Early operative treatment for an enterocutaneous fistula after gunshot wound

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Abstract

Background: The successful treatment of an enterocutaneous fistula (ECF) is challenging even for experienced surgeons, as it is associated with potential complications such as infection, abdominal sepsis, fluid-electrolyte disturbances, septic shock and malnutrition. All of these conditions may congregate and lead to increased mortality in these patients, additional to the original trauma.

Case Report: We describe a 27-year old male who was shot once in the left thoraco-abdominal region without an exit wound. On laparotomy, multiple injuries to jejunum, ileum and sigmoid were identified. Primary primary repair of sigmoid was done as well as end-to-end jejunostomy and end-to-end ileostomy. At postoperative day 10, an ECF erupted as a low output fistula (100ml/24h). The patient was put on full parenteral treatment. Following work up including CT scan and fistulogram, the patient was taken back to the operating room for washout and diverting ileostomy with fistula tract resection. He fully recovered uneventfully following this second operation.

Conclusion: As shown in this patient without malnutrition and penetrating injury, early surgical treatment may work out advantageously and swift, compared to possible conservative treatment in this low output fistula following a gunshot of the thoraco-abdominal region. (TCM-GMJ January 2016; 1:P20-24)

Keywords: Enterocutaneous fistulas, trauma, abdominal trauma

Introduction

While enterocutaneous fistulas are rarely encountered in surgical practice, they are one of the most dangerous complications associated with abdominal surgery that may result in increased morbidity and mortality. This is especially and still true despite recent improvements in their treatment1. This treatment of enterocutaneous fistulas is particularly challenging, as surgeons must be cautious of hydro-electrolyte disorders, septic shock, and malnutrition. All of these conditions may add to the primary trauma and its effects on morbidity and mortality2. Fistulas are defined as an abnormal communication between two epithelized surfaces, and enterocutaneous ones facilitate wanted or unwanted communication between skin and the bowel lumen. Enterocutaneous fistulas are well known a long time, and thus can be found within historical texts.

The earliest record of an enterocutaneous fistula can be found in the Bible, Old Testament, in the book of Samuel, which is said to be timed between 1043 BC and 100BC4.

Celsius first described the first attempt to surgical repair of a colocutaneous fistula. During the 18th century, John Hunter defended a conservative treatment technique reported that, in some cases that these fistulas have closed spontaneously5. At the beginning of the 20th century, enterostomy of the obstructed colon in a healthy area was found to be an adequate solution. In some cases, fistulas closed spontaneously6.

Factors for an “easier” fistula closure are low output fistuli, a long fistula tract, and no obstruction within the aboral bowel section which drains the feeding sucus distally to the fistula.

Most of all enterocutaneous occur after laparotomy, and lead a long path down to to kachexia and malnutrition. The degree of malnutrition is linked to the operative outcome in terms of intraoperative mortality, successful wound healing, uneventful recovery and finally discharge of patient with his EC fistula gone. Thus high caloric hyperalimentation before surgery has been proven to be of paramount importance before surgery, as the fistula may close spontaneously as well1.

Closure rates up to 70 % with mortality rates coming down to 6 % were reported19. This marked the milestone approach of EC fistula care that started with a dire 7% healing rate and 97% mortality with inadequate nutrition, as reported by Chapman et al.20

References


2. Celsius E. De usu et Natura Animalium. 1710.


4. Samuel, 1st King of Israel. 1043-1003 BC.

5. Celsius E. De usu et Natura Animalium. 1710.


7. Celsius E. De usu et Natura Animalium. 1710.


15. Celsius E. De usu et Natura Animalium. 1710.


17. Celsius E. De usu et Natura Animalium. 1710.


EC and trauma, especially after penetrating trauma to the abdomen, is a relatively new region of interest. As most of these patients are young, and time from trauma to surgical care is short, there is nearly no cachexia nor malnutrition. As such, hyperalimentation is not needed, and swift surgical closure of EC fistula with or without temporary stoma protection may be intended.

In this patient we argue and act using the non- malnutrition situation and decide for immediate surgical approach. There are several aspects that especially cases of entero-cutaneous fistulas after traumatic injuries require aggressive treatment, because this gives the surgeon an advantage over conservative treatment: it is the good news of the patient, the short time from trauma, there is no skin compromise or abdominal wall infection (which may arise after long standing fistula) and a low fistula output. The presence of a potentially septic condition (injury) which can be prevented is the ultimate reason that guided our decision in this patient.

**Case Report**

The patient was brought to our hospital with 19/12/2012 at night (9:6 clock p.m.). He had been shot and wounded one hour before by a single gunshot in the left thoraco-abdominal region. There was no exit wound detectable on clinical examination. The patient was hemodynamically stable, so we proceeded with diagnostics as follows: The abdominal X-ray revealed that the bullet lodged in the small pelvis close to the right acetabulum. Thus, the patient was swiftly taken to the operating room. On operation, large amount of jejunal and colonic contaminations were present within the abdomen, which were flushed out. The bullet had caused multiple perforations to the ileum, jejunum and sigmoid colon. The spleen was uninjured, as was the thoracic cavity. No pelvic vascular lesion was present. A jejunal resection with end-to-end - anastomosis 100 cm after the ligament of Treitz was performed, followed by an ileal segmental resection 70 cm apart from the ileocecal valve (end-to-end anastomosis). Primary closure of the single hole in the sigmoid colon was judged feasible and was done. Post-operatively the patient recovered clinically uneventfully up to day 8, when he manifested a sigmoido-cutaneous secretion (enterocutaneous fistula). A CT scan with double contrast was performed, which demonstrated a leak of contrast to the skin. Additionally, there were multiple abscesses present between the intestinal loops, within the left sub-phrenic space, in the sub-hepatic area as well as in the retro-cecal area (Figure 1, 2). A fistulogram confirmed a fistula channel of about 20cm length (Figure 4, 5, 6). In these conditions we re-explored the patient. He was taken back to the operating room for thorough abdominal washout. No further bowel injury could be detected. The sigmoid fistula was resected, and the sigma fistula ostomy carefully debrided and closed primarily again. A temporary diverting ileostomy was fashioned in the right lower quadrant. Abdominal microbiology swabs were taken to correct i.v. antibiotic treatment as needed. Postoperative course was un-eventful, and the patient was discharged home after further five days later.

**Discussion**

Entero-cutaneous fistulas are one of the most feared and catastrophic complications following abdominal surgery, especially in the old and very sick patients. Their metabolic situation is typically not well equilibrated, their nutritional status may be compromised, and concomitant diseases as well as medication needed may hamper wound healing and recovery. It is thus imperative to initiate a most efficient treatment when EC fistula has been seen, which depends on a majority of factors. It is now best practice to treat any signs of malnourishment before any surgical procedure is allowed to follow in this patients. A proper and fast recovery is bound to fail if low albumin levels contradict any attempt of wound healing, as does a depressed immune system reaction in this patient already present with a chronic infectious complication. Chapmans priorities consist of 4 phases as follows (taken from 20):

**Phase 1:** Management of dehydration, sepsis, and fistula secretion fluids.

**Phase 2:** Initiation of electrolyte replacement and i.v. nutrition.

**Phase 3:** Institution of enteral feeding access and continued vigilance in the search for uncontrolled sepsis.

**Phase 4:** Major surgical intervention.

Thus the understanding of EC fistula pathophysiology has lead to further subclassifications in terms of fistula length, fistula volume output and severity of nutritional Dysbalance7, 8, 9 (Figure 6, Table 1, 2), but surgery has had its’ place always after feeding and nutritional needs were corrected.

During long times of phase 1 to phase 3, substantial proportions of fistuli subsided, thus conservative treatment was postulated to be superior to surgical treatment. It took years to differentiate what treatment path was of most benefit for the individual patient, as conservative treatment is not always possible or advantageous (e.g. in high output ECF), as it may be associated with serious complications.4, 5

For example, Sheikh et al. conducted a retrospective study of 213 patients who had received treatment for post-operative entero-cutaneous fistulae during 2001-2008. Based on a regression analysis of the data, they concluded that high output fistulae are not likely to close on their own and that early intervention surgery proved to be lifesaving.

As a result of treatment improvements and a more individualized treatment approach, a decrease in EC fistuli mortality was seen down to 5-25% within the second half of the last century. 10, 11, 12, 13

This easy said, it was and is not always easy to correct...
have created a bowel block impossible to separate without injuring new adjacent bowel segments. This could be a recipe for disaster, creating new fistuli. Thus the insertion of foreign material into the fistuli were tested, using vicryl mesh or vicryl plugs. Gelatine sponges, Histoacryl glue and biodegraded porcine pigs were applied, but with varying degrees of success. Even denaturation with phenol has been thought of, but as in perianal fistuli and pilonidal sinus disease, these approaches have not been showing to do consistently well, guaranteeing the absence of doing any harm.

Surgically speaking, several devices have been proposed to close the fistuli; these were wooden and metal buttons to be inserted into the fistula to stop the outflow.\textsuperscript{21, 22} Also externalization of the fistula has been proposed. When direct suture may repeatedly fail to heal, interposition of well perfused and immunocompetent tissue has been the most promising approach, as with muscle flaps or omentum flaps. These interposition flaps are not always possible though, as repeat abdominal surgery in a septic abdomen may have used up the omentum, or it may be resected or stuck to adjacent organs. Especially in situations with tense intraabdominal adhesions, the source of the bowel leak may be difficult to expose and to close without undue tension.

As small bowel secretions have toxic effects onto the skin, wound care has been improved using the knowledge of stoma therapists. Silicone polymer gels may protect the skin around the cutaneous fistulous openings, as they may protect the skin around a stoma if needed. Continuous suction devices (negative wound pressure dressings) have been gaining ground in desperate cases with large open laparostomas or abdominal wall defects containing EC fistulas. They can contain (suction away) even large amount of aggressive fluids, but fluid and electrolyte replacement have to be kept in mind, as skin protection for the larger area covered with the opposite plastic sheet. A special danger arises if a negative suction dressing is placed into the abdomen onto the bowel. Here is needs only a few days that the bowel will build new fistuli when being kept under direct suction contact. If a plastic sheet or a silicone sheet layer separate bowels and suction dressing, low pressure suction will not harm the bowel. The suction devices enable better and easier wound care, and they buy time for the fistula to close, but they keep sucking at the fistula channel. Do they keep it open?

Enterocutaneous fistulas remain a challenge for the surgeon treating the patient. He needs to know and to work the key decision elements to set the time and decision for the conservative strategy versus surgery.\textsuperscript{16,17} Numerous aspects from nutritional status, immune function, time since occurring and others have to be well be known to guarantee best care for our patients with an EC fistula. Still today, these small tracts remain a challenge to the team.

**Conclusion**

Whereas correction of kachexia, malnutrition, immunocompromise and sepsis remain the mainstay in the weak old patient, early surgical treatment remains the mainstay of treatment in young patients with enterocutaneous fistulas resulting from penetrating trauma. There is still a substantial challenge in the patient with laparostoma and EC fistula to get the bowel leak closed.

Fig. 1 CT scanner abdomen with double contrast

![Fig. 1 CT scanner abdomen with double contrast](image1)

Fig. 2 CT scanner abdomen with double contrast

![Fig. 2 CT scanner abdomen with double contrast](image2)

Fig. 3- Fistulogram in anterior direction

![Fig. 3- Fistulogram in anterior direction](image3)
Fig. 4 - Fistulogram in lateral direction

Fig. 5 - Fistulogram in anterior direction and fistulas channels

Fig. 6 - Fistulogram in lateral direction

Fig. 5 - Fistulogram in anterior direction and fistulas channels

Fig. 6 Anatomic classification

Table 1. Pathology classification

<table>
<thead>
<tr>
<th>Fistula Classification</th>
<th>Location</th>
<th>Internal</th>
<th>Tract contained within body</th>
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<tbody>
<tr>
<td></td>
<td>External</td>
<td>Tract exits through skin</td>
<td></td>
</tr>
<tr>
<td>Involved structures</td>
<td>Colon</td>
<td>Colon</td>
<td></td>
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<tr>
<td></td>
<td>Small bowel</td>
<td>Vagina</td>
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<tr>
<td></td>
<td>Bladder</td>
<td>Skin</td>
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<tr>
<td></td>
<td>Vagina</td>
<td>Rectum</td>
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<td></td>
<td>Recto-</td>
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<td></td>
</tr>
<tr>
<td>Volume</td>
<td>High output</td>
<td>Over 200 ml per 24 hours</td>
<td></td>
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<tr>
<td></td>
<td>Low output</td>
<td>Under 200 ml per 24 hours</td>
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Table 2 - Algorithm of ECF

![Algorithm for Selecting a Fistula Containment System](image)

References