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Treatment of high output entero-cutaneous fistulae associated with large abdominal wall defects: Single center experience

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ABSTRACT

Background and aim: Enteric fistulas are defined by their sites of origin, communication and flow. We evaluate the treatment of complex patients with entero-cutaneous fistulae with large abdominal wall defects.

Materials and methods: Retrospective case note review of 19 patients (15 males, median age 46 years) treated at the Department of Surgical Sciences, University of Insubria, Varese, Italy. These were distinguished by multiple/wide gastrointestinal fistula orifices, with total discontinuity of bowel. Fistulas were not covered by abdominal wall thus presenting with a giant abdominal wall defects. Surgery was planned once adequate nutritional status was present.

Results: All fistulas resulted from previous surgery for IBD in 7 cases (37%), abdominal trauma 4 (21%), acute necrotic infected pancreatitis 3 (16%), intra-abdominal malignancy 3 (16%), and diverticular disease 2 (10%). The most common site of presentation was ileum (80%). Median fistula output was 800 ml/day (range 400–1600 ml/day). Seltzer's prognostic index identified malnutrition in 70% of patients at the time of presentation. The elapsed mean time from onset of fistula and elective time of surgical management were 184 days (range 20–2190 days). The VAC system was used in the last 7 patients preoperatively and in 6 patients with postoperative abdominal wound dehiscences that could not be closed immediately and who were at high risk for healing complications. There were no complications from the VAC therapy. Surgery was successful in 69% of cases. Mortality rate was 21%. Factors related to mortality were persistent malignancy, malnutrition and sepsis.

Conclusions: After optimization of nutritional status surgery with en bloc resection of fistula offers best results. In this series, cancer and sepsis were unfavourable factors for outcome. These fistulas may be successfully managed with a multidisciplinary approach.

1. Introduction

Gastrointestinal (GI) fistula is an abnormal leaks of the bowel contents to other organs (i.e. colovesical fistula), other parts of the intestine (entero-enteral) or the skin (entero-cutaneous).[1] The majority of fistulas are consequences of a surgical procedure. Causes include disruption of the anastomotic suture line, unintentional enterotomy or inadvertent bowel injury

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at the time of closure. Less frequently GI fistulas are the results of trauma. Inflammatory processes, such as inflammatory bowel disease (IBD), may also cause fistulas.[2]

By convention, GI fistulas are usually defined by their sites of origin, communication and flow [3]; moreover, complex fistula are associated with an intra-abdominal abscess cavity.[4]

Severe malnutrition and fluid, electrolyte or metabolic disturbances are the main effect of GI fistulas depending on their location along the intestine.[5–7] Furthermore, they may also be a source of skin problems.[8]

Recent evidences support the fact that fistula output is a significant factor influencing closure of GI fistula, with the odds of spontaneous closure 3 times greater for low output fistulas (effluent $<$ 200 ml/24 h) than for high output fistulas (effluent $>$ 200 ml/24 h).[9,10] Despite advances in metabolic and nutritional care, mortality rates remain high.[11]

This paper reviews our experience on the treatment of entero-cutaneous fistula to evaluate current management practice and outcome. Because GI fistulas display so much variability from patient to patient (high versus low output, site of origin, presence or absence of associated organ dysfunction, and malnutrition), we evaluate the treatment of a specific group of patients with high output entero-cutaneous fistulae associated with a large dehiscence of the abdominal wound.

2. Materials and methods

A retrospective descriptive study of 19 patients (15 males, 4 females; median age 46 years, range 21–79) with entero-cutaneous fistulas associated with a large dehisced abdominal wound treated at a single institution from 2000 to May 2007. This is the Department of Surgical Sciences, University of Insubria, in Varese (Italy) which is a university hospital and referral centre.

At examination all patients presented with grossly visible intestinal mucosa; in details, these were distinguished by multiple and wide fistula orifices (more than 1 cm in diameter), and complete anastomotic disruption with total discontinuity of bowel ends (''end fistulae'') (Fig. 1). All these fistulas presented with an effluent $>$200 ml/24 h and the orifices of the fistulas were not covered by abdominal wall, thus presenting with a large abdominal wall defect.

Upper gastrointestinal tract (esophagus and stomach), biliary and pancreatic fistulas were excluded from this study.[12] Outside referrals accounted for all patients. Patients were followed-up for a median of 22 months (range 1–131 months) after definitive surgical treatment.

Patients were managed by a multidisciplinary team. A daily record was kept of fistula, urine, stomal and/or faecal output.

Sources of sepsis were identified and treated quickly, using appropriate radiological investigation and culture of all sites of potential infection. All patients had more than one investigation; small bowel contrast follow-through studies were most commonly used, followed by fistulography and retrograde studies of the distal bowel. Suspected collections were investigated using computer tomography (CT) or ultrasonography (US).[13]

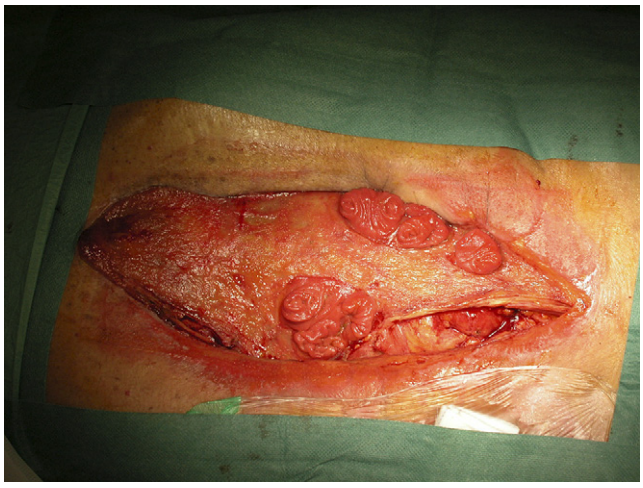


Fig. 1 – A case of multiple and wide entero-cutaneous fistulas with total discontinuity of bowel ends (''end fistulae''), associated with a large dehisced abdominal wound.

We used the Seltzer instant prognostic index to identify nutritional status.[14] All patients were supported with artificial alimentation as total parental nutrition (TPN) or total enteral nutrition (TEN). We consider adequate indexes of good nutritional status serum albumin level $\geq$3.5 g/dl and blood lymphocytic count cells $\geq$1500/mm^3.

We define the following clinical events: T1 the time of first laparotomy; T2 onset/first recognition of fistula; and T3 the elective time of definitive surgical treatment of entero-cutaneous fistula.

Skin protection was achieved at an early stage using a variety of barriers, adhesives and wound drainage bags (Bogota bag),[15,16] allowing containment, drainage, continuous irrigation of the wound with saline, and measurement of effluent and to facilitate healing.

The vacuum assisted closure (VAC) system (Kinetic Concepts, Inc., San Antonio, TX, USA) was used preoperatively and postoperatively in patients with an abdominal wound that could not be closed immediately and who were at high risk for healing complications. The VAC device was maintained on a continuous mode with a negative pressure from $-$75 to $-$125 mmHg (Fig. 2). The dressing was changed every 2 days. In most cases, protection of skin was directed by the surgeon and ostomy nurses.

Initial treatment was conservative except for patients with an abscess who needed urgent drainage. Subcutaneous or intravenous injection octreotide was used in 4 patients preoperatively in an attempt to decrease fistula output.[17] In nonepatients octreotide was administered as prophylaxis postoperatively.

Surgery was planned once adequate nutritional status was achieved. Surgical procedure comprised re-laparotomy, en bloc resection of the involved bowel and overlying skin (Fig. 3a, b), and anastomosis. Careful hand-sewn 2-layered lateral-to-lateral anastomosis created to ensure good mucosal apposition and serosal closure. Finally we ensured that the entire intestine have been mobilized and free from injury. The bowel was temporary defunctioned at fistula surgery by

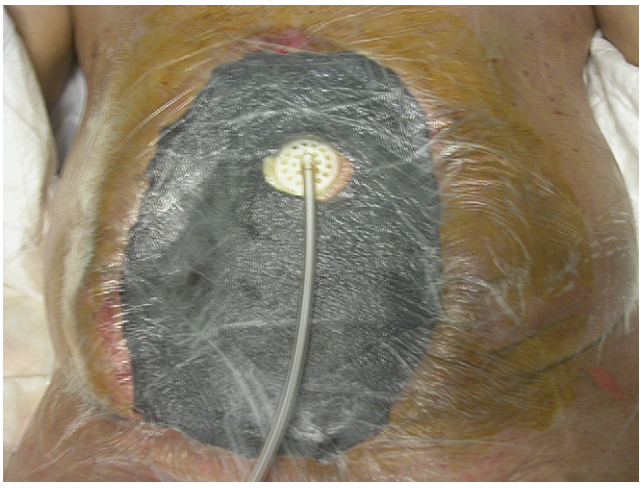


Fig. 2 – Skin treatment with VAC system in a case of entero-cutaneous fistulas associated with a large dehisced abdominal wound.

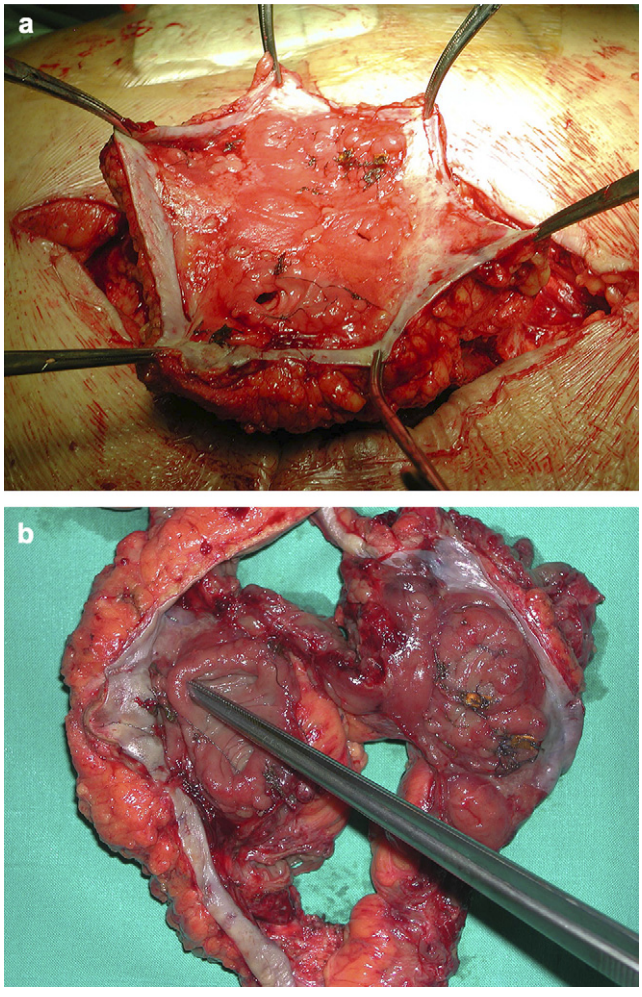


Fig. 3 – (a, b) Laparotomy with en bloc resection of the involved bowel and overlying skin.

Table 1 – Site of entero-cutaneous fistula (*N* = 19)

Organ site	Frequency (%)
Ileum	80
Colon	15
Jejunum	5

fashioning a small bowel stoma proximal to the anastomoses in those patients presenting with complex GI fistulas with multiple intra-abdominal abscess and entero-enteral fistulas, in patients requiring more than one bowel anastomoses.

Before closing the abdomen, we considered placing a transgastric jejunostomy for early postoperative enteral feeding. We placed soft, closed-suction drains only for abscess cavities discovered intraoperatively, with removal following a CT scan or US that demonstrated obliteration of the space. During abdominal closure, omentum was placed between the anastomosis and the midline wound, if possible.

We have developed a staged approach for abdominal wall reconstruction: plastic closure with flaps was preferable to prosthetic mesh in an effort to minimize the incidence of postoperative fistula caused by foreign material. VAC therapy continued until the integrity of the abdominal wall was re-established by surgical procedures or secondary healing with delayed primary wound closure.

All procedures were performed by one senior surgeon (RD).

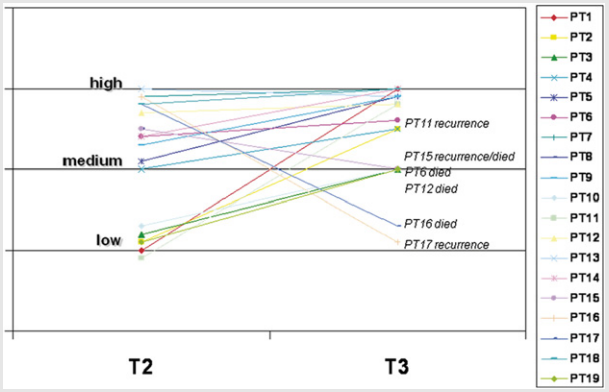
3. Results

Fistulae distribution is reported in Table 1. Fifteen (79%) fistulas were complex: fistula involved multiple bowel loops with an intra-abdominal chronic abscess cavity and internal fistulas. All fistulas (100%) resulted from previously abdominal surgery due to inadvertent enterotomies (unrecognized bowel injuries) or anastomotic dehiscences; in details these had IBD (Crohn's) in 7 cases (37%), previous surgery for abdominal trauma 4 (21%), acute necrotic infected pancreatitis 3 (16%), intra-abdominal malignancy (2 colorectal cancer, 1 gynecologic tumor) 3 (16%), and diverticular disease 2 (10%) (Table 2). These operations consisted also in lysis of adhesions in 8/19 of cases (42%). Mean number of previous laparotomies was 4 (range 2–7). Median fistula output was 800 ml/day (range 400–1600 ml/day).

Table 2 – Postoperative surgical cause of entero-cutaneous fistula (*N* = 19)

Cause	Frequency (%)
IBD	37
Abdominal trauma	21
Intra-abdominal malignancy	16
Infected pancreatitis	16
Diverticular disease	10

Table 3 – Trend of nutritional index (according to Seltzer's nutritional prognostic index) and clinical evolution. Scale from low to high represents nutritional index



T2: first recognition of fistula; and T3: time of definitive surgical treatment. Patients (PT) 11, 15, and 17 had recurrence of a high output fistula (PT15 died). PTs 6, 12, and 16 died (all from previous surgery for malignancy). Five sixth of these patients had medium to low nutritional index in T3.

The elapsed mean time from T1 to T2 was 54 days (range 3–485). The elapsed mean time from onset (T2) and elective time (T3) of surgical management were 184 days (range 20–2190 days).

The majority of the patients were malnourished at the time of presentation (T2). Seltzer's prognostic index identified malnutrition in majority of patients (70%) at the time of presentation (T2). Serum albumin and lymphocytic count showed higher levels at the end of treatment (T3) than at the beginning (T2). In particular, the mean serum albumin and blood lymphocytic count cells were 3.32 g/dl, 1350 cells/mm^3 and 3.45 g/dl, 1560 cells/mm^3, respectively, at T2 and T3 (Table 3). Between T2 and T3, 13 patients (69%) were supported with artificial alimentation (TPN 70% and TEN 30%).

No spontaneous closure/healing of fistulae was observed. In 4 patients, the effect of octreotide was monitored; in none patients, octreotide was of benefit in output reduction or spontaneous resolution.

Six patients (31%) underwent radiologically CT-guided drainage procedures for abscess cavities before definitive surgery as part of initial resuscitation.

Definitive surgery was successful in 13 (69%) cases. The bowel was defunctioned at fistula surgery in 6 patients (31.5%) by fashioning a small bowel stoma proximal to the anastomoses (end/loop ileostomy). There were no intraoperative complications. Three patients underwent radiologically CT-guided drainage procedures for abscess cavities after definitive surgery (16%). Postoperative catheter-related sepsis occurred in 7 patients (36%). Metabolic complications were common, and included hypoalbuminaemia (78%), hypocalcaemia (73%), anemia (63%), and deranged liver function (63%).

The VAC system was used in the last 7 patients preoperatively and in 6 patients with postoperative abdominal wound dehiscences that could not be closed immediately and who were at high risk for healing complications. There were no complications from the VAC therapy. Stable cutaneous coverage was subsequently achieved in all patients by mesh grafting (13) (Fig. 4), or secondary intention healing (6). No patients had part of their VAC therapy as outpatients.

Six patients (31.5%) developed recurrence. Of these 6 cases 3 had low output <200 ml/24 h fistulas all recovering conservatively with spontaneous closure. Three patients with high output re-fistulation required new surgery.

No patient died during the course of treatment for their intestinal fistulas (between T2 and T3). The overall in-hospital mortality rate after definitive surgery was 21% (4/19). Two patients developed a disseminated intravascular coagulopathy secondary to sepsis, and died from multiple organ dysfunction. Two patients died from cardiorespiratory arrest. Three fourth of these patients were affected by fistulas resulted from surgery for intra-abdominal malignancy (persistent/recurrence of cancer).

4. Discussion

This paper is a descriptive, retrospective report of a small number but complex patients with high output entero-cutaneous fistulas associated with a large dehisced abdominal wound. This condition is a challenging clinical problem.

GI fistulas are associated with prolonged hospital stay, high morbidity and mortality.[11] In this study group in which fistula orifices were not covered by the abdominal wall no spontaneous closure/healing was observed. The length of the fistula tract is important because greater the distance between the bowel and the skin, higher the incidence of spontaneous closure.[18,19] A longer tract not only decreases the likelihood of skin epithelialization but also provides a greater resistance to flow through the tract, promoting closure.[18,19] Furthermore, the exposed bowel is at risk for further fistula formation in unprotected loops because of desiccation, dressing changes and lacerations. Moreover, drainage from entero-cutaneous fistulae is associated with severe inflammatory skin reactions such as maceration and erythema. In our experience, successful and simple techniques of external control of the fistula included ''laparostoma'' and the VAC system.[20,21] These devices allow quantification and characterization of the

Fig. 4 – Stable cutaneous coverage by skin grafting.

enteric drainage, improved wound care, permit continuous irrigation, prevent desiccation of exposed loops of bowel, simplify subsequent fluid and electrolyte management.[20,21] Negative pressure wound therapy has been employed as a treatment strategy for patients with complex GI fistula in the preoperative and postoperative definitive surgery (''VAC staged therapy''). There were no complications associated with VAC in the patient population.

Recent improvements in term of reduced mortality associated to entero-cutaneous fistula have resulted from a combination of factors, including advances in critical care, imaging techniques, nutritional support and antimicrobial therapy.[11,22] A complete multidisciplinary approach is recommended consisting of surgeons, microbiologists, physiotherapist, stomatherapist, radiologist nurses and dietitians. Defining the anatomy of a fistula is also essential for future operative planning. US and multiple CT scans are required to ensure optimal drainage of septic foci as abscess cavities. In our experience imaging was helpful to determine anatomy of fistula, as fistulography defines tract, small bowel or barium enema defines state of intestine or distal obstruction.[23,24] Radiological studies as well as interventional radiology were increasingly employed over the duration of this study.

Recent prospective studies have failed to demonstrate a benefit in closure rate or outcome and question whether somatostatin produces a meaningful reduction in fistula output.[25,26] Because of the complex nature of these particular cases, somatostatin and its analogues were considered but occasionally used in this study.

The timing of a major GI reconstruction procedure is a key point. The decision to proceed with definitive surgical reconstruction should be carried out only when the patient is stable, nutritional replete, apyrexial, and if the fistula effluent shows no signs of decreasing in volume after 4–6 weeks of nutritional support, usually after at least 3–6 months, and an appropriate plan has been developed.[3,4,7,27]

Given the rarity of these complex high output enterocutaneous fistulas in general not covered by abdominal wall in particular, it is virtually impossible to set up a controlled prospective trail large enough to yield unbiased results for different types of treatment. Moreover, for the small number of cases it is not a possible statistical analysis and comparison between the successful and failed cases. However, malnutrition is an unfavourable prognostic factor (Table 3). At present, treatment choices are based on clinical situation and do not have a specific algorithm.

Surgical management with bowel resection, including the fistula, is a preferred method of treatment.[28] Multivariate analysis has demonstrated that recurrence is more likely after oversewing than after resection.[29]

Early surgery is only instituted for complications such as obstruction, peritonitis or abscess formation.[3,4] The delayed approach has several advantages: the potential blood loss from fresh adhesions is reduced and the chance of a second bowel injury decreased because clearer anatomic definition of structures within the abdomen is possible. In this study the mean delay from fistula recognition to operative repair in was 26 weeks. Resection of the leaking segment of bowel with careful hand-sewn 2-layered lateral-to-lateral anastomosis has the best chance of resolving the fistula acutely. The anastomosis may be reinforced by greater omentum, if possible. Meticulous technique can certainly lessen the risk of postoperative fistula reformation.

Most other large series publish overall mortalities around 5–15% notably the Cleveland Clinics and St Mark's series.[28,29] In this study mortality was all postoperative and quoted at 21%; in fact these are a selected group of complex patients with grossly visible intestinal mucosa, distinguished by multiple and wide fistula orifices, with total discontinuity of bowel ends, effluent >200 ml/24 h and presenting with a large abdominal wall defect. Moreover, 79% of these fistulas involved multiple bowel loops with an intra-abdominal chronic abscess cavity and internal fistulas.

A higher mortality and recurrence fistula rate were observed in patients previously treated for malignant disease. In one report, uncontrollable sepsis was associated with death in up to 85% of patients, many of whom had underlying malignancy (50%).[22] The decision to operate on patients with malignant fistulas is therefore often unclear. Factors to consider include the patient's life expectancy, the presumed extent of resection, prior administration of radiation and chemotherapy, persistent malignancy and the definition of fistula (radiological, biopsy).[11,22]

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Ethical approval
Written consent of the patients was obtained for publication of this report.

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