODAL POINTS

►**Type of Incision**
__Insert Veress needle in left upper quadrant or infra-umbilical Hasson trocar
__Create pneumoperitoneum to 15mmHg
__5 -10 mm trocar right upper quadrant, mid clavicular line
__10mm trocar right lower quadrant, mid clavicular line
__Additional 5-10 mm trocar left flank/left lower quadrant, if needed

►**Approach**
__Place patient in "left side up" and Trendelenburg position
Key to dislodge small intestine out of the pelvis and expose correct dissection planes
__Lateral-to-medial approach: begin with lateral mobilization of the descending colon, dissecting along the left paracolic gutter on the White line of Toldt
__Medial to lateral approach: begins with identification and ligation of vascular pedicle and ends with lateral dissection of the descending colon.

►**Dissection, Resection, and Reconstruction**
Lateral-to-medial approach
__Proximal mobilization carried laterally along white line of Toldt
__Mobilize splenic flexure by transecting spleno-colic ligaments using vessel sealing device
__Care taken to avoid splenic pancreatic tail injury
__Patient placed in reverse Trendelenburg position
__Camera assistant now to surgeon's right side
__Enter lesser sac by dividing gastro-colic ligament until area of lateral mobilization reached
__Prepare for pelvic dissection once splenic flexure mobilized
__Place patient in "left side up" and Trendelenburg position
__Identify left ureter within retroperitoneum
__Score medial side of mesocolon starting at sacral promontory
__Identify and isolate inferior mesenteric artery (preaortic plane) and vein (lateral to ligament of Treitz) at origin
__Ligate using vessel sealer only after left ureter identified and confirmed out of ligation plane
__After vessel ligation, enter avascular presacral plane
__This areolar/ avascular plane entered by starting dissection at sacral promontory, moving caudally behind mesorectum
__Dissect posterior to mesorectum with energy device along presacral fascia, avoiding superior hypogastric nerve injury
__Complete lateral and anterior dissection, sparing inferior hypogastric and pelvic splanchnic nerve bundles. *Pelvic nerve plexi run laterally and anteriorly along Denonvilliers fascia in males and recto-vaginal fascia in females*
__Distal anatomical landmark for complete mesorectal excision are levator ani muscles

Medial-to-lateral Approach
__Score mesentery at sacral promontory, moving towards inferior mesenteric artery (IMA)
__Ligate IMA after identification of left ureter and gonadal vessels
__Continue blunt dissection in avascular plane, elevating mesentery off retroperitoneum
__Complete mobilization with lateral dissection
__Splenic flexure mobilization, as described above
__Pelvic dissection, as described above

Resection
__Distal margin/point of transection of rectum chosen
At least 1cm distal margin for low-to-mid rectal tumors, 5cm for high rectal tumors) using laparoscopic linear stapler
__Divide mesosigmoid colon using energy device to left of inferior mesenteric artery stalk
__Grasp distal transected rectum with atraumatic bowel grasper
__Create skin incision for specimen extraction either midline/ periumbilical or Pfannenstiel (surgeon preference)
__Insert wound protector
__Exteriorize descending/sigmoid colon and rectum
__Proximal point of transection chosen and clamped using pursetring clamp (>5cm from lesion)
__Thread 0-polypropylene on straight cutting needle through clamp to create pursestring
__Transect colon with scalpel along pursestring clamp
__Send specimen to pathology

Reconstruction
__Insert anvil of circular stapler
__Tie purse string snuggly around shaft of anvil
__Return bowel into abdomen and insert wound protector
__Cover to prepare for insufflation and pneumoperitoneum
__Perform colorectal or coloanal end-to-end anastomosis using circular stapler (Knight-Griffen), after ensuring proper orientation of mesocolon
__Perform air leak test using flexible or rigid sigmoidoscope after proximal colon clamped with atraumatic grasper
__Visualize anastomosis and simultaneously check for hemostasis
__Create diverting loop ileostomy