Original Article

Operative management of typhoid ileal perforation in children

Ali Nuhu, Samuel Dahwa[1], Abdulkarim Hamza[1]

ABSTRACT

Background: Intestinal perforation resulting from complicated typhoid fever still causes high morbidity and mortality. The purpose of the present study is to evaluate the outcome of its surgical management in Nigerian children. **Materials and Methods:** Emergency laparotomy and repair of the ileum was performed on 46 children with typhoid ileal perforation at the Federal Medical Centre (FMC), Azare, Nigeria, between January 2004–December 2008. This was followed by copious peritoneal lavage with warm normal saline and mass closure of the abdomen. **Results:** There were 28 (60.86%) boys and 18 (39.13%) girls, with a mean age of 9.5 ± 3.22 (range, 15 months–15 years). Abdominal pain (45), fever (44), and abdominal distention (36) were the most common presenting symptoms and majority of the patients (36) perforated within 14 days of illness. Solitary ileal perforations were the most common pathology, found in 31 (67.4%) cases. Simple closure of the perforations after debridement of the edges was the most frequent operative procedure performed. A total of 21 patients had one or more complications which included wound infection (21), postoperative fever (16), and wound dehiscence (6). Postoperative anaemia was a problem in 23 (50%) patients. The mortality rate was (13) 28.3%. The mean duration of hospital stay for survivors was 22.9 ± 12.3 (range, 6–46 days). This was not significantly affected by the location or number of perforations on the ileum. **Conclusions:** The clinical course of typhoid ileal perforation may be different for the very young. The typically high rate of complications can be reduced if operation is undertaken earlier. Solitary ileal perforations can be managed safely with simple closure.

Key words: Children, management outcome, typhoid ileal perforation

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Department of Surgery, University of Maiduguri Teaching Hospital, PMB 1414 Maiduguri, Borno State, [1]Department of Surgery, Federal Medical Centre, Azare, Bauchi State, Nigeria

Address for correspondence:
Dr. Ali Nuhu,
Department of Surgery, University of Maiduguri Teaching Hospital, PMB 1414, Maiduguri, Nigeria.
E-mail: nuhualinvwa@yahoo.com

INTRODUCTION

Intestinal perforation resulting from complicated typhoid fever is a continuing challenge for the surgeons practicing in an endemic area, because of the high morbidity and mortality rates associated with its operative management.[1] Salmonella typhi and paratyphi infection (causing typhoid fever), is a serious systemic disease in developing countries and in countries where unhealthy environmental conditions prevail. Intestinal perforation, the most common in the ileum, is the most serious complication of typhoid fever, with mortality rates ranging between 20–60% in the West African subregions.[1-3] In the endemic areas, children below the age of 15 years account for more than 50% of the intestinal perforation cases, with higher mortality in them than the adult population.[4-6] The reasons for these high mortality rates and postoperative complications are, continuing severe peritonitis, septicaemia, malnutrition, fluid, and electrolyte derangements. It is agreed that surgical intervention to seal the source of continuing peritoneal contamination is the treatment modality with the best outcome, but the operative technique of choice is not settled. We have managed 46 children with typhoid ileal perforation mainly by excision and simple closure followed by copious peritoneal lavage after adequate resuscitation. This study reviews the pattern of disease and outcome of such management in a government referral hospital in Northeast Nigeria.

MATERIALS AND METHODS

In a retrospective study, children with typhoid intestinal perforation were identified from the hospital records of all patients with intraoperative diagnosis of typhoid perforation treated by the General Surgery Unit of the Federal Medical Centre, Azare, from January 2004-December 2008. Relevant data regarding clinical diagnosis, investigations, treatment, and outcome were obtained from the operating theatre register and other medical records. Descriptive data were analysed using the SPSS version 15 for windows (SPSS, Chicago,- IL, US) and presented in statistical Tables.

RESULTS

There were 46 children [28 (60.8%) boys and 18 (39.1%) girls], with intraoperative diagnosis of typhoid ileal perforation during the study period. Their mean age was 9.5 ± 3.22 (range, 15 months- 15 years); and male: female ratio was 1.5:1. Also, 36 (76.1%) patients were between the age range of 9−15 years [Table 1]. There were 4 (8.7%) children below the age of five years. Almost all the patients presented with abdominal pain, fever, and features of peritonitis. The mean time lapse between onset of symptoms of perforation and presentation to hospital was 72.44 ± 9.33 hours, (range, 24−168). A total of 44 (95.6%) patients had fever, 36 (78.3%) had abdominal distention, 25 (54.3%) had vomiting, and 23 (50%) had constipation [Table 2]. Of the 41 patients recorded, 21 (51.2%) perforated within the first seven days of illness, 15 (36.6%) within the second week, and 5 (12.2%) within the third week of illness. Plain chest and abdominal radiographs were available for 31 (67.4%) patients with 16 (51.6%) showing free gas under the diaphragm. The main electrolyte derangements were hypokalaemia and raised serum urea in 13 (28.3%) patients respectively. The packed cell volume (PCV) was lower than 30% in 37 (80.4%) children. The widal test was done in only 5 (10.8%) patients with the titre higher than 1:160 in all of them. Blood cultures were not done in any of the patients. A total of 24 (52.2%) patients had surgery within 24 hours of presentation to hospital and the rest 16 (34.7%) were operated after 24 hours of admission. The mean time from admission to laparotomy was 9.4 hours (range, 6−24). The main resuscitative measures in all the patients involved correction of fluid and electrolyte derangements and giving of pareneteral antibiotics. Those with PCVs below 30% had preoperative blood transfusion. The abdomen was entered through a transverse subumbilical incision for those who were five years and below (N = 4), and a midline incision (long or subumbilical), for the others. There were 76 ileal perforations in all, (mean = 1.65), 31 (67.4%) of which were single point [Figure 1]. Also, 5 (10.8%) patients had two perforations, another 5 (10.8%) had three, and 3 (6.5%) had four perforations [Table 3]. There were no caecal perforations. The highest number of ileal perforations in a single patient was 14. The mean estimated size of the perforations was 23.35 ±13.46 mm (range, 10−80). Significant faecal peritonitis was seen in all the patients with moderate to massive soilage documented in 32 (69.6%) of them. Eight (17.4%) patients had mild peritoneal soilage. The main operative procedure was simple two-layered transverse closure after a circumferential excision of the perforation edges in 38 (82.6%) patients and wedge resection in 1 (2.2%) patient. Six (13%) patients had segmental ileal resection and primary anastomosis; while one 8-year-old patient with multiple ileal perforations, the most distal within 5 cm of the ileocaecal junction (ICJ), had right hemicolectomy and

Table 1: Age and sex distribution of 46 children with typhoid ileal perforation

Age (years)	Males	Females	Frequency (%)
1−4	4	0	4 (8.7)
5−8	4	3	7 (15.2)
9−12	11	6	17 (37)
13−15	10	8	18 (39.1)
Total	29 (63.04)	17 (37.00)	46 (100)

Six hundred and seventy children were treated for typhoid fever, giving a perforation rate of 6.8%.

Table 2: Clinical features

Presenting features	Features (%)
Abdominal pain	45 (97.8)
Fever	44 (95.7)
Abdominal tenderness	42 (91.3)
Abdominal distention	36 (78.3)
Vomiting	25 (54.3)
Constipation	23 (50)
Diarrhoea	12 (26.1)

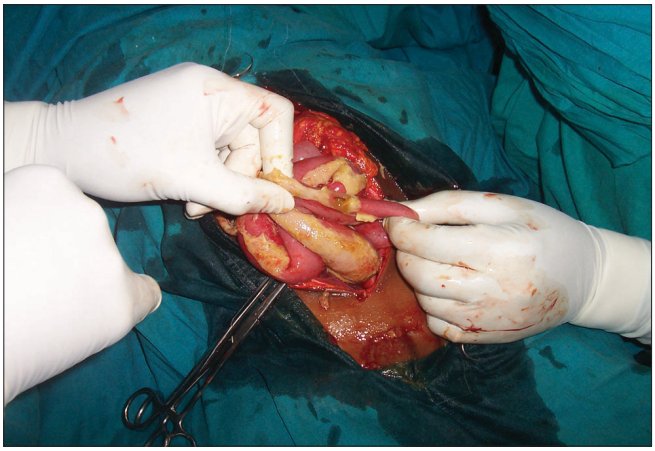


Figure 1: Typical single perforation of the terminal ileum due to typhoid fever in a 10-year-old girl. Note the antemesenteric location and faecal peritonitis

Table 3: Distribution of number of perforations as it relates to mortality

No. of perforations	Frequency (%)	Mortality No. (%)
1	31 (67.4)	8 (25.8)
2	5 (10.8)	2 (40)
3	5 (10.8)	1 (20)
4	3 (6.5)	1 (33.3)
5	1 (2.2)	0 (0)
14	1 (2.2)	1 (100)
Total	87 (100)	13 (28.3)

NB: There were a total of 87 ileal perforations. The highest number of perforations in a single child was 14. The overall mortality rate was 28.3%.

ileotransverse anastomosis. Multiple adhesions were noticed and lysed in 17 (36.9%) patients. The mean estimated distance of the most distal ileal perforation from the ICJ was 20.23 ± 10.34 cm (range, 5−60). Out of 37 documented patients, 19 (51.3%) had their most dital perforations within 10−20 cm of the ICJ. The most common postoperative complications were: wound infection 21 (%), postoperative fever 16 (%), and anaemia 38 (%) [Table 4]. Eight (21.1%) of the 38 patients had simple closure, and 1 (16.7%) of the six had segmental ileal resection reperforated within 4 to 9 days (mean, 5.34±2.89) postoperatively, and reexploration was done for four patients of which one survived. The remaining five were managed conservatively of which two survived. The overall mortality was 13 (28.3%). Death occured 36 hours to 14 days (mean, 6.2±5.4 days) postoperatively from septic complications and multiple organ failure. The mean duration of hospital stay for survivors was 22.89±12.34 days (range, 6−46). The mean duration of follow-up was 4.83±9.36 weeks (range, 2−55).

DISCUSSION

Typhoid ileal perforation is frequently seen among children in our environment. Over this study period, children aged 15 years and younger constituted 55.4% of all cases. This is in keeping with earlier reports from Nigeria where the paediatric age group accounted for more than half the cases of typhoid intestinal perforation.[5,6] In one of the report from Western Nigeria[7] and India,[11] however, typhoid perforation was the most common in the age group of 21−30 years. There was a slight male preponderance (a male female ratio of 1.7:1); similar to previous series.[6,8] The prognosis of typhoid ileal perforation still remains poor, with an overall mortality in this study of 28.3%, in keeping with most previously reported series in the tropical environment, including West Africa.[1−6] We found, as previously reported, that the perforations are the most common in the terminal ileum and survivors were faced with wound infection and high rates of wound dehiscence and enterocutaneous fistulae.[9]

Table 4: Postoperative complications

Postoperative complications	Frequency (%)
Wound infection	21 (45.6)
Postoperative fever	16 (34.7)
Reperforation	9 (19.7)
Wound dehiscence	6 (13)
Enterocutaneous fistula	4 (8.7)
Chest infection	4 (8.7)
Postoperative adhesions	3 (6.5)
Intraabdominal abscess	1 (2.2)

Symptoms and signs of typhoid ileal perforation in Nigerian children are not different from those in other geographical areas,[10,11] with diarrhoea and fever more prominent in those below five years of age. The under five also have atypical features of generalised peritonitis and it may not be easy to make a diagnosis of peritonitis in them with certainty. Therefore, a high index of suspicion is needed for a diagnosis in this age group as demonstrated by other workers.[12] The youngest child affected by typhoid ileal perforation in our series was 15 months old; similar to one year[13] and two years[14] in earlier reports. A report from Zaria,[5] North Central Nigeria, recorded an incidence in a two-month-old infant. This is an unusual finding and may be due to contaminated expressed breast milk among other possibilities. The older children exhibit classical features of peritonitis in over 90% of cases, supporting the diagnosis.[12] Ileal perforations occurred within the first week of typhoid fever in over 50% of our patients, with reference to earlier reports from Northern Nigeria[2] and other parts of tropical Africa.[15] This is in contrast to the classical description of three weeks, ten days,[16] or two weeks[17] in other reports. This may be due to a more virulent strain of *Salmonella typhi* among West Africans, coupled with increased hypersensitivity reaction in the Peyers patches in this subregion, where the perforation rate is higher than other endemic areas.[1] Late presentation, with mean estimated perforation duration of four days (range, 2−7), and delay in operation (over 30% operated after 24 hours of presentation to hospital), were responsible for the high mortality and morbidity in all age groups as reported by other series.[15,18]

The need for aggressive fluid resuscitation and correction of electrolyte derangements and anaemia; together with the choice of a suitable antibiotic combination is crucial to surgical outcome. The antibiotic protocol that has been used over the years included: chloramphenicol, gentamycin, and metronidazole; which are given parenterally at diagnosis and continued for seven days before conversion to oral preparations of chloramphenicol and metronidazole. The rationale is to cover for not only the *Salmonella* organism but also for anaerobes and gram negative coliforms. The emergence of chloramphenicol resistant, *Salmonellae*, has led to the use fluoroquinolones (for example, ciprofloxacin), or third generation cephalosporins.[19] To be certain that the perforation on the ileum is due to typhoid enteritis, a positive blood, stool or urine culture is necessary. However, the yield for blood culture in a patient with typhoid intestinal perforation is low, ranging from 3−34%,[3,20] in some reports. Higher yields of the *Salmonella* organism is obtained from cultures of the

perforation edges, bone marrow, or peritoneal aspirates; but this is often not possible and even when they are done the results do not significantly alter the operative treatment given to the patient. The classical disposition of the typhoid perforation in the longitudinal axis of the ileum and on the antemesenteric border with an antecedent history of prolonged febrile illness in a child, who did not respond to antimalarials, is enough to make a conclusion as to the aetiology of the perforation. A plain abdominal or chest radiograph with free air under the diaphragm is a fairly frequent but variable finding signifying perforated hollow viscus, but its absence does not exclude the diagnosis.

The presence of single ileal perforations in majority (76.4%) of our patients is consistent with other reports[1–6] [Figure 1], and moderate to massive peritoneal contamination favoured the development of septic complications, such as wound infection, wound dehiscence, residual intraabdominal abscesses, and enterocutaneous fistulae, in those patients who survived.[18] We found multiple perforations with massive peritoneal soilage in 15 (32.6%) patients. Prompt surgery after adequate resuscitation, is the treatment of choice for typhoid perforation; this has considerably reduced mortality from 30–60%[1–3] to approximately 6.8% in a recent series.[21] Many surgical techniques have been used, ranging from simple peritoneal drainage under local anaesthesia in moribund patients,[20,22] excision of the edge of the ileal perforation, and simple transverse closure in two layers; as done for majority of our patients, segmental ileal resection and primary anastomosis especially in multiple perforations or right hemicolectomy where the caecum is involved. There are conflicting results of the outcome of these widely practiced techniques. Whereas, better results are reported with simple closure, in many series;[3,20] others favour segmental ileal resection and anastomosis.[23,24] Those that favour simple closure argue, that in such very ill patients any prolonged procedure may jeopardise the outcome and that the ileum affected by typhoid fever, take sutures well without cutting through. This was the experience of the authors. We carried out segmental resection and primary anastomosis only when there were multiple perforations that were in close range and when the caecum was involved. But any operative technique that is carried out in good time, and allows for a swift clearing of peritoneal contamination by a copious peritoneal lavage is the most likely to give the best outcome.

Our practice in managing these children is a simple closure of the perforation, peritoneal lavage with warm normal saline, and closure of the abdominal wall with drainage. Ceftriazone, metronidazole, and gentamicin are given perioperatively to cover for the *Salmonella*, gram negative organisms, and coliforms, respectively. The side-effects of the quinolone ciprofloxacin on the growing cartilage of the child usually make it a second choice in our practice, except when the benefit clearly outweighs this risk.

Mortality rate remains high after surgical treatment for typhoid intestinal perforation; 28.3% in this study, compare favourably with similar studies from Nigeria[5,6] and the West African subregion.[3,9] Mortality is related to endotoxaemia, septicaemia, and multiple organ failure. There have been reports of very high mortality,[1–6] but with early presentation, timely surgery, and improvement in critical care, this can be reduced drastically. Exceptionally, low mortality rates of 3–5% have been reported[25,26] previously. The reason for the high mortality is multifactorial. In our experience, late presentation, delay in diagnosis, and inappropriate or partial treatment of typhoid fever were the main ones.

In conclusion, typhoid ileal perforation in children has a poor prognosis in our environment. Late presentation, delayed operation, faecal peritoneal contamination, and postoperative faecal fistulae are the factors that have adverse effects on survival. Most deaths occurred during the early postoperative period, with survivors having a prolonged hospital stay. There should be a deliberate community drive towards preventive measures; by health education, improvement in potable water supply, sewage disposal, and personal hygiene to stamp out this public health menace.

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REFERENCES

1. Archampong EQ. Typhoid ileal perforation: why such mortality. Br J Surg 1976;63:317-21.
2. Akoh JA. Prognostic factors in typhoid perforation. East Afr J Med 1992;70:18-21.
3. Mock CN, Amaral J, Visser LE. Improvement in survival from typhoid ileal perforation: result of 221 operative cases. Ann Surg 1992;215:244-9.
4. Ugwu BT, Yiltok SJ, Kidmas AT, Opaluwa AS. Typhoid intestinal perforation in north central Nigeria. West Afr J Med 2005;24:1-6.
5. Ameh EA. Typhoid ileal perforation in children: a scourge in

developing countries. Ann Trop Paedtr 1999;19:267-72.
6. Uba AF, Chirdan LB, Ituen AM, Mohammed AM. Typhoid intestinal perforation in children: a continuing scourge in a developing country. Paed Surg Int 2007;23:33-9.
7. Ajao OG. Typhoid perforation: factors affecting mortality and morbidity. Int Surg 1982;4:317-9.
8. Butler T, Knight J, Nath SK, Speelman P, Roy SK, Azao MA. Typhoid fever complicated by intestinal perforation: a persisting fatal outcome requiring surgical management. Rev Infect Dis 1985;7:244-56.
9. Abatanga FA, Wiafe-Addai BB. Postoperative complications after surgery for typhoid perforation in children in Ghana. Paediatr Surg Int 1998;14:55-8.
10. Atamanalp SS, Aydinli B, Ozturk G, Oren D, Basoglu M, Yildirgan MI. Typhoid intestinal perforation: twenty-six year experience. World J Surg 2007;31:1883-8.
11. Talwar S, Sharma KR, Mittal DK, Prasad P. Typhoid enteric perforation. Aust N Z J Surg 1997;67:351-3.
12. Ekenze SO, Ikefuna AN. Typhoid intestinal perforation under 5 years of age. Ann Trop Paediatr 2008;28:53-8.
13. Ekenze SO, Okoro PE, Amah CC, Ezike HA, Ikefuna AN. Typhoid ileal perforation: Analysis of morbidity and mortality in 89 children. Niger J Clin Pract 2008;11:58-62.
14. Lizaralde E. Typhoid perforation of the ileum in children. J Paediatr Surg 1981;16:1012-6.
15. Archampong EQ, Tandoh JFK, Nwako FA, da Rocha-Afodu JT, Foli AK, Darko R, *et al*. Small and large intestine (including rectum and anus). In: Badoe EA, Archampong EQ, da Rocha-Afodu JT, editors. Principles and practice of surgery including pathology in the tropics. 3rd ed. Accra: Ghana Publishing Company Tema; 2000. P. 620-32.
16. Kizilcan F, Tanyel FC, Buyukpamukcu N, Hicsonmez A. Complications of typhoid fever requiring laparotomy during childhood. J Paediatr Surg 1993;28:1490-3.
17. Keenan JP, Hadley GP. The surgical management of typhoid perforation in children. Br J Surg 1984;71:928-9.
18. Adesunkanmi AR, Ajao OG. The prognostic factors in typhoid ileal perforation: A prospective study of 50 patients. J R Coll Surg Edin 1997;42:395-9.
19. Kabra SK, Madhulika, Talati A, Soni N, Patel S, Modi RR. Multi drug resistant typhoid fever. Trop Doct 2000;30:195-7.
20. Khana AK, Misra MK. Typhoid perforation of the gut. Postgrad Med J 1984;60:523-5.
21. Karmacharya B, Sharma VK. Results of typhoid perforation management: experience in Bir Hospital, Nepal. Kathmandu Univ Med J (KUMJ) 2006;4:22-4.
22. Kim JP, Oh SK, Jarret F. Management of ileal perforation due to typhoid fever. Am J Surg 1976;181:88-91.
23. Shah AA, Wani KA, Wazir BS. The ideal treatment of typhoid enteric perforation- resection anastomosis. Int Surg 1999;84:35-8.
24. Ameh AE, Dogo PM, Attah MM, Nmadu PT. Comparison of three operation s for typhoid perforation. Br J Surg 1997;4:558-9.
25. Vargas M, Penne A. Perforated viscera in typhoid fever: a better prognosis for children. J Paediatr Surg 1975;10:531.
26. Santillana M. Surgical complications of typhoid fever: enteric perforation. World J Surg 1991;15:170.

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