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Outcomes of primary fascial closure after open abdomen for nontrauma emergency general surgery patients

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Abstract

BACKGROUND: Emergency general surgery patients are increasingly being managed with an open abdomen (OA). Factors associated with complications after primary fascial closure (PFC) are unknown.

METHODS: Demographic and operative variables for all emergency general surgery patients managed with OA at an academic medical center were prospectively examined from June to December 2013. Primary outcome was complication requiring reoperation.

RESULTS: Of 58 patients, 37 managed with OA achieved PFC. Of these, 14 needed re-exploration for dehiscence, compartment syndrome, infection, or other. Complications after PFC were not associated with age, type of operative intervention, time to closure, re-explorations, comorbidities, or mortality. Complications correlated with higher body mass index ($P = .02$), skin closure ($P = .04$), plasma infusion ($P = .01$), and less intraoperative bleeding ($P = .05$). Deep surgical site infection correlated with fascial dehiscence ($P = .02$).

CONCLUSIONS: Reoperation after PFC was more likely in obese and nonhemorrhagic patients. Recognition of these factors and strategies to reduce surgical site infection may improve outcomes.

The technique of managing physiologically deranged patients with an open abdomen (OA) has been widely described for trauma populations in damage control settings.[1–3] Once physiologic derangement has been resolved in an intensive care unit, the patient then returns to the operating room for definitive management of their injuries.[4] OA management is now also commonly applied to nontrauma emergency general surgery (EGS) patients for a variety of conditions, including intra-abdominal sepsis, abdominal compartment syndrome (ACS), hemorrhage control, necrotizing pancreatitis, facilitating early re-exploration, and rapid re-entry into the abdomen.[5]

Once the underlying disease process is controlled, the goal is to achieve definitive abdominal closure. Failure to achieve primary fascial closure (PFC) has been independently associated with higher morbidity and mortality.[6–8] The most common complications after OA are enterocutaneous or enteroatmospheric fistulae, intra-abdominal abscess, wound infection, and abdominal sepsis.[8]

In trauma patients, several variables have been identified that predict success of PFC: patient comorbidities, time to

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initial re-exploration, total number of abdominal explorations, technique used to obtain closure, resuscitation strategies (blood vs crystalloid; clearance of lactate and base deficit), and timing of enteral nutrition (EN).[5–10] Successful fascial closure of OA in EGS patients has been poorly described. Many studies review ability to achieve PFC, but few evaluate outcomes of fascial closure. The aim of this study is to describe a dedicated nontrauma service's experience with EGS patients managed with OA and identify factors that are associated with fascial complications after PFC. We hypothesize that higher complication rates of PFC will be seen in patients with multiple comorbidities, longer time to PFC, and infectious wound complications.

Methods

After obtaining approval from the institutional review board, EGS patients managed with an OA from June 2013 to December 2013 were prospectively enrolled. All patients were managed by a dedicated, nontrauma, acute care surgery team. The decision to proceed with OA management was made by the attending surgeon at the time of index operation and recorded on the data collection sheet postoperatively. Patients transferred from other institutions with an OA were excluded. Initially, OAs were either managed with a "vacuum packed negative-pressure dressing" as described by Barker et al[11] or the commercially available KCI vacuum negative-pressure system (Wound V.A.C.; KCI Licensing Inc., San Antonio, TX). Fascial management at subsequent take back was left at the discretion of the operating surgeon and included a combination of negative-pressure dressing wound therapy and midline-directed fascial tension sutures.

Variables collected included patient demographics, body mass index (BMI), Charlson comorbidity index (CCI), presence of contamination at index operation, intraoperative blood loss, type and technique of fascial closure, resuscitation needs at index operation, time to 1st re-exploration, resuscitation requirements in the initial 24 hours after index operation and 36 hours (or less if closed in <36 hours after index operation) leading to fascial closure or mesh, intraoperative variables at the time of closure, and number of abdominal washouts before fascial closure was achieved.

In addition, the indication for OA was obtained from the operating surgeon. Indications included damage control, need for 2nd look, excessive contamination, decompression for ACS, or other. Damage control was defined as ongoing intraoperative hypothermia, intraoperative acidosis, or coagulopathy (clinical or laboratory) and was a subjective assignment by the operating surgeon. Second look was defined as the decision to return to the operating room to assess bowel viability in questionable segments. Excessive contamination was a subjective judgment by the surgeon that excess contamination precluded safe closure of the fascia.

The study population consisted of patients who were able to achieve PFC, which was defined as reapproximation of midline fascia to fascia. Approximately 10 acute care surgeons operatively managed this cohort of OA patients, and fascial closure techniques were not standardized, but left to individual surgeon preference. Those who received a mesh buttress (underlay or onlay in addition to fascial reapproximation) or separation of components were considered to have achieved PFC. Patients who achieved PFC were divided into 2 groups: complications (COMP) and no complications (NoCOMP).

Surgical site infection (SSI) definitions of the National Nosocomial Infections Surveillance were used. Complications of initial fascial closure were defined as deep and/or incisional, or organ space surgical site infection, as identified and recorded in the medical record by resident team members or the attending surgeon. Data during the PFC operation were collected from the anesthesia record and included perioperative antibiotic administration (within 1 hour of incision), intraoperative hypothermia ($T < 36°C$), and intraoperative oxygen saturation. Microbiology culture data for SSIs were abstracted from the medical record. Fascial dehiscence and need for relaparotomy at any point after PFC were also examined.

Data were analyzed using chi-square, Fisher exact, Student *t*, Mann-Whitney, or Wilcoxon rank sum tests as indicated with significance set at a P value less than .05. SAS 9.3 software (SAS Institute, Cary, NC) was used to complete the statistical analysis.

Results

Over the 6-month study period, 170 primary exploratory laparotomies were performed, and 58 patients (34%) were managed with an OA. Twenty-one patients never achieved PFC; of these, 11 (52%) died before closure, 8 (38%) required absorbable or biologic mesh closure as a fascial bridge, and 2 (10%) had skin-only closure (Fig. 1).

Thirty-seven patients had PFC. Median age was 64 years. Twenty-three (62%) were males. Damage control was the predominant indication for OA management (n = 19, 51%), followed by excessive contamination (n = 5, 14%), need for a 2nd look (n = 9, 24%), ACS (n = 3, 8%), and "other" indications (n = 1, 3%; Table 1). There was no difference in initial 24-hour fluid balance between patients who achieved PFC and those that did not (median: 3,700 vs 1,300 mL, $P = .89$). Similarly, the fluid balance in the 36 hours (or less if closed within 36 hours of initial operation) was not different between groups (median: 2,100 vs 999 mL, $P = .42$).

Overall, the most common indication for initial operation was mesenteric ischemia, followed by perforated viscus, peritonitis and/or sepsis, ACS, bowel obstruction, pancreatitis, incarcerated ventral hernia, abdominal wall reconstruction with fistula takedown, gastrointestinal bleed, and "other" indications (Table 1). Of the surgical interventions performed, 22 (59%) were bowel resections (Table 2).