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Improvement in postoperative mortality in elective gastrectomy for gastric cancer: Analysis of predictive factors in 1066 patients from a single centre

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Abstract

Background: Gastrectomy represents the main treatment for gastric adenocarcinoma. This procedure is associated with substantial morbidity and mortality. The aim of this study was to evaluate the postoperative mortality changes across the study period and to identify predictive factors of 30-day mortality after elective gastrectomy for gastric cancer.

Methods: This was a retrospective cohort study of a prospective database from a single centre. Patients treated with an elective gastrectomy from 1996 to 2014 for gastric adenocarcinoma were included. We compared postoperative mortality between four time periods: 1996–2000, 2001–2005, 2006–2010, and 2011–2014. Univariate and multivariate analyses were applied to identify predictors of 30-day postoperative mortality.

Results: We included 1066 patients (median age 65 years; 67% male). The 30-day mortality rate was 4.7%. Mortality decreased across the four time periods; from 6.5% to 1.8% ($P = 0.022$). In the univariate analysis, age, ASA score, albumin <3.5, multivisceral resection, splenectomy, intrathoracic esophagojejunal anastomosis, R status, and T status were significantly associated with postoperative mortality. In the multivariate analysis, ASA class 3 (OR 10.06; CI 1.97–51.3; $P = 0.005$) and multivisceral resection (OR 1.6; CI 1.09–2.36; $P = 0.016$) were associated with higher postoperative 30-day mortality; surgery between 2011 and 2014 was associated with lower postoperative 30-day mortality (OR 0.55; CI 0.33–0.15; $P = 0.030$).

Conclusion: There was a decrease in postoperative 30-day mortality during this 18-year period at our institution. We have identified ASA score and multivisceral resection as predictors of 30-day mortality for elective gastrectomy for cancer.

Keywords: Adenocarcinoma; Gastrectomy; Stomach neoplasms; Mortality; Risk factors

Introduction

Gastric cancer remains a leading cause of cancer-related mortality worldwide.[1] In South America, countries like Chile and Peru have a high incidence of gastric cancer.[2]

Surgical resection is the only curative treatment for gastric cancer. Gastrectomy and lymphadenectomy are complex procedures with morbidity rates between 19% and 63% and postoperative mortality rates ranging from 1% to 11%.[3]

Over the last 20 years, multiple improvements in gastric cancer management have been implemented. Outcomes in gastric cancer surgery have been affected by improvements in preoperative assessment, vessel-sealing devices, the use of circular and linear staplers, the development of

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laparoscopic surgery, and better postoperative care, among others. These factors have led to a decrease in postoperative mortality in gastric cancer. This is evident when we compare series from 20 years ago and more recent publications.[4–6]

Several groups have reported postoperative mortality predictors. However, specific factors associated with postoperative mortality have not been well characterised.[7]

The aim of this study was to evaluate the postoperative mortality changes across the study period and to identify predictive factors of 30-day mortality after elective gastrectomy for gastric cancer.

Methods and materials

This was a retrospective cohort study including data from a prospective institutional single-centre database. All consecutive patients treated with a gastrectomy for gastric cancer from 1996 to 2014 were selected. Only patients with stomach or esophagogastric junction adenocarcinoma were included and patients with other histology were excluded. Because the aim of this study was to assess postoperative mortality in elective gastrectomy, we excluded 23 patients who had emergency surgery for active bleeding or perforation due to gastric cancer.

The preoperative assessment consisted of upper gastrointestinal endoscopy, biopsy, complete blood count, liver function tests, electrocardiogram, and nutritional evaluation. Preoperative imaging included an abdominal ultrasound, chest X-ray, and a thorax-abdomen-pelvis CT scan. There was no preoperative adjuvant treatment protocol during the study period.

All surgeries were performed at a single hospital. Epidural analgesia has been routinely used since 2005. Depending on the tumour's location, a total or subtotal gastrectomy was indicated. Surgery included omentectomy with bursectomy and D2 lymph node dissection according to the Japanese classifications in patients with curative gastrectomy.[8]

Splenectomy and pancreatectomy were not routinely performed. In the early years of this series, splenectomy and distal pancreato-splenectomy was performed to improve lymph node dissection in groups 11 and 10 of suspicious nodes and splenectomy was performed according to surgeon preference for upper third gastric cancers; this practice changed over time to a highly selective approach. Multivisceral resection (including spleen, pancreas, colon, and liver) was performed for direct tumour invasion. Partial distal esophagectomy with a transhiatal approach and mediastinal anastomosis was employed for Siewert type II and III cancers. Routine cholecystectomy was performed in curative cases and was not considered a multivisceral resection. A vessel-sealing device has been used for all cases since 2006. A reconstruction using Roux-en-Y was performed after a total gastrectomy; Roux-en-Y or Billroth II was used for subtotal gastrectomy based on the patient's age, R status, and surgeon preference. Esophagojejunal anastomosis has been performed with a circular stapler routinely since 2002, and in 2009 we added a second layer of running monofilament suture to reinforce this mechanical anastomosis. For total gastrectomies, a feeding jejunostomy tube was routinely employed at the beginning of the series, but this changed to selective use in 2006 and was abandoned in 2011. One or two prophylactic drains were used routinely. Starting in 2006, a laparoscopic approach was employed for patients with early gastric cancer (EGC).[9]

In the postoperative period, immediate extubation was favoured. Patients start physical and respiratory therapy as soon as possible, typically on day 1 postoperatively. Over the last 10 years there has been greater availability of physical and respiratory therapists assigned to our surgical ward. Epidural analgesia was generally maintained for 3 days. A nasogastric tube was kept in place for 3–5 days in subtotal gastrectomy. An oral contrast study was performed on postoperative day 5–7 for total gastrectomy; after this study, the patient starts an oral diet and prophylactic drains are removed. The patients were discharged when they were able to tolerate a soft diet for 24 h. All deviations from a normal postoperative course of elective gastrectomy were considered postoperative complications, were prospectively recorded by a dedicated nurse and were periodically reviewed at morbi-mortality meetings.

All of the above-mentioned changes in perioperative care were periodically reviewed by our surgical, anaesthesia, and physical therapy team. During the latter part of this study, we developed a local written guideline statement for managing these patients in a standardised manner and all patients were preoperatively discussed in a weekly meeting with an expert radiologist (FA). Since 2005, Chile has implemented a health care reform that increases the resources for the treatment of gastric cancer.[10,11]

Patients were staged using the TNM seventh edition.[12] A resection with macroscopic and microscopic tumour-free margins was defined as an R0, a microscopically positive resection margin as R1, and a macroscopically positive resection margin as R2.

The primary outcome of the study was 30-day postoperative mortality, defined as death by any cause within 30 days of surgery.

We compared postoperative mortality in four time periods with a logistic regression test: period 1 (1996–2000), period 2 (2001–2005), period 3 (2006–2010), and period 4 (2011–2014).

Data were analysed using the program Stata 13 for Windows (Texas; StataCorp LP). Continuous variables were described by means and standard deviations or medians and ranges. Categorical variables were described with frequencies and percentage. Means were compared using Student's t-test and categorical data were compared using the chi-square test or Fisher's test as appropriate. The T stage was grouped as EGC (T1) and advanced gastric cancer