# Stoma Construction: Single-Port Laparoscopic Approach

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## Introduction

Laparoscopic stoma creation has become a favorable alternative to conventional open stoma construction, proving to be safe and effective [1]. Laparoscopic techniques permit full visualization of the abdominal cavity, minimize surgical trauma, and afford the potential benefits of improved cosmesis, reduced pain, and shorter recovery time [2]. The indications for laparoscopic stoma formation do not differ from those of open surgery [2]. A variety of intestinal sites may be chosen for stoma formation, although the terminal ileum and sigmoid colon are most commonly used.

While stomas are created traditionally with a formal laparotomy, more recently there have been many other means of creative and minimally invasive techniques that are now used to create a stoma. Laparoscopy has emerged as a front-runner in stoma creation because of the minimally invasive technique and the rather quick patient recovery. Many surgeons now believe that this should be the primary means of stoma creation. In this chapter, we will review general principles of stoma creation and describe the single-port laparoscopic approach in detail.

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## Background

Single-incision laparoscopic surgery (SILS) has been described for many general surgery and colorectal surgery procedures. Single-port laparoscopic fecal diversion surgery appears to be both a feasible and safe alternative to standard laparoscopy, affording similar benefits with the additional advantage of a scarless, single incision [1]. Full laparoscopic access to the abdominal cavity is maintained, and if necessary, the procedure can easily be converted to a standard laparoscopy with placement of additional trocars. Several methods have been introduced over recent years, each reported in small case series using slightly modified techniques. In all cases, the stoma is fashioned through the port site, preoperatively selected with aid of an enterostomal therapist. By using this single-port technique, the probability of stoma site herniation and prolapse is minimized, and no additional wounds are at risk for infection or incisional hernia, and secure placement of the stoma appliance is simplified [3, 4]. Based on the favorable results from several small case series, larger studies comparing single-port laparoscopic stoma construction to standard laparoscopic stoma construction will further clarify its role.

## Room Setup and Positioning

Two video monitors are placed angling towards the patient at shoulder level. The patient is most commonly positioned in the supine position; however, the modified lithotomy position is also acceptable. If the latter position is utilized, the hips and knees are gently flexed to an angle no greater than 15° to avoid the patient's thighs interfering with the laparoscopic instruments [2]. Lithotomy is useful for identification of the distal limb, either via intraoperative proctosigmoidoscopy or air insufflation.

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## Operative Steps (Table 24.1)

**Table 24.1** Operative steps

| Operative steps | Degree of technical difficulty (scale 1–10) |
|---|---|
| 1. Port placement and exploratory laparoscopy | 3 |
| 2. Identification and mobilization of bowel | 4 |
| 3. Exteriorization of bowel | 2 |
| 4. Ostomy maturation | 1 |

### Port Placement and Exploratory Laparoscopy

A 2.5-cm incision is made in the right lower quadrant at the predetermined ileostomy site. The incision is carried down to the anterior rectus sheath, which is then divided in a cruciate fashion. The skin and subcutaneous fat are excised as a cone of tissue down to the anterior rectus sheath (see Fig. 24.1). The rectus abdominis muscle is spread in the direction of its fibers exposing the posterior rectus sheath and peritoneum (see Fig. 24.2) which are also divided in a cruciate fashion over a distance of 2.5 cm, wide enough to accommodate two fingers. The single-port access system (see Figs. 24.3 and 24.4) is then inserted through this incision. The abdomen is insufflated with $CO_2$ to 15 mmHg. A 5-mm laparoscope with a flexible steerable tip is used to visualize the abdomen. Single-incision laparoscopic instruments may be used, but standard laparoscopic instruments are suitable in most cases.

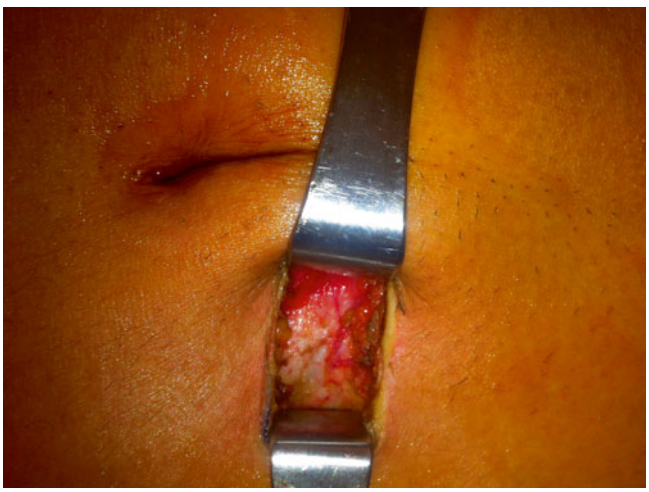

**Fig. 24.1** Anterior fascia

**Fig. 24.2** Posterior fascia

**Fig. 24.3** Triport

### Identification and Mobilization of Bowel

The terminal ileum is located, and a point on the small bowel about 15–20 cm proximal to the ileocecal valve is identified laparoscopically. Visualization of the ligament of Treves, located on the antimesenteric border of the terminal ileum just proximal to the ileocecal valve, is also helpful in identifying the anatomy (see Video 24.1 and Fig. 24.5) [2]. The terminal ileum is inspected for any pathology as well as length of mesentery available for loop stoma creation. The proximal side (one serosal thermal burn) and distal side (three serosal thermal burns) of this point on the small bowel are marked by using laparoscopic electrocautery [1] (see Video 24.2 and Fig. 24.6).

The bowel should be marked close to the ileocecal valve if the stoma is permanent. On the other hand, if the stoma is temporary, the bowel should be marked at least 15 cm proximal to the ileocecal valve to facilitate subsequent closure. Alternatively, the future ileostomy site may be marked with different colored sutures for orientation [2]. If the procedure involves a creation of a laparoscopic sigmoid colostomy, the white line of Toldt is mobilized as needed [2]. When an end stoma is indicated, intracorporeal mesenteric division may be performed either with laparoscopic clips or an endoscopic vascular linear stapler, if necessary [5, 6].

## Exteriorization of the Bowel

With a laparoscopic grasper (e.g., Babcock), the bowel is delivered through the ileostomy incision and exteriorized, with attention to maintaining proper orientation. Because the ascending colon usually tethers the ileocolic vessels to the right lower quadrant, optimal positioning of the stoma requires the placement of the proximal end along the inferior aspect of the stoma site (see Fig. 24.7).

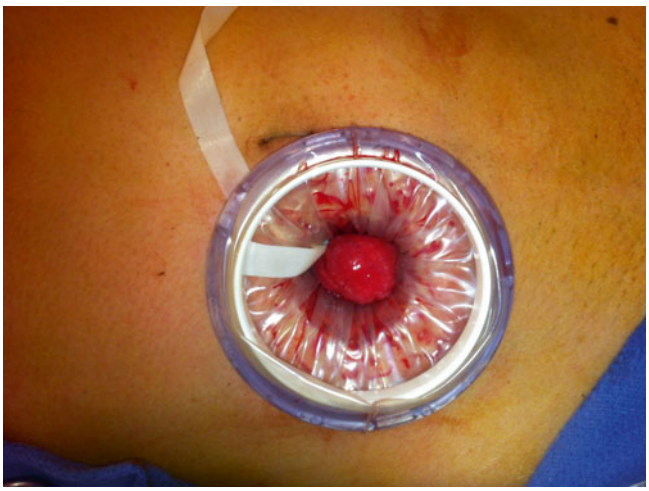

**Fig. 24.4** Triport placed

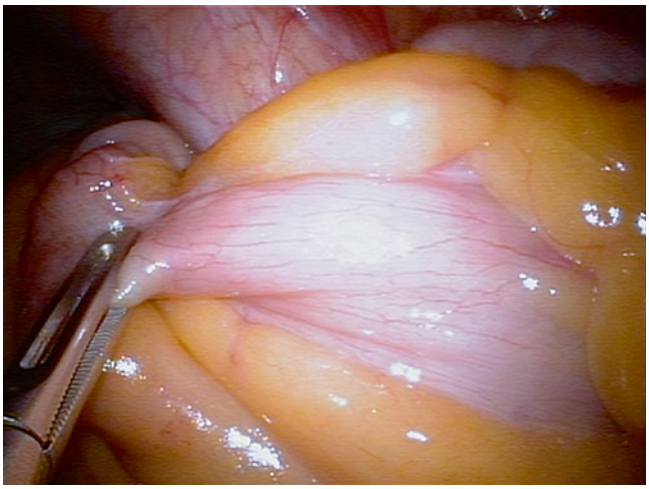

**Fig. 24.5** Treves fold

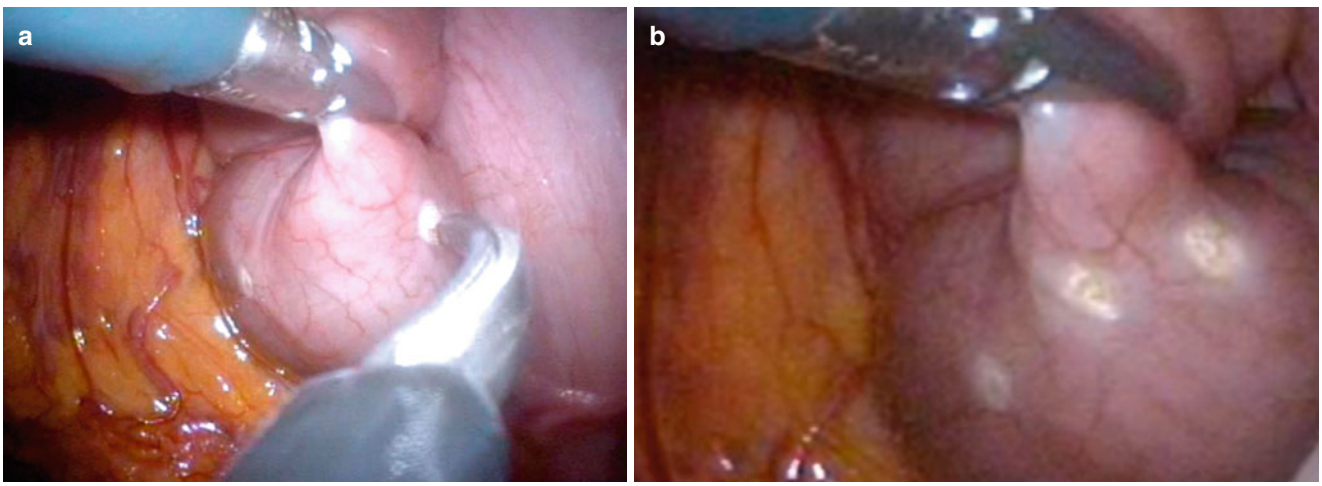


**Fig. 24.6** (**a**) Replaced thermal burns, (**b**) thermal burns

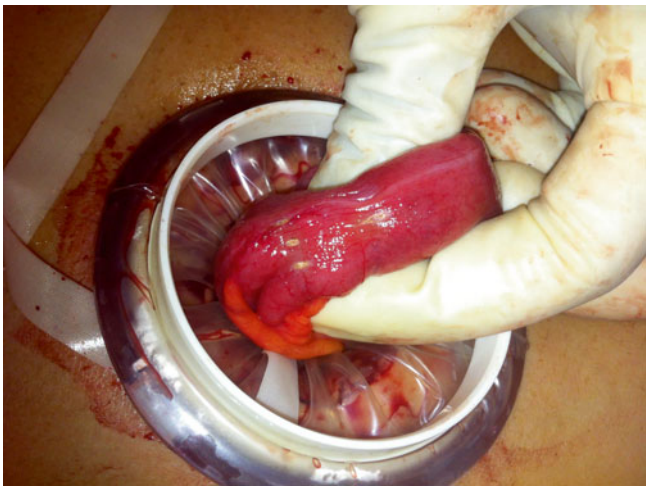

**Fig. 24.7** Orientation stoma

## Ostomy Maturation

The single-port access system is removed. The ileostomy is then matured in the usual fashion (see Fig. 24.8). The surgeon places an index finger both along the side of the stoma down to the fascia as well as into the stoma itself and beneath the peritoneum to ensure the fascial opening is not excessively tight and the stoma is not angulated.

## Description of Alternative Operative Approach

A technique described by Hellinger et al. [4] is essentially a hybrid laparoscopic-open procedure. A circular incision is made in the skin at the predetermined stoma site, and the skin and subcutaneous fat are excised as a cone of tissue down to the anterior rectus sheath. A cruciate incision is made in the anterior rectus fascia, and the rectus abdominis muscle is spread in the direction of its fibers exposing the posterior rectus sheath. The posterior rectus sheath and peritoneum is then divided in a cruciate fashion to permit introduction of 2 fingers. To improve visualization, the operating table is then rotated approximately 30° away from the stoma site and into Trendelenburg position. A right-angle retractor is placed at opposite ends of the incision for elevation of the abdominal wall. The zero-degree laparoscope is introduced to identify the appropriate bowel segment. Once the appropriate loop of bowel is identified, a non-laparoscopic clamp (e.g., Babcock) is introduced alongside the laparoscope to grasp and exteriorize the chosen segment. Visualization and bowel manipulation can be performed with the assistance of a sponge stick. When necessary, dissection of the white line of Toldt can be done

**Fig. 24.8** Stoma final

with long Metzenbaum scissors and subsequent blunt finger dissection. The laparoscope is used to follow each limb confirming the correct orientation and verifying that the loop of bowel is raised tension-free. Proctosigmoidoscopy or distal air insufflation is helpful for identification of the distal limb of a sigmoid colostomy. The ileostomy or colostomy is then matured in the usual fashion. The surgeon places an index finger along the side of the stoma down to the fascia as well as into the stoma itself and beneath the peritoneum to ensure the fascial opening is not excessively tight and the stoma is not angulated.

## Special Considerations and Complications

### The Reoperative Abdomen

This procedure is limited in patients with extensive adhesions. The options are to proceed with standard two-port or three-port laparoscopy or convert to a formal laparotomy [4].

### Morbid Obesity

It may be necessary to divide the mesentery and colon in order to perform an end colostomy. Intracorporeal division of the intestines can be accomplished by introducing a laparoscopic GIA stapler. Alternatively, a mobilized loop of the sigmoid colon can be exteriorized and divided extracorporeally using a GIA stapler [2].

## Crohn's Disease

Not only can mesentery be particularly friable in the Crohn's patient, the mesentery may be foreshortened, creating a challenge in exteriorizing a stoma through the abdominal wall. In these circumstances, an end stoma may not allow exteriorization without significant mesenteric stretch, and a loop stoma may allow for a tension-free ostomy. The intestinal segment selected for stoma maturation must also be inspected for absence of gross disease. Meticulous technique should be practiced when maturing the stoma, carefully avoiding full thickness suturing of the skin, as this may result in enterocutaneous fistulae formation.

## Summary

Single-port laparoscopic ostomy construction offers the potential for improved cosmesis with full laparoscopic visualization and access to the abdominal cavity, allowing adequate intestinal mobilization with attention to preserving the blood supply to the exteriorized segments [1]. Single-port laparoscopy for fecal diversion is technically feasible and can be performed with minimal blood loss and acceptable operative time [1]. Prudent attention to correct limb orientation and creation of a generous fascial opening with judicious laparoscopic manipulation of the bowel is crucial in reducing the potential for vascular congestion and resultant stoma ischemia [1]. This procedure may be difficult to perform in patients with extensive intra-abdominal adhesions or patients with medical comorbidities precluding general anesthesia. Additionally, one must take into account the additional cost for the single access port.

## References

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