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Enteroatmospheric fistulae in open abdomen: Management and outcome – Single center experience

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ABSTRACT

Background: An enteroatmospheric fistula (EAF) is a known, morbid complication of open abdomen (OA) treatment. Patients with EAF often require repeated operations and long-lasting hospitalization. The goal is to reach prompt closure of both the fistula and the OA to avoid further morbidity and mortality. This study describes and analyzes the treatment of EAFs in our clinic and aims at clarifying the factors contributing to the outcome.

Materials and Methods: This study was carried out as a single-institution retrospective chart analysis of patients treated with an OA and EAF at our institute between years 2004 and 2014. Twenty-six patients were included in the analysis.

Results: Twenty-three (88%) of the EAFs were primarily managed surgically: 14 with suturing and 9 with resection and/or stoma. From the latter group two died 1 and 2 days, respectively, after surgery. Of the remaining 21 patients, EAF recurred in 12/14 (86%) patients after suturing whereas in only 3/7 (43%) patients after resection and/or stoma ($p = 0.04$). Among the 21 early survivors after EAF repair, four patients reached fascial closure simultaneously with the EAF repair. Of the rest 9/17 had Bogota bag or drapes as temporary abdominal closure and 8/17 were treated with vacuum assisted closure device with or without fascial traction by mesh. All the nine patients treated with non-negative pressure dressings developed recurrence but only 4/8 in the negative-pressure treated group ($p < 0.02$). All conservatively treated patients developed persistent EAF. The overall in-hospital mortality rate was 35% (9/26).

Conclusion: Surgical repair of EAF has a high failure rate. Primary resection of the affected region appears to be the most successful approach to avoid EAF recurrence. Furthermore, negative pressure wound therapy is superior to non-negative-pressure solutions in relation to EAF recurrence.

1. Introduction

Open abdomen (OA) is an efficient means to treat and follow up critically ill patients with abdominal hypertension (IAH) or abdominal compartment syndrome (ACS) [1–3]. The goal is to reach prompt primary fascial closure, for the longer the OA treatment, the more common are the complications [4,5]. The well-known problem with prolonged OA is the development of adhesions, scarring, lateralization of the abdominal wall and finally frozen abdomen [6]. This course of events predisposes also to the development of enteroatmospheric fistulae (EAF), which are considered as parts of this vicious circle. The Classification of Open Abdomen [7] was designed to improve the management of patients with OA and it describes these phenomena in detail.

The factors predisposing to the development of EAFs are not clear. There are a few studies attaching abdominal sepsis to a higher incidence of EAFs [8,9]. In trauma patients treated with OA the incidence of EAFs has been associated with large-volume resuscitation and an increasing number of re-explorations [10]. Negative pressure wound therapy (NPWT), also used to treat an EAF, is linked to their development in 5% of patients [11]. Earlier reports have revealed the incidence of EAFs to approximately 20% during NPWT [12,13]. The etiology of an EAF may often be multifactorial and represent a combination of several independent factors including the primary diagnosis and cause for OA treatment, iatrogenic lesions of the intestinal tract during laparostomy/relaparotomy, postoperative anastomotic rupture, dehydration, swelling and ischemia of the intestine, exposure of the bowel to materials used for temporary abdominal closure (TAC), adhesions between the bowel and the abdominal wall, wound infections [11]. In line with these data, the incidence of EAFs has been described to be highest among patients with abdominal sepsis and pancreatic necrosis [14,15]. Overall

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the incidence of EAFs varies between 5 and 75% in OA patients [16].

The aim of this study was to assemble and analyze the patients treated for OA and EAF in our clinic. We describe the management of these patients and aim at clarifying possible factors predicting the outcome.

2. Material and methods

This study was carried out as a single institution retrospective chart analysis of patients treated with an open abdomen and enteroatmospheric fistulae at our institute between years 2004 and 2014. The inclusion criterion was diagnosis of an EAF within the studied time period. Exclusion criteria were other existing enterocutaneous fistulae and tumor fistulae. Altogether 229 patients were treated for open abdomen during this time interval. Thirty patients met the inclusion criteria. Three of these were either pre- or postoperatively treated in another hospital and had thus incomplete records and were excluded from the analysis. One trauma patient was hospitalized for over two years and had altogether 150 operations of which several had extra-abdominal targets. This patient was excluded due to impalpable and rambling data.

2.1. OA classification

The open abdomen was characterized at the first diagnosis of an EAF. The amended classification system of the open abdomen was used [17]. Briefly, the status of open abdomen is divided into four classes according to the stage of fixation (1 to 3) and contamination (A to C). Number 4 represents established EAF in a frozen abdomen.

2.2. Temporary abdominal closure (TAC)

Vacuum and mesh mediated fascial traction (VACM) was used for 13 patients as TAC prior to the EAF diagnosis. The other half (13 patients) had either Bogota bag or surgical drapes to temporarily seal the abdomen.

VACM methodology has been previously described by Petersson et al. in 2007 [18] and we have reported it to result in high fascial closure rate after OA [19]. In brief, the commercially available VAC system (V.A.C.® Abdominal dressing system, KCI, San Antonio, Texas; USA) was used. First, the intra-abdominal contents were covered by a polyethylene sheet. An oval-shaped polypropylene mesh was then sutured to the fascial edges and covered with a polyurethane sponge and finally with occlusive sheets. This system was then connected to a suction apparatus creating continuous topical negative pressure (125 mmHg).

TAC changes were performed every two to three days in the operating theater or bedside at the intensive care unit. For VACM patients, the mesh was divided in midline at the first TAC change and then tightened with continuous suturing after replacing the inner polyethylene sheet with a sterile one.

2.3. Method of EAF repair

In cases of twenty-three patients, all the diagnosed EAFs were primarily managed operatively. The methods were direct suturing of the opening of the fistula with absorbable 4/0 or 3/0 sutures, resection of the affected bowel loop and/or preparation of a stoma. Three patients were treated conservatively for their EAFs. One was primarily managed with an intraluminally inserted percutaneous gastrostoma system (PEG) and two were merely followed up because of minimal leakage.

2.4. Statistical analysis

Statistical analyses were performed using IBM® SPSS® Statistics version 19 for Windows® (Armonk, New York, USA). Fisher's exact test was used for comparison of subgroups.

3. Results

3.1. Patient characteristics

Twenty-six patients treated with OA and EAF were included in the analysis. The detailed patient characteristics are described in Tables A.1 and A.2. Twenty-five (96%) patients represented with at least one chronic illness. Eighteen (69%) patients had been through a previous laparotomy before the index hospitalization period and eighteen (69%)patients had at least one antecedent laparotomy done before laparostomy during the index period. 0–6 (mean 2) operations were performed during OA therapy before the first EAF diagnosis. 50% had negative pressure wound therapy (VACM) as TAC. The duration of OA treatment before EAF diagnosis varied from zero to 23 days (mean 7) and as a whole from five to 140 (mean 18) days. The length of hospitalization period varied from six to 87 (mean 29) days.

3.2. EAFs location and number

The twenty-six patients were diagnosed with altogether 56 EAFs. Thirteen (50%) patients were diagnosed with one and the rest (50%) with two to five (mean two) EAFs. More accurate location of the fistulae is described in Table A.2.

In 69% of cases the EAF was found at an anastomosis or at a serosal defect. 31% had their EAFs detected at a previously healthy bowel. (Table A.2)

3.3. OA and EAF-related supportive care

Twenty-one (81%) patients were admitted to the ICU during the index hospitalization period and stayed there for 5 to 56 (mean 24) days. Twenty-three (88%) patients were treated with total parenteral nutrition (TPN) and nine (35%) patients were administered octreotide in order to reduce the effluent volume. Sixteen (62%) patients received iv blood products. Vasoactive support was needed in 73% (19/26) of cases and temporary renal replacement therapy in 35% (9/26).

3.4. EAF repair

3.4.1. Surgery

Primary surgical repair of all diagnosed EAFs was chosen for twenty-three (88%) patients at the diagnosis of an EAF. All these OAs were classified as either 1C or 2C. Fourteen of these were managed with direct suturing of the fistulae. Eight patients underwent bowel resection and for five of these (5/8) also an ileo- or colostoma was prepared. One patient was managed by ileostomy only.

2/9 patients managed with resection/stoma died of MODS 1–2 days after EAF repair. Among the seven survivors a recurrent EAF was diagnosed in three cases (43%). In contrast, 12/14 (86%) patients in the group of direct suturing developed a recurrent EAF ($p = 0.04$).

Altogether fifteen recurrences were diagnosed after surgical EAF repair. Ten of these (33%) were managed operatively with a success rate of (6/10) 60%. (Fig. A.1.) 3/10 died: two due to relapsing EAFs and severe infections and one drifted into prolonged ICU-care,

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