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1 Year Outcomes after Emergency Laparotomy: A Retrospective Study

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Abstract: ***Emergency laparotomy (EL) is a high-risk surgical procedure commonly performed in older patients with significant comorbidities, leading to considerable postoperative mortality. This retrospective study analyzed 62 patients who underwent EL at R L Jalappa Hospital, focusing on one-year survival and factors influencing long-term outcomes. Among patients surviving the initial 90 days post-surgery, 20% died within one year, with outcomes primarily influenced by pre-existing comorbidities and medical complications rather than surgical factors. Higher ASA classifications, elevated Charlson Comorbidity Index (CCI) scores, and prolonged operative times were associated with poorer outcomes. Medical complications, particularly during the early postoperative phase, significantly contributed to long-term mortality. The findings emphasize the critical role of patient health optimization and effective management of complications in improving survival rates. This study underscores the importance of long-term follow-up and advocates for integrating predictive tools with standardized care protocols to enhance EL outcomes.***

Keywords: emergency laparotomy, long-term outcomes, mortality predictors, medical complications, comorbidities

1. Introduction

Emergency laparotomy (EL) is a common surgical procedure with a high incidence of postoperative complications. The patient population undergoing EL frequently consists of older individuals with significant comorbidities, predisposing them to complications and poorer outcomes. The increasing life expectancy and aging global population are driving a greater need for emergency surgery within this demographic. While emergency situations often preclude ideal patient selection, identifying high-risk patients with a low probability of survival is crucial. Predictive tools, such as the CELIOtomy score, have been developed to forecast early postoperative mortality after EL, aiming to prevent unnecessary surgical interventions.

Emergency laparotomy (EL) covers a broad spectrum of procedures, from minor to major, with considerable variation in surgical conditions. Reported one-year mortality rates after EL range from 22% to 34%, while studies focusing on shorter-term mortality (30 and 90 days) have reported rates between 11% and 24%. However, there is a lack of research examining outcomes beyond one year post-EL. Existing evidence indicates that long-term outcomes are primarily determined by patient-related factors, such as comorbidities and medical complications, rather than complications directly related to the surgical procedure. Therefore, this study aimed to investigate long-term outcomes and identify pre- and peri-operative factors associated with mortality following EL.

2. Materials and Methods

Type of study: A Retrospective Study.

Duration of Study: 1 Year.

Mode of selection of subjects: Retrospective Study conducted in Dept of General Surgery at R L Jalappa Hospital and Research centre.

Patients:
All patients (N = 62) who underwent midline emergency laparotomy between December 2023 to December 2024 were identified and reviewd from hospital discharge records.

Inclusion Criteria:
- All patients undergoing emergency laparotomy.

Exclusion Criteria:
- Age > 18 years
- Emergency laparotomy due to gynaecological causes

Statistical Analysis
Statistical analysis was performed using SPSS (version 27.0). Categorical data are presented as numbers and percentages, and continuous data as medians with interquartile ranges (25th-75th percentiles). Group comparisons used Pearson's chi-squared test for categorical variables and the Mann-Whitney U test for continuous variables. Statistical significance was defined as $p<0.05$. Cox regression analysis was used to determine hazard ratios (HRs) and 95% confidence intervals (CIs) for mortality during the follow-up period. Variables with a univariate p-value <0.1 were included in the multivariable Cox model and retained if their multivariate p-value was <0.05 or if they significantly improved the model fit (log-likelihood). The Cox regression model included age, ASA class, smoking status, CCI, operative time, urgency of operation, operative diagnosis, and preoperative levels of CRP, hemoglobin, albumin, and creatinine. Kaplan-Meier survival curves were generated for the most clinically relevant factors identified by the Cox model. Given the retrospective nature of the study, a formal power analysis was not conducted.

Data Extraction
The study collected data on patient demographics, as well as peri-operative and post-operative factors. These included: age, sex, diagnosis, type and duration of surgery, antibiotic use, type of complication, ICU and hospital length of stay (LOS), Charlson Comorbidity Index (CCI), American Society of Anesthesiologists (ASA) classification, and levels

of albumin, leukocytes, platelets, hemoglobin, and C-reactive protein (CRP). Data were obtained from electronic health records, anesthesia records, and surgical records. Surgical procedures were classified into three categories based on urgency: emergency (0.5–3 hours from surgical decision), very urgent (3–8 hours from surgical decision), and urgent (within 24 hours from surgical decision).

Complications were categorized as either operation-related or medical, based on a pre-defined protocol. Operation-related complications included surgical site infections, fascial rupture, hemorrhage, seroma formation, anastomotic leaks, strangulation or herniation, and the need for reoperation during the same admission. Medical complications included pneumonia, respiratory dysfunction, pulmonary embolism, sepsis, acute kidney injury, acute liver dysfunction, stroke, myocardial infarction, resuscitation (presumably cardiopulmonary), heart failure, and atrial fibrillation. Mortality data (in-hospital, 30-day, 90-day and 1 year) were collected from hospital records with additional data on dates of death for non survivors provided by the population register.

Study Flow Diagram:

All patients N=62

Survivors for more than 90 days N=41

	All Patients, N=62
30 day mortality	15
90 day mortality	21
1 year mortality	24

Characteristics of 41 Patients who Survived >90 Days:

Characteristic	Survivors N= 41	Non-Survivors N=21	P – Value
Age	21 - 62	58 - 86	< 0.001
Male gender	34	18	0.195
ASA class	3	3	<0.001
Pre op weight	56-82	64 - 78	0.431
Smoker	29	18	0.03
Excessive alcohol consumption	28	16	0.124
Pre op abdominal CT	37	15	0.932
History of abdominal surgery	22	13	0.785
Malignancy	8	3	<0.001
No comorbidities	20	16	<0.001
Underlying co morbidities:			
HTN	11	4	<.001
Coronary artery ds	3	1	0.821
Heart failure	2	1	<0.001
Kidney failure	4	3	0.266
Dm 2	16	6	0.045
Dm 1	1	1	<0.001
COPD	21	14	0.292
Asthma	12	6	0.0074
Hypercholesterolemia	1	4	0.433
Gout	0	0	0
Psychiatric problems	3	1	0.288
Chrons	2	1	0.898
Ulcerative colitis	3	4	0.066

Table 2: Peri Operative Data for 62 Patients who Survived >90 Days after Emergency Laparotomy:

Variant	Survivors N- 41	Non-Survivors N- 21	P - Value
Operation time, min	96- 108	122- 146	0.033
Urgency:			
Emergency [operation within 0.5-3h]	23	11	0.054
Very urgent [operation within 8h]	11	10	0.856
Urgent [operation within 24 h]	9	7	0.016
Diagnosis:			
Malignancy/tumor	2	3	<0.001
GI ulcer	4	2	0.933
Hernia	6	4	0.82
Vascular cause	2	3	0.139
HBP	1	1	0.789
Diverticulosis/colitis	4	1	0.097
Peritonitis	2	2	0.044
Ileus/occlusion	15	6	0.534
Injury	2	0	0.022
Other rare causes	1	1	0.633
Post operative complication	8	3	0.0813
Operation type:			
Abdominal wall, mesentry, peritoneum, and greater momentum	18	8	0.023
Upper GI	3	2	0.725
Small intestine and colorectal surgery	17	10	0.033
HBP	1	0	0.341
GI complication	2	1	0.954

Table 3: Outcomes of 62 Patients who Survived >90 days after Emergencyh Laparotomy

Post op CRP mg/dl	6-145	21-186	0.003
POD 1 CRP mg/dl	89-259	132-282	0.233
Pre op hb g/l	109-146	102-129	<0.001
POD 1 hb g/l	96-118	95-111	<0.001
Preop leucocytes	6.6-14.3	7.6-14.2	0.401
POD 1 leucocytes	7.6-13.9	7.3-13.7	0.969
Preop albumin	21-26	22-32	0.002
POD1 albumin	22-28	18-23	<0.001
Preop creat	54-94	56-123	0.053
POD 1 creat	55-92	56-114	0.096
Complications	22	15	0.001
Operation related complications	14	8	0.079
Medical related complications	19	12	<0.001
Hospital LOS	5-15	8-26	<0.001
Pre surgery LOS	0-3	0-4	0.009
Post surgery LOS	5-13	7-16	<0.001
ICU admission	10	9	<0.001
ICU LOS	03-	5-14	0.197
Antibiotic therapy:	38	17	0.002
<3 days	3	4	0.699
3-15 days	4	4	0.243
5-14 days	12	5	0.066
>14 days	19	4	0.492
Limitation of treatment	1	2	0.049
Other treatment restrictions	0	1	0.023
Withdrawl from Rx	0	1	0.056
Palliative Rx	4	0	0.006

Table 4: Logistic Cox Regression Analysis of Variables associated With Mortality during Follow Up in 62 Patients who Survived >90 Days after Emergency Laparotomy.

	OR	95% CI	P- Value
Duration of operation >60min	2.21	1.27-3.83	0.005
ASA >2	2.37	1.15-4.88	0.019
CCI >5	4.74	3.15-7.14	<0.001
Medical Complication	1.61	1.05-2.47	0.030
Operation Related Complications	0.77	0.50-1.20	0.236
Age	1.00	0.98-1.01	0.641

3. Results

A total of 62 patients survived >90 days after emergency laparotomy, includibne 21 who died during followup.the median follow up for survivors was 1 year.non survivors were more likely to be smokers (p = 0.030) and higher median ASA classification(p<0.001) than the survivors (table 1).survivors were less likely to have hypertension (p = <0.001), chronic aretery disease (p = 0.821), COPD (p = <0.001) and hypercholesterolemia (p =0.433) than non survivors.

Non survivors were more likely to undergo surgery within 8-24 hours than survivors (p=0.016). The duration of emergency laparotomy was longer (p= 0.033) and more often associated with malignancy (p<0.001) in the non survivors compared to survivors (table 2). The non survivors also had higher median pre operative CRP (p =0.003) and lower median pre operative (p <0.001) and post operative hemoglobin levels (p <0.001) compared to survivors. The non survivors had a higher rate of medical complications (p<0.001) and ICU admissions (p <0.001) compared to survivors palliative care (p = 0.006) were also more found between the two groups in ICU LOS, but the hospital LOS was longer among the non survivors (table 3).

4. Discussion

This study investigated the long-term (one-year) survival of patients who underwent emergency laparotomy (EL). The key finding was that among patients who survived the initial 90 days post-surgery, approximately 20% died within two years. The research revealed that patient-related factors, specifically pre-existing health conditions (comorbidities, as measured by CCI and ASA classifications), and medical complications arising during the initial recovery period, were the strongest predictors of long-term mortality. In contrast, the specific surgical procedure itself had less influence on long-term survival than the patient's overall health status.

A crucial aspect of this research was its focus on long-term follow-up. Most deaths occurred within the first year after EL, underscoring the extended recovery process and demonstrating that studies focusing solely on short-term mortality (90 or 180 days) underestimate the true long-term impact. This study's findings regarding the influence of comorbidities and complications are consistent with existing literature, which has linked higher ASA class, reduced functional status, and sepsis to increased mortality.

The research also confirmed the established link between medical complications and poorer outcomes, even in patients who survived the initial postoperative period. This aligns with previous findings of higher complication and 30-day mortality rates in emergency general surgery compared to elective surgery. The presence of malignancy was also identified as a contributing factor to mortality.

While the specific type of surgery performed during the EL did not directly correlate with long-term mortality, a longer operation time was associated with worse outcomes. This finding is consistent with prior research demonstrating a relationship between longer operative times and increased complications, such as surgical site infections.

In essence, this study provides valuable insights into the long-term prognosis following EL. It emphasizes the critical role of pre-existing health conditions and postoperative complications in determining long-term survival, suggesting that strategies focused on optimizing patient health before surgery and effectively managing postoperative complications could potentially improve long-term outcomes. Furthermore, the study highlights the necessity of long-term follow-up in research examining EL outcomes.

Existing literature confirms the high rates of complications and mortality associated with emergency general surgery. This study's observation that medical complications contribute to poor outcomes is consistent with these prior findings across various patient groups. Research by Havens et al., for example, showed that emergency general surgery patients were more likely to experience complications and 30-day mortality than elective surgery patients, even when considering pre-existing health conditions and overall physiological status. Importantly, this study found that medical complications remained a significant mortality risk even among patients who survived the initial 90 days after surgery. Additionally, a majority of the non-survivors in this study had a history of malignancy, a known risk factor for 30-day mortality after emergency laparotomy.

Although the specific surgical procedure itself did not correlate with mortality during the follow-up period, longer operation times were associated with worse long-term outcomes. While the link between operative time and postoperative complications is well-documented, its association with mortality is less clear. A previous meta-analysis demonstrated a progressive increase in complications (such as surgical site infections, wound issues, bleeding, pneumonia, urinary tract infections, and renal failure) with longer operations. However, this study did not find a direct relationship between operation-related complications and mortality, likely because the analysis only included patients who survived the first 90 days.

The discussion then turns to risk assessment and standardized care. While risk scoring systems like POSSUM exist, their complexity often limits their practical use in emergency situations. Reports from NELA and ELC indicate that implementing care bundles can reduce mortality and length of hospital stay following EL. The ELC bundle includes key elements such as monitoring patient status (NEWS/SIRS/arterial lactate), early sepsis recognition and antibiotic administration, prompt transfer to the operating room (within 6 hours of the decision), senior clinician consultation, cardiac output monitoring, and mandatory ICU admission for all EL patients. Standardized treatment

protocols are known to improve outcomes in emergency surgery.

The discussion concludes by suggesting that integrating risk calculators with care bundles could further improve the quality of care for EL patients. Finally, it emphasizes the importance of assessing quality of life and life expectancy in high-risk patients *before* they undergo emergency surgery.

Research indicates that adverse surgical events negatively affect quality of life, especially in general and gastrointestinal surgery, as shown in a systematic review by Bouras et al. Given the high complication rates following emergency laparotomy (EL), which are further increased by multiple health conditions and older age, minimizing the long-term impact on patients' quality of life is essential. Although withholding surgery could be an option in some cases, this has been minimally explored in research. A significant challenge lies in identifying patients who would not benefit from surgery and would be better suited for palliative care. Currently, there are no clear criteria for determining which patients should forgo surgery. Patient selection in emergency situations is particularly challenging, as it is often a reactive process, unlike the planned selection in elective surgery. While Saunders et al. demonstrated the feasibility of using patient-reported outcomes to assess quality of life after EL, their study was affected by recruitment bias. Consequently, further research specifically investigating quality of life following EL is necessary.

5. Conclusions

This study's key result shows that among patients who survived the initial 90 days after emergency laparotomy (EL), approximately 20% died within one year. Poorer long-term outcomes following EL were linked to postoperative medical complications, higher ASA class (reflecting greater pre-operative health risks), and higher CCI scores (indicating a greater burden of comorbidities).

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