

A Study of Perforative Peritonitis in a Period of One Year during Covid-19 Pandemic at a Medical College in Rajasthan

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Abstract

Hollow viscous perforation is one of the most common emergency dealt by general surgeons worldwide. A high degree of suspicion is required and prompt management is warranted to reduce morbidity and mortality. Here we present a study of perforative peritonitis in our medical college at the outskirts of Udaipur city in the state of Rajasthan, India during the Covid-19 pandemic. During the one year study period from September 2020 to August 2021, a total of 16 cases of hollow viscous perforation admitted and treated. The number is relatively low because of the pandemic and there was a period of total lockdown with negligible patient footfall. All patients had free gas under diaphragm in plain x-ray and all of them were scheduled for emergency laparotomy after adequate resuscitation. Emphasis given on the location of perforation, etiology, organism on culture of peritoneal fluid and procedure undertaken.

Keywords: Perforative peritonitis, hollow viscous perforation, laparotomy, Covid-19 pandemic, duodenal perforation, jejunal perforation, ileal perforation

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Introduction

Gastrointestinal (GI) tract perforations can occur due to various causes, and most of these perforations are emergency conditions of the abdomen that require early recognition and timely surgical treatment. The mainstay of treatment for bowel perforation is surgery. Endoscopic, laparoscopic and laparoscopic-assisted procedures are now being increasingly performed. Moreover, if any signs and symptoms of generalized peritonitis are absent and the perforation site has sealed spontaneously, then a perforated duodenal ulcer can be treated non-operatively.

Owing to these various therapeutic options, the site and cause of GI tract perforation are major questions that should be answered by performing imaging studies.[1] A thorough history, physical examination, and workup, aimed at localization of the source of pneumoperitoneum will ultimately determine the necessary treatments, including the need for operative intervention. [2] Various causes of Small bowel perforation are erosion from duodenal ulcerations, tumour, infection or abscess, Meckel diverticulum, hernia with

strangulation, inflammatory bowel disease/colitis, mesenteric ischemia, foreign body, obstruction, medication/radiation-related, iatrogenic, blunt or penetrating abdominal trauma and large bowel perforation are tumor, diverticulitis, infection or abscess, colitis, foreign body, obstruction, volvulus, iatrogenic, blunt or penetrating abdominal trauma. [3] The common causes of a perforated viscus vary by patient age and geography. In children, bowel perforation is most likely to follow abdominal trauma. The incidence of bowel perforation is 1% to 7% in paediatric trauma patients. [3,4] Upper intestinal perforations proximal to the ligament of Trietz result in significantly less bacterial contamination than distal colonic perforations. In the treatment of distal perforations, antibiotics must include gram-negative and anaerobic coverage. [4] All patients demonstrated free air on abdominal CT. [5] Therefore, the study on intestinal perforation is still proven useful.

Aims and Objectives

The aim of this study is to focus on clinical presentation of the patient, possible aetiology, site of perforation intra operatively and operative procedure.

Material and Method

A total of 16 patients were operated for perforative peritonitis and this study was conducted for a period of 1 year in the department of general surgery in Pacific Institute of Medical Sciences, Udaipur, Rajasthan.

In this study, all patients presented to hospital with signs and symptoms of intestinal perforation and gas under diaphragm in radiological study are included.

All patients were subjected to Covid-RT PCR and HRCT Thorax to rule out Covid-19.

This study excluded the patients with one or more of the following conditions: pregnant females and intestinal obstruction.

For the study, detailed history of the patient was taken along with clinical examination, radiological investigations and other routine blood investigations. Intra-operatively, abdomen was opened by a midline incision and abdomen is explored for perforation.

Results

16 patients of perforation peritonitis were studied and of the whole group 1 patient was evaluated with intestinal perforation due to blunt trauma of abdomen and another patient was diagnosed with GIST.

All patients showed symptoms & signs of peritonitis. Patients presented with diffuse abdominal pain and vomiting with varying degree of dehydration. On examination, all of them had tenderness on palpation which was maximum in epigastrium and paraumbilical region. Though none of the patients presented with classical "card-board" like rigidity, varying degree of rigidity was present in the patients. Rebound tenderness was also elicited. On auscultation, bowel sounds were not audible in any of the patients in our study. All of the patients were Covid-19 negative.

Most common site of perforation was ileum (50%), followed by duodenum (31.25%), jejunum (18.75%). Most common organism grown from pus culture collected while exploratory laparotomy are *E. coli* and *Klebsiella*. Other organisms like tuberculosis, *Citrobacter*, and *Candida* were also found.

In our study, out of 16 patients who underwent laparotomy, we found 8 patients [50%] had ileal perforation, 5 patients [31.25%] had duodenal perforation and 3 patients [18.75%] had jejunal perforation. [Table 1]

Table 1

Site of perforation	Number of patients	Percentage
Duodenum	5	31.25%
Jejunum	3	18.75%
Ileum	8	50%

From the bacterial culture of peritoneal fluid, 6 patients had E.coli and 5 patients had Klebsiella followed by citrobacter, and candida each found in one patient. One patient had tuberculosis. [Table 2]

Table 2

Organism grown	Number of patients
<i>E. Coli</i>	6
<i>Klebsiella</i>	5
<i>Candida albicans</i>	1
<i>Citrobacter freundii</i>	1
<i>Tuberculosis</i>	1

Among the 8 patients of ileal perforation, we did primary repair in two patients. We did ileostomy and resection & anastomosis in 3 patients each. In 3 jejunal perforation patients, we performed primary repair in

one patient and resection & anastomosis in two patients. We did primary repair [Graham's modified omental patch] in all 5 duodenal perforation patients. [Table 3]

Table 3

Site of perforation	Procedure	Number of patients
Ileal	Primary repair	2
	Resection and anastomosis	3
	Stoma	3
Jejunum	Wedge resection and primary repair	1
	Resection and anastomosis	2
	Stoma	0
Duodenum	Primary repair	5
	Resection and anastomosis	0
	Stoma	0

All other patients apart from duodenal perforation, intestinal tissue sample surrounding the perforation was sent for histological examination for information regarding aetiology. One ileal perforation was found out to be due to intestinal

tuberculosis and one jejunal perforation patient had jejunal GIST. In other patients with intestinal perforation, pathology report of sent specimen was non-specific inflammation.

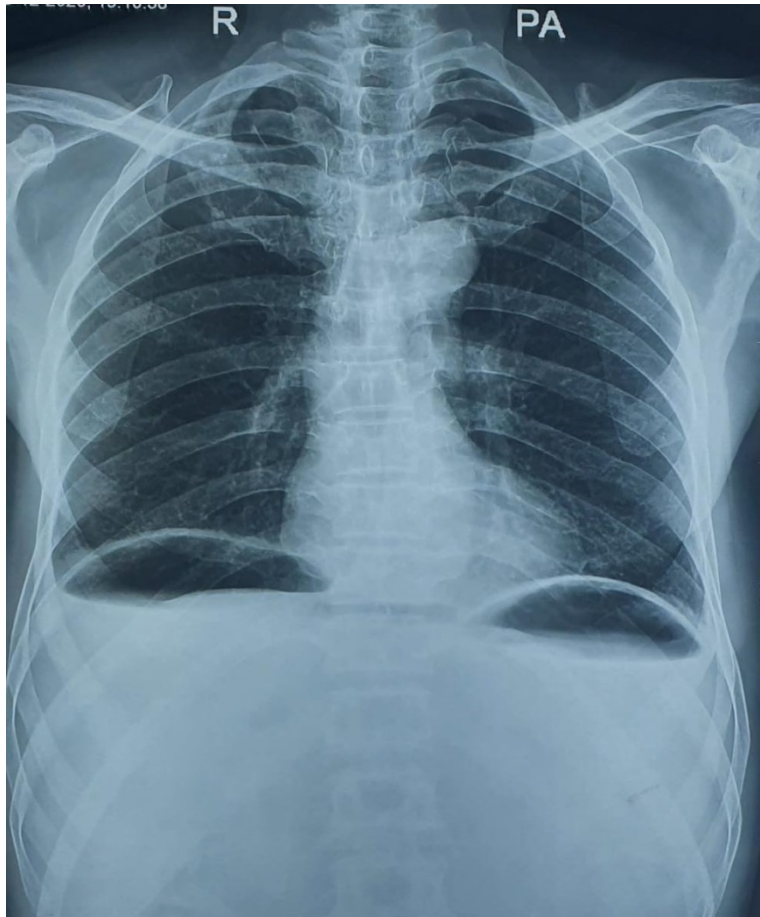


Figure 1: Plain radiograph showing free gas under diaphragm

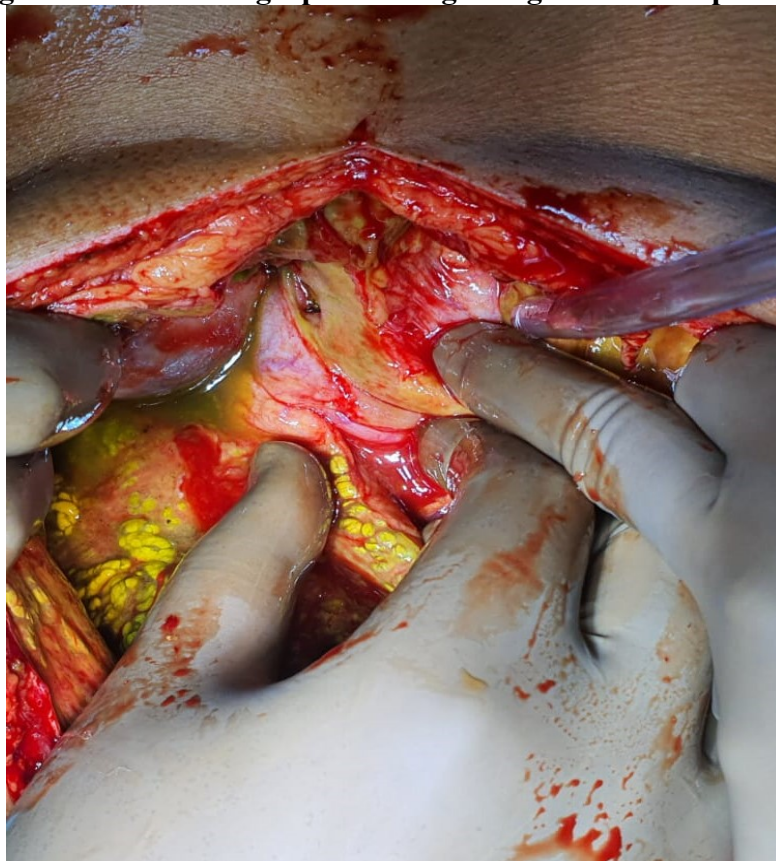


Figure 2: Operative photograph showing duodenal perforation

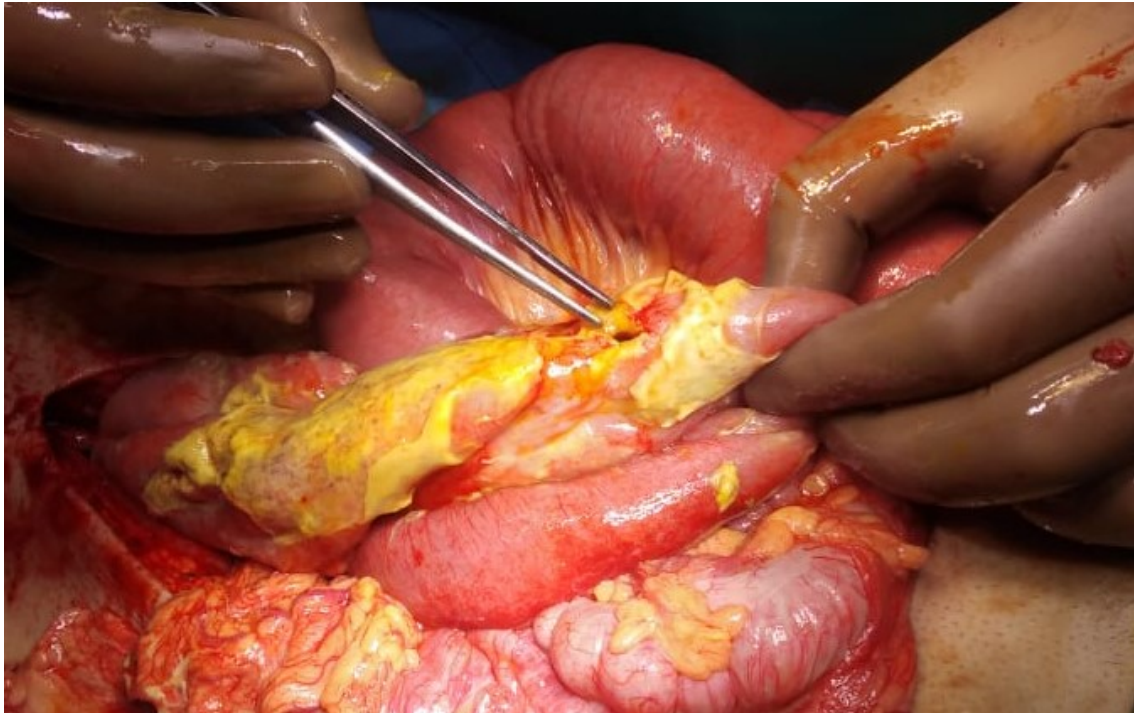


Figure 3: Operative photograph showing ileal perforation

Discussion

In the literature, there were number of studies on intestinal perforation. For over a century the many contributions of several authors have recorded hundreds of references under their appropriate subdivisions. Not much studies focus on the clinical presentation, etiology and position of the intestinal perforation. In a study done in 2009 by Kim SH et al, he concluded that CT findings such as discontinuity of the bowel wall, concentrated bubbles of extraluminal air in close proximity to the bowel wall and abrupt bowel wall thickening with or without an associated phlegmon or abscess are useful for assessing the site of perforation. It is crucial to make a prompt and correct diagnosis of GI tract perforation with respect to the presence, site and cause of perforation [1]. Several factors play a role in determining patient outcomes including time of diagnosis (early vs late), etiology, location, pre comorbidities, and type of treating hospital.

Etiologies of perforation in gastric and duodenal sources overlap in many ways.

Primary causes include iatrogenic, postoperative, malignant, and benign causes. Non traumatic perforation in developing countries can be due to typhoid, HIV, tuberculosis and possibly hook worms [6]. The presentation of foregut perforations is similar to other hollow viscus perforations. Patients typically present with acute upper abdominal pain that progresses to peritonitis. Patients may have reflex emesis or hiccoughs.

Small intestine perforation (SIP) can occur along the length of the entire small bowel, and may be the result of several causes, including trauma, vascular ischemia, obstruction, malignancy, or iatrogenic injury during surgery and patient with small intestine perforation present with nonfocal abdominal pain that progresses to peritonitis if left untreated. Nausea and/or vomiting may be present due to intra-abdominal irritation, ileus, or obstruction. Fevers, tachycardia, and hypotension are more concerning features, and indicate a more severely ill patient. Perforation of the colon and rectum can develop in the setting of other illnesses, such as cancer or

colitis, or may be due to many vascular, infectious, or inflammatory etiologies. Iatrogenic causes include thermal injury, endoscopic procedures and biopsies, and laparoscopy. They typically develop progressive abdominal pain, which is usually focal initially, but leads to peritonitis if untreated. Signs and symptoms are also dependent on the time of presentation. Patients who present late (days) after perforation are more likely to become systemically ill, whereas patients who present early may have only mild symptoms [2,3,7].

In a case reported by Nassour et al, a 73 year old female presented with features of peritonitis and on evaluation she was diagnosed with stent perforation which was placed for acute colonic obstruction which can be the possible cause for perforation peritonitis [8]. Early recognition and prompt treatment are critical to prevent the morbidity and potential mortality of peritonitis and its systemic sequelae that result from the spillage of intestinal contents [4,6,8,9].

A study conducted by Stapakis et al, concluded that only 5 of 13 (38%) patients demonstrated free air on plain radiography and all patients demonstrated free air on abdominal CT. The amount of free air demonstrated on CT was quantified into three groups. Upright chest radiography in the minimal group (less than three 1 mm pockets of air) was totally insensitive in detecting free air, in the moderate group (greater than three 1 mm pockets, but <13 mm diameter collection of air) was 33% sensitive and large group (>13 mm collection of air) was 100% sensitive. So, abdominal CT is clearly superior to upright chest radiography in demonstrating free intraperitoneal air [5,10]. Agrawal and his colleagues in a study found that the overall mortality was 10%. High mortality was observed in jejunal, gall bladder and liver abscess perforation cases. Histopathological evaluation (143 specimens) revealed tuberculosis in 42

(mostly small bowel), malignancy in 8, and inflammation in the rest and an increased performance of enterostomy compared with primary repair in small bowel perforation and a decrease in the leak rate [11]. Perforations were surgically treated depending upon the number of perforations, general health status of patient and degree of faecal contamination [12]. Management typically involves intravenous antibiotics, resuscitation, and either primary repair or resection and anastomosis, depending on the underlying cause of the perforation [13]. In a study done by Chaikof et al, they concluded that despite various causes and delays in diagnosis, resection and primary anastomosis remains an effective treatment for perforation of the small bowel [14]. Primary repair is the most frequent procedure, followed by ileostomy and resection-anastomosis. Superficial wound infection is the most frequent postoperative complication, followed by wound dehiscence. The wound infection rate reduced significantly following delayed primary closure of skin incision [15].

In our study, plain radiographs and CT scan were performed in every patients. Patients were resuscitated with crystalloids and all of them were taken for laparotomy as soon as possible. During laparotomy, peritoneal fluid collected and sent for Gram staining, culture and antibiotic sensitivity. [16]

Decision pertaining to particular procedure undertaken in each case depended on the location of perforation, amount of contamination present, condition of the bowel in the vicinity of perforation and surgeon's preference. All patients with duodenal perforation treated with omental patch repair. In jejunal perforation, stoma formation was not an option due the proximal location. So, primary repair was done with two cases undergoing resection anastomosis and in one patient, who had

jejunal GIST, wedge resection and repair was performed.

Regarding ileal perforation, the main consideration was the amount of contamination present. Ileostomy performed in 3 patients with gross contamination. In 3 patients, bowel surrounding the perforation was unhealthy, so resection and anastomosis done. In 2 cases with very small perforation with healthy bowel and minimal contamination, primary suture repair was performed.

Though hollow viscous perforation is a relatively common disease but the relative small number of patients in this study can be explained by Covid-19. It was hospital protocol to subject all patients to Covid-RT PCR and HRCT thorax to rule out Covid-19 irrespective of symptoms during the pandemic. We had to wait for PCR and HRCT thorax report before taking the patients to theatre and timing of surgery was delayed to some extent which might have led to the massive amount of contamination seen in three patients. In those patients no other surgical option could be offered apart from ileostomy. In that period, patients were managed in isolation ICU.

Regarding aetiology, five operated patients had duodenal perforation due to peptic ulcer disease. One patient of ileal perforation was diagnosed as a case of intestinal tuberculosis and one jejunal perforation patient had jejunal GIST. Rest were non-specific bacterial inflammation.

Broad spectrum antibiotics started and then changed according to sensitivity report.

Conclusion

Hollow viscous perforation is a common surgical emergency faced by general surgeons everywhere. Time is of essence here. Prompt diagnosis, resuscitation and laparotomy is the key for good outcome. Operative procedures depends on site of perforation, level of contamination, patient

factors and surgeon's choice. Proper antibiotics are to be administered. Quick and appropriate management can save a lot of lives.

References

1. 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.
2. Tanner TN, Hall BR, Oran J. Pneumoperitoneum. *Surg Clin North Am.* 2018 Oct;98(5):915-932.
3. Jones MW, Kashyap S, Zabbo CP. Bowel Perforation. [Updated 2021 Sep 9]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan.
4. Hafner J, Tuma F, Hoilat GJ, et al. Intestinal Perforation. [Updated 2021 Aug 13]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan.
5. Stapakis, James C.; Thickman, David. Diagnosis of Pneumoperitoneum, *Journal of Computer Assisted Tomography*: September 1992; 16(5): 713-716.
6. Eid HO, Hefny AF, Joshi S, et al. non-traumatic perforation of the small bowel. *Afr Health Sci* 2008; 8:36-9.
7. Kimchi NA, Broide E, Shapiro M, Scapa E. Non-traumatic perforation of the small intestine. Report of 13 cases and review of the literature. *Hepatogastroenterology.* 2002; 49:1017-1022
8. Nassour, I., & Fang, S. H. Gastrointestinal Perforation. *JAMA Surgery.* 2015; 150(2): 177.
9. Wani RA, Parray FQ, Bhat NA, Wani MA, Bhat TH, Farzana F. Nontraumatic terminal ileal perforation. *World J Emerg Surg.* 2006; 24; 1:7.
10. Hines, J., Rosenblat, J., Duncan, D. R., Friedman, B., & Katz, D. S. (2012). Perforation of the mesenteric small bowel: etiologies and CT findings.

- Emergency Radiology. 2012; 20(2): 155–161.
11. Agarwal N, Saha S, Srivastava A, Chumber S, Dhar A, Garg S. Peritonitis: 10 years' experience in a single surgical unit. Trop Gastroenterol. 2007 Jul-Sep;28(3):117-20.
 12. Khalid S, Burhanulhuq, Bhatti AA. Non-traumatic spontaneous ileal perforation: experience with 125 cases. J Ayub Med Coll Abbottabad. 2014 Oct-Dec;26(4):526-9.
 13. Brown, C. V. R. Small Bowel and Colon Perforation. Surgical Clinics of North America. 2014; 94(2): 471–475.
 14. Chaikof, E. L. Nontraumatic perforation of the small bowel. The American Journal of Surgery. 1987; 153(4): 355–358.
 15. Jain BK, Arora H, Srivastava UK, et al. Insight into the management of nontraumatic perforations of the small intestine. J Infect Dev Ctries 2010; 4:650–4.
 16. Arellano, A., Arellano, A., & Arellano D. Gluteoplasty Implants and Lipotransfer Technique. Journal of Medical Research and Health Sciences. 2022; 5(11): 2329–2338.