INVITED REVIEW

Gastrointestinal Stomas and Fistulas: What is Lost and What to Do?

Rajesh K Pande[1], Arpit Gupta[2]

Abstract

Abnormal connections between gastrointestinal tract (GIT) and skin are called enterocutaneous fistulas (ECFs). Presence of ECF is associated with significant morbidity and mortality. A stoma refers to a surgically created opening in the abdomen to divert feces or urine to the outside of the body, to compensate for partial or complete loss of bowel function. Gastrointestinal (GI) stomas and postoperative ECFs present a unique challenge to the intensivist due to development of malnutrition, dehydration, and sepsis leading to high morbidity and mortality. This review focuses on the basic concepts about the type of fistula and stomas, their indications and complications, and management. Principles of clinical management include replacement of fluid and electrolyte losses, control of sepsis along with reducing fistula output, prevention of malnutrition and psychological support, and skin care.

Keywords: Enteral nutrition, Enterocutaneous fistula, Parenteral nutrition, Sepsis, Surgical stomas.

Indian Journal of Critical Care Medicine (2020): 10.5005/jp-journals-10071-23620

Introduction

Abnormal connections between gastrointestinal tract (GIT) and skin are called enterocutaneous fistulas (ECFs). Presence of ECF is associated with significant morbidity and mortality. Seventy-five to eighty-five percent of ECFs are surgical in origin due to gut injury or significant manipulation and adhenolysis during surgery, or anastomotic leakage later, which is common in susceptible patients with cancer or inflammatory bowel disease.[1,2] Mortality ranges from 6 to 33%, with sepsis, high initial output fistula, high acute physiology and chronic health evaluation II (APACHE II) scores, low albumin, and complications being the leading contributors and predictors of mortality.[3,4] The classification is based on anatomy (site—gastrocutaneous, enterocutaneous, colocutaneous, simple vs complex, end or lateral, and distal obstruction) or based on output-high (>500 mL/day) vs low (<200 mL/day). Another classification is based on the etiology—iatrogenic-percutaneous drainage, operative procedure; trauma, foreign body, Crohn's disease, malignancy, infectious like tuberculosis (TB), actinomycosis.[5]

Stoma is a surgically created small opening on the surface of the abdomen to divert the flow of feces or urine from the bowel or bladder, which is collected in a waterproof pouch called stoma bag. Stomas are created to provide temporary or permanent bowel opening in the abdomen (interruption in gut continuity) for diverse disease conditions. Stomas can be classified on the basis of site, style, and duration.[6]

A colostomy is created when the colon is unable to function normally due to a disease or trauma, or needs functional rest, by making an opening in the colon, and exteriorizing it by bringing out on the left side of abdominal surface to provide an exit for feces and flatus, which are collected in a colostomy bag. An ileostomy involves exteriorizing the ileum onto the surface on the right side of the abdomen, to provide an exit for feces and flatus, which are collected in an ileostomy bag. The clinical indications for colostomy and ileostomy are listed in Table 1.

Proper stoma creation and management improves the quality of life, but poor stoma care can pose significant challenges requiring multiple hospitalizations with significant financial burden and complications.[7]

[1,2]Department of Critical Care, BLK Center for Critical Care, BLK Superspeciality Hospital, New Delhi, India

Corresponding Author: Rajesh K Pande, Department of Critical Care, BLK Center for Critical Care, BLK Superspeciality Hospital, New Delhi, India, Phone: +91 9810536268, e-mail: rajeshmaitree2000@gmail.com

How to cite this article: Pande RK, Gupta A. Gastrointestinal Stomas and Fistulas: What is Lost and What to Do? Indian J Crit Care Med 2020;24(Suppl 4):S175–S178.

Source of support: Nil

Conflict of interest: None

Problems with Stomas (Enterostomy)

Ileostomy is associated with an increased fluid requirement and need for wearing of an appliance and skin barrier, due to liquid to semiliquid consistency of stool that contains proteolytic enzymes. Similarly, the more proximal colonic intestinal stomas are associated

Table 1: Indications for colostomy and ileostomy

Colostomy	*Ileostomy*
Carcinoma of the colon, rectum, or anus	Ulcerative colitis
Diverticular disease	Crohn's disease
Obstruction	Colon cancer
Crohn's disease	Rectal cancer
Radiation enteritis	Radiation enteritis
Ischemic bowel	Bowel ischemia
Fecal incontinence	Trauma
	Congenital abnormalities
	Familial adenomatous polyposis

with semiliquid stool, whereas distal stoma like sigmoid colostomy is associated with formed stool consistency, not requiring any change in fluid requirements.

High-output Enterostomy

Ileostomy generally starts functioning within 24 hours after creation, and the initial output may vary from 0.5 to 2 L/day. The output depends on the intake and the size of bowel left. The normal daily output varies depending on the amount of enteral intake and the remaining length of small bowel. Ileostomy adaptation occurs gradually and is considered complete when the output is controlled between 300 and 700 mL/day. There are three phases—hypersecretory, adaptive, and stabilization.[7,8] After a stoma is created, there can be high amount of biliary fluid losses, lasting 1–3 days representing the hypersecretory phase, but can last up to 2 months. It is followed by adaptation and stabilization phases, which may take up to 2 years with stoma output finally declining to 300–700 mL/day.

High-output fistulas (HOF) with output >1.5 to 2 L/day result in severe malnutrition, dehydration, renal dysfunction, and low magnesium levels, resulting in frequent hospital admissions and longer hospital stays. The incidence of HOF is about 16% in jejunosotmies/ileostomies. Jejunostomy and intra-abdominal sepsis are the most common causes of HOF. Major causes of high-output enterostomies are jejunostomy/ileostomy, intra-abdominal sepsis, short bowel syndrome, *Clostridium difficile* enteritis, and obstructed bowel.[8]

Management of High-output Enterostomy

Infection and development of dehydration and a catabolic state should be avoided in these patients. Decreasing ostomy output and fluid and electrolytes, sepsis control, and nutritional management are the cornerstone of therapy. Necessary investigation includes complete blood count (CBC), liver and kidney function tests (LKFT), serum electrolytes, albumin C-reactive protein, procalcitonin (PCT), and appropriate body fluid cultures.[1] Stool may be analyzed for *C. difficile* infection and fecal calprotectin for ongoing colonic inflammation. X-ray, CT scan/MRI, and MR enterography may be helpful in identify any obstruction, intra-abdominal abscess, or any other pathology.

Fluid and Electrolytes

Initial management should focus on fluid and electrolyte balance and preventing further loss of fluid. Daily meals should also include about a liter each of hypo- as well as hypertonic fluids. If the output still remains high, free water and hypoosmolar solutions may be avoided to reduce further intestinal losses. Electrolyte replacements should take care of Na^+, K^+, Mg^+, and Zn^+ by oral or intravenous (IV) replacement depending on the extent of loss.[8] If the output is still high, medications like antidiarrheal, antimotility, and antisecretory agents can be used before meals to reduce bowel motility and intestinal secretions.

Nutrition

Enteral nutrition (EN) is preferred over parenteral nutrition (PN) due to its beneficial effects and the problems of line-related sepsis with PN. Enteral nutrition should include high-calorie, low fiber diet for better absorption of nutrients. In situations where gut cannot be used, e.g., short or obstructed bowel, partial PN can be used along with EN.[8] Details of nutrition are discussed in the section on management of ECF.

Controlling the Cause

Endoscopy and imaging play a vital role to find out the reason for a high-output enterostomy and help in distinguishing between infective and inflammatory causes. Antibiotics can be used to treat an intra-abdominal infection, and in addition, fecal transplant can also be tried for resistant *C. difficile* enteritis. The problem of steatorrhea can be managed with drugs like cholestyramine.[8]

Problems with Enterocutaneous Fistula

Complications of ECF include electrolyte and fluid imbalance, malnutrition, and sepsis.[9] The management requires a multidisciplinary approach. As an intensivist we are more concerned with the early and medical complications like sepsis, fluid and electrolyte disturbances, and nutrition, and this review we will focus mainly on these aspects. Acute intestinal failure (AIF) refers to a functional decline in absorptive capacity of the gut, necessitating PN supplementation. Intestinal insufficiency refers to a reduction in gut absorptive capacity that does not require PN supplementation to sustain growth and good health.[3]

Favorable outcome is associated with surgical etiologies like appendicitis, diverticulitis, absence of obstruction, infection or inflammation, bowel in continuity, transferrin >200 mg/dL, length >2 cm, end fistula, fistula output <200 mL/day, electrolyte homeostasis, and absence of sepsis and good fistula care.[10]

Sepsis Control

It may require immediate source control in abdominal cavity, and/or adequate drainage of an intra-abdominal abscess. Endogenous bacterial translocation can often give rise to sepsis as in subacute bowel ischemia, colitis, or distended bowel, necessitating targeted antimicrobial therapy.[3] The choice may include a combination of beta-lactam and beta-lactamase inhibitor (BL/BLI) antibiotic or carbapenem with anaerobic ± antifungal cover, which can be modified later as per the culture results. In absence of any overt intra-abdominal cause, a secondary non-abdominal septic focus like a pneumonia or central venous catheter-related infection should be suspected. Image-guided drainage is helpful in avoiding a second hit of sepsis associated with undertaking major surgery in the sick, septic patient.[11]

Optimizing Fluid and Electrolytes and Prevention of Dehydration

Although significant amount of secretions are produced by the gut (6–8 L), but most of them are reabsorbed and a small proportion reaches the colon, where it again is reabsorbed maintaining fluid homeostasis. Intestinal loss immediately after surgery is quite high due to decrease in gut motility and inflammation. Electrolyte (Mg^+, K^+, Na^+) homeostasis should be achieved in all patients.[9] The output may increase significantly if there is a preexisting abdominal disease or sepsis. Ileal resections are associated with more fluid losses due to higher malabsorption and diarrhea as the jejunum poorly adapts to the loss of ileum. Duodenal and pancreatic fistulas may require replacement with bicarbonates.

A urine output of 1 mL/kg/hour should be the goal of fluid resuscitation. Intake–output fluid monitoring is essential in these patients to monitor fluid losses due to diarrheal, nasogastric and stomal losses, and their replacement. Urinary sodium below 20 mmol/L generally suggests fluid and sodium loss that needs to be replaced. Early monitoring of urinary sodium helps in maintaining hydration and prevents development of acute kidney injury

Table 2: Calorie and nutrition requirement of patients with enterocutaneous fistulas

	Calorie (kcal/kg/day)	*Protein (g/kg/day)*	*Vitamin C*	*Other vitamins*	*Elements (zinc, copper, selenium)*
Low output	20–30	1–1.5	5–10 times normal	At least normal	At least normal
High output	25–35	1.5–2.5	10 times normal	2 times normal	2 times trace elements

(AKI).[9] After the early resuscitation phase and control of sepsis, deresuscitation should be performed to achieve a temporary negative balance to prevent bowel and abdominal wall edema and subsequent intra-abdominal hypertension.

Nutritional Support[9,10]

Indirect calorimetry is usually unavailable, and nutrition evaluation scores like Nutritional Risk Screening 2002 (NRS 2002) and Nutritional Risk In Critically Ill (NUTRIC) or Subjective Global Assessment (SGA) scores can be used for nutritional assessment. Nutritional Risk Screening 2002 ≥5 or a NUTRIC score ≥5, >10% ongoing weight loss and signs of fat and/or muscle loss indicate high nutrition risk and severe malnutrition. As these patients are in hypercatabolic state, they should be given 25–35 kcal/kg/day, with 1.5 g/kg of proteins. Amino acid solutions can be added to PN (Table 2).[10] Lipids should constitute 20–30% of all calories. Diet should be supplemented with trace elements, vitamins, and electrolytes. Caution should be done to avoid refeeding syndrome in patients with long-term malnutrition.

Enteral nutrition remains the preferential route of nutrition delivery either through nasogastric or nasojejunal tubes or through a surgical or endoscopically created gastrostomy or jejunostomy. At times, nutritional homeostasis is difficult to maintain with EN alone, and partial PN (PPN) may be used to augment the calorie–protein deficit.

Enetral feeding is beneficial and provision of 20% of calories fed enterally with supplementation of vitamin C and zinc helps in engaging the bowel and helps in maintaining functional integrity of gut (immune, hormonal, mucosal barrier, bacterial translocation, and hepatic protein synthesis). However, enteral feeds are not recommended in bowel obstruction, perforation, or ischemia due to hemodynamic instability. Enteral feeding can be given through endoscopically put nasoenteral tubes bypassing the fistula opening and delivering the feed to the distal healthy bowel, thereby maintaining the bowel continuity and avoiding the need of PN. But, this route is usually successful in patients with proximal rather than distal fistulas. Distal feeding has a positive effect of controlling biliary and pancreatic secretions though inhibitory feedback.

Enteral feeding can be sometimes administered through the fistula (fistuloclysis) or the chyme may be reinfused (enteroclysis). Reinfusion of collected proximal secretions and chyme through the fistula primes and prepares the distal bowel and improves the nutritional status.

Parenteral nutrition with medium chain triglycerides (MCT), polyunsaturated fatty acids (PUFA), and fish oil derived omega-3 fatty acids is recommended.[9]

Decreasing Gastrointestinal Losses and Increasing Gastrointestinal Absorption

Hypergastrinemia and gastric acid hypersecretion are seen with major small bowel resections. Antacids like PPI/H_2 blockers significantly reduce this response, decrease the distal output, and are the mainstay of therapy. Loperamide (up to 40 mg/day), an antimotility drug in high doses, can help in reducing the output. Other drugs include longer acting codeine phosphate (up to 240 mg/day) and cholestyramine—a bile acid adsorber given before food to control diarrhea due to excessive bile salts.

Somatostatin (up to 250 µg/hour) or octreotide also reduces bowel secretions and may be used effectively. Their use is associated with hyperglycemia and there is rebound after stopping.[1]

Protection of Surrounding Skin

Leakage of enteric fluid results in skin damage and breakdown. It can be minimized by diverting the enteral effluent.[12] Vacuum-assisted closure systems isolate the fistula output from the wound by application of –25 mm Hg pressure and help in wound healing.

Psychological Support

Psychological support is very important, as these patients developed fistula as a complication of surgery. They may require prolonged hospitalization, and an open smelly wound with fistula effluents may be quite depressing. As the treatment may take a long time and the fistula may not heal completely at times, the patients would need encouragement and support.

Definitive Surgical Repair

Thirty to seventy-five percent of fistula get closed by conservative management.[13] Inflammatory adhesions due to peritonitis associated with ECF may persist for up to a year, if the abdomen is left open.[14] In the presence of a decreasing fistula output and wound healing, it is prudent to delay reconstruction surgery. Surgical reconstruction can be planned if the patient's nutritional status is good and there is no sepsis. A contrast-enhanced CT scan of abdomen (CECT) may help in identifying the fistula tract.

Conclusion

Enterocutaneous fistula and stoma care require sepsis and output control, skin care, avoidance of dehydration, malnutrition, and other complications. Surgical repairs should only be contemplated after control of these issues and good nutritional build up have been successfully resolved.

References

1. Evenson AR, Fischer JE. Clinical management of enterocutaneous fistula. J Gastrointest Surg 2006;10(3):455–464. DOI: 10.1016/j.gassur.2005.08.001.
2. Berry SM, Fischer JE. Classification and pathophysiology of enterocutaneous fistulas. Surg Clin North Am 1996;76(5):1009–1018. DOI: 10.1016/s0039-6109(05)70495-3.
3. Campos AC, Andrade DF, Campos GM, Matias JE, Cohello JC. A multivariate model to determine prognostic factors in gastrointestinal fistulas. J Am Coll Surg 1999;188(5):483–490. DOI: 10.1016/s1072-7515(99)00038-1.
4. Haffejee AA. Surgical management of high output enterocutaneous fistulae: a 24-year experience. Curr Opin Clin Nutr Metab Care 2004;7(3):309–316. DOI: 10.1097/00075197-200405000-00011.
5. Schecter WP. Management of enterocutaneous fistula. Surg Clin N Am 2011;91(3):481–491. DOI: 10.1016/j.suc.2011.02.004.

6. Engida A, Ayelign T, Mahteme B, Aida T, Abreham B. Types and indications of colostomy and determinants of outcomes of patients after surgery. Ethiop J Health Sci 2016;26(2):117–120. DOI: 10.4314/ejhs.v26i2.5.
7. Tsujinaka S, Tan KY, Miyakura Y, Fukano R, Oshima M, Konishi F, et al. Current management of intestinal stomas and their complications. J Anus Rectum Colon 2020;4(1):25–33. DOI: 10.23922/jarc.2019-032.
8. Adaba F, Vaizey CJ, Warusavitarne J. Management of intestinal failure: the high-output enterostomy and enterocutaneous fistula. Clin Colon Rectal Surg 2017;30(03):215–222. DOI: 10.1055/s-0037-1598163.
9. Klek S, Forbes A, Gabe S, Holst M, Wanten G, Irtun Ø, et al. Management of acute intestinal failure: a position paper from the European Society for Clinical Nutrition and Metabolism (ESPEN) special interest group. Clin Nutr 2016;35(6):1209–1218. DOI: 10.1016/j.clnu.2016.04.009.
10. Gribovskaja-Rupp I, Melton GB. Enterocutaneous fistula: proven strategies and updates. Clin Colon Rectal Surg 2016;29(02):131–137. DOI: 10.1055/s-0036-1580732.
11. Kaushal M, Carlson GL. Management of enterocutaneous fistulas. Clin Colon Rectal Surg 2004;17(2):79–88. DOI: 10.1055/s-2004-828654.
12. Ashkenazi I, Fuentes FT, Olsha O, Alfici R. Treatment options in gastrointestinal cutaneous fistulas. Surg J (NY) 2017;3(01):e25–e31. DOI: 10.1055/s-0037-1599273.
13. Pritts TA, Fischer DR, Fischer JE. Postoperative enterocutaneous fistula Holzheimer RG, Mannick JA, ed. Surgical Treatment: Evidence-Based and Problem-Oriented. Munich: Zuckschwerdt; 2001. Available from: https://www.ncbi.nlm.nih.gov/books/NBK6914/.
14. Lynch AC, Delaney CP, Senagore AJ, Connor JT, Remzi FH, Fazio VW. Clinical outcome and factors predictive of recurrence after enterocutaneous fistula surgery. Ann Surg 2004;240(5):825–831. DOI: 10.1097/01.sla.0000143895.17811.e3.