Original research

Risk factors affecting morbidity and mortality following emergency laparotomy for small bowel obstruction: A retrospective cohort study

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HIGHLIGHTS

- 30-day morbidity and mortality rates were 28% and 13%, respectively.
- Six independent risk factors for morbidity were identified.
- Five independent risk factors for mortality were identified.
- Identified risk factors included chronic nephropathy and low physical performance.

ARTICLE INFO

ABSTRACT

Introductions: To identify risk factors for increased 30-day morbidity and mortality, using standardized measuring tools for the characterization of complications after emergency surgery for small bowel obstruction.
Methods: A retrospective cohort study including patients treated with emergency laparotomy for small bowel obstruction at a Copenhagen University Hospital (2009–2013). Complications were evaluated according to the Clavien-Dindo classification.
Results: A total of 323 patients were included. The overall 30-day morbidity and mortality rates were 28% and 13%, respectively. Six covariates were identified as independent risk factors associated with morbidity by multiple logistic regression analysis. The highest odds for morbidity were seen in patients with chronic nephropathy (Odds Ratio [OR] = 3.9; 95% CI 1.3–15.1), and in patients with a daily use of steroids (OR = 3.5; 95% CI 1.2–10.4). Five independent risk factors were associated with increased odds for mortality. Patients with low physical performance (OR = 3.4; 95% CI 1.3–8.2) or metabolic disorders (OR = 3.2; 95% CI 1.2–8.5) had the highest risk of mortality.
Conclusions: Morbidity and mortality rates were high in this study compared with other studies. Several comorbid conditions were associated with morbidity and mortality. These results may aid the acute care surgeon in identifying patients with a high-risk for postoperative complications and fatal outcomes.

1. Introduction

Small bowel obstruction (SBO) is one of the most frequent indications for emergency laparotomy surgery, and is known as a high-risk procedure with morbidity and mortality rates at 20–30% and 3–5%, respectively [1–4]. Adhesions are the most frequent reason for SBO, accounting for almost 75% of all cases, followed by malignancies, inflammatory bowel disease and hernias [5].

In recent years more interest has been taken in describing postoperative outcomes after abdominal emergencies, and in searching for preoperative factors that predispose poor outcome [6–8]. This information may aid the acute care surgeon in identifying patients with a high-risk for postoperative complications and fatal outcomes and eventually initiate interventions to prevent these adverse outcomes. Previous studies have identified potential risk factors such as surgical delay, increased age, high ASA score (American Society of Anaesthesiologists), septic shock, obesity, and comorbidities as factors associated with morbidity and mortality

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[1–4,9]. There is a need for large studies that characterize these patients with focus on the consequences of their complications in a standardized method. The aim of this study was to use standardized measures for the characterization of complications after emergency surgery for SBO, and to investigate potential risk factors for increased 30-day morbidity and mortality.

2. Methods

2.1. Study design and patients

This study is a retrospective cohort study conducted at a tertiary university hospital situated in the greater Copenhagen area, serving a population of 432.000 citizens. All patients are covered by public health insurance and pay no visit fees. Patients were included if any gastrointestinal emergency surgical procedure, laparoscopy or laparotomy, was performed from May 2009 to April 2013. The study was approved by the Danish Data Collection Agency (HEH-2013-034 I-Suite no: 02336).

2.2. Variables

A group of seven researchers collected pre- and postoperative data by review of medical records. This was done as part of creating a standardized database containing perioperative information of all emergency abdominal procedures performed at the hospital. Data for this study population consisted of all patients diagnosed with SBO, and treated with emergency laparotomy. These patients were identified and extracted from the database by the NOMESCO Classification of Surgical Procedure (NCSP) codes KJFB00 (small bowel resection), KJFK00 (division of adhesive band in intestinal obstruction), and KJFK10 (freeing of adhesions in intestinal obstruction).

Exclusion criterias were death during surgery and patients aged <18 yr. Patients who had any other procedure simultaneously with the SBO (e.g. ileostomy) were excluded. If a patient had more than one incidence of SBO managed surgically during the study period, only data from the index procedure was analysed for complications.

Intraoperative data was collected from the Danish Anaesthesia Database and from the surgery scheduling software. Pre-existing comorbidities and conditions were registered from the admission report, and were considered as existing if the condition was medically treated or if previous treatment was described. The co-morbidities were defined as follows: chronic nephropathy; elevated se-creatinine or dialysis treatment, obstructive pulmonary disease; chronic obstructive pulmonary disease (COPD) or asthma, malignant disease; actual malignant disease (disseminated and not disseminated), metabolic disorder; diabetes or thyroid disease, cardiovascular disease; hypertension, atrial fibrillation, ischaemic heart disease or any history of cerebrovascular disease. Performance score was evaluated by the Eastern Cooperative Oncology Group (EC0G) score [10], which is a six step scale ranging from 0 to 5 (fully active to death). Excessive alcohol consumption was defined as a weekly alcohol intake of >7 units per week for women and >14 units per week for men. The time from the decision to operate was made, and surgical intervention was initiated, was registered. Perioperative blood transfusion was defined as being transfused with blood products between 7 days before and 30 days after surgery. Surgical contamination was evaluated by the wound classification described by Berard et al. [11]. Readmission related to the surgical procedure was also registered.

Postoperative complications were registered according to the Clavien-Dindo (CD) classification [12,13]. The CD classification is a validated ranking system, which classifies postoperative complications based on the therapy used to treat the complication. Any complication is graded on a 5-step scale. CD score 1 is any deviation from the normal postoperative course, without the need for pharmacological treatment or surgical, endoscopic, and radiological interventions. CD score 5 is death of the patient [13]. Complications were divided into two categories: surgical and medical. Surgical complications include bleeding, wound dehiscence, postoperative ileus, wound infection, intraabdominal abscesses and anastomosis leakage. Medical complications were evaluated according to the involved organ system (cardiac, respiratory, neurological, gastrointestinal, renal and thromboembolic). The researchers were instructed in registration of postoperative complications according to the CD classification prior to data collection by clinical examples of complication grades. The researchers were tested by two questionnaires to assess the reproducibility [13]. The collectors were not approved before reproducibility over 90% was achieved.

The first author of this study collected additional variables of interest regarding the populations of patients who had a procedure for SBO performed. This was done by review of medical records and included data regarding peri-operative blood transfusion, daily use of analgesics, previous abdominal surgery, and wound contamination.

2.3. Outcomes

Outcome measures included 30-day mortality and morbidity. We defined postoperative morbidity as a patient having one or more severe complications classified as CD 3–5 [12,13]. A severe complication included any condition demanding, surgical, endoscopic, or radiological intervention (without general anaesthesia = CD 3a, in general anaesthesia = CD 3b), ICU-management (with organ failure = CD 4a, with multi-organ failure = CD 4b) or the death of the patient (CD 5). In case of more than one complication, the higher graded complication was used for further analysis. Mortality was defined by in-hospital death within 30 days (CD 5).

2.4. Statistical analysis

Demographical data were presented with descriptive statistics. Parametric nominal data were presented as mean with standard deviations (SD), and non-parametric data as median with interquartile range (IQR). Categorical variables were reported as absolute numbers and percentages. Baseline variables with missing data were reported.

Chi-square or Fischer's exact tests were used to compare categorical data or dichotomous data respectively. Non-parametric nominal data were compared by Mann-Whitney U tests. Once statistical significance was determined by univariate analyses, all factors with a P-value < 0.2 were included in two separate multivariate backward stepwise logistic regression models to identify independent risk factors for 30-day mortality and morbidity, respectively. Both models were controlled for age (10-year intervals) and gender. Outcomes were presented as odds ratios (OR) with 95% confidence limits. $P \leq 0.05$ was considered statistically significant. All data analyses were performed using SPSS statistics for Windows, version 22.0 (SPSS, Inc.).

3. Results

During the four-year period, 343 patients with SBO underwent an emergency laparotomy. One patient died during surgery, and 14 patients had more than one procedure for SBO in the study period. Four patients were excluded because of an incorrect surgical code. A total of 323 patients were included in the study.