International Surgery Journal
Thirumalagiri VR et al. Int Surg J. 2017 Jul;4(7):2262-2269
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20172778

Original Research Article

Acute peritonitis secondary to hollow viscous perforation: a clinical study

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Received: 24 March 2017
Accepted: 24 April 2017

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ABSTRACT

Background: Peritonitis due to hollow visceral perforation is commonly encountered in surgical practice it is defined as inflammation of the serosal membrane that lines the abdominal cavity and the organs contained therein. The objective of this study was to study the frequency of peritonitis secondary to hollow viscous perforation and complications of operative management.
Methods: 50 cases were studied with peritonitis due to hollow viscous perforation as surgical emergencies underwent emergency laparotomy, details of age, sex, anatomical location, signs and symptoms, reliability of investigation like X-ray-abdomen, complications, mortality were noted.
Results: The most common age group affected is 50 years and above. Duodenum (52%) is the most common site of perforation followed by ileal perforation (26%) appendicular (14%) and colonic perforation (4%). 84% of the patients were male patients and 16% of the patients were females. Duodenal ulcer (52%) is the most common cause of perforative peritonitis followed by small intestinal perforation. The appendicular perforation forms the next commonest cause of perforation (14%). Guarding and rigidity was present in 90% of patients. Diagnosis is made clinically and confirmed by presence of pneumoperitoneum (76%) on radiographs. Laparotomy with closure of the perforation with omental patch (64%) is the commonest operative management for perforated peptic ulcer fallowed by simple closure, resection and anastomosis, and loop ileostomy. The most common postoperative complication observed was lower respiratory tract infection. Overall mortality rate was 8%. The average duration of stay in hospital is 12.44 days.
Conclusions: Laparotomy with closure of the perforation with omental patch closure is the commonest method of surgical management in perforative peritonitis due to hollow viscous perforation.

Keywords: Appendix and colon, Duodenum, Hollow viscous perforation, Ileal

INTRODUCTION

Peritonitis due to hollow visceral perforation is commonly encountered in surgical practice it is defined as inflammation of the serosal membrane that lines the abdominal cavity and the organs contained therein.

Peritonitis is often caused by introduction of an infection into the otherwise sterile peritoneal environment through perforation of bowel, introduction of a chemically irritating material, such as gastric acid from a perforated ulcer. The different modes of presentation of cases may be misleading the diagnosis of its origin. The spectrum of etiology of perforation in tropical countries continues to be different from its western counterpart. In contrast to western countries where lower gastro-intestinal tract perforations predominate, upper gastro intestinal tract perforations constitute the majority of cases in India.[1,2]

Smoking and use of non-steroidal anti-inflammatory drugs are important risk factors for perforation.[3] Diagnosis is usually made clinically and confirmed by the presence of pneumoperitoneum on radiographs. The investigations should be such that it gives a definitive diagnosis in a short time. With the research and development in the field on surgery and intensive care facilities the treatment has swing towards operative approach compared to conservative approach. Sir Cuthbert Wallace puts it "it is better, to check than being waiting". In case of peritonitis i.e. early surgery has got advent ages over the late surgery. It is necessary to know the current surgical procedures for different perforation.

Non-operative management is successful in patients identified to have a spontaneously sealed perforation proved by water soluble contrast gastro-duodenogram. Operative management consists of time honored practice of omental patch closure, but this can also be done by laparoscopic method. Ileal perforation is a common surgical emergency in the tropical countries. It is reported to constitute the 5th commonest cause of abdominal emergencies due to high incidence of enteric fever and tuberculosis in these countries. The mortality rate from Ileal perforations remains high in developing countries, despite improvement in critical care and timely surgical intervention.[4] In the presence of advanced anesthesia of today and tremendous improvement of resuscitative measures, every patient with Ileal perforation should be recommended for surgery.

Appendicitis if untreated, progress to local peritonitis with formation of appendicular mass, gangrene of appendix, perforation and generalized peritonitis. In acute mesenteric ischemia, presence of peritoneal signs mandates surgical exploration along with embolectomy in the absence of the peritoneal signs, embolectomy is the standard of care. Infusion of intraluminal vasodilator is done in non-occlusive mesenteric ischemia.

Colonic perforations which carries high mortality risk is mainly due to diverticular perforation but perforations due to neoplasm, ischemia is also seen. Now-a-days, operative management of peritonitis consists of simple closure of the perforation with a thorough peritoneal lavage and also resection and anastomosis if needed especially in small bowel perforation. Ostomies are not preferred by many surgeons. In colon cancer with gross contamination of the peritoneum resection of the pathologic part with diversion procedure like Hartmann's procedure is considered. To study the frequency of peritonitis secondary to hollow viscous perforation and complications of operative management.

METHODS

The study protocol was approved by the Durgabai Deshmukh hospital and research centre, Andhra Mahila Sabha trust. A written, informed consent was obtained from all the patients.

Inclusion criteria

All the patients who were admitted to Durgabai Deshmukh hospital and research center with diagnosis of peritonitis secondary to hollow viscous perforation were included. Both sexes, all age groups are included.

Exclusion criteria

Patients with peritonitis secondary to esophagus perforation and reproductive tract perforation.

Out of the 50 cases of peritonitis secondary to hollow viscous perforation all underwent emergency laparotomy and the site of perforation, its pathological condition and the amount of peritoneal contamination were determined. The procedures adopted in the management were omental patch closure, simple closure, open appendicectomy, resection anastomosis and loop ileostomy.

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 following proforma.

The admitted cases are selected on the basis of clinical diagnosis and confirmed by operative diagnosis. Observation and evaluation of cases was done clinically from time of admission to discharge or death. All admitted cases are subjected to surgery (emergency laparotomy).

Observation and analysis of results outcome was done in relationship to age, sex, Symptoms, time of admission, anatomical site of perforation, complications, and outcome. Descriptive statistical analysis has been carried out in the present study with Statistical Package for Social Sciences (SPSS) version 19.0. Results on the continuous measurements are presented on Mean±SD (Min-Max) and results on categorical measurements are presented in numbers and percentage (%). P value calculated using T-test and chi-square test, P value <0.005 is taken as statistically significant.

RESULTS

Fifty patients presenting to Durgabai Deshmukh hospital and research center, Hyderabad, with peritonitis secondary to hollow viscous perforation were studied.

In this study, most of the patients with hollow viscous perforation were above the age of 50 years followed by the age group of 20-29 years group. The youngest patient in this study was 16 years who was having ileal perforation and the oldest patients are 75 years, 2 in number, one patient with colonic perforation. Average age is 39.84 (±) 16.05 years. In this study, duodenal ulcer perforation was more common in the age group of above

50 years constituting 16 cases out of 21 cases of hollow viscous perforation above the age of 50 years.

Table 1: Demographic distribution of samples.

Age group (years)	Frequency	Percent
<20	4	8.0
20-29	15	30.0
30-39	3	6.0
40-50	7	14.0
>50	21	42.0
Total	50	100.0
Gender		
Male	42	84.0
Female	8	16.0
Total	50	100.0
Anatomical site involved		
Duodenum	26	52%
Jejunum	2	4%
Ileum	13	26%
Appendix	7	14%
Colon	2	4%

In this study, maximum number of patients was found to be males (84%) and the females constituted about 16%. The table given below shows percentage of male and female within sex.

Most of the patients in duodenal ulcer perforation were males. The male percentage within sex was 59.5% in duodenal ulcer perforation. In appendicular perforation females constituted a major group. The female percentage within sex was found to be 50.0 in appendicular perforation.

The commonest site involved in hollow viscous perforation in this study was duodenal ulcer perforation (52%) followed by ileal perforation (26%) and appendicular perforation (14%). Chi-square test revealed a significant difference between these frequencies.

Table 2: Sites of perforation.

Anatomical site involved	Frequency	Percent
Duodenum	26	52%
Jejunum	2	4%
Ileum	13	26%
Appendix	7	14%
Colon	2	4%
Chi-square 40.200, P=<0.000(S)		
Site of pain		
Diffuse	33	66.0
Right iliac fossa	5	10.0
Right iliac fossa, right lumbar	1	2.0
Epigastric	10	20.0
Right hypochondriac	1	2.0
Total	50	100
Chi square test 71.600, p= <0.000		

Table 3: Distribution of signs and symptoms.

Symptoms	Frequency	Percentage	Chi-square	Significance
Vomiting	34	68	6.480	0.011
Fever	27	54	0.320	0.572
History of pain	19	38	42.000	0.000
Signs				
DA	25	50	000	1.000 (NA)
Dehydration	35	70	8.000	0.0005 (s)
G and R	45	90	32.000	0.000 (s)
OLD	37	74	11.520	0.001 (s)
FF	32	64	3.920	0.048 (s)
BS	22	44	0.720	0.396 (NS)

In this study, ileal perforation constituted 26% of the patients. Abdominal pain was present in all cases, vomiting was present in 8 cases, fever in 12 cases, bowel sounds was present in 3 cases and free fluid was present in 9 cases.

Three cases of ileal perforation with ischemic part were present in this study on examination there was diffuse tenderness with rigidity present in all cases and bowel sounds was absent in all cases the procedure patient went was resection and anastomosis among the three patients one developed septicemia and was expired, one was recovered well and the other patient developed enterocutaneous fistula.

Appendicular perforation was present in 14% of patients most of the patients were in the age group 20-29 years of age, and most presented with classical symptoms of abdominal pain, vomiting, and fever rigidity was present

in all cases and tenderness was diffuse in one patient and localized to right iliac fossa in other cases.

Two gastric ulcer perforation cases were presents in this study. Both the patients were male patients, one patient having diffuse pain and the other patient having pain confined to epigastric region no past history of pain was elicited guarding and rigidity was present in both cases and liver dullness was also obliterated in both case

Abdominal pain was the presenting symptom in all the cases in this study and the onset was acute in patients who presented 2 days after the onset of symptoms the pain was diffuse.

Vomiting is present in 34 cases and it is most commonly observed in patient presenting more than 2 days after the onset of symptoms whereas in the appendicular perforation vomiting was present in most of the patients even from the first symptomatic day in most of the patients with the duodenal ulcer perforation the patient had previous history of abdominal pain suggestive of peptic ulcer disease history of trauma to the abdomen was present in both the cases of Jejunal perforation.

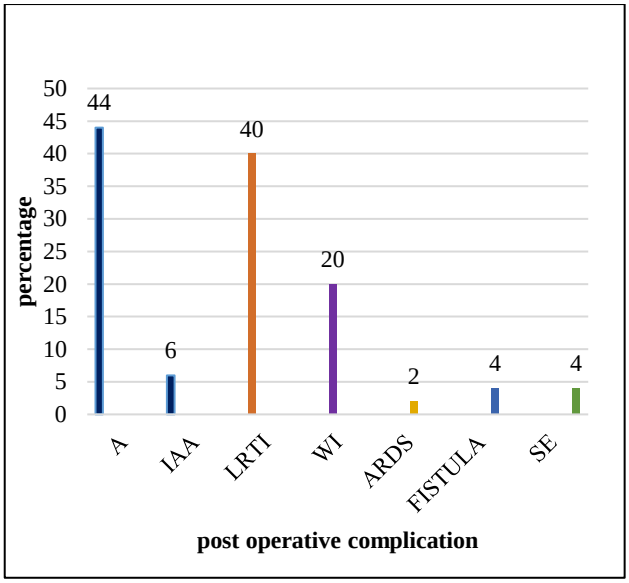
Table 4: Pneumoperitoneum in X-ray abdomen and type of operation performed.

Pneumoperitoneum	Frequency	Percent
Present	38	76.0
Absent	12	24.0
Total	50	100.00
Chi square test- 13.520, p<0.000(S)		
Type of operation		
Omental patch closure	30	60
Appendicectomy	7	14
Simple closure	6	12
Resection and anastomosis	3	6
Loop ileostomy	4	8
Total	50	100.0
Chi square 62.200, p<0.000		

Gas under diaphragm was seen in 38 cases (76%) irrespective of the site of perforation which was statistically significant (Chi square test- 13.520, p<.000(S)). Widal test was positive in 8 cases of ileal perforation.

The most common procedure done was omental patch closure (60%). Appendicectomy was done in 14% of cases and simple closure was done in 12% of cases. Resection and anastomosis was done in 6% of cases and loop ileostomy was done in 8% of cases.

In this study, the most common post-operative complication was lower respiratory tract infection (LRTI) and the LRTI patients presented with fever, cough with expectoration and the chest X-ray showing consolidation changes.



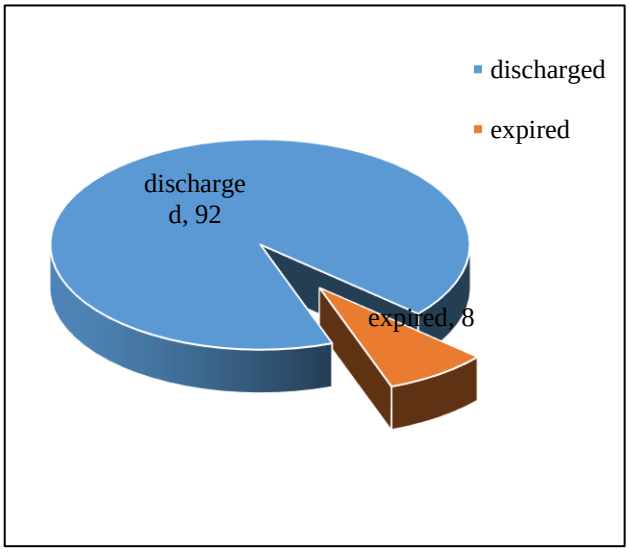
Chi square test 76.400, p<.000(S)

Figure 1: Distribution of samples by post-operative complications.

The next most common complication observed was wound infection which was present in 12% of cases and the patients manifested with pain at wound site and discharge. The pus was drained and antibiotics administered.

One patient who was operated for ileal perforation with ischemic ileum developed enterocutaneous fistula after resection and anastomosis.

One patient who was having gastric perforation and aged 75 years developed acute respiratory distress syndrome(ARDS) and expired even after intensive care treatment.



Chi square test 42.320, p<.000(S)

Figure 2: Distribution of sample by outcome.

In this study, the overall mortality rate was 8% irrespective of site and pathology of perforation out of 4 cases expired, two were of colonic perforation and another one was duodenal ulcer perforation, another one is of intestinal perforation. The average duration of stay in hospital is 12.44 (±) 4.78 days.

Figure 3: Ileal perforation operated for resection and anastomosis.

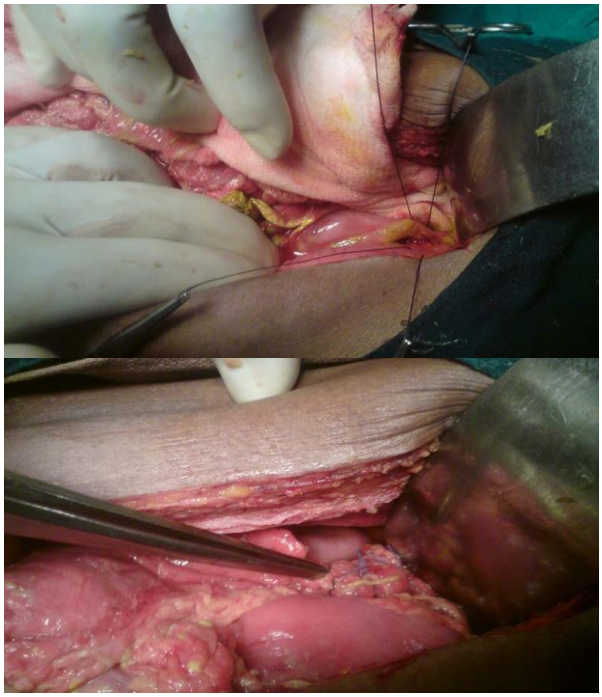


Figure 4: Duodenal ulcer perforation repair with omental patch closure done.

DISCUSSION

This study was conducted in DDH and RC, Hyderabad. A total of 50 patients admitted with particular criteria fixed during the study period were taken as the universe and cases were selected randomly.

The age distribution is as shown in Table 1. The highest number of patients encountered in this series was in the age group 50 years and above followed by the age group of 20-29 years. The mean age group in this study was 39.84 years. This is comparable with the study by Jhobta RS who studied 504 cases of perforation peritonitis in which the mean age was 36.8 years1. In this present study, duodenal ulcer perforation was more common in the age group of above 50 years.

Sex distribution

The ratio of men to women with all types of perforation irrespective of site and pathological condition was 5.25:1 in the present study.

In the present study, the number of male patients with duodenal ulcer perforation was 25 and the number of female patients with duodenal ulcer was. Different authors have found variable results with regard to sex ratio. Ramesh C Bharati et al5. reported sex ratio of 24:1 in their review of 50 cases. Mishra SB et al, found an M: F ratio of 49:1.[2]

The frequency of anatomical site involved in hollow visceral perforation is as shown in the table-1. The commonest site involved in this study was duodenal ulcer perforation (52%) followed by ileal perforation (26%) and appendicular perforation (14%).

Jhobta RS in his study of 504 cases of perforation peritonitis found duodenum as the commonest site of involvement, followed by appendicitis, gastrointestinal perforation due to blunt trauma abdomen, Typhoid fever and tuberculosis.[1]

Clinical features

In case of peptic ulcer perforations, pain abdomen and vomiting were the predominant symptoms. Tenderness, guarding rigidity, obliteration of the liver dullness were the predominant signs.

In the present study, pain abdomen was present in all cases. Guarding and rigidity was present. In 21 patients of duodenal ulcer patients, liver dullness and obliterated in 20 patients of duodenal ulcer perforation. Liver dullness was not obliterated in 6 patients of duodenal ulcer perforation. Probable reasons suggested are sealing of the perforation or lack of gas at the site of perforation or adhesions around the site of perforations.

Past history of pain abdomen suggestive of peptic ulcer disease was present in 38% of patients. Ulcer history of varying period was recorded in 30 cases (60%) by Mishra SB et al in their study of 53 cases in the review of 50 cases of Bharati RC et al, ulcer history was present in 78% of the patients.[2,5] Most of the patients were smokers, alcoholics or both.

Peritonitis is a life-threatening complication of peptic ulcer disease. Diagnosed is made clinically and confirmed by the presence of pneumoperitoneum on radiographs.

The success of proton pump inhibitors and the eradication of *H.pylori* have virtually eliminated the need for elective ulcer surgery. Perforated peptic ulcer is a common surgical emergency and a major cause of death in elderly patients. Perforated peptic ulcer is becoming common in older patients and associated with a higher incidence of recent consumption of non-steroidal anti-inflammatory drugs (NSAIDS).[6] In the present series perforated peptic ulcer constituted 52% of all hollow visceral perforation. The incidence was more common in the age group 50 years and above.

Operative management consists of time honored practice of omental patch closure.

Spontaneous ileal perforation is a serious complication of a variety of diseases. In the developed countries, these perforations are mostly because of foreign bodies radiotherapy, drugs, Crohn's disease, malignancies and congenital malformation. In tropical countries, small bowel perforation is a commonly encountered surgical emergency. Although tuberculosis is an important cause, the most important is typhoid fever. Enteric perforation is more common in males than in females. In the present series male:female ratio was 3.3:1, that is consistent with the ration of 4:1 reported by Adesunkanmi ARK.[7] This is due to fact that enteric fever is more common in males, possibly because of more exposure to infection. Enteric perforation is common in the 20-29 years. of life. The high percentage of cases 26% in the present series is similar to that reported by Vyas.[8] Enteric perforation usually occurs in the second and third week of fever. In the present series, the maximum incidence of perforation was in the second week of fever followed by those in the first week. Purohit reported the majority of perforations in the first week of fever while Eggleston and Santoshi reported 33% in the second week of fever.[9,10] Absence of liver dullness was present in all the cases of ileal perforation. Nair SK et al, in their study of 50 cases demonstrated absence of liver dullness in 63.63% of cases.[4] Gas under diaphragm in X-ray abdomen standing is an important finding and helpful in diagnosis. Enteric perforations are best managed surgically as it prevents further peritoneal contamination by intestinal contents. Repair of perforation should be the choice of treatment in enteritis perforation because this is a simple quick and cost-effective procedure. Ileostomy should be considered selectively in patients with multiple perforations and unhealthy gut. Resection however may be necessary for multiple perforations.

Appendicular perforation

The majority of the cases in the study were in the young age group of 20-29 years. Most of the patients presented with right iliac fossa pain and then spreading diffusely fever and vomiting were the other symptoms. Rebound tenderness and muscular rigidity were marked. Bowel sounds were present in 3 patients who presented early to the hospital. In the diagnosis of perforated appendicitis, gray-scale ultrasound is also valuable despite the fact that the perforated appendix may not be visualized.

Acute mesenteric ischaemia is an abdominal catastrophe that carries high mortality and morbidity rates. Leukocytosis and elevated serum lactate levels are common. Acute abdominal pain is the initial symptom in 85% of patients with AMI is characterized by pain that is out of proportion to physical findings generalized peritonitis and eventually shock develops if treatment is delayed. Elevated serum amylase is nonspecific plain abdominal X-rays are also nonspecific, an ileus pattern. Diffuse distention with air fluid levels, evidence of bowel wall edema, or even gas in the bowel wall or within mesenteric or portal veins are some of the findings that may allow a presumptive diagnosis of mesenteric ischaemia. CT scan is not a specific diagnostic study of choice but it is often used to rule out other pathology. However, it exhibits sensitivity and specificity that is found to be higher than conventional radiography, duplex ultrasonography in experienced hands can be accurate in assessing flow in proximal visceral arteries as well as superior mesenteric and portal veins. The most important diagnostic modality is angiography. It confirms the clinical diagnosis and aids in planning specific therapy. The principal of treatment is adequate rehydration. Broad spectrum antibiotics and early surgical intervention due to short ischemic tolerance time of the intestine. Various studies have shown an improved survival following early diagnosis and aggressive management. Surgical technique involves revascularization techniques and or bowel resection. At laparotomy, the appearance of the bowel wall may vary from pallor to hemorrhagic infarction. Established infarcted bowel should be respected and second look procedure planned 24-48 hours later. Revascularization techniques include isolated embolectomy, thrombo-endarterectomy, bypass techniques and intra-arterial thrombolysis. Clinical assessment relies on color, contractility and capillary bleeding, all of which are insensitive. Doppler ultrasonic flow meter may be helpful but results with the laser Doppler system prove to be promising.

In the present series, gas under the diaphragm in X-ray was present in 76% of cases. Most of the studies series show that, the 70-80% of perforations demonstrate gas under diaphragm. The absence of gas under diaphragm

may be because of sealing of perforation, lack of gas at the site of perforation or adhesions around the site of perforation.

Widal test was present in 8 cases in present study. Nair SK et al demonstrated positive Widal test in 72.7% and Vaidyanathan S in 73% of cases.[4,11]

Operative management

All patients of perforative peritonitis were treated as a surgical emergency. Preoperatively all patients had broad spectrum antibiotic coverage, nasogastric suction and management of fluid and electrolyte imbalance and oxygen supplementation when necessary. Anemic patients required blood transfusion. Postoperatively parenteral antibiotics were continued and after that oral antibiotics were given for 5 days.

Twenty-six cases of duodenal ulcer perforation underwent closure as described by Graham (Omental patch closure). Double layer closure of the Jejunal and ileal perforation was done in 2 and 10 cases respectively using 2-0 vicryl and 2-0 silk. Two patients of ileal perforation underwent loop ileostomy.

Resection of terminal ileum with end to end anastomosis was done in 3 cases of gangrenous bowel with perforation. Of the 7 cases of perforative appendicitis open appendicectomy was done in all the cases. The mortality rate in appendicular perforation was zero. Dandapat MC et al, reported zero mortality rate in their study of 12 cases.[2] In all cases of peritonitis thorough peritoneal lavage was given with 0.9% saline and drains were kept in the pelvis and the site of perforation which were usually removed on the third and fifth postoperative day or when the drainage <50 ml.

Nasogastric tube and usually removed on the second and third postoperative day and started orally on fourth day depending on bowel sounds. All patients were started on chest physiotherapy from the first postoperative day.

Postoperative complications

In the present study, the postoperative morbidity was towards higher side because of late presentation to the hospital, poor build and malnourishment, associated anemia and dehydration at presentation. Most common complication developed by patients was lower respiratory tract infection.

The next most commonly postoperative complication was wound infection which may be sustained by the fact that surgical incision site gets contaminated and most of the patients are malnourished and anemic. Two patients developed septicemia and were expired.

Mortality

In the present study, the mortality rate was 8%. This is comparable to Indian studies, Sharma L et al and Jhobta RS et al (10%).[1,12] Dandapat MC et al recorded a mortality rate of 15.8%.[2] Ramachandra ML in his study found the mortality rate as 14%.[13]

Table 5: Comparison of the present series with other studies.

Author	Mortality rate (%)
Sharma L[12]	8
Jhobta[1]	10
Yadav D[14]	13
Present series	8

CONCLUSION

Duodenum was the most common site of perforation in perforative peritonitis due to hollow viscous perforation. The highest number of patients was seen in the age group 50 years and above, irrespective of the pathological conditions followed by 20-19-year age group. Most of the patients presented 24 hours after onset of the clinical symptoms. Duodenal ulcer perforation was the most common cause of perforation in perforative peritonitis due to hollow viscous perforation, next commonest was enteric perforation followed by appendicular perforation. Gastric and colonic perforations are rare. Duodenal ulcer perforation was more common in the 50 years and above age group.

Laparotomy with closure of the perforation with omental patch closure is the commonest method of surgical management in perforative peritonitis due to hollow viscous perforation. History of fever is one of the most useful clinical criteria to differentiate typhoid from other perforations. Simple repair of perforation in two layers is the treatment of choice for typhoid perforations. Lower respiratory tract infection is the most common complication observed.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Jhobta RS, Attri AK, Kaushik R, Sharma R, Jhobta A. Spectrum of perforation peritonitis in India - review of 504 consecutive cases. World J Emerg. Surg. 2006;1:26.
2. Danapat MC, Mukherjee SB, Mishra PC. Howlader Gastro-intestinal perforations. Indian J Surg. 1991;53(5):189-93.
3. Swanes C, Soreide JA, Soreide O, Bakke P, Vollset SE. A skarstein smoking and ulcer performation. Gut. 1997;41:177-80.

4. Capoor MR, Nair D, Chintamani MS, Khanna J, Aggarwal P, Bhatnagar D. Role of enteric fever in ileal perforations; an over stated problem in tropics?. Indian J Medical Microbiol. 2008;26(1):54-7.
5. Bharti RC, Marwaha DC. Immediate definitive surgery in perforated duodenal ulcer: A comparative study between definitive surgery and simple closure. Indian J Surg. 1996;58(10):275-9.
6. Neil R Borley. Peritoneum and peritoneal cavity. 14th ed. Chapter 64. In: Gray's Anatomy. Anatomy of clinical practice, Susan Standring, ed. Philadelphia: Churchill Livingstone Elsevier; 2008;1099-1110.
7. Adesunkanmi ARK, Ajao OG. The prognostic factors in typhoid ileal perforation: A prospective study of 50 patients. JR Coll Surg Edinb. 1997; 42:395-9.
8. Vyas PN. Study of 15 cases of intestinal perforation in enteric fever. Indian J Surg. 1964;26:1-8.
9. Purhoit PG. Surgical treatment of typhoid: perforations Experience of 1976 Sangli epidemic Indian J Surg. 1978;40:227-38.
10. Eggleston FC, Santoshi B. Typhoid perforation: choice of operation. Br J Surg. 1981;68:341-2.
11. Vaidyanathan S. Surgical management of typhoid ileal perforation. Ind J Surg. 1986;335-41.
12. Sharma L, Gupta S, Soin AS, Sikora S, Kapoor V. Generalised peritonitis in India-The tropical spectrum. Jap J Surg. 1991;21:272-7.
13. Ramachandra ML, Jagadesh B, Chandra SBC. Clinical study and management of secondary peritonitis due to perforated hollow viscus. Arch Med Sci. 2007;3(1):61-8.
14. Yadav D, Garg PK. Spectrum of perforation peritonitis in Delhi: 77 cases experience. Indian J Surg. 2013;75(2):133-7.

Cite this article as: Thirumalagiri VR, Reddy SRJ, Chandra TH. Acute peritonitis secondary to hollow viscous perforation: a clinical study. Int Surg J 2017;4:2262-9.