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## A study on management and outcome of hollow viscus perforation at tertiary care hospital

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### Abstract

An intestinal perforation is a major life-threatening condition with high morbidity and mortality that requires emergency surgery. Despite improvements in surgical and medical treatments, the overall mortality rate is 30% and the mortality rate of cases that also have diffuse peritonitis is up to 70%. The rate of postoperative complications, such as complicated fluid collection, leakage, surgical site infection, and other systemic infections, is higher than for patients receiving elective abdominal surgeries. In our study, 10 (37.1%) patients with Duodenum Perforation underwent immediate surgery while 17 (62.9%) patients underwent surgery on the same day. The mean time interval between admission and surgery of patients was  $6.22 \pm 3.39$  hours. All patients (100%) with Appendicular Perforation underwent surgery on the same day. The mean time interval between admission and surgery of patients was  $10.11 \pm 2.93$  hours. Simple closure with omental patch with thorough peritoneal toileting was very much effective.

**Keywords:** Intestinal perforation, appendicular perforation, duodenum perforation

### Introduction

Gastrointestinal perforation, also known as ruptured bowel, is a hole in the wall of part of the gastrointestinal tract [1]. The gastrointestinal tract includes the esophagus, stomach, small intestine, and large intestine [2]. Symptoms include severe abdominal pain and tenderness [1]. When the hole is in the stomach or early part of the small intestine the onset of pain is typically sudden while with a hole in the large intestine onset may be more gradual [1]. The pain is usually constant in nature [1]. Sepsis, with an increased heart rate, increased breathing rate, fever, and confusion may occur [1].

The cause can include trauma such as from a knife wound, eating a sharp object, or a medical procedure such as colonoscopy, bowel obstruction such as from a volvulus, colon cancer, or diverticulitis, stomach ulcers, ischemic bowel, and a number of infections including *C. difficile*. A hole allows intestinal contents to enter the abdominal cavity. The entry of bacteria results in a condition known as peritonitis or in the formation of an abscess. A hole in the stomach can also lead to a chemical peritonitis due to gastric acid. A CT scan is typically the preferred method of diagnosis; however, free air from a perforation can often be seen on plain X-ray [3].

Perforation anywhere along the gastrointestinal tract typically requires emergency surgery in the form of an exploratory laparotomy. This is usually carried out along with intravenous fluids and antibiotics [1]. A number of different antibiotics may be used such as piperacillin/tazobactam or the combination of ciprofloxacin and metronidazole [3, 4]. Occasionally the hole can be sewn closed while other times a bowel resection is required. Even with maximum treatment the risk of Death can be as high as 50% [1]. A hole from a stomach ulcer occurs in about 1 per 10,000 people per year, while one from diverticulitis occurs in about 0.4 per 10,000 people per year [4, 5]. The mainstay of treatment for bowel perforation is surgery. Endoscopic, laparoscopic and laparoscopic-assisted procedures are now being increasingly performed instead of conventional laparotomy.

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 with non-surgical procedures.

It is important to identify location and cause of the perforation correctly for appropriate management and surgical planning. The clinical diagnosis of the site of gastrointestinal tract perforation is difficult as the symptoms may be non-specific. An intestinal perforation is a major life-threatening condition with high morbidity and mortality that requires emergency surgery. Despite improvements in surgical and medical treatments,

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The overall mortality rate is 30% and the mortality rate of cases that also have diffuse peritonitis is up to 70% [6]. The rate of postoperative complications, such as complicated fluid collection, leakage, surgical site infection, and other systemic infections, is higher than for patients receiving elective abdominal surgeries. Various factors can cause intestinal perforation, including ischemic colitis, intestinal obstruction, stercoral perforation, infection, cancer, diverticulitis, trauma, and colonoscopy [7]. Perforations due to cancer and infection have high mortality rates but iatrogenic perforation during colonoscopy has a low mortality rate. Several studies have identified prognostic factors associated with morbidity and mortality for patients with an intestinal perforation, and several scoring systems are available [8].

### Methodology

Each patient was examined thoroughly, after taking a detailed history. The diagnosis and examination was made with history, clinical features and X-ray abdomen erect posture to support the diagnosis each case was studied at per the proforma.

Based on the time interval between the hospital admission and surgery, the surgery were categorized into,

- Immediate - Less than 4 hours
- Same day - 4 to 24 hours
- Delayed - more than 24 hours

Operative details included the site of the perforation, size of the perforation, nature and quantity of peritoneal soiling, the gross appearance of the bowel bearing the perforation and the nature of operation performed.

Tissue biopsies for histologic confirmation were taken in appropriate cases. Mortality was defined as death following surgery. Morbidity was defined in terms of duration of hospital stay and associated complications following surgery.

Following details were observed from the case sheets and clinical examination.

- Patients name, age, sex, inpatient number.
- Clinical features and abdominal findings
- Delay in hours between admission and surgery
- Operative findings
- Procedure done
- Post-operative complications
- Duration of hospital stay

A detailed history was taken and the presenting signs and symptoms were recorded. A thorough physical examination was done with special emphasis on the abdominal examination. Laboratory investigations included routine blood, urine and stool examinations. Total count and differential leucocyte count were done in appropriate cases. Diagnostic peritoneal tapping was done after taking X-ray and subjected to culture and sensitivity tests. Radiological examination was done in all the cases to detect pneumoperitoneum. Ulcer edge biopsy was taken from cases of, wherever possible, peptic and non-specific ileal perforations and subjected to histopathological examination. In operated cases peritoneal exudate was sent for culture and sensitivity test of the organisms present.

The pre-operative preparation of each case essentially consisted of correction of dehydration, overcoming the shock if it was present, gastric aspiration, parental broad spectrum antibiotic coverage and tetanus prophylaxis. The treatment to be adopted in each case was decided by the attending surgeon. Post-operative fluid and electrolyte balance was maintained by input

and output charts and adequacy of replacement was judged mainly on the basis of clinical features. In most of the cases antibiotics started pre-operatively were continued and changed to suitable antibiotics after the sensitivity of the organisms was known. The drainage tubes were removed on the 3rd and 4th post-operative day and the gastric aspiration was discontinued as soon as the patient passed the flatus. The post-operative complications were studied in the immediate follow up period.

### Results

**Table 1:** Anatomical Distribution of Perforations

| Site of Perforations | No. Of Cases | Percentage |
|----------------------|--------------|------------|
| Duodenum             | 27           | 54%        |
| Appendicular         | 9            | 18%        |
| Ileal                | 8            | 16%        |
| Gastric              | 6            | 12%        |
| Total                | 50           | 100%       |

Anatomically perforations were more common in the duodenum (54%), 18% were appendicular, 16% in the ileum and 12% gastric.

**Table 2:** Operative Procedure of Patients with Duodenum Perforation

| Operative Procedure               | No. of cases | Percentage |
|-----------------------------------|--------------|------------|
| Simple Closure with Omental Patch | 24           | 88.1%      |
| Bilateral Flank Drain             | 2            | 7.4%       |
| Omental Patch Reinforce           | 1            | 3.7%       |
| Total                             | 27           | 100%       |

The patients with Duodenum Perforation underwent simple closure with omental patch in 24 (88.1%) cases, bilateral flank drain in 2 (7.4%) cases and omental patch reinforce in 1 (3.7%) case.

**Table 3:** Hospital Stay of patients with Duodenum Perforation

| Hospital Stay | No. of Cases    | Percentage |
|---------------|-----------------|------------|
| 1-7 days      | 3               | 11.1%      |
| 8-14 days     | 21              | 77.8%      |
| >14 days      | 3               | 11.1%      |
| Total         | 27              | 100%       |
| Mean $\pm$ SD | 9.59 $\pm$ 2.41 |            |

Majority of the patients with Duodenum Perforation (77.8%) had a hospital stay of 8-14 days followed by 1-7 days (11.1%) and >14 days (11.1%). The mean duration of hospital stay of patients was 9.59  $\pm$  2.41 days.

**Table 4:** Post-operative Complications of patients with Duodenum Perforation

| Post-operative Complications | No. of Cases | Percentage |
|------------------------------|--------------|------------|
| Wound Infection              | 3            | 11.1%      |
| Basal Pneumonitis            | 1            | 3.7%       |
| Burst Abdomen                | 1            | 3.7%       |
| Enterocutaneous fistula      | 0            | 0.0%       |
| Death                        | 1            | 3.7%       |

Wound infection (11.1%) was the major post-operative complication followed by basal pneumonitis (3.7%), burst abdomen (3.7%). 1 (3.7%) patient died of which patient was treated by simple closure with omental patch.

**Table 5:** Operative Procedure of Patients with Appendicular Perforation

| Operative Procedure | No. of Cases | Percentage |
|---------------------|--------------|------------|
| Appendectomy        | 9            | 100%       |
| Total               | 9            | 100%       |

All patients with Appendicular Perforation underwent appendectomy (100%).

**Table 6:** Hospital Stay of patients with Appendicular Perforation

| Hospital Stay | No. of Cases     | Percentage |
|---------------|------------------|------------|
| 1-7 days      | 0                | 0%         |
| 8-14 days     | 8                | 88.9%      |
| >14 days      | 1                | 11.1%      |
| Total         | 9                | 100%       |
| Mean $\pm$ SD | 10.44 $\pm$ 2.65 |            |

Majority of the patients with Appendicular Perforation (88.9%) had a hospital stay of 8-14 days followed by >14 days (11.1%). The mean duration of hospital stay of patients was 10.44  $\pm$  2.65 days.

**Table 7:** Post-operative Complications of patients with Appendicular Perforation

| Post-operative Complications | No. of Cases | Percentage |
|------------------------------|--------------|------------|
| Wound Infection              | 2            | 22.2%      |

2 (22.2%) patients with Appendicular Perforation had post-operative complication of wound infection.

**Table 8:** Operative Procedure of Patients with Ileal Perforation

| Operative Procedure              | No. of Cases | Percentage |
|----------------------------------|--------------|------------|
| Closed in 2 layers               | 6            | 75%        |
| Resection Anastomosis            | 1            | 12.5%      |
| Splenectomy & Closed in 2 layers | 1            | 12.5%      |
| Total                            | 8            | 100%       |

6 (75%) patients with Ileal Perforation underwent double layer closure followed by resection anastomosis 1(12.5%) and splenectomy & double layer closure 1 (12.5%).

**Table 9:** Hospital Stay of patients with Ileal Perforation

| Hospital Stay | No. of Cases     | Percentage |
|---------------|------------------|------------|
| 1-7 days      | 1                | 12.5%      |
| 8-14 days     | 7                | 87.5%      |
| >14 days      | 0                | 0%         |
| Total         | 8                | 100%       |
| Mean $\pm$ SD | 10.38 $\pm$ 1.06 |            |

Majority of the patients with Ileal Perforation 7(87.5%) had a hospital stay of 8-14 days followed by 1-7 days (12.5%). The mean duration of hospital stay of patients was 10.38  $\pm$  1.06 days.

**Table 10:** Post-operative Complications of patients with Ileal Perforation

| Post-operative Complications | No. of Cases | Percentage |
|------------------------------|--------------|------------|
| Wound Infection              | 1            | 12.5%      |

1 (12.5%) patients with Ileal Perforation had post-operative complication of wound infection.

**Table 11:** Operative Procedure of Patients with Gastric Perforation

| Operative Procedure               | No. of Cases | Percentage |
|-----------------------------------|--------------|------------|
| Simple Closure with Omental Patch | 5            | 83.3%      |
| Closed in 2 layers                | 1            | 16.7%      |
| Total                             | 6            | 100%       |

5 (83.3%) patients with Gastric Perforation underwent simple closure with omental patch while 1 (16.7%) patient underwent double layer closure.

**Table 12:** Hospital Stay of patients with Gastric Perforation

| Hospital Stay | No. of Cases     | Percentage |
|---------------|------------------|------------|
| 1-7 days      | 1                | 16.7%      |
| 8-14 days     | 4                | 66.7%      |
| >14 days      | 1                | 16.7%      |
| Total         | 6                | 100%       |
| Mean $\pm$ SD | 10.33 $\pm$ 4.23 |            |

Majority of the patients with Gastric Perforation (66.7%) had a

hospital stay of 8-14 days followed by 1-7 days (16.7%) and >14 days (16.7%). The mean duration of hospital stay of patients was 10.33  $\pm$  4.23 days.

**Table 13:** Post-operative Complications of patients with Gastric Perforation

| Post-operative Complications | No. of Cases | Percentage |
|------------------------------|--------------|------------|
| Wound Infection              | 2            | 33.3%      |
| Fistula                      | 1            | 16.7%      |

2 (33.3%) patients with Gastric Perforation had post-operative complication of wound infection while 1 (16.7%) patient had fistula.

## Discussion

In our study, 10 (37.1%) patients with Duodenum Perforation underwent immediate surgery while 17 (62.9%) patients underwent surgery on the same day. The mean time interval between admission and surgery of patients was 6.22  $\pm$  3.39 hours. All patients (100%) with Appendicular Perforation underwent surgery on the same day. The mean time interval between admission and surgery of patients was 10.11  $\pm$  2.93 hours.

All patients (75%) with Ileal Perforation underwent surgery on the same day while 1 (12.5%) patient each were operated immediately and with delay. The mean time interval between admission and surgery of patients was 13.5  $\pm$  11.08 hours. 5 (83.3%) patients with Gastric Perforation underwent surgery on the same day while 1(16.7%) patient was operated immediately. The mean time interval between admission and surgery of patients was 9.66  $\pm$  2.88 hours.

The patients with Duodenum Perforation in our study underwent simple closure with omental patch in 24 (88.1%) cases, bilateral flank drain in 2 (7.4%) cases and omental patch reinforce in 1 (3.7%) case. All patients with Appendicular Perforation underwent appendectomy (100%).

In the present study, 6 (75%) patients with Ileal Perforation underwent double layer closure followed by resection anastomosis 1(12.5%) and splenectomy & double layer closure (12.5%). 5 (83.3%) patients with Gastric Perforation underwent simple closure with omental patch while 1 (16.7%) patient underwent double layer closure. These findings were consistent with the studies of Kemparaj T *et al* [9], Pandian P *et al.* [10] and Dinesh HN *et al* [11].

Kemparaj T *et al.* [9] retrospective study analyzing the incidence of various types of gastrointestinal perforations, their complications and the management of patients with postoperative leaks reported cases operated underwent simple closure in 66% (252), resection with anastomosis in 11% (42), gastrectomies 2% (9) in cases of gastric malignancies, resection with diversion procedures in 9% (33), right hemi colectomy in 1% (4) and appendicectomy in 11% (41). Simple closure of perforation showed good results.

Pandian P *et al.* [10] study to assess the pattern, common age and sex, most common causes and evaluate various modalities of treatment to reduce mortality and morbidity of hollow viscus perforation reported out of the total 16 gastric perforations, 10 were located in lesser curvature, 2 in the pre-pyloric region, and 4 in the body of the stomach. All patients were treated with the simple closure of the defect after freshening of the ulcer margins. All patients with duodenal perforation 36 cases were treated with Modified Graham's Live omental Patch repair and through wash given. In Ileal and jejunal perforations, ileal more commonly due to enteric associated peritonitis, and TB peritonitis, whereas traumatic perforation following blunt injury had jejunal perforations more commonly found.

Dinesh HN *et al*<sup>[11]</sup> prospective, descriptive study to assess the frequency of peritonitis secondary to hollow viscus perforation in relation to age, sex, anatomical location, symptoms and signs, investigation like erect X-ray abdomen and surgical management and its complications reported operative procedures as Omental patch closure 34 (56.66%), Appendectomy 8 (13.33%), Simple closure (two layers) 7 (11.66%), Resection anastomosis 6 (10%) and Loop ileostomy 5 (8.33%) respectively.

In the present study, majority of the patients with Duodenum Perforation (77.8%) had a hospital stay of 8-14 days followed by 1-7 days (11.1%) and >14 days (11.1%). The mean duration of hospital stay of patients was  $9.59 \pm 2.41$  days. Majority of the patients with Appendicular Perforation (88.9%) had a hospital stay of 8-14 days followed by >14 days (11.1%). The mean duration of hospital stay of patients was  $10.44 \pm 2.65$  days.

In our study, majority of the patients with Ileal Perforation 7(87.5%) had a hospital stay of 8-14 days followed by 1-7 days (12.5%). The mean duration of hospital stay of patients was  $10.38 \pm 1.06$  days. Majority of the patients with Gastric Perforation (66.7%) had a hospital stay of 8-14 days followed by 1-7 days (16.7%) and >14 days (16.7%). The mean duration of hospital stay of patients was  $10.33 \pm 4.23$  days.

It was observed in the present study that wound infection (11.1%) was the major post-operative complication followed by basal pneumonitis (3.7%), burst abdomen (3.7%). 1(3.7%) patients died which was treated by bilateral flank drain and 1 patient was treated by simple closure with omental patch. 2 (22.2%) patients with Appendicular Perforation had post-operative complication of wound infection.

1 (12.5%) patients with Ileal Perforation had post-operative complication of wound infection. 2(33.3%) patients with Gastric Perforation had post-operative complication of wound infection while 1 (16.7%) patient had fistula. Similar observations were noted in the studies of Kemparaj T *et al*<sup>[9]</sup>, Pandian P *et al*<sup>[10]</sup>, Dinesh HN *et al*<sup>[11]</sup> and Singh A *et al*<sup>[12]</sup>.

Kemparaj T *et al*<sup>[9]</sup> retrospective study analyzing the incidence of various types of gastrointestinal perforations, their complications and the management of patients with postoperative leaks reported wound infection (30%) was the major post-operative complication followed by pneumonia (21%) and anastomotic leak (21%). The majority of the patients with leaks had small-bowel perforation due to infective pathology. Conservative management in these patients had better outcome and low mortality. Risk factors were: elderly patients, late presentation, poor general condition (shock) and other co-morbid conditions. Post-operative complications were more frequent in patients with one or more risk factors. Mortality rate was 13.9%, the most common cause being septicemic shock. Mortality depended on the general condition of the patient, condition of the bowel, degree of peritoneal contamination and associated pre-operative co-morbid risk factors.

Pandian P *et al*<sup>[10]</sup> study to assess the pattern, common age and sex, most common causes and evaluate various modalities of treatment to reduce mortality and morbidity of hollow viscus perforation reported most common complications were respiratory 36%, wound infections 24%, dyselectrolyte 14%, septicemia 8%, burst abdomen 2.5%. All patients responded well with significantly reduced morbidity with 2 cases of burst abdomen, 10 cases of residual sub hepatic and pelvic intra peritoneal abscess and 1 case of anastomotic leak with fecal fistula which responded well and closed after 4 weeks. 5 patients died due to delayed presentation and septicemia and Multi organ dysfunction.

## Conclusion

- Definitive ulcer surgery was not warranted in the emergency and treatment with H2 blockers and H. pylori eradication achieved good control over the disease in the follow up period.
- The prognostic indicators were early hospitalization, adequate fluid replacement and no co-existing medical illness.
- The role of biopsy in gastric perforation was established with a case proving positive for malignancy.
- Appendicular perforation was the second common gastrointestinal perforation in the study.

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