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Review Article

A New Challenge: Enterocutaneous Fistula Diagnosis and Management

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Abstract

Introduction: Enterocutaneous fistulas mostly (75% - 90%) occur iatrogenically postoperatively. In one study, as many as 95% of enterocutaneous fistulas occurred postoperatively, and the ileum was the most common site for enterocutaneous fistulas. Other enterocutaneous fistulas in 10% - 25% occur spontaneously or as a result of intrinsic abnormalities such as Crohn's disease, radiation enteritis, distal obstruction, or abscess or peritonitis. The risk factors for postoperative enterocutaneous fistula include technical and patient risk factors. Technical risk factors include poor preparation for surgery, operating techniques, and postoperative handling. While the patient's risk factors include age, underlying medical conditions and risky lifestyle. Management of enterocutaneous fistulas requires the involvement of a surgeon, nutritionist, enterostomal therapist, interventional radiologist and gastroenterologist. The fistula must be staged appropriately by combining the patient's clinical condition with investigations such as fluoroscopic contrast studies, fistulography, and CT scan.

Objective: Diagnosis and management in the form of reoperative intervention may be required in some patients based on several factors which will be discussed further.

Discussion: Generally, complaints of postoperative fever and abdominal pain. It is necessary to ask about what operations have been performed and for what indications, underlying diseases such as inflammatory bowel disease, malignancy, distal bowel obstruction, history of radiation, and other conditions the patient has. The definitive diagnosis of enterocutaneous fistula is usually made by visualization of the drain from the surgical incision or from the drain site. Taking all these risk factors into account, it is evident that patients undergoing emergency surgery have a higher rate of fistula formation whereas it is not possible to change many of these factors in the situation as they arise. Operations performed for adhesions, bowel obstruction, cancer, radiation enteritis, or inflammatory bowel disease have the highest rates of fistula formation. It is in these cases that the meticulous surgical technique previously described and the appropriate postoperative care are the mainstays of fistula prevention.

Conclusion: Management of enterocutaneous fistulas is still a challenge to date, although the development of supportive patient management has recently progressed. Once identified, a three-phase approach which includes stabilization consisting of resuscitation and treatment of sepsis, staging and supportive management of optimization of medical and nutritional conditions and, in some cases, definitive surgical intervention is required, which requires careful planning, proper dissection, resection and reanastomosis and reconstruction of the intestine and abdominal wall are of great concern. Most fistulas resolve spontaneously within 4 to 6 weeks with conservative management.

Keywords: Enterocutaneous Fistula; Diagnosis; Management; Risk Factor

Introduction

A fistula is an abnormal relationship between two epithelial surfaces, one of which originates from a hollow organ. Enterocutaneous fistula (ECF) or also known as external intestinal fistula is a condition where there is an abnormal connection between the large intestine or small intestine and the skin surface. An enterocutaneous fistula can originate from the stomach, duodenum, jejunum, ileum, colon, or rectum. Enterocutaneous fistulas are often associated with the sepsis triad, fluid and electrolyte balance disorders, and malnutrition [1-3].

Enterocutaneous fistulas mostly (75% - 90%) occur iatrogenically postoperatively. In one study, as many as 95% of enterocutaneous fistulas occurred postoperatively, and the ileum was the most common site for enterocutaneous fistulas. Other enterocutaneous fistulas in 10% - 25% occur spontaneously or as a result of intrinsic abnormalities such as Crohn's disease, radiation enteritis, distal obstruction, or abscess or peritonitis. The risk factors for postoperative enterocutaneous fistula include technical and patient risk factors. Technical risk factors include poor preparation for surgery, operating techniques, and postoperative handling. While the patient's risk factors include age, underlying medical conditions and risky lifestyle. Optimization of comorbidity and early management of malnutrition needs to be done, especially in elective surgery [1-4,7].

Enterocutaneous fistulas are classified based on the anatomy, physiology, and etiology of the resulting fistula. Anatomically, fistulas can come from the stomach, duodenum, jejunum, ileum, and colon. Physiologically, fistulas are classified as high output, moderate output, and low output based on the amount of fluid discharged within 24 hours. Whereas etiologically, fistulas are named based on the associated disease process, such as diverticular fistula or neoplasmic fistula. In gastroduodenal and jejunal fistulas, fistulas that occur in the form of high output and fluid loss, electrolyte imbalance, and malabsorption are clearly visible. Meanwhile, in ileal and colonic fistulas, the fistula that occurs is in the form of low output so that dehydration, acid-base balance disorders, and malnutrition are rarely found [1,2,4].

The definitive diagnosis of enterocutaneous fistula is usually made by visualization of the drain from the surgical incision or from the drain site. The gold standard in the diagnosis of fistulas is the use of a fistulogram with water-soluble contrast media, which is performed after stabilization and management of sepsis. A fistulogram can show the configuration of the tract, the origin of the fistula, the size, and cavity of the abscess associated with the fistula. In addition, the CT scan modality with contrast can also help in identifying fistulas and delineating the presence or absence of the abscess cavity around the fistula [15,18].

Treatment of enterocutaneous fistulas consists of three phases, namely stabilization, staging and supportive management, and definitive therapy. Once a fistula is identified, management should focus on prompt resuscitation, management of sepsis, and consideration of potential factors that inhibit spontaneous closure. Management of enterocutaneous fistulas requires the involvement of a surgeon, nutritionist, enterostomal therapist, interventional radiologist and gastroenterologist. In the stabilization phase, the emphasis is on resuscitation, treatment of sepsis, and control of fistula output. Once sepsis has been controlled and nutritional therapy has been given, the fistula must be staged appropriately by combining the patient's clinical condition with investigations such as fluoroscopic contrast studies, fistulography, and CT scan. Definitive therapy in the form of reoperative intervention may be required in some patients based on several factors which will be discussed further [1,2,14].

Discussion

Definition

A fistula is an abnormal relationship between two epithelial surfaces, one of which originates from a hollow organ. Enterocutaneous fistula (ECF) or also known as external intestinal fistula is a condition where there is an abnormal connection between the large intestine or small intestine and the skin surface. An enterocutaneous fistula can originate from the stomach, duodenum, jejunum, ileum, or colon. Enterocutaneous fistulas are often associated with the sepsis triad, fluid and electrolyte balance disorders, and malnutrition [1-3,14,15,20].

Epidemiology

Most (75% to 90%) cases of enterocutaneous fistula occur due to iatrogenic, i.e. due to postoperative anastomosis damage, dehiscence of the stomach or intestinal segment that was closed surgically, unknown iatrogenic bowel trauma followed by adhesionolysis, or during closure of the incision. laparotomy. Kumar., *et al*. in his study, 95% of patients developed postoperative enterocutaneous fistula due to leaking anastomosis. Enterocutaneous

fistulas sometimes occur after instrumentation or drainage of the abscess or collection of pancreatic fluid, appendix, or diverticles. Meanwhile, the other 10% to 25% occur spontaneously, most commonly due to inflammatory bowel disease such as Crohn's disease, and can also be caused by malignancy, vascular insufficiency such as radiation enteritis, diverticulitis, appendicitis, pancreatitis, tuberculosis, amoebiasis, typhoid, other intraabdominal infections, abscesses, or inflammatory processes such as malacoplakia and trauma [1,4,6,18,20].

There are three classification systems that are often used in cases of enterocutaneous fistula.

Anatomical classification

Namely by naming the fistula using the organs involved. Systems with higher pressure are named first, for example, gastrocutaneous fistula or aortoenteric fistula. The anatomical classification also includes a description of the fistula tract, such as the origin of the fistula, the location of the fistula (peripheral or lateral fistula), complex or simple fistula, long or short fistula, presence or absence of distal obstruction, and description of bowel defects, which are usually measured as more or less than 1 cm [1,2,15,20].

Physiological classification

Physiologically, fistulas are classified as high output, moderate output, and low output based on the amount of fluid discharged through the fistula in 24 hours. These are grouped into three categories, namely low output (<200 mL / 24 hours), moderate output (200-500 mL / 24 hours), and high output (> 500 mL / 24 hours). This classification can be the sole prognostic factor in determining the likelihood of spontaneous closure and mortality of an enterocutaneous fistula [1,2,4,15,18].

Classification of etiology

Namely by naming the fistula based on the disease process involved, for example, diverticular fistula or neoplastic fistula. This classification system can be used to estimate the mortality rate and the likelihood of spontaneous fistula closure [2,4,15].

Proximal fistula (stomach, duonenum, jejunum) is associated with a greater output, where the fluid that comes out is rich in electrolytes, minerals and protein, causing more fluid, electrolyte and protein loss, and a greater loss of digestive capacity. Distal fistulas (ileum, colon, rectum) tend to have a smaller output, so they are easier to handle and close spontaneously. Early classification of fistulas is very important because it can describe the prognosis of the case and can be considered in the choice of therapy [1,18,20].

Clinical manifestation

The common clinical symptom is postoperative abdominal pain in the patient accompanied by fever and red sores. If the skin sutures are removed, purulent or bloody discharge may be found followed by immediate ingestion of intestinal fluid up to two days thereafter. In addition, persistent ileus, abdominal distension, leukocytosis, and signs of sepsis may also be found [1,2].

The same technical principles that direct surgeons in reducing postoperative infection and the rate of anastomotic leakage are those that reduce fistula formation. Preoperative skin preparation and perioperative systemic antibiotics reduce the incidence of infection as well as the incidence of enterocutaneous fistulas. Intraoperatively, the surgeon should focus on establishing a tension-free anastomosis and ensuring that the bowel is perfectly perfused. Clamping or suture devices, or both, must be placed carefully and accurately to create a complete anastomosis. Performing careful and sharp surgery to avoid unwanted enterotomies and to safely repair any enterotomy or serosal injury is essential. Operating times of more than 2 hours and intraoperative contamination in the field have been shown to increase the anastomotic leak rates; thus, the surgeon must be efficient and take steps to reduce contamination. Drainage should not be placed close to the anastomosis because it can become a foreign object that can erode the anastomosis. Where possible, placing the omentum between the abdominal wall and repairing it can reduce fistula formation, although wrapping the anastomosis in the omentum (omentoplasty) has not been shown to consistently reduce anastomotic leakage. The final step is careful safe closure of the abdomen to avoid accidental inclusion of the small intestine. Postoperatively, the main focus is to maximize oxygen-carrying capacity by ensuring adequate volume status and avoiding hypotension, anemia and hypothermia [8,9].

Malnutrition, low serum albumin, cardiovascular disease, advanced age, chronic obstructive pulmonary disease, use of corticosteroids, previous abdominopelvic radiation therapy, alcohol abuse, smoking, two or more systemic diseases, American Society of Anesthesiologists (ASA) status, intra-abdominal abscess, peritonitis, and sepsis all increase the risk of developing postoperative enterocutaneous fistula. Optimization of comorbid diabetes, coronary vascular disease and inflammatory bowel disease is necessary

before surgery. Nutritional status should be optimized for elective procedures. Smoking and alcohol cessation programs can be started before surgery. Ensuring adequate normovolemia, normotension, and hemoglobin prior to induction of anesthesia optimizes tissue perfusion. Intraoperative or postoperative transfusions of more than two units increase the rate of anastomotic leakage and the severity of the fistula [1,2].

Taking all these risk factors into account, it is evident that patients undergoing emergency surgery have a higher rate of fistula formation whereas it is not possible to change many of these factors in the situation as they arise. Operations performed for adhesions, bowel obstruction, cancer, radiation enteritis, or inflammatory bowel disease have the highest rates of fistula formation. It is in these cases that the meticulous surgical technique previously described and the appropriate postoperative care are the mainstays of fistula prevention [1,2,4,7].

Diagnosis

In the history, there are generally complaints of postoperative fever and abdominal pain. It is necessary to ask about what operations have been performed and for what indications, underlying diseases such as inflammatory bowel disease, malignancy, distal bowel obstruction, history of radiation, and other conditions the patient has.

The definitive diagnosis of enterocutaneous fistula is usually made by visualization of the drain from the surgical incision or from the drain site. In addition, fistulas can also be formed from an infection in the wound, wherein the opening of the wound can be found seeping intestinal fluid. From inspection, it is often found that surgical scars on the abdomen are accompanied by reddish surrounding skin which is sometimes accompanied by abdominal distension. Often from inspection it is clear that a fistula is present, especially if it is accompanied by intestinal fluid leaking out of the drain site, but in some cases additional examinations are required to be sure. From palpation of the abdomen can be found tenderness, abdominal wall stiffness, and tenderness [1,2].

From laboratory examination, it is necessary to find the presence or absence of leukocytosis. A high output enterocutaneous fistula can disrupt the balance of fluids and electrolytes so that electrolyte levels (sodium, potassium, chloride) need to be evaluated periodically. Anemia and hypoalbuminemia can also occur in patients with enterocutaneous fistulas, especially in malnourished patients, so that a complete blood count and serum albumin levels also need to be evaluated.

If there is any doubt about diagnosing an enterocutaneous fistula, the initial test may be oral administration of methylene blue, which if a bluish color on the fistula output confirms the presence of an enterocutaneous fistula. A CT scan is performed on a patient with signs of sepsis, which can depict the area with the abscess. Periodic CT scans after percutaneous drainage to ensure complete drainage are recommended. CT scan with oral contrast media can also depict the fistula tract and provide anatomical information regarding the orientation and length of the fistula tract [1,2,8-10,18].

The gold standard in the diagnosis of fistulas is the use of a fistulogram with water-soluble contrast media, which is performed after stabilization and management of sepsis. A fistulogram can show the configuration of the tract, the origin of the fistula, the size, and cavity of the abscess associated with the fistula. A fistulogram can also show bowel disease underlying the onset of the fistula such as inflammatory bowel disease or distal bowel obstruction. Stuloscopy can be used to identify and remove foreign bodies in the fistula, debridement of the fistula tract, diagnosis and biopsy of neoplasms in the fistula tract, and therapy in some cases [10,18].

Management treatment

Until now, the management of enterocutaneous fistulas is still a challenge even though there have been many advances in the development of handling this case. Once a fistula is identified, management should focus on immediate resuscitation, treatment of sepsis, and consideration of eliminating potential factors that inhibit spontaneous closure by minimizing morbidity and mortality. These factors include, large output (> 500 mL/24 hours), severe intestinal continuity disturbance (> 50% bowel circumference), active inflammatory bowel disease, malignancy, radiation enteritis, distal obstruction, untreated abscess, foreign body. in the fistula tract, the length of the fistula tract is <2.5 cm, the fistula tract is epithelialized. In addition, the conditions below also affect the recovery of an enterocutaneous fistula [1,2,18,20].

Currently, the management of enterocutaneous fistula requires the involvement of a surgeon, nutritionist, enterostomal therapist, interventional radiologist, and gastroenterologist; with treatment consisting of three phases namely stabilization, staging and supportive treatment, and definitive therapy.

FACTORS	FAVORABLE	UNFAVORABLE
Surgical anatomy of the fistula	Long tract, >2 cm Single tract No other fistulas Lateral fistula Nonepithelialized tract Origin (jejunum, colon, duodenal stump, and pancreaticobiliary) No adjacent large abscess	Short tract, <2 cm Multiple tracts Associated internal fistulas End fistula Epithelialized tract Origin (lateral duodenum, stomach, and ileum) Adjacent large abscess
Status of the bowel	No intestinal disease No distal bowel obstruction Small enteral defect, <1 cm	Intrinsic intestinal disease (Crohn's disease, radiation enteritis, recurrent or incompletely resected cancer) Distal bowel obstruction Large enteral defect, >1 cm
Condition of the abdominal wall	Intact Not diseased No foreign body	Disrupted (fistula opens into the base of the disrupted incision) Infiltrated with malignancy or intestinal disease Foreign body (mesh)
Physiology of the patient	No malnutrition No sepsis	Malnutrition Sepsis
Output of the fistula	No influence	Influence

Figure 1: Factors affecting external intestinal fistula healing [1,2,18,20].

The prognosis of enterocutaneous fistula depends on its classification, both from anatomical, physiological, and etiological classification. Mortality was five times greater in high output fistulas than low output fistulas, whereas high output fistulas had a greater incidence of complications such as electrolyte balance disorders, sepsis, and skin excoriation. Enterocutaneous fistula patients with low serum albumin (<2.5 g/dl) had a greater mortality rate (58.5%) than patients with normal serum albumin levels, and no mortality was found in patients with serum albumin levels> 3.5. g/dl [1-3,5,11,20,21].

Figure 2: Use of a vacuum-assisted closure (VAC) system for enterocutaneous fistulas [18].

Kumar and colleagues in their study found a mortality rate in patients with small bowel fistulas who were treated conservatively to be 13% while those who were treated operatively were 9%. Meanwhile, in the group of patients with colocutaneous fistulas, 95% were treated conservatively without any mortality. Overall, the mortality rate in patients treated conservatively was 18% and in patients requiring surgical intervention had a mortality rate of 23%. The overall mortality rate is 20% [3].

Conclusion

Enterocutaneous fistula is a condition in which there is an abnormal connection between the large intestine or small intestine and the surface of the skin. An enterocutaneous fistula can originate from the stomach, duodenum, jejunum, ileum, or colon. Enterocutaneous fistulas predominantly occur iatrogenically postoperatively. Postoperative enterocutaneous fistula risk factors include technical factors both at the time of preparation, during surgery, and post-surgery and factors related to patients such as age, nutritional status, underlying medical conditions and medical history, and lifestyle.

Enterocutaneous fistulas are classified based on the anatomy, physiology, and etiology of the resulting fistula. Anatomically, fistulas can come from the stomach, duodenum, jejunum, ileum, and colon. Physiologically, fistulas are classified as high output, moderate output, and low output based on the amount of fluid discharged within 24 hours. Whereas etiologically, fistulas are named based on the associated disease process, such as diverticular fistula or neoplasmic fistula.

The definitive diagnosis of enterocutaneous fistula is usually made by visualization of the drain from the surgical incision or from the drain site. The gold standard in the diagnosis of fistulas is the use of a fistulogram with water-soluble contrast media, which is performed after stabilization and management of sepsis. A fistulogram can show the configuration of the tract, the origin of the fistula, the size, and cavity of the abscess associated with the fistula. In addition, the CT scan modality with contrast can also be helpful in identifying fistulas and delineating the presence or absence of an abscess cavity around the fistula.

Management of enterocutaneous fistulas is still a challenge to date, although the development of supportive patient management has recently progressed. Once identified, a three-phase approach which includes stabilization consisting of resuscitation and treatment of sepsis, staging and supportive management of optimization of medical and nutritional conditions and, in some cases, definitive surgical intervention is required, which requires careful planning, proper dissection, resection and reanastomosis and reconstruction of the intestine and abdominal wall are of great concern. Most fistulas resolve spontaneously within 4 to 6 weeks with conservative management. If closure does not occur after this time, surgical intervention is indicated.

The prognosis of enterocutaneous fistula depends on its classification, both from anatomical, physiological, and etiological classification. The anatomical location of the fistula affects the size of the fistula output which is a fairly strong and independent predictive factor for mortality where the greater the output of a fistula, the more severe the effect on the patient will be and the greater the mortality rate. Management of enterocutaneous fistulas, either conservative or operatively, also affects the prognosis. There is no superior treatment, but it is best to try to manage enterocutaneous fistulas as conservatively as possible unless complications are found.

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