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Spectrum of Emergency Celiotomy at National Institute of Medical Sciences and Research, Jaipur

Shashank Singhal[1*], Satyendra Pal Singh[2], Nikhil Mishra[3]

[1,2]Department of General Surgery, NIMS University Rajasthan, Jaipur, India
[3]Department of Pharmacy Practice, NIMS University Rajasthan, Jaipur, India

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***Corresponding author:** Dr. Shashank Singhal

Abstract | **Original Research Article**

Emergency Celiotomy is a high risk procedure. This was a hospital-based descriptive study performed in a tertiary care teaching hospital. Celiotomies are more often than not performed in an emergency setting, where these are life-saving procedures, but because of lack of adequate investigations and pre-operative definitive diagnosis as well as inherent risks of the major surgery and anesthesia, involve a significant risk of morbidity and mortality.The aim of the study is to determine the spectrum of emergency celiotomy. Total number of 265 patients were involved under this study who were admitted to the Department of General Surgery, National Institute of Medical Sciences and Research, Jaipur. After collecting the data, the statistical analysis was performed using the licensed version of statistical package for social science version 17 (SPSS-17) available in the department of Preventive and Social Medicine, NIMSR, Jaipur. Peptic perforation (33%), acute intestinal obstruction (21%) and abdominal trauma (21%) are the common causes of Emergency Celiotomy. In our study, early on the day of admission, is the sheet anchor in saving these patients. 82.3% cases of our study were operated within 24 hours of admission. Emergency celiotomy carries with it a high mortality (12.1%) and this mortality is more common in patients with abdominal trauma, because of associated injuries and delayed presentation.

Keywords: Celiotomy, investigations, morbidity, mortality, abdominal.

INTRODUCTION

Celiotomies are one of the most common surgeries performed in the Emergency Operation Theatre. A celiotomy, or a Laparotomy, is a surgical procedure involving an incision through the abdominal wall to gain access into the abdominal cavity [1]. Celiotomies are more often than not performed in an emergency setting, where these are life-saving procedures, but because of lack of adequate investigations and pre-operative definitive diagnosis as well as inherent risks of the major surgery and anesthesia, involve a significant risk of morbidity and mortality [2-4]. Acute mechanical bowel obstruction is a major cause of morbidity and mortality, and is the cause of nearly 15-20% of admissions for acute abdomen. Nearly 85-90% of bowel obstruction originates in the small intestine. Conservative management with bowel rest, nasogastric decompression and fluid resuscitation is often successful but nearly 30% of cases still need operative treatment [5, 6]. Emergency Celiotomies are associated with a high post-operative complication rate such as wound infection, anastomotic leak, electrolyte imbalance, septicemia, hemorrhage, pulmonary complications etc. There are also late complications such as incisional hernia formation [7, 8]. This study focuses on the etiology behind the Emergency Celiotomy and its outcome, including post-operative complications and mortality, at a tertiary care center, the National Institute of Medical Sciences and Research, Jaipur.

MATERIALS AND METHODS

This study was conducted in Department of General Surgery, National Institute of Medical Sciences and Research, Jaipur. The duration of the study was eighteen months. Approval to conduct this study was obtained from the Institutional Ethics Committee before starting the study. Total number of 265 patients were involved under this study who were admitted to the Department of General Surgery, National Institute of Medical Sciences and Research, Jaipur. We informed patients about the study, along their caretakers. Only those who agreed to participate were included in the study. A suitable data collection form was degined to collect and document the data. After collecting the data,

the statistical analysis was performed using the licensed version of statistical package for social science version 17 (SPSS-17) available in the department of Preventive and Social Medicine, NIMSR, Jaipur.

RESULTS

Out of a total of 265 cases of celiotomy studied, 209 (78.9%) were due to Acute abdomen, while 56 (21.1%) were due to abdominal trauma.

Table-1: Distribution of the cases according to Age groups

Age Group (years)	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma (%age)
< 20	4 (1.9%)	2 (3.6%)
20-40	50 (23.9%)	12 (21.4%)
40-60	77 (36.8%)	18 (32.2%)
60-80	64 (30.6%)	17 (30.4%)
>80	14 (6.7%)	7 (12.5%)
TOTAL	**209** (100%)	**56** (100%)

The mean age of all cases was 53.1 years, with the mean age of patients with acute abdomen being 53 years and the mean age of patients with abdominal trauma being 53.5 years. The difference between the 2 groups was statistically insignificant.

Table-2: Distribution of the cases according to Sex Distribution

Sex	Number of cases due to Acute Abdomen(%age)	Number of cases due to Trauma(%age)
Male	141 (67.5%)	38 (67.9 %)
Female	68 (32.5%)	18 (32.1%)
TOTAL	**209** (100%)	**56** (100%)

The male: female ratio was 2.08:1. The male emale ratio in patients with acute abdomen was 2.07:1 and the male: female ratio in patients with abdominal trauma being 2.1:1. The difference between the 2 groups was statistically insignificant, with the p-value being 0.95.

Table-3: Number of cases with a History of Previous Celiotomy

History of Previous Celiotomy	Number of cases due to Acute Abdomen(%age)	Number of cases due to Trauma(%age)
Present	46 (22%)	0 (0%)
Absent	163 (78%)	56 (100%)
TOTAL	**209** (100%)	**56** (100%)

Out of a total of 265 cases, 46 cases had a positive history of previous celiotomy. No cases with abdominal trauma had a history of previous celiotomy, while 22% of case with acute abdomen had a positive history of previous celiotomy.

Table-4: Number of cases with Presence of Comorbidities

Presence of Comorbidities	Number of cases due to Acute Abdomen(%age)	Number of cases due to Trauma(%age)
Present	101 (48.3%)	38 (67.9%)
Absent	108 (51.7%)	18 (32.1%)
TOTAL	**209** (100%)	**56** (100%)

Above depicted table and figure show the presence or absence of any comorbidities in the study group.

Table-5: Distribution of Cases according to Clinical Features

Clinical Feature	Number of cases due to Acute Abdomen			Number of cases due to Trauma		
	Present	Absent	%age	Present	Absent	%age
Fever	73	136	34.9	22	34	39.3
Pallor	41	168	19.6	11	45	19.6
Hernia	19	190	9.1	2	54	3.6
Abdominal Distension	185	24	88.5	47	9	84
Abdominal Guarding	158	51	75.6	32	24	57.1
Abdominal Tenderness	201	8	96.2	35	21	62.5
Abnormal Digital Rectal Examination	12	197	5.7	10	46	17.8

As shown in above figures, there was no statistically significant difference between the two groups on the basis of fever, pallor and abdominal distension; while, abdominal guarding and tenderness were both more in cases with trauma.

Table-7: Distribution of Cases according to Lab Investigations

Clinical Feature	Number of cases due to Acute Abdomen			Number of cases due to Trauma		
	Present	Absent	%age	Present	Absent	%age
Hemoglobin - < 10g/dl	40	169	19.1	25	31	44.64
Total Leucocyte Count - > 11000/cu mm	135	74	64.6	42	14	75
Renal Function Tests - deranged	70	139	33.5	8	48	14.3

Increased TLC was seen in majority of cases, whether they were due to acute abdomen or trauma. RFTs were deranged more commonly in patients with acute abdomen, with the difference being statistically significant.

Table-8: Distribution of Cases according to X-Ray findings

X-Ray Findings	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma(%age)
Gas Under Diaphragm	98 (46.9%)	18 (32.1%)
Multiple Fluid Levels	79 (37.8%)	0 (0%)
Dilated Loops	10 (4.8%)	17 (30.4%)
Non-specific	22 (10.5%)	21 (37.5%)
TOTAL	**209** (100%)	**56** (100%)

Table-9: Distribution of Cases according to USG findings

USG Findings	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma (%age)	Total Number of Cases (%age)
Not Done	81 (38.8%)	26 (46.4%)	107 (40.4%)
Perforation	4 (1.9%)	2 (3.6%)	6 (2.3%)
Obstruction	72 (34.5%)	0 (0%)	72 (27.2%)
Appendicitis	12 (5.7%)	0 (0%)	12 (4.5%)
Free Fluid	30 (14.3%)	14 (25%)	44 (16.6%)
Splenic Injury	0 (0%)	6 (10.7%)	6 (2.3%)
NAD	6 (2.9%)	3 (5.4%)	9 (3.4%)
Others	4 (1.9%)	5 (8.9%)	9 (3.4%)
TOTAL	**209** (100%)	**56** (100%)	**265** (100%)

USG was not done in a total of 107 cases. Features of obstruction was the most common finding, none of the cases in patients with trauma. In patients with abdominal trauma presence of free fluid was the most common finding.

Table-10: Distribution of Cases according to CT findings

CT Findings	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma (%age)
Not Done	172 (82.3%)	39 (69.6%)
Perforation	6 (2.9%)	0 (0%)
Obstruction	24 (11.5%)	0 (0%)
Free Fluid	0 (0%)	6 (10.7%)
Splenic Injury	0 (0%)	6 (10.7%)
Others	7 (3.4%)	5 (8.9%)
TOTAL	**209** (100%)	**56** (100%)

CT was not done in a total of 211 cases. Features of obstruction was the most common finding in patients with acute abdomen. In patients with abdominal trauma, presence of free fluid and splenic trauma were the most common findings.

Table-11: Distribution of Cases according to Pre-operative Diagnosis

Pre-operative Diagnosis	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma (%age)	Total number of cases (%age)
GI Perforation	107 (51.2%)	21 (37.5%)	128 (48.3%)
GI Obstruction	71 (34%)	0 (0%)	71 (26.8%)
Perforated Appendix	7 (3.4%)	0 (0%)	7 (2.6%)
Obstructed Hernia	12 (5.7%)	0 (0%)	12 (4.5%)
SAIO	3 (1.4%)	0 (0%)	3 (1.1%)
Intra-Abdominal Abscess	3 (1.4%)	0 (0%)	3 (1.1%)
Peritonitis	2 (0.96%)	0 (0%)	2 (0.75%)
Penetrating Injury	0 (0%)	8 (14.3%)	8 (3%)
Blunt Splenic Injury	0 (0%)	6 (10.7%)	6 (2.3%)
Blunt Bladder Injury	0 (0%)	3 (5.4%)	3 (1.1%)
BTA	0 (0%)	13 (23.2%)	13 (4.9%)
Blunt Liver Injury	0 (0%)	3 (5.4%)	3 (1.1%)
Great Vessel Injury	0 (0%)	2 (3.6%)	2 (0.75%)
Other	4 (1.9%)	0 (0%)	4 (1.5%)
TOTAL	**209** (100%)	**56** (100%)	**265** (100%)

Table-13: Distribution of Cases according to Post-Operative Diagnosis

Post-operative Diagnosis	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma (%age)	Total Number of Cases (%age)
Gastric Perforation	39 (18.7%)	5 (9%)	44 (16.6%)
Duodenal Perforation	48 (23%)	7 (12.5%)	55 (20.8%)
Jejunal/Ileal Perforation	14 (6.7%)	7 (12.5%)	21 (7.9%)
Appendicular Perforation	7 (3.4%)	0 (0%)	7 (2.6%)
Large Bowel Perforation	3 (1.4%)	0 (0%)	3 (1.1%)
Small Bowel Obstruction	27 (12.9%)	0 (0%)	27 (10.2%)
Large Bowel Obstruction	29 (13.9%)	0 (0%)	29 (10.9%)
Intussusception	6 (2.9%)	0 (0%)	6 (2.3%)
Obstructed Hernia	12 (5.7%)	0 (0%)	12 (4.5%)
Blunt Liver Injury	0 (0%)	3 (5.4%)	3 (1.1%)
Blunt Splenic Injury	0 (0%)	6 (10.7%)	6 (2.3%)
Blunt Bowel Injury	0 (0%)	13 (23.2%)	13 (4.9%)
Blunt Bladder Injury	0 (0%)	3 (5.4%)	3 (1.1%)
Blunt Mesenteric Injury	0 (0%)	2 (3.6%)	2 (0.75%)
Penetrating Small Bowel Injury	0 (0%)	5 (8.9%)	5 (1.9%)
Penetrating Large Bowel Injury	0 (0%)	3 (5.4%)	3 (1.1%)
Great Vessel Injury	**0 (0%)**	**2 (3.6%)**	**2 (0.75%)**
Appendicular Abscess	5 (2.4%)	0 (0%)	5 (1.9%)
Psoas Abscess	3 (1.4%)	0 (0%)	3 (1.1%)
Ruptured Liver Abscess	2 (0.96%)	0 (0%)	2 (0.75%)
Retroperitoneal Abscess	1 (0.48%)	0 (0%)	1 (0.38%)
Perinephric Abscess	1 (0.48%)	0 (0%)	1 (0.38%)
Mesenteric Ischemia	4 (1.9%)	0 (0%)	4 (1.5%)
Volvulus	6 (2.9%)	0 (0%)	6 (2.3%)
Inoperable Malignant Lesion	2 (0.96%)	0 (0%)	2 (0.75%)
TOTAL	**209** (100%)	**56** (100%)	**265** (100%)

All 265 cases were broadly classified into having 27 different diagnoses post-operatively and the resulting distribution is depicted in the below shown table and figure.

The most common diagnosis is peptic perforation (duodenal > gastric) followed by intestinal obstruction. In cases with abdominal trauma, most common diagnosis is bowel injury followed by splenic injury.

Table-14: Distribution of Cases according to Post-operative Complications

Post-operative Complications	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma (%age)	Total Number of Cases (%age)
Wound Infection	67 (32.1%)	0 (0%)	67 (25.3%)
Wound Dehiscence	6 (2.9%)	3 (5.4%)	9 (3.4%)
Anastomotic Leak	2 (0.96%)	0 (0%)	2 (0.75%)
Intra-Abdominal Abscess	3 (1.4%)	5 (9%)	8 (3.0%)
Entero-cutaneous Fistula	3 (1.4%)	0 (0%)	3 (1.13%)
Others	10 (4.8%)	12 (21.4%)	22 (8.3%)
None	118 (56.5%)	36 (64.3%)	154 (58.1%)
TOTAL	**209** (100%)	**56** (100%)	**265** (100%)

In most cases, no complication is seen post-operatively. The most common post-operative complication seen is wound infection, which was seen in nearly 25% cases.

Table-15: Distribution of Cases according to Mortality

	Number of cases due to Acute Abdomen (%age)	Number of cases due to Trauma (%age)
Mortality (in number of cases)	17 (8.1%)	15 (26.8%)
Discharged patients	192 (91.9%)	41 (73.2%)
TOTAL	**209** (100%)	**56** (100%)

Our study, a total of 32 patients out of 265 cases died during the hospital stay. The distribution of cases according to mortality is depicted above.

DISCUSSIONS

In this study, the age of the patients varied from 18 to 84 years of age. The majority of the patients were in their 5th or 6th decades of life. This result matches with the study conducted by Gejoe *et al*. [2] in 2016 where 30.6% of cases were in the 40-60 year age group. Also, in the study conducted by Kumar, Haresh *et al*. [4] in 2018, 33.5% of all cases were in the 41-60 year age group. In the study conducted by A.Clarke *et al*. in UK [7], the mean age of the patients was 63 years with a SD of 18 years. Also a UK based study conducted in 2012 by D.I. Saunders *et al*. [9] reported maximum number of cases in 60-80 years age group. K. Muqueem *et al*. [3] also reported that majority of emergency celiotomy patients were in the 21-50 years age group in his study in 2018 in Karnataka. In the study conducted by A.K. Srivastava *et al*. [10] as well as in the one conducted by Gopalakrishnan et al in 2018 [11], the majority of the cases were in 20-40 years age group. For the patients with abdominal trauma, the majority of the cases in our study were in 40-60 year age group. In the study conducted by Tripathi *et al*. in 1991 [12], 77% cases were in the 11-40 years age group. The mean age of the patients with BTA was 32.5 years in the study conducted by Brasel *et al*. in 1998 [13]. This data can be explained by the fact that people in this age group are generally more active and travel more and are thus prone to RTAs and other occupation-related hazards. The data obtained in this study is in accordance with the general admission trends of this hospital and the population trend of the district. Nair *et al*. in 1981 [14] and Vaidyanathan *et al*. in 1986 [15] studied cases with GI perforation and found most cases to be in 2nd and 3rd decades of their life. In our study, we have 86 female patients out of a total of 265 cases, with a male: female ratio of 2.08:1. This male preponderance follows the general admission trend of this hospital. Gejoe *et al*. [2] reported a M:F ratio of 3.08:1, K. Muqueem *et al*. [5] reported a ratio of 2.33:1; while H. Kumar *et al*.[3] reported a M:F ratio of 5.07:1 in a case study of 164 cases. On the other hand, in the UK based study conducted in 2012 by D.I. Saunders *et al*. [9] reported a M:F ratio of 0.90:1 and A. Clarke *et al*. noted the M:F ration to be 0.69:1. [7] By studying cases of Enteric Perforation, in the study conducted by Singh *et al*. in 1975 [16], they noted a M:F ratio of 2.7:1 and Mock *et al*. noted the ration to be 2.4:1 in 1992 [17]. In BTA cases, Branney *et al*. noted the M:F ratio to be 2.1:1 in 1997[18]. We have found in our study that out of 265 cases, 56 (21.13%) cases were due to abdominal trauma. G. Gejoe *et al*. [2] also reported similar findings in that they observed that out of 376, 17.3% celiotomies were due to abdominal trauma. K. Muqueem *et al*.[3] reported that in their study 21.2% of 137 cases were due to abdominal trauma. The history of any previous celiotomy often denotes an ongoing disease process or can be a cause of disease itself. For

example, post-operative adhesions are a major cause of intestinal obstruction; a history of peptic perforation due to NSAID abuse can predispose a patient to the same disease, especially if a patient does not cease the NSAID overuse. In our study we have found a history of previous celiotomy in 17.6% of cases. This result matches the value obtained by G. Gejoe *et al*.[2] in their study in 2016, in which a history of previous celiotomy was found in 18.9% of 376 cases and also that by K. Muqueem *et al*. [3] who reported history of previous celiotomy in 13.1% cases. Post-operative adhesions have been found to be the most common cause of intestinal obstruction by many researchers including DB O'Connor *et al*.[25], Strickland *et al*. [19], and Ghosheh *et al*.[20]. In this study, we have found that of the 46 cases who had a history of a previous celiotomy, 43 had intestinal obstruction due to adhesion formation, while the remaining 3 cases had ileal perforation. For the purpose of this study, comorbidities were defined as any previous illness for which regular medications were being taken by the patient or he/she was on a regular follow-up. Examples include, Diabetes Mellitus, Pulmonary TB, Asthma, COPD, Hypertension and Chronic Liver disease or any substance abuse. This history is very important in the patient care and prior knowledge of any positive history can determine the patient mortality and morbidity. Diabetes leads to poor wound healing and predisposes a patient to wound sepsis as well as anastomotic leak. History of respiratory disease predisposes a patient to post-operative respiratory failure. In this study, comorbidities were present in 52.45 % of all 265 cases. This result is similar to the one obtained by Gejoe *et al*. [2], who reported that comorbidities were present in 52.9% (199) of the 376 cases. K. Muqueem *et al*. [3] reported that substance abuse was present in 37.2% of all cases and 56.9% cases had a history of comorbidity. We have found in our study that all of the celiotomies conducted on an emergency basis were necessary. All patients had an underlying pathology that was treated during the celiotomy. Morbidity is slightly increased by a negative celiotomy in blunt abdominal trauma, but with advancements in imaging technologies and ICU care, rates of negative celiotomy have been decreasing[21,22]. As studied by Ross *et al*.[23] and Dalton *et al*. [24], surgeon should not hesitate to operate, when in doubt, in acute abdomen or abdominal trauma.

CONCLUSION

Emergency Celiotomy is a high risk procedure. Peptic perforation (33%), acute intestinal obstruction (21%) and abdominal trauma (21%) are the common causes of Emergency Celiotomy. In our study, early on the day of admission, is the sheet anchor in saving these patients. 82.3% cases of our study were operated within 24 hours of admission. Emergency celiotomy carries with it a high mortality (12.1%) and this mortality is more common in patients with abdominal trauma, because of associated injuries and delayed presentation. Conservative management has a definitive role in blunt abdominal trauma.

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