

Prolonged Post-Operative Paralytic Ileus and Anastomotic Leak: Guilty or Not Guilty

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ABSTRACT

Background: Post-operative ileus and intestinal anastomotic leak may be associated. The aim of this study was to evaluate the clinical relationship between postoperative ileus and anastomotic leak in children who had intestinal surgery.

Materials and Methods: This was a retrospective study of children who had intestinal surgery at the pediatric surgery unit of a teaching hospital in Enugu, Nigeria. The study covered a 5-year period. The patients were categorized into 2 groups: Patients with prolonged ileus plus anastomotic leak were categorized as group A whereas Group B patients had prolonged ileus without anastomotic leak. Both groups were compared.

Results: A total of 392 intestinal surgeries were performed in children during the study period. Out of this number, 301 (76.8%) patients had intestinal anastomosis or repair and form the basis of this report. The mean age of the patients was 6 years, and the mean duration of hospitalization was 21 days. The most common indication for intestinal surgery was intussusception and right hemicolectomy with ileotransverse anastomosis was the most frequently performed surgical procedure. The post-operative ileus was prolonged (almost twice) in Group A patients. Wound infection was the most common post-operative complication and about one-tenth of the patients expired due to overwhelming sepsis.

Conclusion: This study, on children who had intestinal anastomosis/repair, has shown that prolonged post-operative ileus could be associated with anastomotic leak.

Keywords: Anastomotic Leak; Children; Intestinal; Paralytic Ileus; Post-Operative

Introduction

Post-operative ileus could be defined as failure of gastrointestinal propulsion following surgery without evidence of mechanical obstruction. It refers to the condition where the motor activity of the bowel is impaired leading to temporary and often painless lack of bowel movement [1, 2]. Ileus manifests as intolerance of oral feeds and abdominal distension. Ileus can result

from surgery, medications (especially opioids), trauma, peritonitis, or severe illness. Ileus is usually an unavoidable consequence of abdominal or retroperitoneal surgery [3]. Postoperatively, ileus manifests within third and fifth day and it lasts for about 2 to 3 days with the small intestine function being the fastest to return. Function returns in the stomach within 24 to 48 hours and the

colon within 48 to 72 hours. A diagnosis of prolonged ileus is made if the ileus exceeds 3 days in the absence of signs of mechanical intestinal obstruction [4].

Intestinal anastomotic leak is a serious complication of intestinal surgery [5]. The incidence of leak after intestinal anastomosis ranges from 0.5% to 30% [6]. The time of occurrence of anastomotic leak may be suggestive of the etiology of the leak. For instance, early leaks are usually due to technical reasons and occur on the first or second postoperative days. Anastomotic leak that occurs around the end of the first postoperative week may be attributed to failure of normal healing process [5]. The clinical presentations of anastomotic leak vary. It could present as localized intraperitoneal abscess when the leak is controlled or frank peritonitis in cases of uncontrolled intestinal leak [7]. Some studies have reported the potential relationship between post-operative ileus and anastomotic leak [6]. The aim of this study was to evaluate the clinical relationship between postoperative ileus and anastomotic leak in children who had intestinal surgery.

Materials and Methods

This was a retrospective study of children who had intestinal surgery at the pediatric surgery unit of Enugu State University Teaching Hospital (ESUTH), Enugu, Nigeria. The surgical access was through a laparotomy. The study covered a 5-year period, from January 2017 to December 2021. Only children with prolonged paralytic ileus were enrolled into the study. For the purposes of this study, prolonged post-operative ileus is defined as ileus lasting more than 72 hours following laparotomy. The patients were categorized into 2 groups: Patients with prolonged ileus plus anastomotic leak were categorized as group A whereas Group B patients had prolonged ileus without anastomotic leak. Children older than 15 years of age were excluded from this study. ESUTH is a tertiary hospital located in Enugu, Southeast Nigeria. The hospital serves the whole of Enugu State, which according to the 2016 estimates of the National Population Commission and Nigerian National Bureau of Statistics, has a population of about 4 million people and a population density of 616.0/km². The hospital also receives referrals from its neighboring states. Information was extracted from the case notes, operation notes, operation register and admission-discharge records. The information extracted included the age, gender, duration of symptoms before presentation, time interval between presentation and intervention, diagnosis at surgery, definitive operative procedure performed, duration of post-op ileus, complications of treatment, duration of hospital stay and outcome of treatment. The need for laparotomy was made based on clinical and radiological findings in the patients. The follow-up period was 6 months. Ethical approval was obtained from the ethics and research committee of ESUTH, and informed

consent was obtained from the patients' caregivers. Statistical Package for Social Science (SPSS) version 21 (manufactured by IBM Corporation Chicago Illinois) was used for data entry and analysis. Data were expressed as percentages, median, mean, and range.

Results

Patients' Demographics

A total of 392 intestinal surgeries were performed in children during the study period. Ninety-one (23.2%) patients had no intestinal resections while 301 (76.8%) patients had intestinal anastomosis or repair and form the basis of this report. The mean age of the patients was 6 years and there were 198 (65.8%) males and 103 (34.2%) females. The median duration of symptoms before presentation to the hospital was 7 days (range 2-10). The mean time interval between presentation and surgical intervention was 2 days (1-3). The mean duration of hospitalization was 21 days (range: 12-27).

Diagnosis at Surgery

The diagnosis made is shown in Table 1.

Table 1: Diagnosis (n=301).

Diagnosis	Number of patients (%)
Intussusception	185 (61.5)
Typhoid intestinal perforation	70 (23.3)
Ruptured appendix	41 (13.6)
Penetrating abdominal injury	5 (1.6)

Definitive Operative Procedure Performed

The operative procedure performed depended on the findings observed at surgery. Table 2 shows the operative procedures.

Table 2: Operative procedures performed (n=301).

Operative procedures	Number of patients (%)
RHC + ITA	161 (53.5)
Primary closure for TIP	64 (21.3)
Appendectomy + cleaning of the peritoneal cavity	41 (13.6)
Segmental ileal resection	24 (8.0)
Ileostomy for TIP	6 (2.0)
Primary closure of bowel perforation	5 (1.6)

RHC=Right hemicolectomy; ITA=Ileotransverse anastomosis; TIP=Typhoid int. perforation.

Mean Duration of Post-Operative Ileus

The mean duration of post-operative ileus is shown in Table 3.

Table 3: Mean durations of post-operative ileus for group A and group B patients.

Group of patients	Mean duration of post-op ileus
Group A	7
Group B	4

Complications of Treatment

Fifty-nine (19.6%) patients developed post-operative complications: Wound infection 35 (11.6%); intra-abdominal abscess 12 (4%); enterocutaneous fistula 6 (2%); and stitch related complications 6 (2%).

Treatment Outcome

Two hundred and seventy-seven (92%) were treated successfully and discharged home. However, 24 (8%) could not make it due to uncontrollable sepsis. Typhoid intestinal perforation accounted for 21 (87.5%) of the 24 mortalities.

Discussion

Following intestinal surgery in children, post-operative recovery is eventful if there is leak from intestinal anastomosis or repair. Anastomotic leak can have severe consequences [8]. Healing of intestinal anastomosis/repair is a complex process involves inflammation, collagen formation, angiogenesis, growth factors and epithelialization [9]. It is believed that the etiology of anastomotic leak is multifactorial. The key mechanism underlying post-operative ileus is intestinal inflammation and this inflammation is evoked by intestinal handling during surgery [10]. There are experimental trials being conducted to mitigate the inflammatory response [11].

In the present study, amongst the patients that had intestinal surgery, about two-thirds had intestinal anastomosis/repair whereas about one-third did not undergo any intestinal repair. Patients who had no intestinal repair included infants who benefitted from manual reduction of intussusception. The large number of intestinal repairs could be from late presentations of intussusception cases and endemic nature of typhoid fevers in developing country like Nigeria. The mean age of the patients of 6 years recorded in the current study is consistent with the average ages of intussusception and typhoid intestinal perforation cases: Intussusception occurs mostly in infants (less than 1 year) while typhoid perforation occurs mostly in older children. More males were affected. The reason for the male predominance is not known. However, pediatric abdominal surgical emergencies have been reported to be more common in males [12]. The duration of hospital stay may be related to the specific pathology, definitive operative procedure performed and the post-operative course.

Intussusception was the most common indication for intestinal surgery in the current series. Intussusception is the invagination of a segment of the intestine into another segment and is a

common cause of intestinal obstruction and an abdominal surgical emergency in children [13]. Operative treatment of intussusception entails manual reduction or bowel resection. There were more bowel resections. The large number of bowel resections could be explained by the number of gangrenous intussusception due to late presentation of the patients. Typhoid intestinal perforation was the second most common reason for intestinal repair. Typhoid intestinal perforation is one of the most common surgical complications of typhoid fever and may be associated with significant morbidity and mortality [14, 15]. Typhoid fever is multisystem infection caused by the bacteria, *Salmonella enterica* serovar typhi and *Salmonella enterica* serovar paratyphi A and B which are transmitted through feco-oral route by ingestion of contaminated food and/or water. Surgical treatment of typhoid intestinal perforation involves primary repair of intestinal perforation. Segmental ileal resection and anastomosis is another option of treatment of typhoid intestinal perforation [16]. In gross peritoneal contamination and severe sepsis where a primary repair may not heal, an enterostomy (ileostomy) may suffice.

Most of the patients had right hemicolectomies with ileotransverse anastomosis for gangrenous or non-reducible intussusception. This high number of right hemicolectomies could be accounted for by the large number of intussusceptions treated in our centre. This surgical procedure is predicated on the arterial supply of the right colon [17]. Segmental ileal resection can be performed in non-reducible small bowel intussusception in appropriately selected patients. In single ileal perforation in typhoid intestinal perforation and penetrating intestinal injury, primary intestinal closure is effective.

With regards to the period of post-op ileus, patients with intestinal leak had prolonged period of ileus (about twice longer) when compared with patients without intestinal leak. The prolonged ileus may have precipitated the anastomotic leak. There are systemic and local factors associated with anastomotic leak and they contribute to poor healing and failure of anastomosis [18]. Some of the systemic factors include anemia, malnutrition, and hypoalbuminemia. Intestinal ischemia is one of the local factors that can cause anastomotic leak [5]. The mechanism could be that paralytic ileus impairs blood supply to the intestine causing tissue death at the anastomotic/repair site and subsequent leak [5]. One study from Netherlands reported the association between post-operative ileus and anastomotic leak [8]. The authors documented the high plasma levels of soluble tumour necrosis factor receptor and levels of C-reactive protein responsible for the increased inflammatory response that leads to anastomotic leak [8]. Venara, et al. reported that post-operative ileus and anastomotic leakage are highly associated, and that post-operative ileus is the first stage leading to anastomotic leak [19]. However, Peters et al reported that it is not possible to determine if anastomotic leak leads to post-

operative ileus or if post-operative ileus leads to anastomotic leak [8].

Conclusion

This study, on children who had intestinal anastomosis/repair, has shown that prolonged post-operative ileus could be associated with anastomotic leak. However, in terms of chronology, this study could not specify which of the events came before the other and this forms the basis of future research.

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