

## Early Outcome Following Emergency Gastrectomy

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### Abstract

**Introduction:** Emergency gastrectomy has been shown to be associated with poor morbidity and mortality rates. The aims of this study were to review the outcomes of emergency gastrectomy in our institution and to determine any factors that were associated with worse perioperative outcomes. **Materials and Methods:** A retrospective review of all patients who underwent emergency gastrectomy for various indications from October 2003 to April 2009 was performed. All the complications were graded according to the classification proposed by Clavien and group. **Results:** Eighty-five patients, median age 70 (range, 27 to 90 years), underwent emergency gastrectomy. The indications for the surgery included perforation, bleeding and obstruction in 45 (52.9%), 32 (37.6%) and 8 (9.4%) patients, respectively. The majority of the patients (n = 46, 54.1%) had an American Society of Anesthesiologists (ASA) score of 3. Partial or subtotal, and total gastrectomy were performed in 75 (88.2%) and 10 (11.8%) patients, respectively. Malignancy was the underlying pathology in 33 (38.8%) patients. The perioperative mortality rate was 21.2% (n = 18) with another 27 (31.8%) patients having severe complications. Twelve (14.1%) patients had a duodenal stump leak. The independent factors predicting worse perioperative complications included high ASA score and in perforation cases. Other factors such as malignancy, age and extent of surgery were not significantly related. The presence of a duodenal stump leak was the only independent factor predicting mortality. **Conclusion:** Emergency gastrectomy is associated with dismal morbidity and mortality rates. Patients with high ASA scores and perforations fared worse, and duodenal stump leak increases the risk of mortality.

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**Key words:** Emergency, Gastrectomy, Surgery, Treatment outcome

### Introduction

Emergency gastrectomy has been associated with high morbidity and mortality rates.<sup>1-4</sup> These complications arise as a direct consequence following the procedure, such as duodenal stump leak and intra-abdominal collections, or more frequently, because of the resultant systemic complications.<sup>3,4</sup>

Surprisingly, reports illustrating the numerous issues surrounding emergency gastrectomy have been lacking in the literature. Some of the factors that have been associated with worse perioperative outcomes included advanced age, lower albumin and worse contamination in perforation cases.<sup>1-6</sup> We henceforth undertake this study with the primary aim to review the outcomes of all patients who underwent emergency gastrectomy. Our secondary aim was to evaluate

the various factors that could predict worse perioperative outcome and mortality.

### Materials and Methods

#### Study Population

A retrospective review of all patients who underwent emergency gastrectomy from October 2003 to April 2009 was performed. Patients were identified from the hospital's operating records.

In our series, emergency gastrectomy was defined as any form of gastric resection (excluding ulcerectomy or wedge resection) performed in the emergency setting for benign or malignant pathology in situations such as perforation, bleeding or gastric outlet obstruction. The extent of the

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resection and the type of the subsequent anastomoses were at the discretion of the primary surgeon. The duodenal stumps were closed using either the hand-sewn technique or overrun with a running polyglactin suture if it was stapled. All cases were operated by a surgeon of at least consultant grade.

The data collected included age, gender, American Society of Anesthesiologists (ASA) score, comorbid conditions, presenting signs and symptoms, and clinical parameters. Preoperative laboratory values, including full blood count, renal panel and serum albumin levels were also recorded. In addition, duration from symptoms to surgery, operative findings and interventions, length of surgery, perioperative complications, mortality and length of hospital stay were also documented. The grades of complications (GOC) were in concordance to the classification proposed by Clavien and group<sup>7-9</sup> (Table 1). Duodenal stump leak was diagnosed either radiologically and/or confirmed through the contents of the abdominal drain.

Table 1. Classification of Surgical Complications<sup>7-9</sup>

Grade of Complications (GOC)
<b>Grade I:</b> Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic, and radiological interventions.
<b>Grade II:</b> Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.
<b>Grade III:</b> Requiring surgical, endoscopic or radiological intervention.
<b>Grade IV:</b> Life threatening complication(s) requiring ICU management (including organ dysfunction).
<b>Grade V:</b> Death of a patient.

Statistical analysis was performed using both univariate and multivariate analyses. The variables were analysed to the various outcomes using the Fisher's exact test, and their Odds ratio and 95% confidence interval were also reported. For the multivariate analysis, the logistic regression model was applied. All analyses were performed using the SPSS 17.0 statistical package (Chicago, Illinois) and all *P* values reported are 2-sided, and *P* values of <0.05 were considered statistically significant.

## Results

During the study period, 85 patients, median age 70 years (range, 27 to 90 years), underwent emergency gastrectomy and formed the study group. More than half (*n* = 45, 52.9%) of the patients were operated for perforation. The majority of the patients (*n* = 58, 68.2%) were males and had an ASA score of 3 (*n* = 46, 54.1%). Hypertension, hyperlipidaemia and diabetes mellitus were the most common premorbid conditions in 47 (55.3%), 28 (32.9%) and 28 (32.9%) patients, respectively. Preoperative computed tomographic

Table 2. Characteristics of the 85 patients Who Underwent Emergency Gastrectomy

	Perforation group, <i>n</i> = 45 (%)	Bleeding group, <i>n</i> = 32 (%)	Obstruction group, <i>n</i> = 8 (%)
<b>Median age, range (years)</b>	69 (30 to 90)	72 (39 to 87)	70 (27 to 83)
≤65	18 (40.0)	11 (34.4)	1 (12.5)
>65	27 (60.0)	21 (65.6)	7 (87.5)
<b>Gender</b>			
Male	31 (68.9)	20 (62.5)	7 (87.5)
Female	14 (31.1)	12 (37.5)	1 (12.5)
<b>ASA status</b>			
1	3 (6.7)	2 (6.3)	1 (12.5)
2	8 (17.8)	3 (9.4)	5 (62.5)
3	24 (53.3)	20 (62.5)	2 (25.0)
4	10 (22.2)	7 (21.9)	0
<b>Premorbid condition</b>			
Hypertension	23 (51.1)	23 (71.9)	1 (12.5)
Diabetes mellitus	13 (28.9)	14 (43.8)	1 (12.5)
Hyperlipidaemia	13 (28.9)	14 (43.8)	1 (12.5)
Ischaemic heart disease	10 (22.2)	7 (21.9)	1 (12.5)
History of cerebrovascular accident	6 (13.3)	3 (9.4)	0
<b>Number of premorbid condition</b>			
≤1	23 (51.1)	14 (43.8)	7 (87.5)
>1	22 (48.9)	18 (56.2)	1 (12.5)
<b>CT scan performed</b>			
Yes	24 (53.3)	13 (40.6)	0
No	21 (46.7)	19 (59.4)	8 (100.0)
<b>Median serum albumin level (g/L)</b>	27 (<10 to 43)	25 (<10 to 42)	30 (18 to 34)
>30	14 (31.1)	5 (15.6)	4 (50.0)
≤30	31 (68.9)	27 (84.4)	4 (50.0)
<b>Median WBC count (x10<sup>9</sup>/L)</b>	10.8 (2.1 to 31.6)	9.2 (1.7 to 19.0)	8.4 (6.1 to 14.1)
≤10.0	18 (40.0)	17 (53.1)	6 (75.0)
>10.0	27 (60.0)	15 (46.9)	2 (25.0)
<b>Median haematocrit (%)</b>	35.1 (18.0 to 60.0)	27.3 (17.4 to 38.6)	32.0 (25.5 to 38.5)
<33.0	18 (40.0)	28 (87.5)	5 (62.5)
≥33.0	27 (60.0)	4 (12.5)	3 (37.5)

(CT) scan was performed in 45 (52.9%) patients.

Preoperative haematological investigations highlighted low albumin levels in a majority of the patients (*n* = 62, 72.9%). Raised white blood cell counts and lower haematocrit levels were expectedly more commonly seen in the perforation and bleeding groups, respectively. Table

2 illustrates the characteristics of the study group.

*Operative Findings*

Partial or subtotal gastrectomy was performed in the majority of the patients (n = 75, 88.2%) with another 10 (11.8%) patients undergoing total gastrectomy. Of the 85 anastomoses, 51 (60.0%) were stapled, while the other 34 (40.0%) were hand sewn. Malignancy was the underlying aetiology in 33 (38.8%) patients, with gastric adenocarcinoma being the most common histology in 29 (87.9%) patients. The remaining 4 patients had gastric lymphoma (n = 4, 11.4%). Table 3 highlights the surgical observations and procedures performed.

Table 3. Surgical Observations and Procedures of the Study Group

	n (%)
<b>Underlying pathology</b>	
Malignancy	33 (38.8)
- Adenocarcinoma	- 29
- Lymphoma	- 4
Non-malignant	52 (61.2)
<b>Time from symptoms to surgery</b>	
<24 hours	40 (47.1)
≥24 hours	45 (52.9)
<b>Surgeries performed</b>	
Partial/subtotal gastrectomy	75 (88.2)
Total gastrectomy	10 (11.8)
<b>Nature of anastomosis</b>	
Hand sewn	34 (40.0)
Stapled	51 (60.0)

*Complications*

The mortality rate of our study was 21.2% (n = 18) with another 27 (31.8%) patients having severe complications (GOC III and IV) (Table 4). Notably, respiratory and wound causes accounted for most of the complications in 56 (65.9%) and 24 (28.2%) patients, respectively. Of the 18 mortalities, 13 (72.2%) were from septic complications, while the remaining 5 (27.8%) were due to respiratory failure from fulminant pneumonia. Table 5 classifies the various complications between benign and malignant aetiologies. The median length of stay was 15 days (range, 3 to 345 days).

Twelve (14.1%) patients had duodenal stump leaks. All these patients had low albumin levels. Nine of them (75.0%) had pyloric and/or duodenal ulcers. Eight of them (66.7%) were operated for perforation, while the remaining 4 (33.3%) were for bleeding. The only 3 patients who underwent relook laparotomy for their duodenal stump leaks all died from septic complications subsequently. In the remaining 9 patients, all had their leaks managed conservatively with

Table 4. Perioperative Outcome of the Study Group

	n (%)
<b>Grade of complications</b>	
No complications	18 (21.2)
Grade I	12 (14.1)
Grade II	10 (11.8)
Grade III	4 (4.7)
Grade IV	23 (27.1)
Death or Grade V	18 (21.2)
Reoperation	7 (8.0)
Median length of stay (range)	15 (3 to 345)

Table 5. Specific Complications between Benign and Malignant Aetiologies

	Benign aetiologies, n = 52 (%)	Malignant aetiologies, n = 33 (%)	Overall, n = 85 (%)
<b>Specific Complications</b>			
Duodenal stump leak	7 (13.5)	5 (15.2)	12 (14.1)
Intra-abdominal collection	13 (25.0)	3 (9.1)	16 (18.8)
Anastomotic leak	4 (7.7)	2 (6.1)	6 (7.1)
Wound dehiscence	4 (7.7)	1 (3.0)	5 (5.9)
Wound infection	16 (30.8)	8 (24.2)	24 (28.2)
Cardiac complications	14 (26.9)	7 (21.2)	21 (24.7)
Urinary tract infection	7 (13.5)	5 (15.2)	12 (14.1)
Respiratory complications	35 (67.3)	21 (63.6)	56 (65.9)
Renal complications	17 (32.7)	5 (15.2)	22 (25.9)

drainage and parenteral antibiotics. Three died eventually while the other 6 patients were discharged well with spontaneous closure of their leaks.

*Analysis — Complications*

Worse complications (GOC III or IV) occurred more frequently in patients with higher ASA score (3 to 4), ≥ 2 pre-morbid conditions and renal impairment. Patients who had perforation also fared worse. After multivariate analysis, the 2 independent factors were high ASA score and in perforation cases (Table 6). Factors such as neoplastic pathology, age, extent of surgery and time to surgery (for perforated cases) were not significantly associated.

*Analysis — Mortality*

Patients who died had higher ASA scores, benign aetiologies, and suffered from duodenal stump leaks (Table 7). After multivariate analysis, the only independent factor was duodenal stump leak. The time to surgery (for perforated

cases) was not significantly associated with mortality.

## Discussion

Our series affirmed the dismal perioperative outcomes following emergency gastrectomy. The mortality rate in our series was 21.2%, which is comparable to other series.<sup>3,4,10,11</sup> Perhaps more importantly, only around one-fifth of our patients were discharged without any complications. The majority of these complications arose from the incision site and the respiratory system rather than a direct complication

following the gastrectomy. This observation was also documented in other series.<sup>3,4,10,11</sup> Apart from the significant postoperative pain from the lengthy upper abdominal midline incision predisposing to pulmonary atelectasis and pneumonia, the relatively high proportion of our patients requiring surgical intensive care and intubation postoperatively would have also increased the risks of respiratory complications. In addition, performing these surgeries in an emergency setting, especially in perforated cases would have contributed to the numerous wound-related and septic complications.

Table 6. Analysis of Variables Associated with Worse Perioperative Outcome (Excluding Death)

Characteristics	GOC 0-II (n = 40)	GOC III-IV (n = 27)	OR (95% CI)	P value
>65 years old	24 (60.0%)	18 (66.7%)	1.33 (0.48 to 3.70)	>0.05
Female gender	11 (27.5%)	10 (37.0%)	1.55 (0.55 to 4.41)	>0.05
ASA score 3 to 4	23 (57.5%)	23 (85.2%)	4.25 (1.24 to 14.58)	0.030*
≥2 premorbid conditions	15 (37.5%)	18 (66.7%)	3.33 (1.20 to 9.29)	0.026
WBC >10 (x10 <sup>9</sup> /L)	19 (47.5%)	17 (63.0%)	1.88 (0.69 to 5.10)	>0.05
Hct <33.0 (%)	23 (57.5%)	17 (63.0%)	1.26 (0.46 to 3.42)	>0.05
Creatinine >110 (umol/L)	12 (30.0%)	17 (63.0%)	3.97 (1.41 to 11.15)	0.012
Urea >9.3 (mmol/L)	12 (30.0%)	15 (55.6%)	2.92 (1.06 to 8.06)	0.045
Albumin ≤30 (g/L)	25 (62.5%)	21 (77.8%)	2.1 (0.69 to 6.38)	>0.05
Total over subtotal gastrectomy	6 (15.0%)	3 (11.1%)	0.71 (0.16 to 3.12)	>0.05
Stapled anastomosis	22 (55.0%)	18 (66.7%)	1.64 (0.59 to 4.51)	>0.05
Neoplastic aetiology	20 (50.0%)	10 (37.0%)	0.59 (0.22 to 1.59)	>0.05
Duodenal stump leak	3 (7.5%)	3 (11.1%)	1.54 (0.29 to 8.28)	>0.05
Perforation	15 (37.5%)	19 (70.4%)	3.96 (1.39 to 11.26)	<b>0.013*</b>
Perforated cases Operated >24 hours	1/15 (6.7%)	3/19 (15.8%)	2.63 (0.24 to 28.2)	>0.05

\*statistically significant on multivariate analysis

Table 7. Analysis of Variables Associated with Mortality

Characteristics	Alive (n = 67)	Death (n = 18)	OR (95% CI)	P value
>65 years old	42 (62.7%)	13 (72.2%)	1.55 (0.49 to 4.86)	>0.05
ASA score 3 to 4	46 (68.7%)	17 (94.4%)	7.76 (0.97 to 62.2)	0.033
≥2 premorbid conditions	33 (49.3%)	8 (44.4%)	0.82 (0.29 to 2.35)	>0.05
WBC >10 (x10 <sup>9</sup> /L)	36 (53.7%)	8 (44.4%)	0.69 (0.24 to 1.96)	>0.05
Hct <33.0 (%)	40 (59.7%)	11 (61.1%)	1.06 (0.37 to 3.08)	>0.05
Creatinine >110 (umol/L)	29 (43.3%)	11 (61.1%)	2.06 (0.71 to 5.97)	>0.05
Urea >9.3 (mmol/L)	27 (40.3%)	12 (66.7%)	2.96 (0.99 to 8.86)	0.063
Albumin ≤30 (g/L)	46 (68.7%)	16 (88.9%)	3.65 (0.77 to 17.35)	>0.05
Total over subtotal gastrectomy	9 (13.4%)	1 (5.6%)	0.38 (0.05 to 3.21)	>0.05
Stapled anastomosis	40 (59.7%)	11 (61.1%)	1.06 (0.37 to 3.08)	>0.05
Neoplastic aetiology	30 (44.8%)	3 (16.7%)	0.25 (0.07 to 0.93)	0.033
Duodenal stump leak	6 (9.0%)	6 (33.3%)	5.08 (1.40 to 18.46)	<b>0.017*</b>
Perforation	34 (50.7%)	11 (61.1%)	1.53 (0.53 to 4.41)	>0.05
Perforated cases Operated >24 hours	4/34 (11.8%)	4/11 (36.4%)	4.29 (0.86 to 1.48)	>0.05

\*statistically significant on multivariate analysis

From this series, the authors were able to highlight several factors that were associated with worse perioperative complications. The independent factors included high ASA score and perforation cases. Although ASA score has been criticised for its failure to consider the implications of several other important factors such as age, haemodynamic variables and operative findings, it is still able to accurately predict perioperative outcome in several recent series.<sup>12-16</sup> On a similar note, operating in a contaminated environment would have definitely contributed to the numerous local and systemic complications such as intra-abdominal collections and wound-related infections. In addition, the ensuing systemic response from the bacteraemia is not negligible and often carries significant morbidities. Hence, the conventional surgical teaching of copious lavage and early surgery in all perforated cases must be reinforced in an attempt to improve the outcomes.<sup>17,18</sup>

Duodenal stump leak was seen in 12 (14.1%) of our patients. This was rather disappointing when compared to the other series.<sup>3,19</sup> Apart from the low albumin levels which were well known to be associated with numerous postoperative complications,<sup>20,21</sup> we noted that the majority of the ulcers were from the pylorus and the duodenum. This would definitely have made the closure of the duodenum more challenging. Perhaps more importantly, duodenal stump leak was the only independent factor that was associated with mortality. Although our study is not sufficiently powered to determine if early diagnosis of the leak would have made a difference in the eventual outcome, it would be prudent to have a high index of suspicion of the possibility of a duodenal stump leak, especially in patients with the various aforementioned risk factors. Early detection and treatment are likely to be associated with better outcomes. Fortunately, a majority of patients with duodenal stump leak can be successfully managed conservatively, as seen in our series, without the routine need of a relook laparotomy.

Surprisingly, there appears to be an interesting trend seen in our series suggesting worse perioperative outcome in patients whom underwent emergency gastrectomy for non-neoplastic pathologies. This has also been supported in another small series.<sup>22</sup> Unfortunately, the small number of patients in both series would significantly undermine any true relationship if present. Further evaluation by larger series is perhaps warranted.

There were numerous limitations in our current study. The patients were enrolled from a single institution and retrospectively evaluated. The relatively small number of patients may also mask other important factors that could be accountable for the outcomes measured. In addition, there are no standardised guidelines in our institution governing the decision to perform gastrectomy and the subsequent surgical techniques. Any decisions were based

on the discretion of the primary surgeon.

Although these limitations are significant, this study remains important in highlighting the numerous issues pertinent in emergency gastrectomy that are rarely discussed in the literature. Our study also identified various factors that could predict worse postoperative complications and mortality following emergency gastrectomy.

## Conclusion

Emergency gastrectomy is associated with dismal morbidity and mortality rates. Patients with high ASA scores and perforations fared worse, and the presence of duodenal stump leaks is associated with increased risk of mortality.

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