Preoperative Considerations and Creation of Normal Ostomies

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ABSTRACT

Stomas provide fecal diversion in emergent and elective settings. Preoperative planning and counseling are extremely important to the creation of an acceptable and functional ostomy for the surgeon and patient. Proper site selection will help decrease the incidence of postoperative complications. Ileostomy, colostomy, and cecostomy indications and techniques are discussed.

KEYWORDS: Stoma, ileostomy, colostomy, cecostomy

Objectives: On completion of this article, the reader should be able to summarize the indications, preoperative considerations, and surgical techniques of ostomy creation.

Ostomies are an integral part in the operative care for patients with colorectal tumors, trauma, inflammatory bowel disease, and diverticulitis. However, the incidence of ostomies is decreasing with recent developments in surgical techniques. These developments allow for primary anastomosis and sphincter sparing operations. Unfortunately, stoma formation is often regarded as the least important part of an operation, which may be relegated to the most junior member of the operating team. This vastly underscores its importance when considering the multitude of complications a poorly constructed stoma has on the patient's quality of life. Preoperative preparation for a stoma creation includes selection of the most optimal site for the stoma, while preoperative counseling prepares the patient mentally for life with a stoma. The surgeon and the enterostomal therapist should emphasize that a stoma does not preclude a normal lifestyle.

INDICATIONS FOR STOMA CREATION

A stoma is created to provide fecal diversion for both emergent and elective procedures. It may be intended to be temporary or permanent, depending on the reason for the operation. The major indications for emergency colostomy creation are due to colonic obstruction or colonic perforation with peritonitis. Colonic obstruction is most often due to primary cancer of the distal colon or rectum, complicated diverticular disease (stricture or abscess), or trauma of the distal colon with perforation and fecal spillage. The utility of a colostomy in these conditions is to ensure the safe evacuation of stool from the body by preventing the consequences of an anastomotic leak from a high-risk primary anastomosis. Depending on the severity of the patient's illness, colostomy creation may be the only procedure performed during the entire operation. However, if the patient's condition can tolerate an extended operation, and if it is technically feasible, an attempt to address the diseased segment should be made.

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In such cases, the diseased colon may be resected and an end colostomy (with a mucous fistula or closure of the distal stump) created, or a primary anastomosis with a protective proximal colostomy could be performed. Emergent colostomies are also used in newborn infants with distal obstruction, often due to Hirschsprung's disease or imperforate anus. Definitive surgery and colostomy closure is typically delayed for one or more years.

Elective indications for colostomy creation are most commonly due to low rectal cancers, which require an abdominoperineal resection to remove the tumor. The entire anal sphincter, rectum, and the sigmoid colon are removed with the creation of a permanent end colostomy. Other indications for an elective colostomy include protection of a low colorectal or coloanal anastomosis, rectovaginal fistula, incontinence, radiation proctitis, and perianal sepsis.

Indications for emergent ileostomy creation are generally due to conditions requiring small bowel or proximal colon resection, in which the integrity of a primary anastomosis would be compromised. This may be due to a diffuse bowel injury (long-standing peritonitis or obstruction, radiation, Crohn's disease) creating friable tissues that cannot hold a suture. Other emergent indications for an ileostomy occur due to hemorrhage, ischemia, perforation, or sepsis. This includes neonates who develop intestinal perforation due to necrotizing enterocolitis with resection of the involved segment and ileostomy.

An elective ileostomy is commonly used for patients undergoing surgery for rectal cancer, inflammatory bowel disease, or familial polyposis. These patients require the removal of the rectum and possibly the entire colon as well. The utility of an ileostomy in these conditions is to ensure the safe evacuation of stool from the body in the setting of a low pelvic anastomosis at reasonably high risk for anastomotic leakage. The ileostomy may be used as an alternative to a colostomy for fecal diversion proximal to a low colorectal or coloanal anastomosis, or the only option for fecal diversion proximal to an ileal pouch anal anastomosis. In cases where a total proctocolectomy is necessary, and the anal sphincter cannot be salvaged, an ileostomy is the only option for fecal diversion.

Finally, a cecostomy is only created as an emergent measure to decompress the distal colon. This is done for the critically ill patient with massive colonic dilatation with impending colonic perforation. It may be due to an obstructing cancer or a pseudo-obstruction seen in elderly and immunocompromised patients. It can also be used for cecal and right-sided colon injuries.

PREOPERATIVE CONSIDERATIONS

Preoperative counseling and stoma site selection are critical components of preparing a patient for an oper-

ation in which a stoma may be necessary. When discussing the operation with the patient, the need for an ostomy should be emphasized. For elective operations, it is very important that the patient receive preoperative counseling about living with a stoma. This should include a visit with an enterostomal therapist or a member of the United Ostomy Association (www.uoa.org). This will help prepare the patient psychologically and emotionally. The goal of the meeting is to reinforce the information given by the surgeon and provide real-life experiences of patients with a stoma. Most patients are anxious about obtaining a stoma and this visit should help alleviate the patient's concerns. The concept of a stoma is unnatural to most patients and having one affects their self-image. Patients may have concerns about hygiene, fueled by bad experiences they may have encountered with family or friends who have had a poorly functioning stoma. Other patients may worry about limitation in social or athletic activities, or elimination of intimate relationships due to the presence of the stoma. Most patients can be reassured and made more comfortable with the concept of a stoma if the surgeon spends extra time discussing this. It is important to relate to the patient the benefit of a stoma. It may be life-saving, protective from severe infection, or significantly improve quality of life in most patients with disordered bowel function (colitis, incontinence). When quality of life is expected to improve, it is helpful to make the patient aware that the stoma will take control of his or her symptoms, and the patient only has to take control of the stoma to regain his or her lifestyle. Preoperative discussions can also help the patient become acquainted with appliances and the ease of stoma care. The patient should receive a pamphlet regarding ostomies and see a picture of a stoma to clarify expectations. If possible, the patient should meet with an ostomate. This will allow the patient to ask questions from an individual who has already undergone the surgery and is living a full life with a stoma. Moreover, issues such as odor, leakage, diet, clothing, and sexuality should also be addressed whether or not the patient brings them up. Finally, meeting with an enterostomal therapist will help assure the patient that specialists are available to aid the patient with his or her needs well after the surgery is completed.

Most difficulties with stomas occur due to incorrect placement. This can be eliminated with proper preoperative planning, which includes the surgeon, enterostomal therapist, and patient. Correct stoma placement and creation increases the ability to care for the stoma and maintain a secure pouch without leakage for approximately one week. Improperly located stomas lead to leakage of stool, peristomal skin inflammation and excoriation, emotional stress, and increased cost. For temporary stomas, these problems may be managed by

Figure 1 Stoma placement. The site is selected to bring the stoma through the rectus abdominis muscle. (Reprinted with permission from Beck DE. *Intestinal stomas*. In: Beck D, ed. *Handbook of Colorectal Surgery*. 2nd ed. London/Philadelphia: Taylor & Francis; 2003:127–148.)

early closure. However, permanent stomas may need to be revised or relocated.

Stoma placement needs to be individualized for each patient based on several considerations.^{1–4} The majority of patients do not have a flat, muscular abdomen without scars. The stoma should be placed at the superior apex of the infra-umbilical fat fold in the lower quadrant to improve the visibility of the stoma to the patient. In obese individuals, the stoma may be better located in the upper abdomen to allow for proper visualization and care, which would not be possible with the standard location. Care should be taken to avoid skin creases, bony prominences, scars, drain sites, and belt lines, which may interfere with the quality of the skin seal and the adherence of the skin seal and of the appliance. Finally, the stoma aperture should pass through the rectus abdominis muscle to reduce the likelihood of a parastomal hernia or stomal prolapse (Fig. 1).

Stoma site marking should be done prior to the patient reaching the operating room for all elective procedures.⁴ Determining the location during an operation while the patient is supine with the abdomen open may lead to an imperfect stoma site. The goals for stoma site placement are summarized as follows: place the stoma within the rectus abdominis muscle, below the belt line, on a flat surface, and easily visualized by the patient. To optimally assess the location, the patient should be evaluated supine, sitting, standing, and bending forward. Confirm with the patient that the selected site is indeed visible to the patient. This permits proper self-care of the stoma. The patient's belt-line should be avoided because this can cause direct trauma to the stoma. The stoma should be below the belt-line so that the stoma and appliance can be better concealed under the patient's garments. Some circumstances may require adjustments in the site selection. Placement of the stoma below the belt line may not be possible because of scars, skin folds, and bony prominences, in which case the stoma should be placed in the upper quadrants because the risk of leakage is too great. Obese patients

may not be able to see a stoma located below the umbilicus when standing. Additionally, the abdominal wall thickness is usually greater below the umbilicus, making delivery of the bowel through the aperture much more difficult. Therefore, stoma sites above the umbilicus are often better in morbidly obese patients. Patients undergoing pelvic exenteration require two stomas. The urinary stoma should be placed higher than the fecal stoma if a belt needs to be worn with the pouching system. Keeping the stomas on different horizontal planes will avoid the possibility of the pouching belt traumatizing the other stoma. Finally, some patients use a brace or prosthesis for back support, or are wheelchair bound. Their stoma sites should be selected while wearing the prosthetic or while sitting in the wheelchair. Paying careful attention to these issues will hopefully obviate possible stomal complications and allow for proper stomal care. This is crucial for permanent stomas, and very important for temporary stomas. The patient with a temporary stoma may not wish, or be able, to have the stoma reversed. Alternatively, temporary ostomates may require another stoma in the future and refuse to consent for another stoma after having an initial bad experience with a stoma.

The stoma site can be marked with various techniques. The skin can be tattooed permanently using methylene blue. One drop should be placed on the skin, and the skin poked several times with a 25-gauge needle to place the dye in the intradermal location. The skin site can be lacerated using a needle or a scalpel. This can be painful and may cause infection. A marking pen can be used to draw a circle or an "X" at the selected site. The site is covered with an occlusive dressing until surgery. The mark remains visible for several days, but will fade with washing. The site should be scratched into the skin after the patient has been anesthetized, prior to cleansing the skin for surgery.

SURGICAL TECHNIQUE

Creation of the Stoma Aperture

The abdomen should be opened in the midline to best preserve multiple locations for ostomies. Before bringing the intestine through the abdominal wall, the aperture is made. The layers of the abdominal wall are oriented together by placing a clamp on the dermis and the fascia and pulling them medially. A folded laparotomy sponge is placed under the proposed stoma site to protect the viscera. The skin, both clamps and sponge are all held in the nondominant hand throughout the creation of the aperture (Fig. 2A). A small circular incision, ~2 cm in diameter, is made at the designated site. A circular opening facilitates subsequent care. Some surgeons place clamps on the skin and incise around the clamp. This technique, however, has the potential for producing an

A

B

Figure 2 Ostomy creation. (A) Circular skin is removed. (B) Fascia is divided.

C

Figure 2 (Continued) (C) End of bowel is brought through fascia and skin opening. (Reprinted with permission from Beck DE. End sigmoid colostomy. In: MacKeigan JM, Cataldo PA, eds. *Intestinal Stomas. Principles, Techniques, and Management*. London/Philadelphia: Taylor & Francis;1993:97–106.)

asymmetric skin opening. The epidermis and dermis are removed, and the subcutaneous fat is preserved and divided with electrocautery in a vertical direction. Preservation of the subcutaneous fat provides support for the stoma and helps to maintain it in an everted position. The vertical incision is continued through the subcutaneous fat down to the anterior rectus sheath. Exposure is provided with two right angle retractors, which are frequently repositioned as the incision is deepened. A longitudinal or cruciate incision is made in the anterior rectus sheath with each limb being ~3 cm. The rectus

muscle is spread in the direction of its fibers using a curved clamp to expose the posterior rectus sheath (Fig. 2B). This is done to avoid the inferior epigastric vessels and unnecessary bleeding. Once the posterior rectus sheath is identified, a longitudinal incision is made through this layer and the peritoneum. The folded laparotomy sponge protects the viscera. The opening in the abdominal wall should allow two average size fingers to pass easily. The aperture is then inspected from both the internal and external surfaces for bleeding, especially from the rectus muscle. Placing the curved clamp

through the aperture and using it as a handle to expose the internal surface of the aperture facilitates inspection. Prior to removing the clamp, the laparotomy sponge should be pulled through the aperture and clamped to itself to maintain the path for the bowel. This type of opening, in the rectus sheath inferior to the umbilicus, allows the stoma to be passed through the strongest portion of the abdominal musculature and the strongest fascia. This will help reduce postoperative complications such as parastomal hernia and stomal prolapse.⁵⁻⁷ The bowel selected for the stoma is then delivered through the aperture, avoiding tension or torsion of the bowel (Fig. 2C). Care must be taken when delivering the bowel through the aperture. Excessive external pulling with clamps or drains may damage the bowel wall or tear the mesentery and cause bleeding. This is most often encountered with narrow apertures, obese patients, and large appendices epiploicae. Reducing the size of the appendices, pushing the bowel up from within the abdomen, and increasing aperture size may help.

End Colostomy

An end colostomy is usually created in conjunction with another procedure and is usually located in the left lower quadrant, but may also be placed through the low midline fascia. An end colostomy is typically created during an abdominoperineal resection for low rectal cancer or with a sigmoid colectomy with a rectal pouch for diverticulitis (Hartmann's procedure). It is very important that there is enough length of colon to be brought through the abdominal wall without tension. The left colon and sigmoid colon should be mobilized on its mesentery and detached from its lateral peritoneal reflection. This may include mobilization of the splenic flexure in special circumstances. Obese patients have larger abdominal wall depth and require the additional length obtained from detaching the splenic flexure. The inferior mesenteric artery may need to be transected at its origin to gain adequate length and the mesentery between the descending and sigmoid colon is divided. If the inferior mesenteric artery was sacrificed, the entire sigmoid colon must be removed because its arterial blood flow has been divided. The end of the descending colon is used for the stoma because its blood supply is not compromised. Its blood supply is based on the middle colic artery through the marginal artery. Moreover, patients that may have received preoperative radiation therapy may also have compromised blood flow. Finally, it is extremely important to verify that the distal end has adequate blood flow; this may be affected by an excessively narrow aperture, atherosclerosis, or tension on the bowel. Pulsatile arterial blood from the cut end of the colon must be observed or the colon should be transected more proximally.

Figure 3 End colostomy. Stoma is matured by suturing end of bowel to deep dermal layer of skin.

After the aperture has been made in the abdominal wall as described previously, the closed end of the colon is brought through it gently, avoiding twists, kinks, or tension. The terminal portion of the intestine is grasped with a noncrushing (Babcock) clamp and brought through the abdominal wall (Fig. 2C). The colon should protrude ~3 to 4 cm from the skin. Tacking sutures are not necessary between the fascia and colonic wall. Small defects between the colonic mesentery and the lateral abdominal wall should be closed; large defects should be left open. After terminating the intraabdominal portion of the operation and closing and covering the abdominal wound, the colostomy is matured. The end of the colostomy is opened and matured by using approximately eight absorbable sutures between the full-thickness colon and the dermis of the abdominal wall (Fig. 3). If the colostomy output is expected to be liquid, it is helpful to create an everted colostomy (see the *End Ileostomy* subsection). An appropriate pouch is placed over the colostomy before the patient leaves the operating room. The pouch should be oriented laterally because the patient tends to be supine in the immediate postoperative period, and this orientation will help prevent fecal spillage onto the abdominal wound and subsequent wound infection. Moreover, the pouch should be clear to allow daily visual inspection of the stoma after surgery.

Loop Colostomy

A loop colostomy is usually made using the transverse or sigmoid colon. The transverse loop colostomy tends to be placed in the upper quadrants or in the upper portion of the midline abdominal wound. The colon may be mobilized, if necessary, by detaching the adjacent flexure. The greater omentum is mobilized off of, or divided over, the transverse colon to allow the colon to be brought through the aperture without the omentum. A small opening is made in the mesentery of the colon near the edge of the bowel wall with a curved hemostat. An umbilical tape or Penrose

Figure 4 Loop colostomy.

drain is passed through this defect. The tape and colon are passed through the abdominal wall carefully ensuring that there is no tension on the colon (Fig. 4). After the colon has been delivered, a T-shaped or straight rod is placed through the mesentery. As with an end colostomy, the remainder of the operation is completed and the abdominal wound is closed and protected.

The loop colostomy is then matured, by opening it longitudinally along one of the taenia coli. Fecal diversion can be enhanced by the use of the stoma rod and creating the colostomy mostly in the bowel proximal to the rod. This results in a very small eccentrically placed opening over the distal bowel (Fig. 4 insert). The end of the rod can be tacked to the skin so that it does not slip out from under the colon prematurely. Full-thickness bowel is then sutured to the dermis using absorbable suture. The colostomy appliance is placed hanging to the side to avoid wound contamination. The rod can be removed after 3 days providing the rod is loose. It may be necessary to leave the rod in place longer for obese or malnourished patients.

End Ileostomy

The surgical construction of an ileostomy is more demanding because the ileal effluent is a high volume liquid made of proteolytic enzymes. The stoma location should be determined preoperatively, and it should have a spigot configuration to allow for precise appliance placement and stomal emptying above skin level.

The abdominal opening is made in the right lower quadrant with the technique previously described. The distal ileum is brought gently through the opening while assuring that there is no torsion or tension. The end of the ileum should protrude 6 cm from the skin. The mesentery should be sutured to the peritoneum to close the right stomal gutter. This helps prevent volvulus of the prestomal bowel, and reduce the possibility of bowel obstruction related to internal herniation. The remainder of the intraabdominal operation is completed and the wound is closed and protected. The staple line is removed from the end of the ileum and an adequate blood supply is confirmed. Next, a protruding, everting ileostomy is created by suturing full-thickness ileum at the cut end to the seromuscular

Figure 5 Ileostomy maturation (alternate methods). (A) Serosa is attached to Scarpa's fascia and the mucosal edge sutured to dermis. (B) Triangular stitch from ileal end to serosa to dermis. Tying sutures inverts the ileum to the skin.

coat at the stomal base and then to the dermis in four quadrants (Fig. 5). The mesenteric fat should not be removed because this may compromise the stoma's blood supply. An additional four sutures are placed between the first four, excluding the seromuscular bite. Sutures through the epidermis should be avoided because this may result in the formation of mucosal islands in the skin beneath the appliance and prevent proper appliance adherence due to the moisture placed between the appliance and skin.⁸ The blunt end of a short forceps can be used to evert the bowel by placing it between the two serosal surfaces of the bowel while the first four sutures (which include the extra seromuscular bite) are tied. After completing the stoma, the appliance is placed with the pouch hanging to the side to prevent wound contamination.

Loop Ileostomy

The loop ileostomy is most useful when both fecal diversion and distal decompression are required. It has the additional advantage of being able to be reversed without a laparotomy. The choice of location is the same as that for an end ileostomy. First, orienting sutures are placed on the proximal and distal end of the ileum. We use a blue-dyed suture proximal to the proposed ostomy site and a brown (chromic) stitch distally. This is remembered easily by the phrase, "Blue to the sky, brown goes down." A small mesenteric opening is created with a curved hemostat through which an umbilical tape or Penrose drain is passed. The tape and ileum are delivered through the abdominal opening. If a total proctocolectomy and pelvic pouch has been performed, the proximal (functional) end is placed in the superior position, while the distal end is placed inferiorly. If the ileocecal junction is still present, the loop is better oriented with the functional end in the inferior position. A rod is placed through the mesenteric opening and it is not tacked to the peristomal skin, but rather has heavy suture tied

around each side so if it dislodges it can be replaced easily. (The Editor prefers to suture the rod in place with absorbable suture.) The remainder of the intraabdominal operation is completed and the abdominal wound is closed and protected. The ileostomy is opened transversely, making a four-fifths circumferential opening 1 cm from the skin margin on the recessive limb. The recessive limb is matured first, using three interrupted sutures between the full-thickness cut edge and the dermis. The lateral and medial sutures in the recessive limb are placed eccentrically in the inferior half of the stoma aperture to narrow the opening. The functional limb is then matured with five sutures between the full-thickness cut edge of bowel and the dermis. The central stitch is placed first, the medial and lateral sutures near the stoma rod are next, and medial and lateral sutures between central and "rod" sutures are placed last. The blunt end of a short forceps is used to evert the bowel by placing it between the two opposed serosal surfaces of the functional limb and pushing gently away from the skin. The sutures are tied in the same order as they were placed. An appliance is placed, hanging to the side, on the stoma and the rod is removed in a few days if it is loose.

Alternative Ostomies

Various types of loop stomas (split loop, defunctioned loop, divided loop, and end-loop stomas) can be created for many different purposes as ileostomies, ileo-colostomies, and colostomies. In a *split (or defunctioned) loop stoma*,⁹ the bowel is transected and the proximal end is brought out through the stoma aperture as previously described for an end ostomy. However, the distal end is also brought out as a stoma in the same location. This distal end is deemphasized by opening one corner. This small opening is sutured to the dermis with only two sutures (Fig. 6). These defunctioned loop stomas completely divert the fecal stream and do not need a rod. The absence of a rod allows for better appliance placement in the immediate postoperative period, and decreased leakage. They also provide a distal limb, which may be studied in the future. *Divided loop stomas*¹⁰ are similar except that the distal end is not brought through the aperture, nor is it opened. Instead, it is tacked to the proximal end beneath the fascia or skin. These stomas can also be closed with a small circumstomal incision, avoiding a laparotomy. An *end-loop stoma*^{11,12} is used when the mesentery cannot be divided or if there is undue tension on the mesentery. Patients with a thick or short mesentery or an obese abdominal wall benefit most from this method. With this technique, the distal end is oversewn and a proximal loop of bowel is brought through the stoma aperture. The distal end remains in the abdomen and it is matured proximally as a loop ostomy (Fig. 7).

Figure 6 End-loop (or defunctioned loop) colostomy from Prasad et al.⁹ (A) The entire divided edge of the proximal limb and antimesenteric corner of the distal limb are gently drawn through the opening in the abdominal wall. After the abdomen has been closed, the staple line of the proximal limb is excised completely and only the antimesenteric corner of the distal staple line is removed. (B) The proximal limb is matured flush with the skin by suturing the deep dermal skin to full-thickness colon with absorbable sutures. Transition sutures may be placed to help mature the mucous fistula, which has the appearance of a "mini stoma." (C) Sagittal view of the completed end-loop colostomy. Note the portion of the distal staple line in the subcutaneous tissue. (Reprinted with permission from Orkin BA, Cataldo PA. Intestinal stomas. In: Wolff BG, Fleshman JW, Beck DE, Pemberton JH, Wexner SD, eds. ASCRS Textbook of Colorectal Surgery. New York: Springer-Verlag; 2007:622–642.)

Figure 7 Loop end colostomy. (A) A tape or rubber drain is passed through a small hole in the mesentery of the segment of colon to be exteriorized. (B) A plastic rod is placed through the mesenteric opening to support the loop on the skin and is sutured in place. The loop is opened transversely for about two-thirds of its circumference toward the distal end. The longer portion of the colon is everted with interrupted absorbable sutures. (C) Completed loop colostomy. (Reprinted with permission from Orkin BA, Cataldo PA. Intestinal stomas. In: Wolff BG, Fleshman JW, Beck DE, Pemberton JH, Wexner SD, eds. *ASCRS Textbook of Colorectal Surgery*. New York: Springer-Verlag; 2007:622–642.)

SELECTING THE STOMA TYPE

There are several factors that should be considered when selecting which type of stoma should be created for a particular patient and condition. These include the indication for the stoma (fecal diversion, intestinal decompression), the site of intestinal pathology, available stoma sites, patient body habitus (obesity), complications related to specific stoma configurations, ease of caring for the stoma, and difficulty of subsequent stoma reversal.

Stomas are created to provide fecal diversion away from diseased bowel, or to decompress obstructed bowel. An end stoma provides complete fecal diversion, but does not allow for distal bowel decompression. Therefore, in cases where the distal bowel is obstructed and must be decompressed, a loop stoma or

defunctioned loop stoma is an excellent option. If an end stoma is created, a mucus fistula must also be created.

The site of intestinal pathology often dictates the choice between an ileostomy and colostomy. However, in cases where a choice exists, factors such as ease in management and stoma complications may affect the choice of stoma type. Ileostomy patients are more prone to metabolic problems such as chronic dehydration, electrolyte imbalances, cholelithiasis, and nephrolithiasis. This is an even greater concern in patients with short bowel due to prior resection and patients receiving chemotherapy. In these cases, a colostomy is a better option if available. It is generally easier to care for an ileostomy than a colostomy. An ileostomy requires more frequent appliance changes than a colostomy, and the

odor of the ileostomy effluent is much less offensive from a colostomy. Ileostomy effluent is also more caustic to a patient's skin. Colostomies are also more prone to prolapse than ileostomies, especially transverse loop colostomies. Although colostomies have several disadvantages in caring for them, colostomy irrigation can eliminate the output from the stoma for as much as 24 to 48 hours. During this period, the patient may elect to cover the colostomy with a gauze dressing rather than wear an appliance, which will require emptying several times each day.¹³

Loop stomas have several advantages over end stomas. The circulation to the stoma is preserved with a loop stoma, but may be inadequate with an end stoma. This may be crucial in obese patients in which a long and tight passage to skin level may compromise the circulation of an end stoma further. Loop stomas are easier to close than end stomas. The proximal and distal bowel limbs are in the same aperture, allowing the stoma to be closed with a local circumstomal incision. Creation of a loop stoma also minimizes the potential for opening the wrong end of the bowel, which can happen with an end stoma. An end stoma will often require a laparotomy to bring the proximal and distal bowel limbs together. The advantages of an end stoma include complete fecal diversion and protection from anastomotic leakage. Properly constructed loop stomas can be fully diverting, but only in the absence of stoma retraction or prolapse. Unfortunately, these complications cannot always be avoided.

Although many stomas are intended to be temporary, nearly half of all stomas are not reversed. Therefore, it is important to create the most appropriate stoma with the fewest complications and difficulties in management to optimize patient satisfaction and quality of life.

Cecostomy

A cecostomy is created for the critically ill patient with massive colonic distention due to an obstructing cancer or a pseudoobstruction. These operations are typically done urgently and the anatomy is distorted due to the distention. The incision is made directly over the dilated cecum, and this location can be determined preoperatively by placing a radioopaque marker on the umbilicus and obtaining an abdominal film. The incision is carried through the fascia and peritoneum. Once the cecum is identified, a series of interrupted peritoneal-seromuscular sutures are placed at appropriate locations, which will allow the cecum to reach the skin when opened. Once the cecum is sealed off from the rest of the abdominal cavity, it is needle decompressed to reduce the tension on the intestinal wall. The cecum is then incised and opened, and its full-thickness bowel wall is sutured to the dermis. The disadvantage of this approach is that it

does not allow for full abdominal exploration to assess for bowel viability.

An alternative to a formal cecostomy is a tube cecostomy. A tube cecostomy can be constructed using a large-bore Foley, mushroom, or Malecot catheter. The catheter is secured within the cecum using two purse-string sutures and brought out through a separate stab incision. The cecum is also tacked to the abdominal wall at this location. A formal cecostomy does not close spontaneously and requires an operation to close the colocutaneous fistula. The advantage of a tube cecostomy is that it will frequently close spontaneously. However, the tube needs to be irrigated often to maintain patency because the tube tends to clog with feces and will occasionally leak around the drain.

CONCLUSION

Stoma creation is rarely the major thrust of an operation. However, it is a long-lasting and externally visible result and remains a major concern to the patient. Attention to detail during the preoperative planning and construction of a stoma will help reduce post-operative difficulties and complications from stomas. Preoperative preparation is vital to achieve patient acceptance and understanding of the stoma, and selection of an optimal stoma location. There are numerous indications for a stoma in the elective or emergent situation, and multiple choices in the creation of a stoma. A surgeon needs to be well versed in these considerations and options and be able to decide which stoma will best serve the patient on a temporary or permanent basis.

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