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Review

ACQUIRED ENTEROCUTANEOUS FISTULAS: CLASSIFICATION AND TREATMENT

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Summary

Acquired enterocutaneous fistulas are a considerable problem of abdominal surgery. In most cases, they result from surgical intervention. There are different classifications based on different signs and factors. We aimed to summarize the management principles for patients with acquired enterocutaneous fistulas. Critical evaluation of the data available from existing studies. The therapeutic regimen includes nutritional support, sepsis control, skin care, and, possibly, surgical treatment. Surgical interventions are considered in high-output small bowel fistulas. The treatment is continuous and requires a multidisciplinary approach.

Keywords: acquired enterocutaneous fistula, classification, complex treatment

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Terminology and classification

An enterocutaneous fistula (ECF) is an abnormal connection between the gastrointestinal tract and the skin [1]. Such fistulas are a challenge to surgeons due to their etiological heterogeneity and the lack of a stratified treatment protocol, and the incidence of ECFs is still too high despite modern innovative and minimally traumatic surgery. By 1960, the mortality rate of ECFs exceeded 45%, while for the period 1998-2008, it decreased significantly to 25%, yet remained alarmingly high [2-4].

There are various classifications of fistulas. Their origin suggests that fistulas are divided into spontaneous and artificial [5]. Spontaneous fistulas result from a pathological process, while artificial fistulas are iatrogenic, occurring after surgical or other types of diagnostic or therapeutic interventions. Another propaedeutic classification divides them into simple and complex based on their morphology. For simple fistulas, only one channel is available, while complex ones are multi-channel [6, 7].

Some authors call the fistulas between the gastrointestinal tract and the skin enterocutaneous, while others – external enteral

fistulas [8]. According to the third group of authors, enterocutaneous fistulas are only those emanating from the small intestine, and those from the large intestine are called stercoral or colonic [9].

The anatomical classification divides ECFs into proximal and distal. The proximal ones include gastric, duodenal, and jejunal [10]. The distal ones, in turn, are divided into ileal, colonic (stercoral), and rectal [11].

The physiological classification is based on the output rate of fistulas. The output rate is a determining factor in the spontaneous closure of fistulas. According to their output rate, fistulas are divided into low-output (less than 200 ml/24 hours), medium-output (between 200-500 ml/24 hours), and high-output (above 500 ml/24 hours) [12].

According to the etiological factor, fistulas are divided into spontaneous, postoperative, and traumatic. The most significant percentage includes the most common post-traumatic ones and accounts for 95% of all fistulas [13]. They are associated with iatrogenic lesions, anastomotic insufficiency, drainage-associated fistulas, and mesh-associated fistulas. Traumatic fistulas are most often the result of diagnostic procedures, and spontaneous ones are associated with pathological processes such as Crohn's disease, irradiation, diverticulitis, or others.

Prognostic and risk factors

Spontaneous closure of ECFs is a multifactorial process depending on the patient's comorbidity and the characteristics of the fistula itself. Multicenter studies have shown that low-output fistulas are more prone to spontaneous closure than those that do not occur due to surgery [14, 15]. Authors studying the etiology of ECFs have indicated the following factors determining the likelihood of spontaneous closure: absence of intestinal obstruction, simple fistula without intra-abdominal abscess, absence of inflammatory bowel disease, fistula length less than 2 cm, fistula without epithelialization, low-output fistula, fistula orifice diameter less than 1 cm [16, 17].

Malnutrition is a prognostic factor in patients with ECFs. On the one hand, the supply of nutrients may be limited due to restriction of oral intake and, on the other hand, to anorexia associated with the underlying disease. Nutritional needs range from 20 kcal or 1-2 grams of protein per kilogram to 35 kcal or 2 grams per kilogram of body weight [18-20]. Patients with ECFs lose water, electrolytes, proteins, energy, bicarbonates, vitamins, and microelements. The amount of loss depends on the output rate of the fistula. In a fistula with 1-liter output, 12.5 grams of protein is lost, and protein loss is higher in septic patients [21]. Albumin rates less than 30 g/l are defined as an unfavorable risk factor. Some authors have reported transferrin values higher than 200 mg/dl as a poor prognostic sign [22].

Principles of treatment

Treatment of ECFs needs a multidisciplinary approach. Edmund introduced the classical triad in the treatment of fistulas, namely: the treatment of sepsis, malnutrition, and electrolyte disturbances [23]. In 1964, Chapman introduced the four basic principles in the treatment of fistulas: correction of daily needs, external drainage, output control, and skin protection [24]. Today, we adhere to the following rules: identification of the fistula, resuscitation and control of sepsis, skin protection and output control, nutritional support, radiographic examination, definitive treatment, and surgery [25]. Modern researchers have introduced the abbreviation SOWATS: S – for sepsis control, O – for optimization of nutritional status, W – for skin care, A – for assessment of the anatomy of the fistula, T – for timing the surgical intervention, S – for the surgical strategy [26]. The treatment can be divided into 3 phases. The patient is resuscitated, stabilized, and diagnosed in the first phase. In the second, nutritional support and skin care are realized, and in the third and last phase, a definitive surgical treatment is performed after the patient has been optimally prepared to undergo surgery [27]. Colonic (stercoral) fistulas are usually low-output, do not lead to severe metabolic disorders, and are prone to spontaneous closure. In contrast, small bowel ones are subject to critical therapeutic interventions and are not prone to spontaneous closure without surgery [28].

Sepsis control

The most crucial point in treating ECFs is the

management of sepsis. Under poor control, there is over 80% mortality [29]. Sepsis, together with low levels of albumin, are factors that increase mortality [30].

Spontaneous fistula closure is impossible against the background of an active abdominal infection or intra-abdominal abscess. A significant percentage of patients have the so-called "dormant infections," which remain unrecognized and untreated for a long time. The typical symptoms of a systemic inflammatory response with fever, tachycardia, tachypnea, and hypotension should not be expected in patients with ECF due to their immunocompromised condition. Patients with ECFs are jaundiced and cachexic and usually have hyponatremia and hyperkalemia [31, 32].

Computed tomography is an important diagnostic method for elucidating the source of infection. In case of an abscess cavity, it is recommended to place a percutaneous drain under echographic control, if possible [33].

With the adequate drainage of the active infection, administering antibiotics is not recommended. According to the Surviving Sepsis guidelines, antibiotic prophylaxis should not last more than 7 days [34]. Empirical administration of antibiotics may lead to the cultivation of resistant strains. Antibiotics should be administered according to the antibiogram obtained after a blood culture result.

Optimization of nutritional status

Basically, there are three reasons for malnutrition in patients with ECFs: insufficient caloric intake, catabolism due to the septic condition, and prolonged losses through the formed fistulas. The daily protein loss in patients with ECF may be between 25 and 75 grams.

Daily needs are calculated according to the Harrison-Benedict formula, but the daily basal needs of a patient with ECFs are 1.5 times higher than those of a healthy person [35, 36].

Monitoring albumin, prealbumin, and ferritin levels is essential for determining the prognosis and optimizing the nutritional status.

Prealbumin and albumin determine the body's visceral protein supply, and ferritin is a transport protein.

Another noteworthy point for optimizing food maintenance is calculating the nitrogen balance. It is calculated by the following formula:

Nitrogen balance = [Protein intake (g) / 6.25]-[24-hour urea in urine+4 g+(2 g x liters of abdominal fluid loss) + (2 g x liters of fistula effluent)] [37].

A positive nitrogen balance indicates anabolism. Nutritional support is provided through enteral and parenteral nutrition. Indications for enteral nutrition are a low-output fistula, lack of bowel obstruction, and the presence of at least 4 feet of small bowels from the ligament of Treitz to the outer orifice of the fistula. Enteral nutrition improves mucosal integrity and immune function of the gastrointestinal tract, so parenteral nutrition is recommended in addition to enteral nutrition. Contraindications to parenteral nutrition include liver dysfunction or catheter-associated sepsis. It is recommended for high-output fistulas until the fistula output is reduced by 30 to 50% [38, 39]. Sometimes it is the only option to provide calorie needs. Parenteral nutrition is 4 times more expensive than enteral nutrition. One of the common complications of parenteral nutrition is deep vein thrombosis, reaching up to 40%, and over 80% of the patients on total parenteral nutrition develop catheter-associated sepsis [37].

In the case of short bowel syndrome, when the patient has no more than 75 cm of small bowels, enteral nutrition is contraindicated. Enteral nutrition could be attempted if the patient can tolerate it at a fistula output rate lower than 1.5 liters per 24 hours. Essential for enteral nutrition is the distal patency of the intestine. In the absence of patency and the presence of a high-output fistula, total parenteral nutrition is recommended [40].

Skincare

Skincare is a significant factor for patients with ECFs, and prevention of skin maceration determines the patient's adaptability to adapt to his social environment. Gastrointestinal secretions have different acidity, and their direct interaction with the skin leads to different degrees of chemical burns. Using proton pump inhibitors and somatostatin analogs reduces and limits skin maceration [41]. The more liquid content has a more destructive effect on the skin. Efforts should also be directed to the use of drugs that thicken the intestinal fluid. A key point is the

trained nursing staff with an individual post for the patients. Various pharmaceutical products (adhesive powders, pastes, hydrophilic creams, etc.) have been developed for skin care in patients with ECFs.

Evaluation of the anatomy of the fistula

Defining the anatomy of the fistula is crucial for subsequent surgical treatment. It is recommended to perform computed tomography and fistulography with water contrast to determine the level of the fistula. In some cases, magnetic resonance imaging can also be considered [42].

Surgical intervention timing, surgical strategy

Surgical treatment is considered if, within 12 weeks, the enterocutaneous fistula does not close spontaneously. Different authors recommend different times to initiate surgery. Most often, it is recommended that this occurs between 6 and 12 weeks after the onset of fistula formation [43]. The Table 1 below indicates the most appropriate period for surgical treatment according to the different research teams. Surgical treatment is indicated in cases of high-output fistulas, in which no effect of the substituting total parenteral support is observed.

Surgical intervention can be considered only when the septic condition has been controlled, the patient has a normal metabolic status, and the anatomy of the fistula is known. Spontaneous closure of fistulas is observed in 60% of people, and in 90% of them, it occurs between 4-6 weeks after complex conservative treatment. Surgical treatment should not be undertaken if albumin levels are less than 30 g/l [44].

The main goal of surgical treatment is to enter the abdominal cavity and perform a total adhesiolysis from the ligament of Treitz to the rectum. Then the fistulous segment is verified, followed by resection with subsequent restoration of the intestinal tract, and closure of the abdominal cavity. In most cases, primary end-to-end anastomosis after resection of the fistulous segment is the surgical procedure of choice [45]. Other authors prefer a side-to-side two-layer anastomosis with a protective ileostomy [46]. Resection of the fistulous segment without prior adhesiolysis would compromise future anastomosis [47, 48].

Low-output fistulas that do not lead to severe dehydration and metabolic distress do not require surgical treatment. These fistulas close spontaneously in over 90% [49, 50].

Vacuum-assisted closure (VAC)

VAC has some advantages in treating patients with ECFs, and the major one is protecting skin and preventing subsequent tissue breakdown [51].

The management technique includes a drainage tube connected to the dressing through a slot of the transparent film concatenated to the vacuum system [52].

Fibrin sealant

Avalos-Gonzalez J et al. reported fistula closure at 12.5 days in the treatment group versus 32.5 days in the control group [53]. Other authors reported a series of 15 patients who underwent fibrin sealant measures, leading to an 86.6% healing rate at 16 days [54]. Generally, fibrin sealant management could be applied in selected patients with favorable results.

Somatostatin-14 and its analogs

Somatostatin-14 and its analogs are not used as placement for conservative treatment. Instead,

Table 1. Appropriate surgical time according to different researches.

Researchers	Period
Hollington	8 months
Evenson et Fischer (42)	4 months
Rahbour et al. (13)	12 months
Datta et al. (28)	6 months
Lynch et al. (50)	6 months
Li et al. (7)	6 months
Mcintyre (20)	6 months

when used in combination, somatostatin-14 and TPN appear to exert a synergistic effect on reducing gastrointestinal secretions and improving fistula closure rates [55].

Octreotide promotes earlier closure of fistula than TPN alone, even with malignant enterocutaneous fistulas, and is beneficially in reducing secretions in high-output fistulas[56].

Conclusions

Acquired enterocutaneous fistulas are a complex problem in abdominal surgery. Small bowels fistulas lead to severe metabolic disorders, malnutrition, and significantly impaired quality of life, while large intestinal fistulas have a more favorable course and prognosis. The treatment of ECFs requires a multidisciplinary approach and team. The surgical intervention is only a part of their management, and its application should be undertaken after meticulous.

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