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Original Research Article

Outcome of surgeries for non-traumatic hollow viscous perforations

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ABSTRACT

Background: Patients with non-traumatic hollow viscous perforations present challenge to the surgeons and outcome depends upon location and surgeon skills. Present study was to investigate the outcome of surgeries for non-traumatic hollow viscous perforations.
Methods: This is a prospective observational study carried out in surgical wards in Mamata General Hospital between October 2015 and September 2017 over a period of 02 years. Evaluation of all the patients fulfilling the inclusion and exclusion criteria with respect to history, physical findings, operative findings and postoperative complications in line with the predetermined objectives was done. Various treatment modalities available and their outcome were also evaluated.
Results: Benign causes of gastrointestinal perforation constituted majority of non-traumatic gastrointestinal perforations. Peptic ulcer perforation (68%) was the major cause of gastrointestinal perforation. Most common site for non-traumatic gastrointestinal perforations was duodenum (48%). Simple closure with omental patch was the operative procedure done for all cases of peptic ulcer perforation and appendicectomy for appendicular perforation. Ileal perforations secondary to typhoid perforation were treated with resection and end-to-end anastomoses in the present study. Colonic perforation was managed with Hartmann's procedure. Most common complication was SSI (34%). Mortality was 8% and was due to septicemia.
Conclusions: Aggressive resuscitation and early meticulous surgery is required to decrease morbidity and mortality in hollow viscous perforation cases.

Keywords: Hollow viscous perforations, Non-traumatic, Outcome, Surgeries

INTRODUCTION

The history of gastrointestinal perforation probably starts with identification of duodenal perforation by To Cheng in 1984, when he found a duodenal perforation in a preserved body in China which dates back to 167 BC.[1]

In 1843 Edward Crisp first reported 50 cases of peptic perforation and accurately described the clinical aspects of perforation, stating: The symptoms are so typical; I hardly believe it possible that anyone can fail to make the correct diagnosis.[2]

The basic idea for conservative treatment came from Crisp who noted that perforations of the stomach were filled by adhesions to the surrounding viscera which prevented leakage from the stomach into the peritoneal cavity. Johan Mikulicz-Radecki often referred to as the first surgeon who closed a perforated peptic ulcer by simple closure (1850-1905).[2]

The Taylor method of conservative management, which included treatment by nasogastric aspiration, antibiotics and intravenous fluids, was presented in 1946, based on the theory that effective gastric decompression and

continuous drainage will enhance self-healing of perforation. Patients likely to respond to conservative management can be selected by performing a gastroduodenogram, as described by Donovan. Cellan-Jones and Graham advocated use of omental patch for closing peptic perforations.[3]

Marshall BJ et al, who identified *H. pylori*, revolutionized the management of peptic disease.[4]

The Maastricht III consensus report laid down the guidelines for chemotherapy of *H. pylori* by using triple drug regime.[5]

Today, surgery for peptic ulcer disease is restricted to the treatment of complications such as perforation, bleeding etc. In peptic perforation, conservative treatment can be given in selected cases. If laparotomy is necessary, simple closure is sufficient in majority of cases and definitive ulcer surgery is no longer required in these patients. Centre's having facilities of laparoscopy with expertise undertake laparoscopic closure of perforation.[6]

Aristotle was the first to describe intestinal injury as a consequence of blunt abdominal trauma. The first report of intestinal injury from penetrating trauma is attributed to Hippocrates.[7] Ileal perforation is common surgical emergency in tropical countries. It is reported to constitute the common cause of abdominal emergencies due to high incidence of enteric fever and tuberculosis in these countries. Despite the availability of modern diagnostic facilities and advances in treatment regimens, this condition is associated with a high mortality and unavoidable morbidity.[8]

Singh BU in 2003 concluded that repair of typhoid perforation is a better procedure than temporary ileostomy in enteric perforation due to its cost effectiveness and absence of complications related to ileostomy and ileo-transverse bypass.[9] They should be considered as treatment option in patient with an unhealthy gut alone.

Present study was done to study outcome of surgeries for non traumatic hollow viscous perforations.

METHODS

The present study was a single-center, prospective observational study. The study was done in Mamata General Hospital, Khammam, Telangana state over a period of 2 years from October 2015 to September 2017. This study was conducted on 50 patients fulfilling the inclusion and exclusion criteria as mentioned below.

Inclusion criteria

- Patients with abdominal pain and features of peritonitis; generalized or localized.
- Patients with abdominal pain, with investigations revealing hollow viscous perforation.
- Evidence of gas under diaphragm.
- Patients with hollow viscous perforation underwent surgery as a treatment modality.
- Patients willing to be a part of this study.

Exclusion criteria

- Patient with blunt / penetrating injury of abdomen with signs of hollow viscous perforation determined clinically and radiologically.
- Patients with abdominal pain but with no features of hollow viscous perforation radiologically (or) intra-operatively.
- Patients who sustained inadvertent iatrogenic perforation during previous laparotomy.
- Patients with perforations of genitourinary tract like urinary bladder, ruptured ectopic pregnancy, etc.
- Patients not undergone surgery as a treatment modality.
- Patients unwilling to be a part of this study.

The patients included in the study were subjected to a thorough history and physical examination. All the patients were subjected to undergo relevant investigations like;

- Complete hemogram
- Urine analysis
- Renal function tests
- Serum electrolytes
- Coagulation profile including bleeding time and clotting time
- Widal test (in selected cases, when suspected of complicated enteric fever)
- Plain X-ray abdomen supine, erect / left lateral decubitus position depending on the condition of patient
- X-ray chest PA view in erect posture including the domes of the diaphragm
- Ultrasonographic evaluation of abdomen.

After clinical assessment and basic investigations, patients were first actively resuscitated with intravenous fluids especially Ringer lactate, nasogastric aspiration, administration of broad spectrum antibiotics and analgesics. The preferred antibiotics were combination of injection cefoperazone-sulbactam (1.5 g, Intravenous, 8th hourly) and injection metronidazole (500 mg, Intravenous, 8th hourly) covering the broad spectrum of gram positive cocci, gram negative aerobic bacilli and anaerobic gram negative rods. Injection amikacin (500 mg, Intravenous, 12th hourly) was given to individuals with normal renal function tests. Later antibiotics were changed in due course of illness depending on the culture and sensitivity report of the inflammatory peritoneal fluid.

After stabilizing the patient initially, the other necessary investigations like basic radiological investigations and special radiological investigations like CT scan of abdomen, where indicated, were completed as per necessity and patients were taken up for laparotomy under epidural-spinal or general anesthesia, depending on the suspected site of pathology and the general condition of the patient. In the majority, midline abdominal incisions were used, and the abdominal viscera inspected carefully for pathology. The site of lesion was located, and appropriate surgery performed depending on the pathology made out intraoperatively.

Thorough peritoneal toileting was done with normal saline. Mass closure of abdomen was done with drain in position. Post-operatively patients were managed with nasogastric aspiration, intravenous fluids, antibiotics, analgesics and other supportive treatment as required. Daily patients were monitored and assessed for recovery and complications which were identified and treated appropriately. Patents were discharged after full recovery and were followed up for a minimum period of 1 to 3 months depending on the type of surgery performed.

A separate proforma for each patient, containing all the relevant particulars were maintained and reviewed for the analysis at the end of the study.

RESULTS

Peptic ulcers contribute to about 68% of the non-traumatic hollow viscous perforation in the study population. Acute appendicitis was the cause of appendicular perforation (24%) in the study population. Ileal perforations were secondary to typhoid fever. Internal hernia leading to jejunal perforation was seen in 2% of study population. Colonic perforation in the study population was secondary to malignancy involving the recto sigmoid. Etiology has been attributed after the histopathological diagnosis report was available but not on intra-operative findings alone.

Table 1: Etiology of hollow viscous perforation.

Site of perforation	Etiology	Number	Percent
Stomach	Gastric ulcer	10	20
Duodenum	Chronic duodenal ulcer	24	48
Jejunum	Internal hernia	1	2
Ileum	Typhoid perforation	2	4
Appendix	Appendicitis	12	24
Colon	Carcinoma	1	2

Table 2: Surgical modalities performed for hollow viscous perforation.

Site	Procedure	%
Stomach	Graham's omental patch closure with peritoneal lavage (ulcer edge biopsy)	20
Duodenum	Graham omental patch closure with peritoneal lavage	48
Jejunum	Resection anastomoses	2
Ileum	Resection anastomoses	4
Appendix	Appendectomy	24
Colon	Hartmann's procedure with resection of involved segment	2

20% of the study population had gastric perforation in the present study. Duodenal perforations were seen in 48% of the study population. In all the cases, Graham's omental patch closure was done (after taking a biopsy from the edge in case of gastric ulcers). Jejunal perforation was secondary to jejuna diverticulosis with internal hernia. Resection of the involved segment of jejunum followed by anastomoses was done. Ileal perforation was secondary to typhoid enteritis in both (4%) the cases. Resection anastomoses of the involved segment were done. Hartmann's procedure following resection of involved segment was done for colonic perforation situated in the recto sigmoid.

Table 3: Postoperative complications.

Site of perforation	Complications			
	SSI	Respiratory	Septicemia	Burst abdomen
Stomach	3 (6%)	5 (10%)	3 (6%)	0
Duodenum	7 (14%)	4 (8%)	0	0
Jejunum	0	1 (2%)	1 (2%)	0
Ileum	1 (2%)	0	0	1 (2%)
Appendix	5 (10%)	0	0	0
Colon	1 (2%)	0	0	0

Complications in the present study included local wound infections, respiratory complications and septicemia. Local wound infections included superficial surgical site infections of varying grades (Southampton grading

system). Total wound complication rate was 34% in the present study. Superficial SSIs in case of duodenal perforation had an incidence of 14%, followed by appendicular perforation contributing to 10% of superficial SSIs. SSI rate was 6% in case of gastric perforations. Remaining 4% of the SSIs were seen in ileal and colonic perforation. Respiratory complications in the present study included pneumonia and ARDS. Pneumonia was seen in 14% of the study population which responded to medication. ARDS was seen in 8% of the study population which was the cause of mortality. Preoperatively, features of septic shock were seen in 8% of study population, of which 6% cases had gastric perforation and 2% had jejunal perforation. All these patients died within 3 days of postoperative period due to complications of sepsis especially ARDS. Burst abdomen was seen in 2% of population in the present study.

Table 4: Mortality rates among the study subjects.

Anatomical site	Total no. of cases		Total no. of deaths	
	Number	%	Number	%
Stomach	10	20	3	6
Duodenum	24	48	0	0
Jejunum	1	2	1	2
Ileum	2	4	0	0
Appendix	11	22	0	0
Colon	1	2	0	0
Total	50	100	4	8

4 deaths occurred during the study period contributing to about 8% of total cases. Out of the 8% deaths, 6% mortality was seen following gastric perforation that underwent Graham's omental patch repair and 2% mortality was seen in jejunal perforation secondary to diverticulosis with internal herniation. The cause for the mortality was ARDS leading to respiratory failure, as a result of septicemia in all the cases.

DISCUSSION

Malik P noted that most common site of perforation was duodenum (35.8%) followed by ileum (27.6%). Other sites included gastric (0.85%), esophageal (0.14%), jejunal (13.3%), appendicular (18.4%) and colonic perforation (3.8%).[10] The findings of the present study correlate with this study with respect to predominance of duodenal perforations (35.8%). 93% of gastro-duodenal perforations were secondary to acid peptic disease in this study which is similar to results of the present study (100%). Ileal perforations had an incidence of 27.6% whereas in the present study the incidence was 4%. Etiology of ileal perforations in this study included typhoid (64%) and tuberculosis (31%) whereas in the present study, typhoid ileitis led to perforation in both (100%) the cases. Jejunal perforations in this study were secondary to trauma. But in the present study, traumatic perforations have been excluded and the incidence of non-traumatic jejunal perforation was 2%, secondary to jejunal diverticulosis with internal herniation. Incidence of appendicular perforations in this study correlates with the present study. 77% of colonic perforations were secondary to malignancy in this study whereas in the present study, there was only a single case of colonic perforation (2%) involving sigmoid colon secondary to malignancy of recto sigmoid junction.

Kemparaj T reviewed 369 cases retrospectively over a period of 10 years to study the incidence and management of gastrointestinal perforations.[11] Peptic ulcers and malignancy were the cause for 95% and 2% of the gastrointestinal perforations respectively, correlating with the present study, except that there was no case of gastric malignancy in the present study. 88% of the ileal perforations were secondary to typhoid ileitis correlating with the present study.

In this study, appendicular perforations were seen in 11% of study population, especially in individuals presenting late. This is comparable to the present study.

Majority of colonic perforations were secondary to trauma (72%) followed by malignancy (28%). In the present study, traumatic colonic perforations were excluded. There was a single case of non-traumatic colonic perforation (2%) in the present study which was secondary to malignancy.

In a prospective study by Vyas AK, 227 cases of perforation peritonitis were studied. Acid peptic disease contributed for 57% of total perforation peritonitis followed by appendicular (18%) perforations.[12] These findings correlate with the present study with 68% of the hollow viscous perforations secondary to acid peptic disease, followed by appendicular perforations in 24% of study population. This study included traumatic hollow viscous perforations with an incidence of 7%, therefore differs from the present study in this aspect. Spanned over a period of 3-year, 545 cases of secondary peritonitis were studied by Parthasarathi Ghosh to study the epidemiological trend in Indian subcontinent. A clear male predominance was found in their cohort (n = 461; 84.58%).[13] Gastro duodenal (GD) perforation due to acid peptic disorder (henceforth called GD perforation) remained the most common cause of peritonitis in this series (48.44% of study population) followed by appendicular (18.53%) and typhoid (6.2%) perforations. This study had 13.5% of traumatic perforations. If these traumatic perforations are excluded and incidence recalculated, the incidence of non-traumatic GD perforation (56.9%) due to acid peptic disease is similar to the present study (68%). Incidence of typhoid perforations were more in this study, due to large sample size when compared to the present study. 90% of the gastro duodenal perforations were secondary to acid peptic disease in a study by Jhobta et al.[14] The authors included both traumatic and non-traumatic cases in their study. Malignancy was the etiology of gastric perforation in case of 4% of study population, whereas in the present

study, there was no case of biopsy proven malignancy. 45% of the small bowel perforations were secondary to typhoid followed by tuberculosis (22%), malignancy (5%) and strangulation (5%). In the present study, 66.6% of the small bowel perforation was secondary to typhoid. Malignancy was responsible for 26% of large bowel perforations in this study, whereas only 2% of cases with large bowel perforation due to malignancy were seen in the present study.

In other studies, like Shrestha K gastro-duodenal perforations secondary to peptic ulcer disease were common. In case of small bowel perforations, typhoid was the most common etiology found in their studies.[15] These findings correlate with the present study. However gastric perforations in majority of the studies were secondary to malignancy in contrast to present study, where gastric perforations were secondary to acid peptic disease. Appendicular perforations in majority of the studies were due to delayed presentation which is similar to the findings of the present study.

20% of the study population had gastric perforation in the present study. Duodenal perforations were seen in 48% of the study population. In all these cases, Graham's omental patch closure was done (after taking a biopsy from the edge in case of gastric ulcers). Jejunal perforation was secondary to jejuna diverticulosis with internal hernia. Resection of the involved segment of jejunum followed by anastomoses was done. Ileal perforation was secondary to typhoid enteritis in both (4%) the cases. Resection anastomoses was done in perforations involving small bowel. Hartmann's procedure following resection of involved segment was done for colonic perforation situated in the sigmoid colon.

Jhobta et al in his study on perforation peritonitis performed simple closure of perforation in 60% of the study population, especially gastro duodenal perforations.[14]

Appendectomy alone was performed for appendicular perforations. In case of small and large bowel perforations, resection and anastomoses (9%) was done in cases with limited peritoneal contamination. Resection without anastomoses (13%) in the form of ileostomy/colostomy with mucus fistula/Hartmann's procedure was done in unstable patients with gross peritoneal contamination. In the present study, resection and anastomoses was done in 6% of study population who presented with ileal and jejunal perforation.

Hartmann's procedure was done in 2% of study population due to peritoneal contamination. Similar to this study, simple closure with Graham's patch was done in 68% of study population with gastro duodenal perforation and appendectomy in 24% of study population who presented with appendicular perforation in this study.

Malik P et al in their study, performed simple closure (49.6%) for gastro duodenal and traumatic small bowel perforations.[10] Resection without anastomoses was performed in small and large bowel perforations with gross peritoneal contamination in 21% of cases in the form of ileostomy, colostomy or Hartmann's procedure. [10] Resection with anastomoses (11%) was done in case of small and large bowel perforations with limited peritoneal contamination. Appendectomy (18.4%) was done in all the cases of appendicular perforations. In the present study, resection without anastomoses was done in a case of colonic perforation.

Kemparaj T in his retrospective study analyzed the outcomes of various surgical modalities performed for the closure of gastrointestinal perforations. Simple closure (66%) was the most common procedure done in this study followed by appendectomy (11%) and resection and anastomoses (11%). Definitive surgery for gastric malignancy in the form of Billroth-I and Billroth-II was performed in 2% of study population.[11] Resection with diversion procedures were done in 9% of study population. Simple closure showed better results in his study.

Superficial surgical site infection rates varied in different studies. Superficial SSI rates in the studies by Jhobta et al, Shrestha K, Kemparaj T, were 25%, 40%, 30% respectively.[11,14,15] These SSI rates are similar to the present study. Respiratory complications are considered as the major cause of morbidity and mortality among various studies. In the present study, 22% of the study population had respiratory complications in the form of pneumonia or ARDS. Mortality was 8% in the present study which was due to ARDS and shock. Respiratory complications in the other studies by Jhobta et al, Kemparaj were 28%, and 21% respectively.[11,14] They contribute to increased hospital stay.

Features of shock secondary to septicemia were seen in 8% of the study population in the present study. Shrestha K reported the incidence of 32% for shock in her study on perforation peritonitis due to gastrointestinal perforations.[15] Present study has the lowest incidence of burst abdomen (2%) when compared to other studies like Shrestha, Kemparaj T, Jhobta et al.[11,14,15]

4 deaths occurred during the study period contributing to about 8% of study population in the present study. Mortality in gastric perforation, which underwent Graham's omental patch repair, was more contributing to 6% of the study population and 2% mortality was seen in jejunal perforation secondary to diverticulosis with internal herniation. The cause for the mortality was septicemia in all the cases.

Mortality rate in the present study correlates with the studies of Vyas AK (8%), Jhobta et al (10%), Malik P (7.2%) and Kemparaj T (13.8%).[10-12,14]

CONCLUSION

Aggressive resuscitation and early meticulous surgery is required to decrease morbidity and mortality in hollow viscous perforation cases.

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