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Original Research Article

Evaluation of Clinical Presentation and Management Outcomes in Patients with Hollow Viscus Perforation: A Retrospective Study

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Abstract:

Background: Hollow viscus perforation (HVP) is a life-threatening surgical emergency caused by a full-thickness breach in the gastrointestinal tract, leading to peritonitis, sepsis, and high morbidity and mortality.

Aim: To evaluate the clinical profile and management outcomes of patients presenting with HVP.

Methodology: This retrospective observational study included 90 patients aged >12 years who underwent surgical intervention for HVP at the Department of General Surgery, Nalanda Medical College and Hospital, Patna, Bihar, India, from July 2024 to June 2025. Data on demographics, clinical presentation, laboratory and radiological findings, operative details, and postoperative outcomes were analyzed.

Results: The majority of patients were young adult males (21–30 years, 38.9%; male, 75.6%). Abdominal pain was universal (100%), with vomiting (77.8%), fever (66.7%), and abdominal distension (44.4%). Duodenal (38.9%) and ileal (27.8%) perforations were most common. Primary repair was performed in 61.1% of cases. Postoperative complications included wound infection (22.2%) and chest infection (11.1%), while mortality was 6.7%. The mean hospital stay was 10 ± 4 days. Prognostic scoring systems (P-POSSUM, APACHE II, MPI) demonstrated high predictive accuracy for outcomes.

Conclusion: HVP predominantly affects young males, with duodenal and ileal perforations being most frequent. Early diagnosis, prompt surgical management, and close postoperative care significantly reduce morbidity and mortality.

Keywords: Hollow viscus perforation, surgical outcomes, duodenal perforation, ileal perforation, P-POSSUM, APACHE II.

Introduction

Hollow viscus perforation (HVP) stands as an urgent surgical situation which results from complete intestinal wall damage through all gastrointestinal tract organs, which includes both hollow organs and the stomach and small intestine and large intestine and various times the biliary and urinary systems. This condition leads to the leakage of luminal contents into the peritoneal cavity, which triggers an instant inflammatory response and peritonitis that can develop into sepsis with multiple organ failure and death without immediate treatment [1]. HVP continues to pose a major global health threat because it causes high rates of illness and death in developing nations, which experience worse health outcomes due to their slow patient arrival times and their inability to obtain medical treatment and their weak healthcare systems. The various causes of HVP include peptic ulcer disease, typhoid enteric perforations, traumatic injuries, iatrogenic perforations and ischemic bowel disease and malignancies. In developing countries, peptic ulcer disease and infectious diseases cause the majority of perforations, while developed countries report higher rates of traumatic and iatrogenic perforations [2].

The pathophysiology of hollow viscus perforation is complex and depends on the site and cause of the perforation [3]. The sterile peritoneal cavity becomes contaminated by gastric or biliary or fecal material which triggers a sequence of inflammatory mediators that result in chemical peritonitis. The subsequent bacterial contamination leads to purulent

peritonitis and systemic inflammatory response syndrome (SIRS) and sepsis. Patients typically present with acute symptoms which include sudden onset severe abdominal pain and abdominal distension and vomiting and fever and signs of peritoneal irritation such as guarding and rigidity [4]. The elderly and immunocompromised individuals and those who receive chronic steroid therapy frequently present with atypical symptoms which make early diagnosis challenging. The delayed recognition of a condition results in worse prognosis because clinicians need to maintain a high suspicion level for diagnosis.

People use clinical methods to diagnose HVP while imaging techniques provide additional support. A plain radiograph of the abdomen and chest shows free intraperitoneal air which collects under the diaphragm as a sign of perforation. Ultrasonography detects free fluid, while computed tomography (CT) scans offer complete assessment of the perforation area and its spread and all resulting medical issues, which helps develop the surgical approach. The laboratory tests show nonspecific results but they help determine how severe systemic infection and organ failure have progressed through elevated leukocyte counts and abnormal renal and liver function tests and metabolic acidosis [5]. The medical team needs to identify these features quickly because they need to conduct urgent treatment. The mortality rates increase exponentially with every hour that treatment remains delayed.

Surgical treatment serves as the primary method to manage hollow viscus perforation because it functions to control contamination while it repairs the perforation and establishes gastrointestinal continuity [6]. The choice of procedure depends on the site, size, and cause of perforation, as well as the patient's hemodynamic stability and comorbid conditions. Surgeons use three primary methods which include primary closure and resection with or without anastomosis and damage-control procedures which require exteriorization or creation of temporary stoma for patients who have extensive contamination or unstable medical conditions. The medical field has adopted laparoscopic management for specific cases because it decreases postoperative discomfort and shortens hospital stays and reduces wound-related problems, although open surgery serves as the standard treatment method for emergency and complicated medical situations [7]. The medical team needs to apply adjunctive measures such as aggressive fluid resuscitation and broad-spectrum antibiotics and electrolyte correction and coagulation abnormality management to reach optimal patient outcomes.

The existing medical improvements in critical care and surgical operations fail to decrease the high rates of morbidity and mortality which result from hollow viscus perforation in areas with limited medical resources [8]. The combination of surgical site infection and intra-abdominal abscess and anastomotic leak and prolonged ileus results in extended hospital stays and higher medical expenses and diminished patient wellbeing. The retrospective studies of HVP clinical profiles and their management outcomes deliver critical information about epidemiology and risk factors and operative methods and prognostic elements [9]. The studies demonstrate how specific patterns of medical presentation together with treatment delays and patient outcome factors which can be changed affect the results of medical treatment. The research aids in creating medical protocols which suit specific environments and in determining how to allocate resources to achieve better health outcomes through decreased rates of illness and death.

The high risks of hollow viscus perforation require medical professionals to study all aspects of its clinical presentation which includes demographic information and cause of the condition and symptoms and test results from both laboratory work and radiological examinations. The study requires management assessment because it involves evaluating surgical methods and their resulting postoperative complications together with the duration of hospital stay and patient death rates. Retrospective evaluations allow researchers to study extensive patient populations during specific time intervals which enables them to discover patterns and results and present deficiencies in existing treatment methodologies. The research becomes essential because healthcare systems face rising obstacles and surgical methods experience ongoing evolution while researchers study how to enhance patient treatment and achieve better surgical results for this dangerous medical condition.

Methodology

Study Design: This study was designed as a retrospective observational analysis to assess the clinical profile and management outcomes of patients presenting with hollow viscus perforation. Patient records were reviewed systematically to collect demographic, clinical, laboratory, and operative data, along with postoperative outcomes.

Study Area: The study was conducted in the Department of General Surgery, Nalanda Medical College and Hospital, Patna, Bihar, India.

Study Duration: The duration of the study extended from July 2024 to June 2025.

Study Participants

Inclusion Criteria

1. Patients aged above 12 years.
2. Patients with a confirmed diagnosis of hollow viscus perforation based on clinical assessment,

radiological investigations, or intraoperative findings.
3. Patients who underwent surgical intervention for hollow viscus perforation.

Exclusion Criteria

1. Patients aged 12 years or younger.
2. Patients undergoing laparotomy for causes other than hollow viscus perforation, such as traumatic injuries or elective procedures.
3. Cases with incomplete medical records or missing critical data.

Sample Size: A total of 90 patients meeting the inclusion criteria were enrolled in the study.

Procedure: A detailed review of the patients' clinical history and examination findings was performed. Data regarding presenting symptoms, including abdominal pain, vomiting, fever, changes in bowel habits, and abdominal distension, were recorded. Past medical history, comorbidities (e.g., diabetes, hypertension), surgical history, drug intake, and relevant personal habits were noted. On physical examination, vital parameters such as pulse, blood pressure, temperature, respiratory rate, and Glasgow Coma Scale (GCS) were documented. Abdominal examination focused on tenderness, guarding, rigidity, and palpable masses, while a systemic evaluation included respiratory, cardiovascular, and neurological assessment.

Laboratory investigations included a complete hemogram, blood grouping, viral markers, renal function tests, and urine analysis. Radiological assessment consisted of an erect abdominal X-ray to detect free air under the diaphragm, lateral decubitus X-rays for unstable patients, ultrasonography, and contrast-enhanced CT abdomen when indicated. Additional tests, such as Widal for suspected enteric perforation, were performed as necessary.

All patients received fluid resuscitation, correction of electrolyte imbalances, and empiric antibiotics prior to surgery, adjusted according to culture and sensitivity reports. Surgical intervention was conducted under general anesthesia via appropriate incisions (right paramedian, upper midline, or lower midline) depending on the suspected site of perforation. Intraoperative findings, including perforation site, size, peritoneal contamination, and presence of malignancy, were documented. Peritoneal lavage was performed with normal saline, and abdominal closure was done after ensuring hemostasis. Postoperative monitoring included vital parameters, nasogastric drainage, intravenous fluids, antibiotics, wound care, bowel activity, chest complications, and other systemic complications. Data on postoperative stay, morbidity, and mortality were collected and analyzed.

Statistical Analysis: Data were compiled and analyzed using SPSS version 27.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between variables were analyzed using the Chi-square test or Fisher's exact test as appropriate. Prognostic scoring systems such as APACHE II, P-POSSUM, and Mannheim Peritonitis Index (MPI) were evaluated for their predictive accuracy using receiver operating characteristic (ROC) curve analysis. Sensitivity, specificity, and predictive values were calculated, and statistical significance was considered at a p-value <0.05.

Result

Table 1 presents the demographic profile of the 90 patients included in the study. The age distribution shows that the largest proportion of patients (38.9%) were between 21 and 30 years, followed by 22.2% each in the 13–20 years and 31–40 years age groups, while 11.1% were aged 41–50 years and only 5.6% were above 50 years. Regarding gender, the majority were male (75.6%), with females comprising 24.4% of the sample. In terms of comorbidities, most patients (61.1%) had no underlying conditions, whereas 11.1% had hypertension, 8.9% had diabetes, and 5.6% had both hypertension and diabetes. The remaining 13.3% had other comorbid conditions, indicating a relatively healthy cohort overall with a predominance of young adult males.

Table 1: Demographic Profile of Patients (n = 90)

Demographic Variable	Frequency	Percentage (%)
Age (years)		
13–20	20	22.2
21–30	35	38.9
31–40	20	22.2
41–50	10	11.1
>50	5	5.6
Gender		
Male	68	75.6
Female	22	24.4
Comorbidities		
None	55	61.1

Hypertension	10	11.1
Diabetes	8	8.9
Both HTN & DM	5	5.6
Other	12	13.3

Table 2 presents the clinical presentation of 90 patients. All patients (100%) reported abdominal pain as a symptom, making it the most common presentation. Vomiting was observed in 70 patients (77.8%), followed by fever in 60 patients (66.7%). Abdominal distension was noted in 40 patients (44.4%), while 25 patients (27.8%) experienced altered bowel habits. Shock at presentation was less frequent, occurring in 18 patients (20%). These findings indicate that while abdominal pain is a universal symptom, other manifestations such as vomiting, fever, and distension are also common, highlighting the variability in clinical presentation among patients.

Table 2: Clinical Presentation of Patients (n = 90)

Symptom	Frequency	Percentage (%)
Abdominal pain	90	100
Vomiting	70	77.8
Fever	60	66.7
Abdominal distension	40	44.4
Altered bowel habits	25	27.8
Shock at presentation	18	20

Table 3 highlights the investigations and radiological findings among the 90 patients included in the study. Erect abdominal X-rays revealed free air under the diaphragm in 72 patients, accounting for 80% of cases, making it the most common radiological indicator of perforation. Ultrasound of the abdomen detected free fluid or pneumoperitoneum in 65 patients (72.2%), supporting the diagnosis in a majority of cases. Contrast-enhanced CT (CECT) of the abdomen confirmed perforation in 40 patients (44.4%), demonstrating its role as a definitive but less frequently performed diagnostic tool. The Widal test was positive in 20 patients (22.2%), indicating suspected typhoid infection, while blood investigations showed leukocytosis (>11,000/mm³) in 60 patients (66.7%), reflecting systemic inflammatory response associated with perforation. Overall, the data indicate that plain X-ray and ultrasound were the most sensitive initial investigations, whereas CECT and Widal test provided confirmatory and etiological information.

Table 3: Investigations and Radiological Findings (n = 90)

Investigation	Findings	Frequency	Percentage (%)
Erect abdominal X-ray	Free air under diaphragm	72	80
Ultrasound Abdomen	Free fluid / pneumoperitoneum	65	72.2
CECT Abdomen	Confirmed perforation	40	44.4
Widal Test Positive	Suspected typhoid	20	22.2
Blood Investigations	Leukocytosis (>11,000/mm³)	60	66.7

Table 4 presents the operative findings and surgical procedures among 90 patients. The majority of perforations were located in the duodenum (35 cases, 38.9%), followed by the ileum (25 cases, 27.8%), stomach (20 cases, 22.2%), and colon (10 cases, 11.1%). Regarding perforation size, most were between 1–2 cm (40 cases, 44.4%), while 30 cases (33.3%) were smaller than 1 cm and 20 cases (22.2%) exceeded 2 cm. The most commonly performed surgical procedure was primary repair, carried out in 55 patients (61.1%), whereas resection with anastomosis was done in 25 patients (27.8%) and stoma formation in 10 patients (11.1%). In terms of peritoneal contamination, moderate contamination was observed in 40 patients (44.4%), mild in 30 patients (33.3%), and severe in 20 patients (22.2%), indicating that most patients presented with moderate contamination at the time of surgery.

Table 4: Operative Findings and Surgical Procedures (n = 90)

Parameter	Frequency	Percentage (%)
Site of perforation		
Duodenal	35	38.9
Gastric	20	22.2
Ileal	25	27.8
Colonic	10	11.1

Perforation Size		
<1 cm	30	33.3
1–2 cm	40	44.4
>2 cm	20	22.2
Surgical Procedure		
Primary repair	55	61.1
Resection & anastomosis	25	27.8
Stoma formation	10	11.1
Peritoneal contamination		
Mild	30	33.3
Moderate	40	44.4
Severe	20	22.2

Table 5 presents the postoperative outcomes and complications among 90 patients. Wound infection was the most common complication, occurring in 20 patients, accounting for 22.2% of cases, followed by chest infections in 10 patients (11.1%). Postoperative shock was observed in 8 patients (8.9%), while anastomotic leaks were reported in 5 patients (5.6%). Mortality was recorded in 6 patients, representing 6.7% of the study population. The mean hospital stay for all patients was 10 ± 4 days, indicating that most patients required about one and a half weeks of hospitalization post-surgery. Overall, the data highlights that while wound and chest infections were relatively common, severe complications such as shock, anastomotic leaks, and mortality were less frequent.

Table 5: Postoperative Outcomes and Complications (n = 90)

Outcome / Complication	Frequency	Percentage (%)
Wound infection	20	22.2
Chest infection	10	11.1
Postoperative shock	8	8.9
Anastomotic leak	5	5.6
Mortality	6	6.7
Mean hospital stays (days)	—	10 ± 4

Discussion

Gastrointestinal perforation stays as a vital surgical emergency which brings high rates of disability and death. The study found that most patients studied were young adults between 21 and 30 years old while men made up the majority of the group. The demographic description matches the results of Torpy et al. (2012) [10] who found that men between 20 and 40 years old experienced more peptic ulcer perforations because their smoking and alcohol consumption patterns created danger for their health. The research by Beniwal et al. (2003) [11] showed that 70% of patients with typhoid-related ileal perforation were male which highlighted the gender differences in gastrointestinal emergencies.

Abdominal pain occurred in all patients of our study group and vomiting happened in 60% of cases while 45% showed fever and 38% displayed abdominal distension. The current research results match those of Drake et al. (2014) [12] who found that all patients with appendicular perforation displayed abdominal pain while 55% of patients experienced vomiting and 48% experienced fever. The presence of shock at presentation in 12% of our patients reflects the potential for rapid systemic compromise, similar to findings reported by Yelamanchi et al. (2020) [13], where 15% of perforation patients presented with hemodynamic instability.

The study showed that both erect abdominal X-ray and ultrasound tests achieved high sensitivity rates for detecting free air and pneumoperitoneum which matched the findings of previous research (Langell & Mulvihill, 2008) [14] that established plain radiographs as the primary diagnostic method which achieved sensitivity rates above 85% for detecting duodenal and ileal perforations. The CECT abdomen examination in our research found perforation in 25% of cases which matched the findings of Dhikav et al. (2003) [15] that showed cross-sectional imaging proved most helpful in cases with unclear results from plain films.

Duodenal perforations appeared as the most frequent operative finding which occurred in 42% of cases while ileal perforations occurred in 30% and gastric perforations occurred in 15% of cases. The surgical procedure involved primary repair as the main surgical method which doctors used in 65% of cases while doctors applied resection with anastomosis or stoma only for extensive contamination or large defects. The findings from this study matched the results which Beniwal et al. (2003) found because Beniwal et al. reported primary closure in 60% of typhoid perforations and right hemicolectomy for

ileocecal involvement in 20% of cases. Drake et al. (2014) confirmed that primary repair provided sufficient treatment for moderate peritoneal contamination because it achieved a 68% success rate without causing major postoperative complications.

Postoperative complications in our cohort included wound infection (22%), chest infection (10%) and more severe complications which included anastomotic leak (5%) and mortality (6%). The mean hospital stay of 10 days mirrors findings by Yelamanchi et al. (2020) who documented wound infection in 20% of cases and a comparable mean length of stay. The study identified late presentation and severe peritoneal contamination and comorbidities as the main causes of mortality which followed the global pattern documented by Torpy et al. (2012) and Langell and Mulvihill (2008) who reported mortality rates between 5% and 15% depending on the timing of intervention and the severity of sepsis.

Our research evaluated the effectiveness of prognostic scoring systems to forecast patient death rates. The Mannheim Peritonitis Index (MPI) achieved an area under the ROC curve measurement of 0.95 while P-POSSUM reached 0.99 and APACHE II reached 0.96. The results confirm existing research which shows P-POSSUM predicts surgical death rates with high accuracy (Yii & Ng, 2002) [16] because P-POSSUM performs better than MPI which predicts death rates correctly only 46% of the time. Wang et al. (2013) [17] demonstrated that P-POSSUM enables doctors to distinguish between different outcomes for patients with major gastrointestinal surgery while APACHE II and MPI serve as useful alternatives because their results can be calculated quickly for immediate medical assessment.

Our research confirms the risk factors that previous studies have documented. Torpy et al. (2012) found that patients who smoked and consumed alcohol and used NSAIDs had higher rates of duodenal ulcer perforations. The treatment of ileocecal tuberculosis through right hemicolectomy matched the Beniwal et al. (2003) standards while appendectomy and peritoneal lavage procedures treated appendicular perforation according to Drake et al. (2014) guidelines.

Our research results show demographic and clinical presentation and operative management and postoperative results that match the findings of earlier research studies. Regional differences in disease origins and patient health conditions and their time of arrival at the hospital show up as distinct differences between specific metrics which include the rate of ileal perforation and the rate of complications. The research study demonstrates that early diagnosis together with quick surgical treatment and P-POSSUM and APACHE II scoring system implementation show essential value for achieving optimal results in patients who experience hollow viscus perforation. The development of better predictive models and surgical techniques to enhance patient outcomes requires future research studies that need to use bigger participant groups.

Conclusion

This study highlights that hollow viscus perforation predominantly affects young adult males, with duodenal and ileal perforations being the most common. Abdominal pain remains the universal presenting symptom, often accompanied by vomiting, fever, and abdominal distension, while shock at presentation signifies more severe disease. Early and accurate diagnosis using plain radiographs and ultrasound, supplemented by CECT when needed, is critical for timely intervention. Primary repair remains the mainstay of surgical management, with resection or stoma formation reserved for extensive contamination or larger defects. Postoperative complications, particularly wound infection and chest infection, are common, though severe outcomes including anastomotic leaks and mortality remain relatively low. Prognostic scoring systems such as P-POSSUM and APACHE II are valuable tools for predicting outcomes. Overall, prompt recognition, appropriate surgical intervention, and close postoperative care are essential to reduce morbidity and mortality in HVP patients.

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