ORIGINAL RESEARCH

A study of the clinical evaluation, management and outcome of small bowel perforation

[1]Alambir Singh, [2]Saurabh Gupta, [3]Rajan Dagla

[1-3]Department of General Surgery, Adesh Institute of Medical Science and Research, Bathinda, Punjab, India

Corresponding author
Saurabh Gupta
Department of General Surgery, Adesh Institute of Medical Science and Research, Bathinda, Punjab, India

Received: 18 July, 2023 Accepted: 20 August, 2023

ABSTRACT

Background: Perforation of the small bowl is a common abdominal surgical emergency faced by the general surgeon. Perforation of the small bowel from a wide variety of causes comprises one of the major entity among emergency surgical admissions. The perforated small bowl viscus challenges the surgeon's knowledge of pre-operative, intraoperative and post operative care of severely ill surgical patient. Surgery plays on important role in the management of perforations. Hence thi s study is undertaken to find out the age, sex incidence, etiological factors, Clinical features for small bowel perforations and its complications in our set up. **Materials and methods:** A prospective study of 56 patients presenting to Adesh Hospital, Bathinda, with a clinical diagnosis of small bowel perforation. The clinical data, investigations done and the surgical procedure undertaken are recorded. **Results:** Small intestinal perforation is the commonest surgical emergency among all cases of acute abdomen. Male to Female ratio observed was 50:6. Most commonly affected age group is among 31 to 40 years. Majority of patients presented to causality after 24 hours. Among small bowel perforation, 32.1% were Duodenal, 55.3% Ileal and 18.6% jejunal. Overall mortality in small bowel perforation is 8.6%. Mortality rate in duodenal perforation (11.1%) being greater than ileal perforation (7.89%). **Conclusion:** We concluded that the small intestinal perforation is the commonest surgical emergency among all cases of acute abdomen. Incidence is more in economically productive age group, 2nd to 5th decade. Commonest complications in duodenal perforation were wound infection toxemia and uremia.

Keywords: Clinico- etiological factors, small bowel, perforation, acute abdomen

INTRODUCTION

Among all the surgical emergencies encountered, the most common is peritonitis caused by small intestine perforation. It is broadly divided into spontaneous and traumatic. Traumatic can be either penetrating or blunt. The latter include the one which are caused due to fall, due to some blow from blunt objects or animals or motor vehicleaccident.[1]

CAUSES OF SMALL BOWELPERFORATION[2]

IMMUNE-MEDIATED OR INFLAMMATORY
Crohn's diseaseCeliac disease
Graft-vs-host disease (GVHD)

INFECTIONS
Viral: Cytomegalovirus (CMV)
Bacteria: Salmonella para-typhi, mycobacterium tuberculosis
Parasites: Ascaris lumbricoides Protozoa: Entamoeba histolytica

DRUGS AND BIOLOGICAL AGENTS
NSAIDs: Indomethacin
Enteric-coated potassium chloride Chemotherapy (steroids) Monoclonal Antibodies: Bevicuzimab

CONGENITAL
Meckel's diverticulum Jejunal or ileal duplications

METABOLIC
Homocystinuria

VASCULAR
Wegener's granulomatosis Giant cell arteritis
Allergic granulomatous arteritis (*i.e.*,Churg-Strauss syndrome)
Henoch-schonlein purpura Buerger's disease
Atherosclerotic vascular occlusion
Radiation-induced vascular injury

NEOPLASM
Primary (adenocarcinoma) Secondary (melanoma, breast, mesothelioma, lung).

Free and recurrent, perforation may worsen an already existing clinical disorder such as Crohn's disease or it may be the early clinical presentation of some underlying/occult condition of intestine for example a celiac disease complicated by lymphoma causing an acute abdomen or diffuse peritonitis. Diagnose of the

actual cause may be difficult initially but now because of computerized tomography imaging. The perforated site is helpful in defining the cause. However, for correct diagnosis and treatment urgent surgical intervention is required. In India one of the developing countries, typhoid fever is an endemic disease which may be attributed to the poor sanitation, low socio-economic status (SES) and poor personal hygiene. Typhoid fever is regarded as major etiological factors for ileal perforation occurring in 2nd-3rd week of the disease.[3]

The perforation especially the one caused by typhoid is a serious complication and surgeons consider it as a significant problem. Wherever the medical facilities are not available it is linked to high morbidity and mortality. Obscure peritonitis is caused by terminal ileal perforation and the clinical symptoms observed are abdominal pain along with tenderness of the abdomen, guarding and rigidity spread over the rightiliacfossa.[4]Anastomosis of the small bowel is considered safe, although associated with risk of peritonitis, bowel obstruction and sometimes hypotension.[5] On a x ray-abdomen done in erect posture if perforation of a hollow viscus is diagnosed, the mainstay of treatment is emergency exploratory laparotomy and closure of the perforation. Also owing to the early diagnosis and treatment the mortality rates because of perforation has tremendously come down, but still there is a high chance of morbidity as a result of the condition and following thesurgery.[6]

Among various abdominal surgical emergency, small bowel perforation is commonest one. It is considered to be frequent emergency deal by general surgeon. Small bowel perforation is comparatively common in endemic areas of typhoid, tuberculosis and parasitic infestations. It is evident that general surgeon should possess adequate knowledge about various pre-operative, intra-operative and post operative parameters related to these patients. Small bowel perforation is well managed by surgery which plays an essential role. Therefore, considering this, we planned present study to assess age, gender incidence, etiological factors, clinical symptoms and complications of small bowel perforations cases in our institute.

MATERIAL AND METHODS

This study was conducted in the department of General Surgery, AIMSR Bathinda. Ethical clearance was obtained from ethics committee, Adesh University. 56 patients with small bowel perforation within the study duration and satisfying the study design were included in the study.

INCLUSION CRITERIA

- All patients, willing to give consent to participate in this study.
- All patients operated for Small Bowel Perforations.

EXCLUSION CRITERIA

- Patients with large bowel perforation.
- Patients not willing for study.
- Iatrogenic perforation

METHODOLOGY

The present prospective observational study was conducted in AIMSR, Bathinda in patients diagnosed with small bowel perforation. In all the patients complete detailed history was taken including age of the patient, signs and symptoms and their duration and relevant past history. Complete physical examination including clinical and systemic examination was done. Patients went for all the routine investigations including routine blood investigations and radiological investigations.

STATISTICAL ANALYSIS

Results were studied statistically. Association between the factors was calculated using chi-square test.

RESULTS

Table 1: Age distribution with sex

Age in years	Male		Female		Total	
	No	%	No	%	No	%
0-20	2	5.5	2	10	4	7.1
21-30	12	33.3	5	25	19	33.9
31-40	14	38.9	4	20	16	28.5
41-50	5	13.9	5	25	10	17.8
>50	3	8.3	4	20	7	12.5
Total	36	100	20	100	56	100

Table 1 shows that out of 50 males, maximum (14)was present in age group 31-40 years. Out of 20 females, 5 each were seen in age group 12-20 yearsand 41-50 years.

Most of the patients reported were from rural areas. Maximum patients had low socio- economic status (SES). They were illiterate, anemic and malnourished and were exclusively accountable for their family earning. Small bowel perforation found to be the reason for physical, mental and psychological aspect affecting economic status of the family.

Table 2: Time interval between occurrence of perforation and institutional therapy

Time	Duodenal	%	Jejunal & Illeal	%
Within 24 hours	8	44.4	25	65.7
48 hours	3	16.6	5	13.1
3 days	3	16.6	4	10.5
4 days	3	16.6	2	5.2
More than 4 days	1	5.5	2	5.2

Table 2 shows that time interval between occurrence of perforation and institutional therapy was within 24 hours seen in 8 cases of duodenal, 48 hours in 3, 3 days in 3, 4 days in 3 and more than 4 days in 1 case of duodenal and within 24 hours in 25 cases of jejunal and illeal, 48 hours in 5, 3 days in 4, 4 days in 2 and more than 4 days in 2 cases.

Table 3: Clinical Symptoms

Symptoms	Duodenal Perforation	Percentage	Jejunal & Ilealperforation	Percentage
Pain	18	100	38	100
Distention	11	61.1	14	36.8
Vomiting	10	55.5	6	15.7
Fever	6	33.3	8	21.0
Constipation	7	38.8	10	26.3
Headache	4	22.2	5	13.1
Loose motion	2	11.1	4	10.5
Chest Pain	0	0	0	0

Table 3 shows that abdominal pain was observed in18 and 38, distention in 11 and 14, vomiting in 10 and 6, fever in 6 and 8 and constipation in 7 and 10 in duodenal and jejuna and ileal perforation respectively.

Table 4: Clinical Signs

Signs	Duodenal Perforation	Percentage	Jejunal & Ileal perforation	Percentage
Tenderness	18	100	38	100
Distension	17	94.4	19	50
Guarding	17	94.4	23	60.5
Rigidity	16	88.9	21	55.2
Obliteration of liver dullness	17	94.4	15	39.4
Bowel sounds AbsentPresent	15 3	83.3 16.7	28 10	73.7 26.3
Shock	6	33.3	9	23.6

Tenderness was seen in 100% in both groups. Distension in 94.4% and 50%, guarding in 94.4% and 60.5% and rigidity in 88.9% and 55.2% in bothgroups respectively.

Table 5: Radiological investigation

No. of Patients	Gas Under Diaphragm	Percentage	Diagnosis	
			Duodenal	Jejunal & lleal
56	48	86	28	15

Plain x-ray abdomen (erect posture) was done in all patients, out of 56 patients, 48 showed gas under diaphragm (86%).

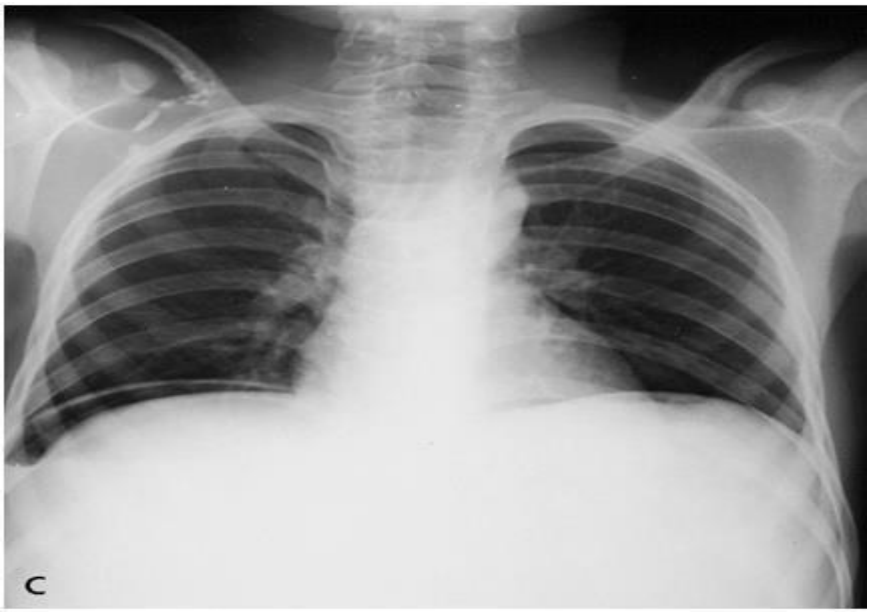

Fig 1: Gas under Diagram

Table 6: Widal test

Total No. of Cases of suspected enteric fever	Done	Positive	Percentage
20	20	13	65

Table 6 shows that out of 20 cases, widal test was positive in 13 cases.

Table 7: Histopathology

Suspected casesof Tuberculosis	Done	Positive	Percentage
10	9	6	60

Table 7 shows that biopsy specimen taken from the edge of the perforation and lymph nodes in suspected tubercular, it was positive in 6 cases.

Table 8: Post Operative Diagnosis of Ileal and Jejunal Perforation

Post-Operative Diagnosis	Number (n=56)	Percentage
Duodenal Perforation (18)		
H. Pylori	10	55.5%
NSAIDS	6	33.3%
Traumatic	2	11.2%
Ileum Perforation (31)		
Typhoid Fever	10	32.2%
Tuberculosis	5	16.1%
Crohn's Disease	3	9.6%
Congenital	4	12.9%
Traumatic	9	29.0%
Jejunum Perforation (7)		
Traumatic	3	42.8%
Typhoid fever	3	42.8%
Tuberculosis	1	14.2%

Duodenal perforation was seen in 18, ileal perforation in 31 and jejunum perforation in 7 cases. Under duodenal perforation, H. pylori was seen in 10 (55.5%), NSAIDS in 6 (33.2%) and traumatic in 2(11.2%) cases. Under ileal perforation, typhoid feverwas seen in 10 (32.2%), tuberculosis in 5 (16.1%), Crohn's disease in 3 (9.6%), congenital in 4 (12.9%)and traumatic in 9 (29%) cases. Under jejunum perforation, traumatic was seen in 3 (42.8%), typhoid fever in 3 (42.8%) and tuberculosis in 1 (14.2%).

Table 9: Different surgical procedures

Procedure	Frequency			
	Duodenal	Percentage	Jejunal &Ileal	Percentage
Simple closure withomentum (Simple				

closure alone in case of ileal and jejunal perforation)	12	83.3	8	21
Resection and Anastomosis	3	16.7	11	28.9
Simple drainage	2	11.1	6	15.7
Simple closure with Stricturoplasty	1	5.5	0	0
Ileostomy (stoma formation)	0	0	13	34.2

Table 9 shows that simple closure with omentum was done in 12 duodenal and 8 jejunal and ileal perforation, resection and anastomosis was done in 3 cases in duodenal perforation and 11 in jejunal and ileal perforation, simple drainage in 2 duodenal and 6 jejunal and ileal perforation, simple closure with stricturoplasty in 1 case of duodenal perforation and Ileostomy (stoma formation) in 13 cases of jejunal and ileal perforation.

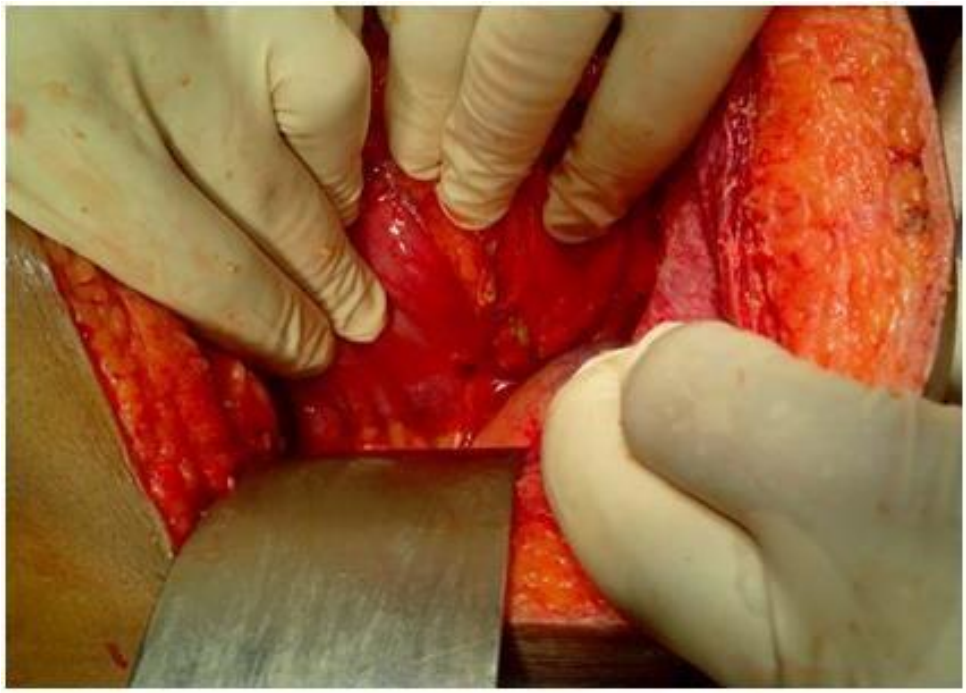

Fig 2: Duodenal Perforation

Fig 3: Ileal Perforation

Fig 4: Traumatic Jejunal Perforation

Table 10: Post operative complications

Post operative complications	Duodenal Perforation	Percentage	Ileal & Jejunal Perforation & Jejunal Perforation	Percentage
Wound infection	8	40	8	21
Burst abdomen	1	5.5	2	5.2
Toxaemia	4	22.2	8	21
Respiratory	2	11	4	10.5
Paralytic ileus	1	5.5	1	2.6
Faecal fistula	1	5.5	4	10.5
Uraemia	3	16.6	7	18.4
Cardiac arrest	1	5.5	1	2.6
Obstruction	0	0	0	0
Hypotension	3	16.6	5	13.1
Encephalopathy	0	0	0	0

Table 10 shows that most common post- operative complication was wound infection in 8 (40%) duodenal perforation cases and 8 (21%) jejunal perforation cases.

Fig 5: Laprotomy and Drainage of Purulent fluid

Fig 6: Peritoneal fluid

Fig 7: Resection of part of Ileum

Fig 8: Resection and Anastomosis

DISCUSSION

Small bowel perforation is an emergency situation demanding immediate intervention. It is the major cause of mortality in surgical patients inspite of advancement in medical and surgical field. Broad spectrum antibiotics, recent diagnostic aids and intensive patient care is not found to be sufficient in minimizing mortality. Hence, this condition needs to be thoroughly studied by surgeons in order to ensure better patient outcome. The present study identified the etiology, clinical presentation, diagnostic dilemmas in patients of small bowel perforation

CLINICAL PRESENTATION (Jejunal & Ileal)

Table: 11. Showing common symptoms

Symptoms	Present study	N.D. Swadia[7]	G.C. Sepaha[8]
Pain	100%	93.75%	100%
Distension	73.3%	66.71%	100%
Vomiting	66.7%	56.25%	5%
Fever	40%	100%	80%
Constipation	20%	9.82%	--
Headache	6.7%	81%	--
Loose motions	13.3%	4.45%	5%
Chest Pain	--	--	--

Table: 12. Showing common signs

Symptoms	Present study	N.D. Swadi [7]	G.C. Sepaha[8]
Tenderness	100%	100%	100%
Distension	93.3%	76%	--
Guarding	96.7%	88.39%	--
Rigidity	86.7%	50.89%	100%
Obliteration of liver dullness	93.3%	--	100%
Bowel sounds Absent Present	 80% 20%	 33.03% 42.85%	 60%
Shock	33.3	--	58.3%
Tachycardia	100	--	100%

Tables show that pain abdomen was seen in 100%, distension in 73.3%, vomiting in 66.7%, fever in 40%, constipation in 20%, headache in 6.7% and loose motions in 13.3%. We observed tenderness in 100%, distension is 93.3%,guarding in 96.7%, rigidity in 86.7%, obliteration of liver dullness in 93.3%, bowel sound in 20% and tachycardia in 100% patients. 33.3% of patients are in a state of shock at the time of presentation. According to Baily[7] most common symptom was pain abdomen, fever, vomiting in most cases of duodenal ulcer perforation. They noted tenderness, board like rigidity, tachycardia and distension as common signs. Most of the patients present with extreme signs of peritonitis at the time of admission because of late arrival to hospital.

Table13: Gas under diaphragm

Author	Percentage
Grassi et al., 1998[9]	46
Sachin Talwar 1997[10]	82.7
Kimbal Imaul[11](duodenal)	60.7
Present study	86

In our study most of the x-ray erect abdomen are taken on emergency basis 86% of cases showed gas under diaphragm.

Table 14: Widal test

Author	Positive Percentage
W.K. Nair[12] 1978	66.6
Saching Talwar[13] 1997	68.7
G.C. Sepaha[8]	82
E.Q. Archampong[10]	100
Present study	55

DUODENAL PERFORATION

Most of the patients underwent Grahams simple closure operation. 90% of cases had live omental patch used. No definitive ulcer surgery done.

ILEAL AND JEJUNAL PERFORATION

Most of the perforation are single situated within in 30 cm of ileo caecal junction. Multiple perforations are found out in 3 cases number varies from 2 –4. Two cases of ileal perforation with stricture of small bowel identified. Most of the cases faecal purulent peritonitis noted.

SURGERY

Simple closure with omentum procedure was preferred method in maximum patients. 5 patients underwent resection anatomosis. Simple drainage was performed in 4 patients as the general condition of patients was very poor and not fit for any kind of anesthesia. 1 patient underwent simple closure of perforation with stricturoplasty. Bilateral drainage of peritoneal cavity was perfomed in all cases with drains kept at-least for 5 days.

Table: 15.Post-operative Diagnosis

Post-Operative Diagnosis	Number (n=56)	Percentage
Duodenal Perforation (18)		
H. Pylori	10	55.5%
NSAIDS	6	33.3%
Traumatic	2	11.2%
Ileum Perforation (31)		
Typhoid Fever	10	32.2%
Tuberculosis	5	16.1%
Crohn's Disease	3	9.6%
Congenital	4	12.9%
Traumatic	9	29.0%
Jejunum Perforation (7)		
Traumatic	3	42.8%
Typhoid fever	3	42.8%
Tuberculosis	1	14.2%

Duodenal perforation was seen in 18, ileal perforation(32.2%), tuberculosis in 5 (16.1%), Crohn's disease in 3 in 31 and jejunum perforation in 7 cases. Under(9.6%), congenital in 4 (12.9%) and traumatic in 9 duodenal perforation, H. pylori was seen in 10 (55.5%),(29%) cases. Under jejunum perforation, traumatic was NSAIDS in 6 (33.2%) and traumatic in 2 (11.2%) cases.seen in 3 (42.8%), typhoid fever in 3 (42.8%) and Under ileal perforation, typhoid fever was seen in 10tuberculosis in 1 (14.2%).

COMPLICATIONS

Table: 16. Duodenal perforation

Symptoms	Present study	N.D. Swadia[7]	G.C. Sepaha[8]
Wound infection	21.4	21	18.8
Burst abdomen	5.7	6.6	--
Toxaemia	17.1	6.6	9
Respiratory	7.1	6.6	54
Paralytic ileus	4.2	--	--
Faecal fistula	1.4	--	--
Uraemia	11.4	--	13
Cardiac arrest	4.2	--	--
Obstruction	--	6.6	--
Hypotension	11.4	--	--

Wound infection was seen in 21.4%, toxaemia in 17.1% of the cases, Uraemia and Hypotension occurred in 11.4% of the cases.

Table17: Ileal and jejunal (enteric)

Jeujnal & Ileal	Present study	Sachin Talwar[13] et. al.	N.D. Swa dia et al[7].
Wound infection	33.3	79.1	55.3
Burst abdomen	10	21.8	4.6
Toxaemia	33.3	83.1	26.7
Respiratory	16.6	9.1	20.3
Paralytic ileus	6.6	--	12
Faecal fistula	20	10	3.5
Uraemia	30	--	2.6
Cardiac arrest	3.3	--	0.8
Obstruction	--	--	--

Hypotension	23.3	--	--
Encephalopathy	--	--	--

In present study, wound infection (33.3%) and toxaemia (33.3%) are the two major post operative complications. Other reported were burst abdomen in 10%, respiratory in 16.6%, paralytic ileus in 6.6%, faecal fistula in 20%, uraemia in 30%, cardiac arrest in 3.3% and hypotension in 23.3%. Wound infection is lesser than what reported by Sachin Talwar 79.1% and N.D. Swadia (55.3%). Toxaemia developed in 33.3% of cases which is nearer to the N.D. Swadia (26.7) studies. Fecal fistula rate is much higher than the two authors (10% and 3.5%). This may be due to poor tolerating capacity of patient, anaemia and malnutrition.

MORTALITY

Malnourishment and anemia were the major contributory factors for high mortality rate in present study. Patients also reported late in hospitals. Approximately 20% of patients presented in a state of shock, and septicaemia. Maximum patients travelled long distance to reach our institute leading to high death rates among patients.

Table 18: Mortality in duodenal perforation

Author	Percent
Gordan A Donaldson[14] 1970	9%
John A weight et al (traumatic)[15]	16%
SB Mishra 1982[16]	10%
Present study	5.35%

We reported 5.35% mortality in this study. SB Mishra recorded 10% mortality. We found that mortality in duodenal perforation is less compared to ileal perforation because of early diagnosis and late onset septicaemia.

Table 19: Mortality in ileal and jejunal perforations

Author	Percent
Prasad et al.[13] 1974	31%
ND Swadia et al.[7] 1979	32%
G.C. Sepaha[8]	25.3%
Present study	7.69%

E.Q. Archampong[10] recorded a mortality to 29.8 in 1969 and 14.1% in 1976. This indicates improved modality of treatment. In present study, out 26 ileal perforation cases, there were 2 deaths which constitutes 7.69%. The reason being many people tried indigenous treatments and quacks before reaching hospital. As earlier stated poor general condition, nutritional status influences the mortality.

CONCLUSION

We concluded that the small intestinal perforation is the commonest surgical emergency among all cases of acute abdomen. Incidence is more in economically productive age group, 2nd to 5th decade. Commonest complications in duodenal perforation were wound infection toxemia and uremia.

REFERENCES

1. Christopher J Bulstrode and R.C.G. Russel, Jermy Thompson. The Peritoneum, omentum, mesentry and retoperitoneal space. Bailey and Love's Short Practice of Surgery. Page No. 1133-1152, 24th edition, 2004.
2. Thal Erwin R. abdominal Trauma. The Surgical clinics of North America 1990; 70(3):517-75
3. Nair SK, Singhal VS, Kumar S. Non traumatic intestinal perforation, IJS1981;43:371- 77.
4. Donavan R.J.: Selective treatment of duodenal ulcer both perforation, Am, of Surgery VOL. 189, No. 5 Mary 1979, PP. 627.
5. Eustache JM, Kreis DJ. Typhoid perforation of the intestine, Arch Surg Nov 1983;118:1269-71
6. Kouame J, Kouadio L, Turguin H. Typhoid ileal perforation surgical experience of 64 cases. Acta chir belg 2004;104:445-47.
7. Swadia ND, Trivedi PM, Thakkar AM. The problem of enteric ileal perforation int Surg Oct-Nov 1979; 644-50.
8. Sepaha GC, Khandekar JD, Chabra MC. Enteric perforation. A study of 60 cases. Journal of Indian Medical Association. 1970 June 16; 54(12):558-61
9. Grassi, Pinto, Rotondo: Conventional plain film radiology Ultrasonography and CT in Jejuno – Ileal Perforation. Acta. Radiol Vol. 39(1) 1998 page 52-6
10. Archampong EQ. Typhoid ileal perforation. Why such mortalities ? British Journal of Surgery 1979 April: 63(4):317-21
11. Kimball I Maull. Pneumogastrography in diagnosis of perforated peptic ulcers. The American Journal of Surgery Vol. 146, September 1983, Page 340-44
12. W.K. Naik : Non traumatic intestinal perforation, Indian Jr. of Srug. May 1981, PP. 371-76.
13. Talwar S. Sharma RK, Mittal DK, Prasad R. Typhoid enteric perforation. Aust Nzj Surg 1997; 67:351-353
14. Gordan A. Donaldson M.D. : Perforated gastroducodenal ulcer disease at the Massachusetts general hospital from 1952 to 1970, American Journal of Surgery, Vo.120, September 1970, Page 306-11
15. John A Weight: Duodenal injuries, surgical clinics of north America Vol. 70 No. 3 June 1990 Page 529-39
16. S.B. Mishra: Surgical Management of acute perforated duodenal ulcer ind. J.R. OF Surgery Oct. No. 1982, PP, 705-709