

Typhoid Perforation of the Bowel

Experiences in 78 Cases

F. C. EGGLESTON, M.D., F.A.C.S., B. SANTOSHI, M.S., C. M. SINGH, M.S., PH.D.

Seventy-eight patients ranging from four to 65 years of age were treated for typhoid perforation of the bowel. Sixty-one patients (78%) were males. The average time from perforation to admission was 56 hours. The mortality rate was 32% and was adversely influenced by the duration of illness, duration of perforation, shock, uremia, encephalopathy and fecal peritonitis. Forty-nine patients were treated by closure of the perforation, resection or miscellaneous procedures; the other 29 by closure of the perforation combined with an end-to-side ileotransverse colostomy. Although mortality was the same in both groups, those undergoing bypass had a significantly smoother postoperative course.

TYPHOID FEVER CONTINUES to be a major problem through much of the world, particularly in tropical climates. The introduction of Chloramphenicol resulted in a dramatic decrease in the overall mortality from this condition, but did not, unfortunately, reduce the incidence of perforation. The management of patients with this complication has been debated in recent years and attention focused upon the role of surgery. It is our purpose to review our experience with 78 patients treated for typhoid perforation and to discuss a new surgical approach which, although it has not altered mortality, has lowered morbidity.

Materials and Methods

The case records of all patients undergoing operative procedures because of typhoid perforation from January, 1963 through December, 1978 were reviewed. There were 78 patients in this study, the criteria for inclusion being isolation of *Salmonella typhi* from the blood or stool, a positive Widal reaction or typical operative findings in conjunction with histological examination.

Results

Incidence of Perforation

The overall incidence of perforation was 5.3% of 1,470 patients discharged with a diagnosis of typhoid

From the Department of Surgery, Christian Medical College and Hospital, Ludhiana, Punjab, India

fever. It is of interest to note that this incidence has been rising significantly over the years ($p < 0.001$) (Table 1).

Age and Sex

The youngest patient was four years old and the oldest 65 (Table 2) with 63% in the second and third decades of life.

Sixty-one, (78%) of the patients were males. Among all the patients treated for typhoid fever in this study period, males made up 65.9%. This difference was significant ($\chi^2 = 5.6$, $p < 0.02$).

Seasonal Incidence

Although patients with typhoid perforation were seen throughout the year, over half were admitted during the four months (July to October) following the onset of the monsoon.

Duration of Illness

Approximately half of the perforations occurred during the second and third weeks of illness (Table 3). Those who had symptoms for more than four weeks were generally in a state of relapse. Mortality was significantly less in patients ill less than one week ($\chi^2 = 5.49$, $p < 0.02$).

Duration of Perforation

In 64 patients it was possible to determine with accuracy the duration of perforation (Table 4). Mortality was significantly lower in those with perforations of less than 48 hours ($\chi^2 = 6.08$, $p < 0.02$).

Signs and Symptoms

The majority of patients presented with fever and malaise, often associated with bowel symptoms. They

Reprint requests: Dr. F. C. Eggleston, Professor and Head, Department of Surgery, Christian Medical College and Hospital, Ludhiana, Punjab 141008, India.

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TABLE 1. Incidence of Perforation

Years	Typhoid Cases Hospitalized	Perforations	Percentage
1963-67	422	7	1.7
1968-72	410	17	4.1
1973-78	638	54	8.5
	1,470	78	5.3

$\chi^2 = 24.9, p < 0.001.$

had noted a sudden increase in abdominal pain often associated with vomiting and distension at time of perforation. However, 14 were unaware of any specific time at which perforation occurred.

On examination, findings were remarkably similar, with signs of toxemia and "acute abdomen." All the patients had abdominal rigidity. Hyperresonance was present over the liver in 70% of the patients and paralytic ileus was noted in 68%. Fifteen patients were in shock, eight (53%) of whom died.

Laboratory Investigations

Thirty-two of 41 patients in whom abdominal x-rays were taken had pneumoperitoneum. Total leukocyte count varied from 1,300 to 26,000 per mm³ with a mean of 8,200. Fourteen patients had a leukocyte count below 5,000 while 24 had a leukocytosis greater than 10,000. Blood culture was done in 46 patients and was positive in 14. *S. typhi* was found in six and in the remaining patients *E. coli*, candida, staphylococci, klebsiella or psuedomonas were grown. Widal reaction was positive in 45 cases.

Previous Treatment

Twenty-seven patients had previously received incomplete treatment for typhoid or were under treatment in the hospital at the time of perforation. Eight of these patients (30%) died. An additional 22 patients gave a history of having received antibiotics other than chloramphenicol or ampicillin.

TABLE 2. Age and Sex of Patients

Years	Male	Female	Total
0-9	7	0	7
10-19	14	7	21
20-29	25	3	28
30-39	6	3	9
40-49	8	4	12
50+	1	0	1
	61	17	78

TABLE 3. Duration of Illness

Weeks	Cases	Deaths	Mortality Per Cent
less than 1	15	1	7
1-2	25	8	32
2-3	17	9	53
3-4	4	1	25
4+	17	6	35
	78	25	32

Admission Diagnosis

In 63 patients (81%) the diagnosis on admission was typhoid perforation. In five others it was considered in the differential diagnosis. The remaining 10 patients, however, were never suspected of having a typhoid perforation. In six, the diagnosis was ruptured appendix with peritonitis; in three, intestinal obstruction; and in one, acute cholecystitis.

Treatment

Patients were resuscitated as rapidly as possible and operated on without delay. Laparotomy was done in all but one patient who had septicemia and was moribund. In him, abdominal drainage was done under local anesthesia and a laparotomy was planned if his condition improved. However, he died three hours later.

Operative Findings

Peritonitis was present in all patients and was "fecal" in 15, of whom none (60%) died. In 52 of the 53 cases in whom peritoneal culture was done, pathogenic bacteria were found: *E. coli* in 48, klebsiella in 24 and other organisms in 16. In no case was *S. typhi* isolated.

In 74 patients open perforations were present. These were solitary in 67, while six patients has two perforations and one multiple perforations. In one patient the perforation was sealed off; and in two there was gangrene of the involved bowel. All perforations were on the antimesenteric border of the ileum except one

TABLE 4. Duration of Perforation

	Cases	Deaths	Mortality Per Cent
less than 24 hrs.	10	1	10
24-48 hrs.	14	2	14
48-72 hrs.	22	7	32
72-96 hrs.	12	5	42
96+ hrs.	6	4	67
unknown	14	6	42
	78	25	32

TABLE 5. Operative Procedures

	Cases	Deaths	Mortality Per Cent
Simple closure	43	13	30
Ileotransversostomy	29	9	31
Ileal resection	3	2	67
Drainage or unknown	3	1	33

which was in the cecum. Half were within 20 cm of the ileocecal junction.

Operative Procedures

In the earlier part of this series, simple closure of the ulcer was the most commonly done procedure (Table 5). This was generally done in two layers after freshening the edges. Since 1975, we have begun a prospective trial of an end-to-side ileotransverse colostomy in addition to closure of the ulcer. This has now been done in 29 of the last 39 cases.

The group undergoing ileotransverse colostomy (bypass group) was compared with those undergoing other procedures. No differences were found in age, duration of illness, duration of perforation or incidence of shock. The only significant difference was a higher incidence of fecal peritonitis in the bypass group (31% vs 12%) ($\chi^2 = 4.1$, $p < 0.05$).

Complications

Sixty-three (81%) of the patients had one or more complication (Table 6). For the most part these were related to sepsis in one form or another. When analyzed according to whether a bypass procedure or another procedure was done, it was apparent that although the total complication rate was the same, the incidence of major wound complications and fecal fistulae was significantly less in those having a bypass ($\chi^2 = 5.47$, $p < 0.02$).

Three patients developed fatal uremia. Two others had jaundice, one transiently. Chloramphenicol was

TABLE 6. Postoperative Complications

	No Bypass (49)	Bypass (29)
None	8	7
Major wound infection or dehiscence	12	2
Fecal fistula	7	2
Chest infection	16	8
Septicemia	4	5
Intra-abdominal abscess	5	0
Encephalopathy	5	1
Minor wound infection	5	10
Miscellaneous	12	9

TABLE 7. Duration of Hospitalization in Survivors

	No bypass (33)		Bypass (20)	
	Cases	Per Cent	Cases	Per Cent
2 weeks	3	9	4	20
2-3 weeks	9	27	9	45
3-4 weeks	6	18	3	15
4-5 weeks	8	24	2	10
5+ weeks	7	21	2	10

used extensively and two patients had nonfatal leukopenia.

Eight patients returned with late complications. Four had subacute obstruction managed without further surgery. Two developed incisional hernias, one (in the bypass group) had a mild short bowel syndrome for which treatment was refused. One patient had been discharged with a fecal fistula that was nearly closed. He was reoperated on at another hospital and returned to us with a massive and eventually fatal fistula.

Mortality

Overall mortality, including the single late death, was 32%. This mortality was unrelated to the operative procedure done, but was definitely influenced by several factors, namely, the duration of disease prior to admission (Table 3), the duration of the perforation prior to surgery (Table 4), the presence of shock, uremia or encephalopathy, the presence of fecal peritonitis, endotoxemia and the development of postoperative fecal fistulae. In the majority of patients it was impossible to ascribe a single cause of death other than that of severe sepsis.

Hospital Stay

In patients surviving, the mean duration of postoperative hospitalization was 28.1 days. However, patients having a bypass procedure had an average hospitalization of 23.1 days compared to 31.5 days for those not having such a bypass. A significantly greater number of survivors went home within three weeks of surgery when a bypass was done ($\chi^2 = 4.1$, $p < 0.02$) (Table 7).

Discussion

The frequency of enteric perforation in typhoid fever has been reported variously from 0.8%¹⁷ to 18%.³ This may represent variations in the virulence of the organism or differences in sociological circumstances. The rising incidence of perforation among hospitalized patients (Table 1) suggests that patients with typhoid fever are being treated by private doctors in the home more

frequently than previously and are only referred to the hospital for complications.

Typhoid fever produces hyperplasia of the reticulo-endothelial system with necrosis and ulceration of the gut, generally limited to Peyer's patches in the terminal ileum, although the jejunum and cecum may occasionally be involved. Cecal ulcers are smaller than those in the ileum and rarely perforate.¹² The number and size of the ulcers is unrelated to the severity of the clinical symptoms.⁴ Characteristically these ulcers do not produce peritoneal reaction before they perforate, and even after perforation, peritoneal response seems to be delayed and the ulcer is rarely found to be sealed off at operation.^{6,11} In contradistinction to other perforations, the omentum does not migrate to the site. Bowel contents, therefore, continue to empty into the peritoneal cavity.

These perforations, generally single, appear as "punched out" holes on the anti-mesenteric border of the bowel. Huckstep⁹ and Olurin et al.¹⁴ claim that the bowel around the perforation is friable, a finding with which we do not agree.²⁰ Sutures hold well, but healing is impaired and complications common.

Typhoid perforation is rare under the age of five or over the age of 50.^{3,9,13} More than 50% of patients are in the second or third decade of life and males predominate in a three to one ratio.^{3,13}

Perforation may be accompanied by a sudden sharp pain or an abrupt increase in abdominal symptoms associated with vomiting, distension and constipation. However, in patients who have been ill for a long time, the symptoms may be much more subtle and the exact time of perforation difficult to determine.⁸ Abdominal tenderness and toxemia are constant findings. Bowel sounds are frequently absent and x-ray examination demonstrates pneumoperitoneum in about half the patients.^{5,7} Shock carries a bad prognosis.

Enteric perforation is best managed surgically. Huckstep⁹ in 1960 recommended a nonoperative approach (albeit with certain exceptions). He mentioned that the contamination from these perforations was "virtually sterile." Few workers today agree with him,¹⁹ although some have suggested avoiding surgery in very late cases.¹³ The consistent operative findings in our patients make us feel that surgery is mandatory. In 96% either an open perforation or gangrene was found, rarely with any signs of localization, even in late cases. Furthermore, all but one of 53 peritoneal cultures (98%) demonstrated one or more pathogenic organism even though 34 (64%) of this group had received preoperative antibiotics. Not to remove this purulent (and often frankly fecal) material and prevent further soilage of the peritoneal cavity just does not make sense. Accordingly, we have operated upon all of our patients.

In addition to an adequate peritoneal toilet, the correct management of the perforation itself is essential. Probably as a result of the known high incidence of postoperative complications, a wide variety of operative procedures have been utilized. These include simple closure of the perforation,^{2,6,20} local wedge resection of the ulcer,²⁰ purse string closure,¹ resection of the affected ileum^{5,11,20} sometimes combined with right hemicolectomy,²⁰ side-to-side ileotransverse colostomy,¹⁵ temporary ileostomy¹⁸ or ileostomy through the perforation.¹⁰

All operative procedures reported have been followed by a high complication rate. Archampong,² for example, had a 52% incidence of wound sepsis. The combination of massive peritonitis and poor patient resistance is the obvious cause for this. Reperforation or perforation from another ulcer is followed by peritonitis and fecal fistula and generally a fatal outcome.^{7,20} It is difficult to differentiate the two unless reoperation is performed.¹⁴ This procedure is frequently impossible because of the poor condition of the patient or associated wound sepsis. Accordingly, since 1975 we have performed an end-to-side ileotransverse colostomy in the majority (75%) of our cases. It is our belief that the ideal procedure for these patients should be one which is relatively bloodless and quick and one which protects against fecal contamination should the perforation reopen or a new perforation at another site occur. End-to-side ileotransverse colostomy carried out well proximal to the perforation should do this. It is now our procedure of choice.

While our mortality rate has not changed with the introduction of this procedure, morbidity has ($p < 0.02$). This has been particularly evident in the reduction of major wound infections, dehiscences and fecal fistulae. The most convincing proof has been in the significantly ($p < 0.02$) shorter period of hospitalization in survivors (Table 7).

Mortality varies greatly. Kim et al.¹¹ reported a 9.9% mortality rate, whereas Dickson and Cole⁷ reported 62%. It appears that this is related to the delay in presentation of the patient, it being 38 hours in the former series and three days in the latter. In our series, the average duration was 56 hours and mortality 32%.

Until typhoid fever is eliminated by improved sanitation and immunization programs, surgeons will be confronted with its complications. Of these, enteric perforation is the most common and lethal. Only prompt recognition and urgent surgical intervention will improve results.

References

1. Abdel-menein, R. I.: Surgical Management of Perforated Typhoid Ulcer. *Int. Surg.*, 52:405, 1969.

2. Archampong, E. Q.: Operative Treatment of Typhoid Perforation of the Bowel. *Br. Med. J.*, 3:273, 1969.
3. Archampong, E. Q.: Typhoid Ileal Perforations: Why such Mortalities? *Br. J. Surg.*, 63:317, 1976.
4. Boyd, W.: Pathology, Philadelphia, Lea and Febiger, 1970, pp. 326-331.
5. Conroy, J. V.: Acute Ileitis with Ulceration and Perforation due to Paratyphoid Fever—Report of Eighty-five cases. *Milit. Med.*, 120:79, 1957.
6. Dawson, J. H.: Surgical Management of Typhoid Perforation of the Ileum. *Am. Surg.*, 36:620, 1970.
7. Dickson, J. A. S. and Cole, G. J.: Perforation of the Terminal Ileum. *Br. J. Surg.*, 51:893, 1964.
8. Huckstep, R. L.: Recent Advances in the Surgery of Typhoid Fever. *Ann. R. Col. Surg. Eng.*, 26:207, 1960.
9. Huckstep, R. L.: Typhoid Fever and Other Salmonella Infections, Edinburgh, E. & S. Livingstone, Ltd., 1962, p. 190 ff.
10. Kaul, B. K.: Operative Management of Typhoid Perforation in Children. *Int. Surg.*, 60:407, 1975.
11. Kim, J. P., Oh, S. K. and Jarrett, F.: Management of Ileal Perforation due to Typhoid Fever, *Ann. Surg.*, 181:88, 1975.
12. Kissane, J. M.: Bacterial Diseases in Anderson, W. A. D. and Kissane, J. M. (ed.) Pathology, St. Louis, C. V. Mosby, 1977, p. 397 ff.
13. Mulligan, T. O.: The Treatment of Typhoid Perforation of the Ileum. *J. R. Col. Surg. Edin.*, 17:364, 1972.
14. Olurin, E. O., Ajayi, O. O. and Bohrer, S. P.: Typhoid Perforations. *J. R. Col. Surg. Edin.*, 17:353, 1972.
15. Prasad, P. B., Choudhury, D. K. and Prakash, O.: Typhoid Perforation Treated by Closure and Proximal side-to-side Ileotransverse Colostomy. *J. Ind. Med. Assoc.*, 65:297, 1975.
16. Rowland, H. A. K.: The Complications of Typhoid Fever. *J. Trop. Med. Hyg.*, 64:143, 1961.
17. Samantray, S. K., Johnson, S. C., and Chakrabarti, A. K.: Enteric Fever: An Analysis of 500 Cases. *Practitioner*, 218:400, 1977.
18. Spray, G., Ejazy, M. M. and Rahini, N.: 31 Cases of Ileal Perforation Due to Typhoid. Place of Temporary Ileostomy with Resection. *J. Chir. (Paris)*, 106:341, 1973.
19. Tseng, H. C. and Feng, C. H.: Perforation of Typhoid Ulcer. *Chinese Med. J.*, 67:531, 1949.
20. Welch, T. P. and Martin, N. C.: Surgical Treatment of Typhoid Perforation. *Lancet*, 1:1078, 1975.