International Journal of Surgery 27 (2016) 21–25

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original research

Risk factors for fatal outcome in surgical patients with postoperative aspiration pneumonia☆

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HIGHLIGHTS

- Postoperative aspiration pneumonia remains a severe disease with a significant mortality of 27% in this series.
- Older age, blood transfusion and bilateral pulmonary infiltrates are risk factors for mortality after aspiration pneumonia.
- The identification of patients at increased risk for death after aspiration may help to further improve patients outcome.

ARTICLE INFO

Article history:
Received 11 June 2015
Received in revised form
2 January 2016
Accepted 18 January 2016
Available online 20 January 2016

Keywords:
Aspiration pneumonia
Abdominal surgery
Complication
Critical care

ABSTRACT

Introduction: Aspiration pneumonia in hospitalized surgical patients has been associated with a mortality of approximately 30%. The aim of this study was to assess pre-, intra- and postoperative risk factors for mortality in patients suffering aspiration pneumonia after abdominal surgery.
Methods: Retrospective study from 01/2006–12/2012 of patients with clinically and radiologically confirmed aspiration pneumonia after abdominal surgery.
Results: A total of 70 patients undergoing abdominal surgery and postoperative aspiration pneumonia were identified. There were 53 (76%) male patients, the mean age was 71 ± 12 years and the mean ASA score was 3 ± 1. The surgical procedures included 32 colorectal or small bowel resections, 10 partial liver resections, 9 gastric surgeries, 8 esophageal resections, 5 pancreatic surgeries, and 6 hernia repairs. Aspiration pneumonia occurred at mean postoperative day 7 ± 10. Overall, 53% (n = 37) of patients required re-intubation, with 4 ± 5 days of additional mechanical ventilation. Mean hospital and ICU length of stay was 32 ± 25 days and 6 ± 9 days, respectively. Overall mortality was 27% (n = 19). Forward logistic regression revealed older age [OR 7.41 (95% CI: 1.29–42.62)], bilateral aspiration pneumonia [OR 7.39 (95% CI: 1.86–29.29)] and intraoperative requirement of blood component transfusion [OR 5.09 (95% CI: 1.34–19.38)] as independent risk factors for mortality (overall $R^2 = 0.336$).
Conclusion: Postoperative aspiration pneumonia remains a severe complication with significant mortality. Increasing age, the need for intraoperative blood component transfusion and bilateral pulmonary infiltrates are independent risk factors for fatal outcome after aspiration pneumonia. Therefore, these patients suffering aspiration pneumonia require special attention and increased monitoring.

1. Introduction

Postoperative pulmonary complication is a major contributor to the overall risk of abdominal surgery [1–3], and is associated with considerable morbidity and mortality (8). With a mortality rate of around 30%, or historically of up to 90%, aspiration pneumonia is the most precarious postoperative pulmonary complication [4] [5]. Moreover, it may cause re-admission to the intensive care unit as well as prolonged hospital length of stay, with significant increases in the costs of hospital care [6]. Despite this, awareness of the consequences of postoperative aspiration pneumonia remains relatively low [7].

Surgical patients requiring general anesthesia and abdominal surgery with potential consequent bowel paralysis have an increased risk of pulmonary aspiration and aspiration pneumonia.

☆ Oral Presentation at the 100th Congress of the Swiss Surgical Society, 2013, Bern, Switzerland.

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http://dx.doi.org/10.1016/j.ijsu.2016.01.043
1743-9191/

Furthermore, patients with altered levels of consciousness, neurological disorders, history of pulmonary disease, older age and gastroesophageal reflux disease are at risk of aspiration pneumonia [8,9]. The 30° elevation of the upper body has been shown to reduce the risk of aspiration pneumonia in the intensive care unit (ICU) [10]. Routine nasogastric decompression tubes [11] or percutaneous feeding tubes instead of nasogastric feeding tubes have not been shown to reduce the risk of pulmonary aspiration [12].

While guidelines and recommendations to identify patients at risk of aspiration pneumonia have been studied and published, risk factors for lethal outcome after diagnosed aspiration pneumonia have not been studied so far. However, identification of risk factors for fatal outcome may help to improve the management of this severe complication.

In this retrospective study, we opted to identify independent risk factors for mortality in patients suffering postoperative aspiration pneumonia on the regular ward. Therefore, pre-, intra- and postoperative parameters were analyzed of patients undergoing major abdominal surgery with postoperatively confirmed aspiration pneumonia. The early identification of those patients at increased risk for death after aspiration may help to further improve patients outcome.

2. Materials and methods

A retrospective study of patients from 01/2006–12/2012 with clinically and radiologically confirmed aspiration pneumonia *after* abdominal surgery was performed at Bern University Hospital, which is a tertiary academic medical center in central Switzerland. In order to improve population homogeneity, patients with pre- or intraoperative aspiration pneumonia were not included into the study, as in this group of patients pulmonary aspiration may have different reasons (e.g. micro-aspiration during intubation or prolonged ventilation, preoperative vomiting). All patients who undergo abdominal surgical procedures received antibiotic prophylaxis. Insertion of nasogastric tubes was at the discretion of the attending surgeon. At Bern University Hospital, protocoled measures to prevent pulmonary aspiration are in place through the pre-, intra-, and postoperative phases.

Patients with aspiration pneumonia were identified through the institutional digital patients' chard system, using the keywords "aspiration" AND/OR "pneumonia". Subsequently, all patients were carefully reviewed by one investigator (GR). To reduce heterogeneity, patients who aspirated *before or during* the surgical procedure were excluded from the study. Aspiration pneumonia was diagnosed by witnessed aspiration and subsequent confirmation by a conventional X-ray or computed tomography (CT) scan of the chest. All X-rays and CT scans were reviewed by one independent attending radiologist (DO).

Patient characteristics were collected using a computerized spreadsheet (Microsoft Access 2003, Microsoft Corporation, Redmond, WA). The collected demographic and pre-operative variables were: age, gender, main diagnosis, as well as co-morbidities, prior surgical procedures (thoracic, cardiovascular, abdominal), preoperative insertion of nasogastric tube, smoking history, alcohol abuse, drugs administered preoperatively (proton pump inhibitors, antibiotics, sedatives, opiates, neuroleptic agents), chronic pulmonary disease, gastro-esophageal reflux disease (GERD), and American Society of Anesthesiologists (ASA) physical status classification. Intraoperative variables collected included: type of surgery performed, ileostomy, colostomy, respiratory global insufficiency, amount of blood loss, operation time, transfusion of fresh frozen plasma (FFP), red blood cell (RBC) transfusion, and episodes of intraoperative hypotension [mean arterial pressure (MAP)≤ 55 mmHg]. Postoperative parameters collected included: postoperative day of pulmonary aspiration, days on intensive care unit (ICU), days on intermediate care (IMC), ICU readmission, length of mechanical ventilation, the need for re-intubation, nasogastric tube postoperatively, re-insertion of nasogastric tube, feeding jejunostomy, nausea, vomiting, first bowel movement, day of first mobilization, patient controlled analgesia, peridural analgesia, postoperative medication, and hospital length of stay (HLOS).

2.1. Statistics

Continuous and categorical variables are reported as mean ± standard deviation (SD), or median ± range and percentages. In order to identify risk factors for fatal outcome after aspiration pneumonia, all parameters were compared between the survivor and non-survivor group. Proportions were compared using the Fisher exact test and continuous variables were compared using and the Mann–Whitney U test. Potential risk factors were identified using a p-value <0.2 in univariate analysis. Moreover, those variables of special interest were forced into the equation. Forward logistic regression analysis using a multivariate model was applied in order to identify independent risk factors for mortality.

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS Windows©), version 21.0 (SPSS Inc., Chicago, IL). A p-value of <0.05 was considered statistically significant.

3. Results

From 01/2006–12/2012, a total of 70 patients with aspiration pneumonia after abdominal surgery were detected and included in the study. There were 53 (76%) male patients, the mean age was 71 ± 12 years and the mean ASA score was 3 ± 1. The following surgical intervention were performed in the entire study population: 32 colorectal or small bowel resections, 10 partial liver resections, 9 gastric surgeries, 8 esophageal resections, 5 pancreatic surgeries, and 6 hernia procedures. Fifty (71.4%) interventions were elective operations, and 20 (28.6%) cases were emergency interventions, including 16 (22.8%) patients preoperatively presenting with clinical signs of an ileus. According the inclusion criteria, all patients arrived in the normal ward postoperatively without a history of aspiration, but subsequently sustained aspiration pneumonia.

3.1. Incidence and outcome of postoperative aspiration pneumonia

Patients with esophageal resection, partial liver resections and pancreatic resections presented with an incidence of aspiration pneumonia of 6.5% (8/124), 2.0% (10/499), and 2.3% (5/221), respectively. For the remaining surgical procedures, the incidence of aspiration pneumonia was <1.5% (n = 3652 laparotomies were performed in the study period).

Aspiration pneumonia occurred on average postoperative day 7.0 ± 10.0, in survivors on day 6.5 ± 9.6 and in the non-survivors on day 8.4 ± 11.1 ($p = 0.595$). Overall mortality was 27.1% (n = 19). A total of 39 (55.7%) patients were admitted to the ICU after aspiration pneumonia. Of those, 37 (52.9%) patients had to be re-intubated, with an additional average length of mechanical ventilation of 4.1 ± 4.9 days and an additional ICU length of stay of 5.7 ± 9.5 days. Non-survivors were intubated longer than the survivors (3.4 ± 4.5 vs. 6.2 ± 5.7 mechanical ventilation days, $p = 0.059$). Total HLOS of the entire study population was 31.9 ± 24.8 days.