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Typhoid Intestinal Perforations in Nigerian Children

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Abstract. This study was a retrospective analysis of 75 children with perforated typhoid enteritis treated at the Baptist Medical Centre in Ogbomoso, Nigeria over a 4-year period. The mean age was 11.4 years. The usual symptoms were fever and abdominal pain, with a mean duration of 10.5 days. The diagnosis of perforation was usually based on the history and physical examination alone. The time interval from hospital presentation to operation was 11 hours, during which intravenous crystalloid and antibiotics were administered. Among the 75 children, 53 (71%) had a single perforation, and 22 had multiple perforations. Débridement and two-layered closure was performed in 71 (95%) and resection with anastomosis in 4 (5%). Ileus resolution was usually not complete until the eighth postoperative day, and the mean time until the surviving children were afebrile was 10 days. Complications other than death occurred in 7 (9%) children, and there were 15 deaths (20% mortality). All deaths were attributed to overwhelming sepsis, and all but one of the deaths occurred during the first 72 postoperative hours. The only factor statistically significant as a predictor of mortality was the duration of abdominal pain. Improvement in perioperative management including intensive care nursing and more effective antibiotics, although expensive, could result in decreased mortality. A significant decrease in mortality can occur only when the prevention of typhoid fever becomes a higher priority than its treatment.

Typhoid fever is a serious global health problem that usually occurs in places with the fewest resources available for effective treatment. Enteric perforation is the complication of typhoid fever associated with the highest morbidity and mortality. This report reviews a 4-year experience with the management of perforated typhoid enteritis in children presenting to a Nigerian general medical practice hospital.

Materials and Methods

The records of 75 consecutive children with perforated typhoid enteritis treated at the Baptist Medical Centre in Ogbomoso, Nigeria, between January 1991 and December 1994 were analyzed retrospectively and form the database for this report. Statistical analysis was performed using logistic regression.

The diagnosis of typhoid fever was generally based on the history and physical examination alone. Blood cultures were obtained as a supplement in some children, but serologic tests such as the Widal test were not utilized. Intestinal perforation was diagnosed solely on the basis of the history and physical findings in most cases, but radiographs, if available, were used to look for pneumoperitoneum when the diagnosis was uncertain after evaluation of the history and physical examination. As soon as the diagnosis of perforation was entertained, nasogastric decompression and intravenous fluid resuscitation with Ringer's lactate solution or normal saline were implemented. Intravenous antibiotics, including gentamicin, chloramphenicol, and ampicillin or penicillin, were administered to all children. Some children were also given metronidazole by rectum, but parenteral metronidazole was not used because of its prohibitive cost in our location. Acetaminophen and tepid sponge baths were used as needed to control pyrexia. After adequate urine output was established, operative exploration was undertaken.

General endotracheal anesthesia with ketamine and halothane as the only anesthetic agents was used routinely. Operative exploration was conducted through a lower midline incision. The degree of peritoneal contamination and the number and location of the perforations were recorded. Single perforations were débrided and a two-layered bowel closure performed. If multiple perforations were found to be adequately spaced, multiple débridements and two-layered closures were utilized; but if the perforations were close together, resection and primary anastomosis was performed. The fascia was closed with a monofilament permanent suture, and the subcutaneous and skin layers were left open to minimize wound infections.

Postoperatively, children were extubated and observed in an open children's ward, as we do not have an intensive care unit or a pediatric ventilator. Intravenous fluid therapy was monitored using physical findings and urine output as parameters. Our laboratory is unable to perform serum electrolyte determinations. Parenteral antibiotics were continued until a return of bowel function, at which time oral ampicillin and chloramphenicol were substituted. Metronidazole was given rectally in some patients until ileus resolution and was then switched to oral administration. Antibiotics were continued for at least 2 weeks following operation. Oral intake was resumed following resolution of the ileus, and the child's "normal diet" was supplemented with "homemade" soybean milk to provide as many calories and as much protein as possible. After discharge from the hospital, children were monitored for continued growth and well-being in an outpatient clinic.

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Table 1. Symptoms.

Symptom	Children with symptom (%)	Duration (days) (mean of whole series)
Fever	96	11
Abdominal pain	95	5
Vomiting	40	6
Constipation	36	4
Diarrhea	31	5
Headache	19	9

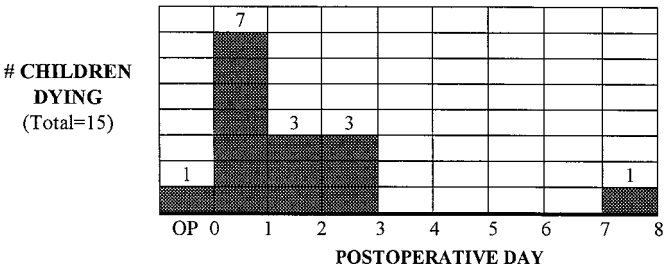

Fig. 1. Time of death.

Results

Seventy-five consecutive children with the diagnosis of perforated typhoid enteritis were operatively managed at Baptist Medical Centre in Ogbomoso, Nigeria between January 1991 and December 1994. There were 47 males and 28 females with a mean age of 11.4 years (range 2–18 years). There was no seasonal variation, with the rainy, dry, and transitional seasons equally represented. The most common presenting symptoms (Table 1) were fever and abdominal pain, and the mean duration of symptoms was 10.5 days. Less common symptoms were vomiting, constipation, diarrhea, and headache. Most children appeared volume-depleted on presentation, and all had generalized abdominal tenderness. The mean time interval from hospital presentation to operation was 11 hours, during which intravenous crystalloid was used to establish urine output and antibiotics were administered.

The mean operating time was 90 minutes. Altogether 53 (71%) children had a single perforation, 16 had two perforations, 3 had three perforations, and 1 child each had four, five, and six perforations. Typically perforations were located on the antimesenteric portion of the ileum 20 cm (range 0.5–60.0 cm) proximal to the ileocecal valve. In no instance had the omentum succeeded in sealing the perforation or even in localizing the resultant infection. Peritoneal contamination was moderate or severe in 67 (89%) children and mild in only 8 (11%). Perforations were managed by débridement and two-layered closure in 71 (95%) children, and resection with primary anastomosis was performed in 4 (5%). Twelve (16%) children underwent additional suture imbrication of "preperforations."

Ileus resolution usually began around the fifth postoperative day, but progress to a "regular" prehospital diet could not be achieved until the eighth postoperative day. The mean postoperative time until the surviving children were afebrile was 10 days, and the mean time until hospital discharge was 14 days. Complications other than death occurred in 7 (9%) children. Early postoperative morbidity necessitating a repeat operation included one child with a leak from a previously closed perforation, one with a metachronous perforation (7 days after the first perforation), one with a pelvic abscess, and one with a fascial dehiscence. One child with an enterocutaneous fistula was successfully managed nonoperatively. Late complications included small bowel obstruction necessitating laparotomy with adhesiolysis in two children.

There were 15 deaths (20% mortality). One child died intraoperatively, and 10 died during the first 48 postoperative hours (Fig. 1). All deaths were attributed to overwhelming sepsis with presumed fluid and electrolyte abnormalities and multiple organ system dysfunction. The only factor statistically significant as a predictor of mortality was the duration of abdominal pain ($p = 0.02$). Factors not predictive of mortality included age, gender, presence or duration of any symptom other than abdominal pain, particular physical signs, number of perforations, degree of peritoneal contamination, type or difficulty of operation, and the need for repeat operation.

Discussion

The Baptist Medical Centre (BMCO) in Ogbomoso, Nigeria is a 180-bed general medical practice hospital that faces daily operational impediments similar to those faced by most, if not all, hospitals in less developed countries (LDCs) [1, 2]. The only consistent factor about the supply of water and electricity is the inconsistency. X-ray film and developing solutions are expensive and scarce, and therefore radiographs are used only when the result might modify patient care. The only reliable laboratory tests available at BMCO are the complete blood count, serum glucose assay, urinalysis, and routine bacterial cultures. The only appropriate antibiotics that are readily available for bowel flora are penicillin, ampicillin, gentamicin, chloramphenicol, and enteral metronidazole. Parenteral metronidazole, cephalosporins, and quinolones, if available at all, are economically inaccessible to almost all of our patients. A nurse anesthesia service at BMCO provides good general anesthesia with endotracheal intubation; but at many LDC hospitals laparotomy is, of necessity, performed using ketamine and diazepam without an endotracheal tube. There is no intensive care unit at BMCO, and children are managed postoperatively in a 27-bed, open ward. Parenteral nutrition is unavailable. Without the availability of computed tomography scanning and ultrasonography, postoperative intraabdominal abscesses are presumptively diagnosed by clinical examination and confirmed by the ultimate diagnostic modality, exploratory laparotomy.

Children with typhoid fever generally present to our hospital during the second week of their illness. They have usually been treated at home with chloramphenicol, which is readily available without prescription. Many children have also been treated with various other medicinals by traditional healers or traveling "injectionists." When the abdominal pain fails to improve, they are brought to the hospital as a last resort. At this point they are generally seriously ill with obvious volume depletion, and it is easy to diagnose typhoid fever. The difficulty comes when deciding whether the bowel has perforated. Many children have obvious peritonitis on physical examination, and the decision to operate is readily made. There are children with more subtle findings, however, and the diagnosis of perforation is not as obvious in these cases. One helpful physical test in these instances is the

"umbilical hernia sign" [3]. Most children in Nigeria have umbilical hernias, and assessment of tenderness on gentle manipulation of the umbilical hernia has been a sensitive, specific test for diagnosing perforation. The umbilical hernia also provides safe access for paracentesis if the diagnosis is in question after the physical examination. Upright radiographs, if available, are somewhat helpful for determining bowel perforation, but the relatively low sensitivity limits their effectiveness [4]. After physical examination and radiography there are still some children in whom the diagnosis of perforation is in question at the time of laparotomy. During the 4-year period of this study, three children (not included in the study) had a presumptive diagnosis of enteric perforation but were found at laparotomy to have nonperforated typhoid enteritis.

Nonoperative management was at one time considered the better treatment for patients with perforated typhoid enteritis [5, 6], but operation is now the accepted standard of care [1–4, 7–9]. The operative procedure of choice, however, is still debated. Options include simple closure, débridement and closure, resection with primary anastomosis or stoma, and ileal exclusion (Eggleston [10] operation). The only published prospective study [11] comparing operative techniques concluded that resection and primary anastomosis was the preferred technique. That study was not effectively randomized, however, and therefore decisions concerning the choice of operative technique for typhoid perforations must still be made on the basis of basic surgical principles and anecdotal reports such as ours. In this series there were only three children (4%) who might have received any benefit from a more extensive operation: one child who developed an enterocutaneous fistula, one who perforated in a different location 7 days after the initial operation, and another who leaked from one of six perforations that had been débrided and closed. The last child clearly should have had a resection at the initial operation. Our data support, but certainly do not prove, that the best policy is routine débridement and closure for single perforations, with resection reserved for multiple perforations in a short segment of bowel.

The postoperative course is usually a stormy one for children with perforated typhoid enteritis. Typhoid fever is truly a systemic illness, as demonstrated by the average time of 10 days for children in this series to become afebrile even when there was no identifiable, localized source of infection. Without sophisticated imaging techniques intraabdominal abscesses can be difficult to diagnose. A digital rectal examination is the best diagnostic modality for a pelvic abscess. Subphrenic abscesses are suspected when the child has hiccoughs or increasing shoulder pain. Interloop abscesses are diagnosed only at repeat exploratory laparotomy performed on the basis of a strong clinical suspicion.

Usually children with perforated typhoid enteritis are grossly catabolic at the time of hospital presentation (Fig. 2). The typhoid fever-induced hypermetabolic state combined with a prolonged period of postoperative ileus exaggerates this catabolism. Akgun et al. [12] concluded that all patients with perforated typhoid enteritis should receive parenteral nutrition for at least 10 days after operation. As noted by Bissett [13], however, this endeavor is expensive and is currently technologically and economically inappropriate for hospitals such as ours where routine electrolyte determinations are not even available and "sterility" is a relative term. In an attempt to improve the nutritional status of children in a technologically appropriate manner, we have initiated a prospective, randomized trial comparing our conventional postoperative therapy to therapy using early postoperative enteral feeds with homemade soy milk given through a jejunostomy tube placed at the initial operation. Our goal is to improve the nutritional status of these children in order to shorten the duration and severity of their postoperative sepsis.

Fig. 2. Catabolic child with typhoid enteric perforation at the time of presentation to Baptist Medical Centre, Ogbomoso, Nigeria.

The major purpose of this review of perforated typhoid enteritis in children is to search for ways to decrease mortality rates. The 20% mortality in this series is consistent with that in most other reports [1, 7, 10, 11, 14–16]. The lowest published rate of 3% was achieved by Vargas and Pena [17] using sophisticated critical care monitoring and aggressive fluid and electrolyte therapy, although a similar rate of 5% was achieved in Peru [2] in a less developed situation. Our present study has identified only one factor (duration of abdominal pain) that is of value for predicting which patients will die, but identification of this factor has few if any therapeutic implications. About the only thing that can be concluded is that if patients had come to the hospital sooner after the onset of abdominal pain their survival rate might have been better. Community education encouraging people to seek professional care earlier for typhoid fever is certainly a worthwhile goal but a difficult one to implement effectively, especially in less developed situations.

In order to propose methods for improving mortality, it is important to note the time of death in these children (Fig. 1). Altogether, 11 (73%) of the 15 deaths in this series occurred within 48 hours of operation, and only 1 (7%) death occurred more than 72 hours after operation. The rather obvious implication is that improvement is needed during the perioperative period. Implementation of intensive perioperative care at Baptist Medical Centre would probably have resulted in improved fluid, electrolyte, and blood therapy, important factors in lowering mortality [18]. Improved antibiotic coverage is also needed for patients in our hospital and in other health care facilities in LDCs. Several reports have documented the increasing emergence of multidrug-resistant *Salmonella typhi* [8, 19–22]. Chloramphenicol is the only anti-*Salmonella* drug available to us. We do not routinely perform cultures for patients with obvious typhoid, and

we do not perform any sensitivity testing. We therefore have no idea whether we are dealing with resistant *Salmonella* strains. Even if we identified such strains, we might not have had more appropriate antibiotics to use. Strains of *Salmonella* resistant to chloramphenicol provide a rational explanation for continued postoperative fever in the absence of an identifiable source. Some of our children with continued pyrexia despite chloramphenicol treatment might well have had a resistant strain. Mock et al. [1] emphasized the importance of anaerobic coverage for the fecal peritonitis from typhoid perforation, and they pointed out that chloramphenicol is good in vitro but not in vivo against *Bacteroides fragilis*. Fifty of our children received rectal metronidazole [1], but we cannot comment on its efficacy because there were no controls in this portion of our study. Until better antibiotics become physically and economically available for use by our hospital and most other hospitals in LDCs, we must continue with our present antibiotic regimen of rectal metronidazole and parenteral ampicillin, gentamicin, and chloramphenicol.

Typhoid fever remains a devastating disease in LDCs. Improvement in perioperative management techniques including intensive care nursing and more effective antibiotics is expensive but could result in decreased mortality for patients who actually present to a health care facility. The most cost-effective strategy for decreasing mortality from typhoid fever, however, is to provide clean drinking water for all children through well digging and sanitation programs. A significant global decrease in mortality from typhoid fever will occur only when health providers elevate the *prevention* of typhoid fever by providing clean drinking water for all people to a higher priority than the *treatment* of typhoid fever using more expensive antibiotics or a better operation.

Résumé

Nous avons analysé rétrospectivement les dossiers de 75 enfants traités pour perforation d'entérite typhoïde à l'Hôpital Baptist Medical Centre à Ogbomoso, Nigeria, pendant quatre ans. L'âge moyen des enfants était de 11.4 ans. Les symptômes habituels ont été fièvre et douleur abdominale, dont la durée moyenne a été de 10.5 jours. Le diagnostic de perforation a été fait sur l'histoire et l'examen physique. L'intervalle de temps entre l'admission à hôpital et l'intervention a été de 11 heures, période pendant laquelle les enfants ont été perfusés avec des solutions de cristalloïdes et ont reçu des antibiotiques. Cinquante-trois enfants (71%) ont eu une seule perforation, 22 ont eu des perforations multiples. Excision des berges et fermeture en deux couches a été le traitement chez 71 (95%) des enfants alors que quatre (5%) ont eu une résection suivie d'anastomose. La reprise du transit s'est faite habituellement au 8ème jour et l'apyrexie a été obtenue en 10 jours en moyenne. Des complications (autre que le décès) ont été observées chez 7 (9%) enfants. Il y a eu 15 (mortalité de 20%) décès. Tous les décès ont pu être attribués à un sepsis, et tous les décès sauf un ont eu lieu pendant les 72 premières heures postopératoires. Le seul facteur prédicteur significatif de mortalité a été la durée de douleur abdominale. Pour améliorer le traitement périopératoire, il faut envisager des soins en unité spécialisée (soins intensifs) et une meilleure antibiothérapie, solution onéreuse mais qui pourrait réduire la mortalité. Une réduction de mortalité significative aura lieu, cependant, lorsque la *prévention* de la fièvre typhoïde aura la priorité sur le *traitement* de la fièvre typhoïde.

Resumen

Este es un análisis retrospectivo de 75 niños con enteritis tifoidea perforada tratados en el Baptist Medical Centre en Ogbomoso, Nigeria, en un periodo de 4 años. La edad promedio fue 11.4 años. Los síntomas usuales fueron fiebre y dolor abdominal con duración de 10.5 días. El diagnóstico de perforación fue establecido con base en la historia y el examen físico solamente. El intervalo entre el momento de presentación en el hospital y la operación fue de 11 horas, periodo durante el cual se administraron cristaloides intravenosos y antibióticos. Cincuenta y tres niños (71%) desarrollaron perforación única, y 22 desarrollaron perforaciones múltiples. Se practicó desbridación y cierre en dos capas en 71 (95%) de los pacientes y resección y anastomosis en 4 (5%). El íleo postoperatorio no cedió antes del octavo día postoperatorio y el tiempo promedio hasta que el niño apareciera afebril fue de 10 días. Se presentaron complicaciones en 7 (9%) niños y 15 murieron (mortalidad de 20%). La totalidad de las muertes se debió a sepsis, y todas, menos una, ocurrieron en las primeras 72 horas postoperatorias. El único factor de predicción de mortalidad estadísticamente significativo fue la duración del dolor abdominal. El mejoramiento en el manejo perioperatorio, incluyendo enfermería de cuidado intensivo y antibióticos más efectivos, sería costoso pero podría resultar en reducción de la mortalidad. Sin embargo, una disminución significativa de la mortalidad sólo se podrá observar una vez que la prevención de la fiebre tifoidea se convierta en una prioridad más alta que el tratamiento.

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