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ORIGINAL RESEARCH

A study of the clinical evaluation, management and outcome of small bowel perforation

[1]Dr. Rommel Singh Mohi, [2]Dr. Vikas Goyal, [3]Dr.Janpreet Singh Arora, [4]Dr. Lovekesh Gupta, [5]Dr. Amber Khare, [6]Dr. Monica Gupta

[1]Associate Professor, [2]Assistant Professor, [3]Former Junior Resident, [4,5]Junior Resident, Department of General Surgery, Government Medical College and Rajindra Hospital, Patiala, Punjab, India
[6]Consultant Anesthesia, Mata Kaushalya Hospital, Patiala, Punjab, India

Correspondence:
Dr. Vikas Goyal
Assistant Professor, Department of General Surgery, Government Medical College and Rajindra Hospital, Patiala, Punjab, India

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Abstract

Background: Intestinal perforation is the third most common cause for explorativelaparotomy in a surgical emergency.[1] The present study was conducted to highlight the clinical presentation, causes of perforation, site of perforation, surgical treatment, postoperative complications, and mortality in patients of small bowel perforation.

Methods: 50 patients admitted with acute abdomen, proven to be a case of small bowel perforation, were randomly selected for this study. These patients were evaluated based on pre-operative signs and symptoms and investigations. Co-morbidities and primary cause of perforation were studied with necessary investigations and intra-operative findings. Post-operative complications in all patients were recorded. Evaluation of the treatment outcome was done in terms of the mortality rate.

Results: Most small bowel perforations (58%) occurred in the age group of 21-45 years, with majority (74%) in male patients. All of the patients(100%) presented with pain abdomen with a varying incidence of other associated symptoms. Abdominal tenderness was present in all the patients on examination, while guarding/rigidity of the abdomen was present in 98% of the patients. Air was seen under the right dome of the diaphragm on an X-rayin 90% of patients. Ileal and duodenal perforations were the more common sites of perforation, accounting for 90% of the cases in our study. Enteric fever and Peptic ulcer disease were the leading causes of small bowel perforation (66%). Ileostomy with or without primary repair of the perforation was done for 76% of the cases of ileal perforation. Primary repair with an omental (Graham's) patch was done for all the patients with duodenal perforation. The most common postoperative complication observed in our study was postoperative respiratory complications (30%). A mortality rate of 10% was seen among the patients included in the study.

Conclusion: Despite advances in the medical field, mortality and morbidity remain high in patients with small bowel perforation.

Keywords: Small intestine perforation, abdominal pain, abdominal tenderness, Air under the right dome of the diaphragm, ileostomy.

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Introduction

Perforation, defined as an abnormal opening in a hollow organ or viscus, is derived from the Latin *'perforatus'*, which means to "bore through."[2]Small bowel perforation can either result in diffuse peritonitis or localisedminimalperitonitis and needs to be manageddecisively and as early as possible.[3] Owing to the morbidity and mortality associated with small bowel perforations, an early diagnosis of small bowel perforation is of foremost importance. The common etiologies for perforations within the small bowel vary according to the part of the small intestine involved. Patients with gastric or intraperitoneal duodenal perforation usually present with acute abdominal pain, guarding, and rigidity caused by the chemical peritonitis. Retroperitoneal duodenal perforations may not present as acute abdomen. The clinical examination may be negative initially, withsigns appearing only when the duodenal contents enter the peritoneal cavity, warranting a high degree of suspicion for early diagnosis of these perforations.[4]Diagnosis of small bowel perforation is made based on a thorough history and clinical examination, supplemented and confirmed by appropriate imaging studies like an X-ray, Ultrasonography (USG) and Computerized Tomography (CT) scan. Erect radiographs of the chest and a plain upright radiograph of the abdomen are the first lines of diagnostic imaging when any gastrointestinal perforation is suspected. The presence of free air under the diaphragm, suggestive of pneumoperitoneum, is the most common sign of gastrointestinal perforation. [5] USG whole abdomen is routinely used to examine almost all patients with abdominal pain and is often considered anextension of clinical examination. CT scan, particularly contrast-enhanced CT (CECT) whole abdomen,has been established as a highly sensitive imaging technique for identifying the presence, site, and cause of GI tract perforation. It can detect extraluminal, intraperitoneal as well as retroperitoneal air. The overall accuracy of CT in predicting the location of bowelperforation ranges between 82% and 90%.[6]Haematological investigation done in cases of small bowel perforation not only help inassessing the status of patients, especially in case of sepsis, but also help in planning for further course of management.

All patients with perforation having signs of sepsis or peritonitis require surgery. Exploratory laparotomy has been the intervention of choice for acute abdomen withthe repair of the perforated bowel depending on the site and size of perforation.[7] In most cases, thorough peritoneal toileting with the placement of peritoneal drains is done. Perforation peritonitis caused by small bowel perforation is associated with high morbidity and mortality, with reported mortality rates rangingbetween 10% to 30%. The present study was done to understand the various factors for clinical evaluation, management, and outcome of small bowel perforation.

Methods

This prospective analytical study was conducted after permission from the institutional ethics committee. Fifty patients admitted to surgical emergency with acute abdomen, between January 2020 to July 2021, proven to be a case of small bowel perforation based on investigations (X-ray Abdomen, USG Whole Abdomen and CECT Abdomen if needed) and intra-operative findings were selected randomly for this study. These patients were evaluated based on pre-operative signs and symptoms and investigations. Co-morbidities and the primary cause of perforation were studied with the help of necessary investigations and intra-operative findings. Post-operative complications in all patients, like wound infection, wound dehiscence, intra-abdominal abscess, faecal fistula, septicemia, stoma-related complications, etc., were recorded. The data collected included age, gender, presenting signs and symptoms, clinical parameters, laboratory, and radiological investigations. Intraoperative findings like the number of perforations, site and size of perforations, the operative technique used were

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recorded.Postoperative data were recorded for any postoperative complications and mortality. Follow up was done for all patients for six months. Patients with peritonitis due to an anastomotic leak were excluded from the study, as were the patients who did not consent to or withdrew their consent at any point in the study. Data was described in terms of range; mean ± standard deviation (± SD), median, frequencies (number of cases), and relative frequencies (percentages) as appropriate.

Observations

The mean age of the patients was 37.02 years + 16.48 years. 18% (n=9) of the patients belonged to the age group of ≤20 years. 26% (n=13) of the patients belonged to the age group of 21 to 30 years, while 32% (n=16) of the patients belonged to the age group of 31 to 45 years. 14% (n=7) of the patients belonged to the age group of 46 to 60 years. 10% (n=5) patients belonged to the age group of more than 60 years. The most common age group for perforation in our study was 31-45 years, followed by 21-30 years. 74% (n=37) of the patients were males while 26% (n=13) were females.

Table 1: The incidence of various associated symptoms in small bowel perforations

	Number of patients	Percentage
Abdominalpain		
Nausea/vomiting		
Constipation/Obstipation		
Fever		
Abdominal Distension		

Abdominal pain and Nausea/Vomiting were the most consistent symptoms. Abdominal pain was seen in 100% (n=50) of the patients, whereas nausea/vomiting was seen in 76% (n=38) of the patients. Constipation/Obstipation was seen in 64% (n=32) and fever was seen in 62% (n=31) patients. Abdominal distension was present in 46% (n=23) of the patients.

Table 2: Incidence of various associated signs in small bowel perforations

	Number of patients	Percentage
Tenderness		
Guarding/Rigidity		
Absence ofbowelsounds		
Signs of Dehydration		
Shock (SBP<65 mm Hg)		

Abdominal tenderness was present in 100% patients (n=50); guarding/rigidity in 98% (n=49), bowel sounds were absent in 94% (n=47) patients and signs of dehydration in 80% (n=40) out of which 42% (n=21) were in shock (Mean Arterial Pressure <65 mm of Hg at the time of admission).

Air was seen under the right dome of the diaphragm on X-Ray in 90% (n=45) patients.

Table 3: Distribution of patients according to the site of perforation.

Site of Perforation	Numberof patients	Percentage
Duodenum	11	22%
Jejunum	5	10%
Ileum	34	68%
Total	50	100%

Duodenum was the site of perforation in 22% (n=11) of patients; the jejunum was the site of perforation in 10% (n=5), ileum was the site of perforation in 68% (n=34) patients. The most common perforation site was ileal, followed by duodenal and jejunal perforation.

94% (n=47) patients had single perforation, 4% (n=2) had 2 perforations and 2% (n=1) patients had 3 perforations.

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Table 4: Size of largest perforation in each patient

Size of Perforations	Number of patients	Percentage
Up to 0.5 cm		
0.6 to 1 cm		
1.1 to 1.5 cm		
1.6 to 2 cm		
More than 2 cm		
Total		

16% (n=8) patients had perforation up to 0.5 cm, 34% (n=17) had perforation of size between 0.6 to 1 cm, 30% (n=15)had perforation of size between 1.1 to 1.5 cm, 14% (n=7) had perforation of size between 1.6 to 2 cm and 6% (n=3) patients had perforation larger than 2 cm.

Table5: Etiologic profile of small bowel perforations

Etiology	Number of Patients	Percentage
Typhoid	22	44%
Peptic Ulcer Disease	11	22%
Trauma	7	14%
Tuberculosis	6	12%
Ascariasis	1	2%
Nonspecific Inflammation	3	6%
Total	**50**	**100%**

The most common aetiology of small bowel perforations in our study was Typhoid followed by Peptic Ulcer Disease, Trauma, and Tuberculosis. Typhoid was the etiologic factor in 44% (n=22) of the patients, Peptic Ulcer Disease in 22% (n=11), Trauma in 14% (n=7) of the patients Tuberculosis was the etiologic factor in 12% (n=6), Ascariasis in 2% (n=1) of the patients, nonspecific inflammation was reported in 6% (n=3) patients.In patients with Duodenal perforations, Peptic ulcer was the etiologic factor in 100% (n=11). In patients with jejunal perforations, Nonspecific inflammatory changes were found in 40% (n=2) patients, Trauma in 60% (n=3). In ileal perforations, Typhoid was the major etiological factor in 64% (n=22) patients, followed by Tuberculosis in 18% (n=6) patients followed by Trauma in 12% (n=4); Nonspecific inflammatory changes were found in 3% (n=1) patients of ileal perforation. In our study, ascariasis was the etiological factor in one case of ileal perforation.

Table 6: Surgical treatment given according to the site of perforation

Site of Perforation	Operative Procedure	Number of Patients	Percentage
Duodenum (n=11)	Graham's Patch Repair	11	100%
Jejunum (n=5)	Primary Closure	5	100%
Ileum (n=34)	Loop Ileostomy	18	52%
	Resection with Double Barrel Ileostomy	2	6%
	Primary Closure	7	21%
	Primary Closure with Diversion Ileostomy	6	18%
	Resection and Anastomoses	1	3%

In patients with Duodenal perforations, Graham's Patch Repair was done in 100% (n=11) patients. In patients with jejunal perforation, Primary closure was done in 100% (n=5) patients. In patients with Ileal perforations, Loop ileostomy was done in 52% (n=18) patients, Primary closure was done in 21% (n=7) patients, Primary repair with Diversion Ileostomy in

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18% (n=6) patients and Resection with Double barrel Ileostomy in 6% (n=2) patients and Resection and anastomoses in 3% (n=1).

Table7: Incidence of postoperative complications

Complication	Number of Patients	Percentage
Wound Infection	12	24%
Wound Dehiscence	4	8%
Anastomotic leak	1	2%
Respiratory Complications	15	30%
Stoma-related Complications (Total stomas made=26)	1	3.8%

24% (n=12) patients had local wound infection, 8% (n=4) developed wound dehiscence. 30% (n=15) developed respiratory complications. Anastomotic leak was seen in 2% (n=1) of patients. 3.8% (n=1) of patients where a stoma was created reported a major stoma-related complication in the form of prolapse of the stoma.

There was a mortality rate of 10% (n=5) among the patients included in the present study. All patients with duodenal perforation survived. 2 patients with jejunal perforation died.One of these patients was discharged after surgery during the first hospitalisation and was readmitted for perforation peritonitis three months later but died post-operatively during the second hospitalisation.

Three patients with ileal perforation died during hospitalisation.

Discussion

In our study, 26% (n=13) of the patients belonged to 21 to 30 years, while 32% (n=16) of the patients belonged to the age group of 31 to 45 years. The mean age of the patients is 37.02 years± 16.48years. Inastudy conductedby SinglaS.et al., 26%and20%ofthe patients belonged to 21to30years and 31to40years age groups, respectively. In another study conducted by Ersumo T. et al., the mean age of the patients with gastrointestinal perforation was 32.5 years.[8] Yadav et al., in another study, reported that the mean age was 33 ± 14.1 years.[9]Utaal et al reported that the maximum number of patients were in the age group of 20-39 years and the mean age of the patients was 37.63 years.[10]

Inourstudy, 74% (n=37) of the patients were males, the male-to-female ratio being 2.84:1. There was male predominance in our study. Our results are in concordance with the result obtained by previous authors who also have reported male preponderance in their respective studies.

Abdominalpain and nausea/vomiting were the two mostconsistentsymptoms in our study, followedbyconstipation/obstipation and fever and then abdominal distension. Jain et al reported that abdominal pain was the constant symptom present in all patients (100.0%), while fever (70.8%), obstipation (55.2%), and vomiting (35.9%) were the other frequent symptoms.[11]Shahet al, intheirstudy,reportedthat 100% of patients had complaint ofAbdominal pain, 72% had complaint of vomiting, 22% had abdominal distension and 10% of patients had nausea.[12]

Inourstudy,Abdominal tenderness was present in 100% patients (n=50); guarding/rigidity in 98% (n=49), bowel sounds were absent in 94% (n=47) patients and signs of dehydration in 66% (n=33) out of which 42% (n=21) were in shock (Mean Arterial Pressure <65 mm of Hg at the time of admission).Singlaetal in their study reported that every patient displayed Abdominal tenderness; Rigidity and guarding were found in 82% of patients while other signs observed were Tachycardia(68%), Shock(14%), and Absence of bowel sounds(93%).[13]Meenaet al,in their study reported that tenderness was seen in100%, signs of dehydration were seen in 61.5% of patients while 30.8% of patients were in shock preoperatively.[14]

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Free air was seen under the right dome of the diaphragm on X-Ray in 90% (n=45) patients, while in 10% (n=5) patients, free air under the diaphragm was absent.Meena et al reported that free gas under diaphragm was observed in 86.2% of patients.[14]Utaal et al reported that 87.5% (35 cases) had air detected under the diaphragm in the chest radiograph.[10]

The most common perforations in our study were ileal, followed by duodenal followed by jejunal perforation. Yadav et al reported in their study that Ileum was the most common site of perforation (39.1%) followed by Duodenum (26.4%) followed by Jejunum (4.6%).[9] Utaal et al reported in their study that the most common site of small bowel perforation was ileum (35%) followed by duodenum (20%) followed by jejunum in 5% patients.[10] Meena et al reported that Duodenal perforations (35.7%) were most common among small bowel perforations followed by ileal perforations (31.9%) followed by Jejunum (9%).[14]

In our study, Typhoid was the etiologic factor in 44% (n=22) of the patients, peptic ulcer Disease in 22% (n=11), trauma in 14% (n=7) of the patients, tuberculosis was the etiologic factor in 12% (n=6) and ascariasis in 2% (n=1) of the patients. Nonspecific inflammation was reported in 6% (n=3) patients.Malhotra et al, in their study, reported that the most common cause of perforation peritonitis was Peptic Ulcer Disease (46%) followed by Enteric Fever (29%) followed by Tuberculosis (3.2%) followed by Trauma (6.4%).[15] Yadav et al reported that Perforated duodenal ulcer due to acid-peptic disease and small bowel perforation due to typhoid were the most common causes of perforation peritonitis noticed in 26.4 % each, followed by small bowel tubercular perforations in 10.3%. [9] Jhobta et al reported that Acid peptic disease was the most common cause of gastroduodenal perforation (57%) whereas typhoid fever was the most common cause of small bowel perforation (45%) followed by tuberculosis (22%) and trauma(15%).[16] The present studies have reported typhoid as the leading cause of perforation which is in contrast to previous studies where Peptic ulcer disease is the leading cause of gastrointestinal perforations. However regional variations may be responsible for the same.

In patients with duodenal perforations, Graham's Patch repair was done in 100% (n=11) patients. In patients with jejunal perforation, primary closure was done in 100% (n=5) patients. In patients with ileal perforations, loop ileostomy was done in 52% (n=18) patients, primary closure was done in 21% (n=7) patients, primary repair with diversion ileostomy in 18% (n=6) patients.Resection with double barrel ileostomy was done in 6% (n=2) patients and resection and anastomoses in 3% (n=1) patients.Utaal et al reported that in their study, all the patients of duodenal perforation were managed by primary repair. In patients with ileal perforations, 3 (21%) were managed by primary repair, 3 (21%) patients needed resection and anastomoses and 8 (58%) patients were managed by ileostomy formation.[10] Meena et al in their study reported that primary repair of the perforation was the most frequently performed procedure (44.2%) followed by ileostomy (25.5%), resection and anastomosis (19.3%), and a combination of these procedures in the remaining 10.9% patients.[14]

Respiratory complications (30%) were most common postoperative complications reported in our study followed by local wound infection (24%) and wound dehiscence (8%). Enterocutaneous fistula was seen in 1 patient. Agarwal et al reported in their study reported that major complications were chest infection (13.3%), burst abdomen (6%), wound infection (5.3%), ileus (5.3%), anastomotic leak (5.3%), and multi-organ failure (3.5%).[17] Utaal et al reported post-operative wound infection in 35% of patients out of whom 15% developed wound dehiscence while respiratory complications were seen in 30.9% of patients.[10]

There was an overall mortality rate of 10% (n=5) among the patients included in the present study. This is in line with the mortality rates among the patients with GI perforations reported in previous studies.

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Limitations of the study

The small sample size and short follow-up period were the limitations of the present study. Further studies are required at multiple centres and on larger samples for conclusive evidence.

Bibliography

1. Dharamdev D, Mascarenhas RM, Kumar A. A clinical study of the spectrum of gastro intestinal perforation peritonitis in a tertiary care centre. International Surgery Journal. 2021 Apr 28;8(5):1486-9.
2. Sharma S, Kaneria R, Sharma A, Khare A. Perforation peritonitis: a clinical study regarding etiology, clinical presentation and management strategies. IntSurg J 2019;6:4455-9.
3. Amini A, Lopez RA. Duodenal Perforation. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan.
4. Nepal P, Maemura K, Mataki Y, Kurahara H, Kawasaki Y, Hiwatashi K, Iino S, Sakoda M, Arigami T, Ishigami S, Shinchi H. Management of horizontal duodenal perforation: a report of three cases and review of literature. Surgical case reports. 2017 Dec;3(1):1-6.
5. Sofić A, Bešlić Š, Linceder L, Vrcić D. Early radiological diagnostics of gastrointestinal perforation. Radiology and Oncology. 2006 Jun 1;40(2).
6. Kim SH, Shin SS, Jeong YY, Heo SH, Kim JW, Kang HK. Gastrointestinal tract perforation: MDCT findings according to the perforation sites. Korean J Radiol. 2009;10(1):63-70. doi:10.3348/kjr.2009.10.1.63.
7. Hafner J, Tuma F, Hoilat GJ, et al. Intestinal Perforation. [Updated 2021 Aug 13]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538191/
8. Ersumo T, W/Meskel Y, Kotisso B. Perforated peptic ulcer in TikurAnbessa Hospital: a review of 74 cases. Ethiop Med J . 2005 Jan;43(1):9-13.
9. Yadav D, Garg PK. Spectrum of perforation peritonitis in Delhi: 77 cases experience. Indian Journal of Surgery. 2013 Apr;75(2):133-7.
10. Utaal MS, Bali S, Batra P, Garg N. Clinical profile in cases of intestinal perforation. International Surgery Journal. 2017 Feb 25;4(3):1002-8.
11. Jain BK, Arora H, Srivastava UK, Mohanty D, Garg PK. Insight into the management of non-traumatic perforation of the small intestine. The Journal of Infection in Developing Countries. 2010 Oct 15;4(10):650-4.
12. Shah PH, Panchal HA. Acute peptic perforation: clinical profile and our experience with operative outcome. IntSurg J 2016;3:2227-32.
13. Singla S, Verma S, Garg P, Verma A, Noori MT, Yadav A. Pattern and etiology of patients with gastrointestinal perforations: an observational prospective study. Int J Contemp Med Res. 2019;6:6-9.
14. Meena LN, Jain S, Bajiya P. Gastrointestinal perforation peritonitis in India: A study of 442 cases. Saudi Surgical Journal. 2017 Sep 1;5(3):116.
15. Malhotra MK, Singal R, Chowdhary K, Sharma RG, Sharma S, Dhankhar A. Spectrum of perforation peritonitis in a Rural Medical College. Bangladesh Journal of Medical Science. 2016 Apr 11;15(1):70-3.
16. Jhobta RS, Attri AK, Kaushik R, Sharma R, Jhobta A. Spectrum of perforation peritonitis in India-review of 504 consecutive cases. World journal of Emergency surgery. 2006 Dec;1(1):1-4.
17. Agarwal N, Saha S, Srivastava A, Chumber S, Dhar A, Garg S. Peritonitis: 10 years' experience in a single surgical unit. Tropical Gastroenterology. 2008 Jun 27;28(3):117-20.