Original article

Spectrum of Gastrointestinal Perforations in a Tertiary Care Hospital of Central Nepal: An Analytical cross-sectional study

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Abstract

Introduction: Perforations of the gastrointestinal tract are frequently encountered surgical emergencies associated with high morbidity and mortality. This study was conducted to evaluate different spectrum of gastrointestinal tract perforations, their presentations, mode of surgery, complications and factors associated with mortality.

Methods: This was an analytical cross-sectional study conducted in the Surgical Gastroenterology Department at College of Medical Sciences, Bharatpur, Chitwan, Nepal from October 1st 2021 to October 31st 2022. Patients undergoing emergency laparotomy for GI tract perforations were included in this study. Patients demographics, comorbidities, preoperative investigation, site and cause of perforation, type of surgery and postoperative complications were recorded.

Results: A total 100 patients with gastrointestinal perforations were analyzed. The mean age was 46.55 years. Male predominance with M:F=1.56:1 was seen. Almost 54% patients presented after 24 hrs of onset of pain. Peptic ulcer disease as a cause of perforation was seen in 26%, trauma in 23% cases, appendicular perforation in 20%, malignant perforation in 8%, tubercular perforation in 7% and foreign body perforation in 3% cases. Duodenal, appendicular and colorectal perforations were seen in 28%, 20% and 17% cases respectively. Total morbidity was 54% and mortality was 13%. Increasing age, delayed presentation, presence of comorbidities, systolic blood pressure less than 100 mm Hg, oliguria, presence of malignancy were significantly associated with high mortality.

Conclusion: Perforations of duodenum, appendix and colorectum are commonly encountered. Acid peptic disease, trauma and infections are the leading causes of perforations. Increasing age, delay in presentation, comorbidities, oliguria and hypotension are the factors associated with high mortality.

Keywords: Acid peptic disease; Gastrointestinal perforations; Infections; Trauma; Malignancy.

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Introduction

Despite progress in surgical techniques, antimicrobial therapy and intensive care support, gastrointestinal tract perforation remains a condition associated with considerable mortality, ranging from 10-30%.[1] Patients can land in emergency with varied presentation. Oesophageal perforations can present with non-specific symptoms such as acute chest pain, odynophagia and vomiting, gastroduodenal and small bowel perforations present with acute abdominal pain, whereas colonic perforations tend to follow a slower progression course, presenting with secondary bacterial peritonitis or localised abscess formation.[2]

The numerous underlying causes implicated in GI tract perforations include: penetrating foreign body, bowel obstruction secondary to intraluminal, intramural or extrinsic pathology, direct loss of bowel wall integrity secondary to blunt trauma, gastrointestinal ischemia, and infection.[2] Most of the patients, in this part of the world, present with perforation of the upper gastro intestinal tract whereas in the western world the distal gastro intestinal tract is generally involved.[4] Most of the time presentation to the hospital is delayed with established peritonitis with purulent or fecal contamination and sometimes with septicemia. [4]

To identify high-risk patients for more aggressive treatment procedures, and determination of the best perioperative anesthetic management, early prognostic evaluation of abdominal sepsis is needed.[5] Age, sex, site of perforation, renal dysfunction, hypoglycemia, the duration of symptoms have been reported as the determinants of morbidity and mortality in patients with GI tract perforations.[4]

This study was designed to evaluate the different types and causes of GI tract perforations, different surgical interventions, complications and predictors of morbidity and mortality.

Methods

An analytical cross-sectional study was conducted in the Surgical Gastroenterology Department at College of Medical Sciences, Bharatpur, Chitwan, Nepal conducted from October 1st 2021 to October 31st 2022. Patients undergoing emergency laparotomy for GI tract perforations were included in this study. Patients with age less than 15 years, with upper and mid-oesophageal perforations, patients who died intra-operatively were excluded from this study.

Sample size was calculated using Cochran formula by taking 13.7% as prevalence[6] with 95% confidence interval and 7% margin of error. The optimum sample size was (n= $n=Z^2pq/e^2=1.96*1.96*0.137*0.867/(0.07)2=93$ but this study was conducted among 100 patients. Ethical clearance was taken from Institutional Review Committee of College of Medical Sciences and Teaching Hospital (Ref.no.COMSTH-IRC/2021-65/01). Informed and written consent was taken from all the patients prior to the enrollment.

All the patients where resuscitated prior to laparotomy depending on the urgency of the surgical conditions. Patients demographic, comorbidities, preoperative investigation, site and cause of perforation, type of surgery and postoperative complications were recorded in a pre-designed proforma. Postoperative complications were noted till 30 days of laparotomy. All the collected data was checked for completeness and accuracy. Data was entered and analyzed using SPSS version 20.0. Data was analyzed by using descriptive and inferential statistics. In the descriptive statistics, for categorical variables frequency and percentage were calculated whereas for continuous variables mean and standard deviation were calculated. In the inferential statistics to find the association between variables Chi-square test was used. P-value less than 0.05 was considered as statistically significant.

Results

The mean age was 46.55 years. There were 61% males with M:F ratio of 1.56:1. Mostly 54% patients presented after 24 hours of onset of pain. Abdominal pain, obstipation and abdominal distension were seen in 100%, 70% and 59% cases while peritonitis was seen in 72% of the cases (**Table 1**). Seventy one percent patients presented with decrease in urine output. Comorbidities like hypertension (HTN), diabetes mellitus (DM) and respiratory problems were seen in 21%, 9% and 17% cases respectively. History of smoking and alcohol intake was seen in 45% and 22% cases respectively.

Systolic blood pressure of <100 mmHg was seen in 30% of the patients. Leucocytosis was seen in 82% patients while

Table 1. Age, gender, presenting symptoms and signs and timing of presentation

Age (Mean±SD)	46.55±19.36
Gender	
Male	61
Female	39
M:F	1.56:1
Presenting symptoms and signs	
Abdominal pain	100
Not passing stool and flatus	70
Abdominal distension	59
Peritonitis	72
Systolic BP <100 mm Hg	30
Oliguria (urine <30ml/hour)	71
Presenting symptom duration	
≤24 hrs	46
≥24 hrs	54

Table 2. Important lab investigations

Parameters	No. of patients
Haemoglobin <10 gm%	10
Total leucocyte count	
10,000-20,000	72
>20000	10
Sodium <135 meq/l	41
Potassium <3.4 meq/l	37
Urea >28mg/dl	47
Creatinine > 1.2 mg/dl	68

hyponatremia, hypokalemia and raised urea was seen in 41%, 37% and 47% cases (**Table 2**). Peptic ulcer disease as a cause of perforation was seen in 26%, trauma as a cause of perforation (blunt trauma, penetrating trauma and iatrogenic) was seen in 23% cases, appendicular perforation in 20%, malignant perforation in 8%, tubercular perforation in 7% and foreign body perforation in 3% cases (**Table 3**). Duodenal, appendicular and colorectal perforations were seen in 28%, 20% and 17% cases respectively. Exploratory laparotomy with omental patch repair was done in 26% cases, exploratory laparotomy with resection anastomosis with diversion ileostomy/colostomy done 16% cases. The overall morbidity was 54% and mortality was 13% (**Table 4**).

Discussion

Gastrointestinal tract perforations are frequently encountered in the surgical emergency and are associated with high degree of morbidity and mortality. The mean age of the patients in this study was 46.55 and M:F ratio was

Table 3. Site of perforation and cause of perforations

Site of perforation	No. of patients
Duodenum	28
Appendix	20
Ileum	16
Colorectal	17
Stomach	8
Jejunum	8
Gallbladder	2
Distal oesophagus	1
Cause of perforation	
Trauma	23
Acid peptic disease	26
Appendicitis	20
Malignancy	8
Obstruction	5
Diverticular disease	4
Tuberculosis	7
Foreign body impaction	3
Others	4

Table 4. Complications seen

Overall morbidity	**54(54%)**
Pneumonia	20 (35.7%)
Wound infection	21(37.5%)
Wound dehiscence	7(21.42%)
Anastomotic leak	5(8.9%)
Overall mortality	**13(13%)**

1.56. The mean age in similar studies done by Shrestha et al[7] and Chakma et al[8]; ranged from 37 years to 48.8 years and M:F ratio ranged from 1.18 to 4:1 in the same studies. The common presenting symptoms and signs were pain abdomen (100%), not passing stool and flatus (70%), abdominal distension (59%), peritonitis (72%), oliguria (71%) and shock (30%). Gupta et al[9] in similar study found pain abdomen (100%), not passing stool and flatus (67%), abdominal distension (84.5%), peritonitis (88.2%), and shock (33.3%). Poudel et al[10] in their study found pain abdomen (100%), not passing stool and flatus (20%), abdominal distension (42.2%), and shock (23.3%).

Delay in presentation is one of the factors for increased morbidity and mortality in GI perforations due to increased risk of septicemia. In the present study delay in presentation beyond 24 hours was seen in 54% cases. Similar finding was seen in study by Shrestha et al[7] where 53.8% patients presented beyond 24 hours.

GI perforation can occur from the oesophagus to the rectum, and depending on the site, the presentation can vary. In the present study duodenal perforation was seen in 28% cases followed by appendicular (20%), ileal (16%) and colorectal perforation(17%). Perforation of the oesophagus(1%) and gallbladder(2%) were less common site of perforation. Various studies from Nepal and India show duodenal perforation(27.7%-57%) as the most common site of perforation followed by ileal(22%-28.4%) and appendicular perforation (12%-23.06%).[7,11,12] Among the traumatic perforations there were four cases of iatrogenic perforations, two ERCP induced retroduodenal perforations managed conservatively and two cases of colonoscopic perforations managed with laparotomy and primary repair. We had more colorectal perforations (16%) much more than (4%-4.8%) from other similar studies from Nepal and India[7,11,12] but worldwide the rate of large bowel perforation is variable and ranges from 1.275-32%.[13] The explanation for this findings of colorectal perforation is that our institute is a tertiary care center in central Nepal with availability of GI surgical unit with expertise and we get referral from far west and eastern region of Nepal. In this study traumatic perforations were also high due to close proximity of the hospital to east-west national highway.

The underlying cause of GI tract perforation are penetrating foreign body, bowel obstruction secondary to intraluminal, intramural or extrinsic pathology, direct

Table 5. Factors associated with adverse outcome

Variables	Outcome		p value
	Discharge	Death	
Age			
≤ 50	49	03	0.036**
>50	38	10	
Gender			
Male	52	09	0.762**
Female	35	04	
Symptom onset			
≤ 24 hrs	43	03	0.067**
>24 hours	44	10	
Co morbidities			
Absent	47	02	0.015**
Present	40	11	
Urine output			
>30 ml/hr	29	1	0.018** (fischer exact)
<30 ml/hr	58	12	
Systolic BP (mm Hg)			
less than 100	20	10	0.000**
100 and more	67	03	
Haemoglobin (gm/dl)			
< 10	6	4	0.024
≥10	81	9	
Potassium (Meq/L			
< 3.5	30	7	0.177
≥3.5	57	6	
Urea (mg/dl)			
≤ 28	49	4	0.083**
> 28	38	9	
Sodium (Meq/L)			
≤ 135	32	9	0.035**
>135	55	4	
Malignancy			
absent	82	9	0.015**
present	5	4	

loss of bowel wall integrity secondary to blunt trauma, gastrointestinal ischemia, and infection. Depending on the cause, the presentation and outcome may vary. In the present study the most common cause of perforation was acid peptic disease (26%), trauma-23% (including blunt trauma, penetrating injury and iatrogenic trauma), appendicitis-20%, tuberculosis-7%, malignancy-8%, obstruction-5%, diverticular disease -4% (1 jejuna and 3 colonic) and foreign body impaction-3%. In similar studies cause of perforations were acid peptic disease in (21.4%-58.92%), trauma (7.75-17.64%), appendicitis (3.9%-23.07%), tuberculosis (2.2%-10%) and cancer (2.4%-7.8%).[7,9-11,14]

Postoperative complications lead to morbidity and prolong hospital stay. In the present study overall morbidity was seen in 56(56%) patients out of which respiratory complications were seen in 20(35.7%), surgical site infection in 21(37.5%), wound dehiscence in 7(12.5%), acute kidney injury in 12(21.42%), MODS in 10(17.85%) and anastomotic leak in 5(8.9%%). In similar studies the overall morbidity was 42.8%-57.7%, out of which respiratory complications were 24.2%-35.7%, wound infection 20.1-37.5%, wound dehiscence 9-13.3%, and anastomotic leak in (6.1-7.7%) cases. [7,9,11,12,14]

The overall mortality in our study was 13% which was in range with similar studies.[7,9,11,12,14] On analyzing cause of death in these patients most of the patients (69.23%) were more than 60 years with comorbidities in the form of COPD. Malignant perforation was the cause of death in 30.76% patients, duodenal perforation and tubercular perforations were the cause of death in 23.07% patients each.

On analyzing various factors associated with mortality, age >50 years, delay in presentation >24 hours, associated comorbidities, urine output<30ml/hour, systolic BP <100 mmHg, hemoglobin <10 mg/dl, hyponatremia and malignant perforations were significantly associated with increased mortality with p-value <0.05 (**Table 5**). Kumar et al[4] and Meena et al[14] in their study also reported these factors to be significantly associated with increased mortality and morbidity.

Although our findings are in line with the findings of similar studies done elsewhere, due to the of number of patients and being a single-centre study, our study findings may not be representative of the overall picture of Nepal.

Conclusion

GI tract perforations are common emergency situations dealt by general and GI surgeons all over the world. Perforations of duodenum, appendix and colorectum are commonly encountered. Acid peptic disease, trauma and infections are the leading causes of perforations. Increasing age, delay in presentation, comorbidities, oliguria and hypotension are the factors associated with high mortality.

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