

How a hand-assist can help in lap colectomy

This hybrid approach has matched the clinical benefits of total laparoscopic colectomy without the learning curve.

Laparoscopic colectomy has delivered multiple short-term clinical benefits to the patient. When performed correctly for colon cancer, it matches the short- and long-term oncologic outcomes of conventional surgery.

However, laparoscopic colectomy also has significant disadvantages. It is technically challenging and time consuming. It demands a long learning curve.

Enter hand-assisted laparoscopic surgery, or HALS, a hybrid technique that employs a special hand port that allows the surgeon to place a hand in the abdomen to assist in visualization and in the use of laparoscopic instrumentation.

HALS has maintained the clinical benefits of laparoscopic colectomy while shortening operating time and decreasing the surgeon's learning curve. We report on our HALS technique for operating on sigmoid and upper-rectal cancers, and review the literature supporting its use.

Slow embrace of total laparoscopic approach

Since the first laparoscopic-assisted colectomies were reported in 1991, surgeons have been slow to adopt the procedure as the preferred approach for colorectal resections.¹⁻³ Unlike laparoscopic cholecystectomy, which quickly became the standard of care, laparoscopic colectomy

represents a minority of the colon resections in the United States today.

The major technical limitations of laparoscopic colectomy include the lack of tactile feedback, difficulty of handling a large mobile organ, ligation of numerous large vessels, and the need to operate in multiple regions of the abdomen. Nontechnical concerns beside the learning curve are prolonged operative times, high equipment costs, and a possible neg-

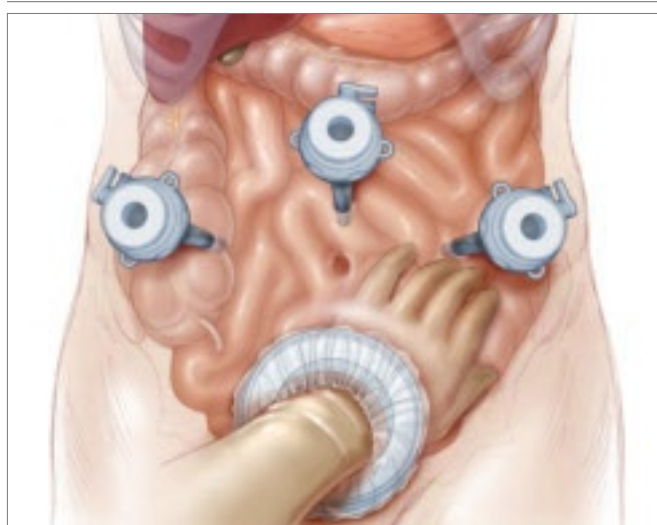
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FIGURE 1
Placing the hand port



Our standard hand-port placement for HALS left colon and anterior rectal resections. The surgeon stands between the patient's legs. (Illustration by Jennifer Fairman)

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The port maintains pneumoperitoneum with the operator's hand in the abdomen while permitting laparoscopic visualization.

Four recommendations for best practices

1) Laparoscopic and open colectomy have equivalent oncologic outcomes for all stages of colon cancer.

Level of evidence: I

2) Laparoscopic colectomy has numerous short-term clinical benefits for the patient, including decreased length of stay, fewer pulmonary complications, and decreased narcotic use. **Level of evidence: I**

3) HALS colectomy is a hybrid technique that retains many of the short-term clinical benefits of laparoscopic colectomy while maintaining some advantages of open colectomy. **Level of evidence: III**

4) HALS colectomy is technically easier to learn than traditional laparoscopic-assisted colectomy. **Level of evidence: IV**

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ative impact on oncologic outcomes in colorectal cancer.

Authors have amply documented the benefits of laparoscopic colectomy: shorter hospital stays, decreased narcotic use, and fewer postoperative pulmonary and wound complications.⁴ Single-institution and large randomized controlled clinical trials have demonstrated the technique is equivalent to open colectomy from an oncologic standpoint.⁵⁻⁷

Principle of HALS

With HALS, the surgeon inserts a hand into the abdomen through an access port. The port maintains a pneumoperitoneum with the operator's hand in the abdomen while permitting laparoscopic visualization and placement of other laparoscopic instruments.

Using the hand in combination with laparoscopic visualization and instru-

ments, the surgeon can palpate intra-abdominal organs, assist in retraction and dissection, and control bleeding when necessary.

Since its introduction, HALS has been used for splenectomy, segmental bowel resection, gastrectomy, bariatric procedures, proctocolectomy, and nephrectomy.^{8,9} In these studies, HALS provided an excellent means to thoroughly explore the abdomen, safely retract, and help perform advanced procedures considered too difficult for the standard laparoscopic approach.

Advantages of HALS

Further, authors have shown HALS typically has taken less time than the laparoscopic approach yet maintained the same patient benefits. Reports have also shown HALS has decreased the learning curve for the surgeon with no experience performing laparoscopic colectomy and expanded the complexity of a surgeon's minimal-access colorectal procedures.¹⁰

HALS is ideal for any left-sided colonic resection. It permits easy mobilization of the left colon and splenic flexure with excellent visualization of all the appropriate surgical planes.

Patient prep and the approach

At our institution, the patient has a preoperative mechanical bowel preparation. Once the patient is induced, the surgical team places a nasogastric tube and urinary catheter and positions the patient in the Lloyd-Davies position with both arms tucked at the side. Next, the team sterilely prepares the abdominal and perineal skin.

Thought leaders have recommended two different HALS approaches for left-sided colonic or rectal resection. They differ in the location of the hand-access port.

Some surgeons prefer a left-lower quadrant oblique or transverse incision. We prefer placing the port site either through a lower-midline incision starting 2 cm above the pubis symphysis or a low Pfannenstiel incision (**FIGURE 1, P 19**). Two

advantages of the lower-midline placement are:

- The incision is easy to extend if we must convert to an open approach.
- The incision is directly over the anastomosis, the most difficult part of the operation.

Gaining abdominal access

We first enter the abdomen through the lower midline, making a 7-cm incision 2 cm above the pubis. It is important to ensure that the hand access device is placed above the pubis to allow the intra-abdominal portion of the device to seat directly against the anterior abdominal wall. If placed too low, part of the device will rest against the pubic bone making it difficult to maintain pneumoperitoneum.

Next, we assess the abdomen to determine if a HALS approach is technically feasible. We then place two 5-mm trocars:

- A camera port in the midline above the umbilicus at least 15 cm from the top of the lower hand-access device.
- A working port in the left-lower quadrant about 1 cm medial from the left superior iliac crest (**FIGURE 2**).

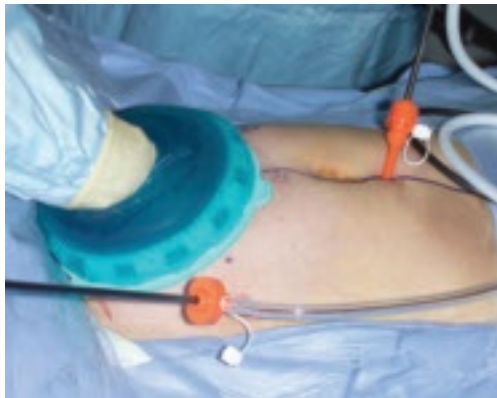
Our hand-access device of choice is the Gelport (Applied Medical Resources, Rancho Santa Margarita, CA). It maintains pneumoperitoneum continuously despite numerous hand exchanges, seems to lessen hand fatigue, adjusts easily to abdominal walls of different thicknesses, and its base can act as a combined retractor and wound protector.

Positioning the OR team

The camera operator stands to the patient's right while the operator stands between the legs. The primary video monitor is placed off the patient's left shoulder, the secondary monitor off the patient's left leg. The secondary monitor is used when the operator moves to the right side to perform the distal sigmoid and rectal dissection.

Initially, the patient is placed in steep

FIGURE 2
Trocar placement



Intraoperative photography demonstrates the placement of laparoscopic trocars for a left colon or anterior resection.

Trendelenburg with the right side down. This maneuver uses gravity to pull the small bowel to the right-upper quadrant. The operator places the left hand in the abdomen and uses the right hand to manipulate the laparoscopic dissector through the left-lower quadrant trocar. We prefer a lateral-to-medial dissection.

Mobilizing key organs

We mobilize the upper sigmoid and descending colon along the white line of Toldt. With the left hand providing gentle medial retraction, we then dissect the colon off of the retroperitoneum. Often the splenic flexure can be released without repositioning the patient. However, if the splenic flexure is too high, it may be lowered into the operator's reach by moving the patient into reverse Trendelenburg with the left side of the abdomen tilted upward.

The splenic flexure mesentery is mobilized off Gerota's fascia. To ensure adequate mobility of the splenic flexure, we often dissect the omentum from the distal transverse colon (**FIGURE 3, P 22**). This maneuver is performed by using the hand within the abdomen to hold up the omentum. This exposes the posterior omental attachments to the transverse colon. Dividing this avascular attachment

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We prefer placing the port site through either a lower midline incision that starts 2 cm above the pubis symphysis or a low Pfannenstiel incision.

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One option for completing the operation is to remove the hand-access port and mobilize the distal sigmoid colon and upper rectum as in an open colectomy.

FIGURE 3
Hand-assisted dissection



A video image of the surgeon's hand assisting in the dissection of the splenic flexure.

allows entry into the lesser sac and the complete release of the splenic flexure.

Two options for completion

Once the entire left colon and splenic flexure are mobilized to the midline of the abdomen, the surgeon has two choices for completing the procedure.

Mimic the open approach

One choice is to remove the hand-access port and, through the lower midline incision, mobilize the distal sigmoid colon and upper rectum as in an open colectomy. Using the lower midline incision for the hand port places the origin of the inferior mesenteric artery, sacral promontory, and the presacral space directly under the incision. This positioning assists in mobilization of the rectum.

Using the trocar

The other choice is to move to the patient's right and place the right hand through the hand port. Then, place the camera through the left-lower quadrant trocar and use the supraumbilical trocar for the laparoscopic dissector.

We prefer to perform the latter portion of the left or sigmoid colectomy or anterior resection using an open technique through the hand-access device incision. If we need more exposure, we

can extend the fascial incision to the pubis without extending the skin incision. This lets us divide the blood vessels to the sigmoid colon and rectum either intracorporeally or extracorporeally.

Anastomotic options

Similarly, one may perform the anastomosis under laparoscopic visualization or as an open method using the hand-access incision. We prefer the latter for left-sided colorectal resections, performing a colorectal double-stapled anastomosis under direct vision.

We routinely test the anastomosis by insufflating the rectum and colon with air from a proctoscope. If the surgeon wishes to place a drain in the presacral space, a 19-French round drain through the left-lower quadrant 5-mm trocar site would suffice because the diameter of the drain and trocar site are the same.

How HALS compares

Authors have reported their experience with HALS across a variety of general surgical procedures including colorectal resections.^{9,11-13} Nearly all series that compared HALS and laparoscopic colectomy found the former was associated with decreased operative times but had the same patient benefits: shorter hospital stay, less narcotic use, fewer wound complications, and even similar average incision length.

Comparing surgical efficiency

Interestingly, one small comparative study used video to analyze the efficiency of the colectomies performed.¹⁴ This analysis used a "surgical action efficiency" ratio: 1 represented maximal efficiency. The authors calculated the average surgical action efficiency for laparoscopic colectomy at 0.55 versus 0.71 for HALS. This improved efficiency likely accounts for the decreased operative times.

A large retrospective single-institution series compared HALS sigmoid colectomy with laparoscopic-assisted sig-

moid colectomy (66 HALS, 85 laparoscopic colectomy). The authors found that operative times for HALS were slightly shorter but the incisions were slightly larger: 8.1 cm for HALS versus 6.2 cm for laparoscopic colectomy.

Conversion rates for HALS

The conversion rate was significantly less in the HALS group (0%) versus 13% in the laparoscopic colectomy group. Short-term postoperative outcomes between the two groups, such as return of bowel function and length of stay, were similar. So were reported complications such as anastomotic leaks, wound infections, or ileus.¹⁵

Only one prospective trial in colorectal surgery has compared HALS and laparoscopic colectomy. The HALS approach had a 7% conversion rate compared with 23%, while preserving the same immediate clinical outcomes.¹²

Only one small series has reported on HALS for anterior resections.¹⁶ The authors found no cases required conversion to an open procedure. Most patients had discontinued narcotic pain medications by postoperative day three, and the average length of stay was 5.6 days. ■

Disclosures

The authors had no affiliations to disclose.

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Our experience with HALS

Our own institutional experience as well as that of others supports the use of HALS as an acceptable approach to left-sided colon resections and anterior resections. We recently reported our initial experience with HALS colectomy, which has grown rapidly since it was first introduced into our practice in early 2004.¹⁷

In 2003 at the Mayo Clinic, we performed 113 laparoscopic colectomies without any HALS cases. However, in the 18 months after the introduction of HALS, our group performed 187 HALS colectomies. The primary indications for HALS procedures were ulcerative colitis (37%), cancer (20%), and diverticulitis (18%).

Furthermore, 113 of those cases were complex colectomies comprised of total proctocolectomies, subtotal colectomies, ileoanal pouch procedures, and rectal cancer surgeries. An analysis of our HALS colectomies for cancer (N=38) showed 68% were for left-sided or rectal cancers. In this subset, no anastomotic leaks were reported and the wound infection rate was 5%.

Overall, we have found HALS to be an extremely useful technique for complex colorectal procedures while maintaining the short-term clinical benefits of laparoscopy.

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For anastomosis, our choice in left-sided colon resection is the colorectal double-stapled approach under direct vision through the hand-access incision.