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BOWEL RESECTION IN CHILDREN
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ABSTRACT

Background: **In developed countries, most bowel resections in children are for congenital anomalies and massive resection and short bowel syndrome are frequent problems.**
Objective: **To review indications, morbidity and mortality of bowel resection in children in a developing country.**
Design: **A retrospective study.**
Setting: **Ahmadu Bello University Teaching Hospital Zaria, Nigeria.**
Subjects: **Forty six children aged ≤12 years who had bowel resection in a period of five years.**
Results: **The commonest indication was typhoid perforation 25 (54%), 21(84%) of them aged >5 years. Intussusception was the indication in eight (17%), six less than one year. Bowel resection was performed for congenital anomalies in nine (18%) patients, seven of them <1 month (abdominal wall defect in four, intestinal atresia in two, strangulating inguinal hernia in one, strangulating band in one, Meckel's diverticulitis, one). Resection for trauma and neoplastic conditions were few (2.4% each). Twelve patients (26%) developed 17 complications including wound infection in seven (15%) anastomotic dehiscence, five (11%), abdominal wound dehiscence, three (14%), intra-abdominal abscess and stitch sinus, one (2%) each respectively. Most of the complications followed right hemicolectomy for intussusception and resection for typhoid perforation. Massive bowel resection was necessary in only one patient. There were nine deaths (20%). The mortality was highest in neonates and infants (38%).**
Conclusion: **The indications for bowel resection in this environment differ from that in developed countries. Most of the indications (74%) are preventable by improvements in sanitation and early presentation and treatment. The morbidity and mortality are highest in neonates and infants and meticulous attention to technical details may minimise them.**

INTRODUCTION

Bowel resection is an important surgical procedure in children, particularly in neonates and infants, due to potential morbidity and mortality. In developed countries, bowel resections in children are frequently performed for necrotising enterocolitis and congenital anomalies(1,2) such as midgut volvulus and gastroschisis, and short bowel syndrome is a major problem in surviving patients(3). Though there are reports on conditions requiring bowel resection in developing countries, bowel resection and its problems as a whole have not been looked into. This is a retrospective study of the indications, morbidity and mortality of bowel resection in children in a developing country.

MATERIALS AND METHODS

Children aged ≤12 years who had bowel resection between January 1994 and December 1998 at the Ahmadu Bello University Teaching Hospital Zaria were identified from the operation register. The hospital records of the patients have been reviewed. Patients who had colonic resection as part of correction of Hirschsprung's disease were excluded from the study.

RESULTS

There were 29 boys and 17 girls. The age range was one day to 12 years (median 6 years). The indication for bowel resection in neonates was congenital (intestinal strangulation in five, intestinal atresia in two). In infants (<1 year), intussusception was the commonest indication (5 out of 6) and in older children (≥1 year), typhoid perforation was the indication in 73% (24/33). Intestinal resection was performed for jejunal perforation from blunt trauma in two patients and in two others; neoplasia was the indication for resection (small intestinal leiomyoma in one, lymphoma in one). Overall, typhoid perforation was the most frequent indication for bowel resection (25, 54%) followed by intussusception (8,17%) (Table 1).

The small intestine was the site of resection in 40 (87%) patients; 36 (90%) were segmental resections and 4 (10%) wedge resections. The length of small intestine resected was 5cm - 50cm (median 20cm); two neonates who had gastroschisis with intestinal gangrene had extensive resection (ileocaecal valve not resected). Six (13%) patients had resection of the right colon (right hemicolectomy) for intussusceptions in five and ruptured exomphalos with

Table 1

Age and indication for bowel resection in 46 children

Indication	Age (years) <1 month	1 month - 1 yr	1-5	>5-9	10-12	Total (%)
Typhoid perforation	–	1	3	14	7	25 (54)
Intussusception	–	5	1	2	–	8 (17)
Abdominal wall defect	4	–	–	–	–	4 (8)
Intestinal atresia	2	–	–	–	–	2 (4)
Trauma	–	–	–	1	1	2 (4)
Neoplasia	–	–	–	2	–	2 (4)
Strangulated inguinal hernia	1	–	–	–	–	1 (2)
Srangulating band	–	–	1	–	–	1 (2)
Meckel's diverticulitis	–	–	1	–	–	1 (2)
Total	7	6	6	19	8	46 (100)

Table 2

Morbidity of bowel resection in 12 children

Morbidity	Age (years) <1 month (n=7)	<1 (n=6)	1-5 (n=6)	>5-9 (n=19)	10-12 (n=8)	Total (n=46)
Wound infection	1	1	–	2	3	7
Anastomotic leakage	–	4	1	–	–	5
Wound dehiscence	–	2	–	1	–	3
Intraabdominal abscess	–	–	–	–	1	1
Stitch sinus	–	–	–	–	1	1

Table 3

Mortality following bowel resection in nine children

Indication for resection	Age (years) <1 month (n=7)	<1 (n=6)	1-5 (n=6)	>5-9 (n=19)	10-12 (n=8)	Total (n=46)
Typhoid perforation (n=25)	–	–	2	–	2	4
Intussusceptions(n=8)	–	3	–	–	–	3
Abdominal wall defect (n=4)	1	–	–	–	–	1
Intestinal atresia (n=2)	1	–	–	–	–	1
Total (%)	2 (29)	3 (50)	2 (33)	0 (0)	2 (25)	9 (20)

gangrenous caecum in one. The left colon was not resected in any patient. End-to-end anastomosis was performed after resection in all patients, with single layer suture in neonates and two-layers in others.

Twelve patients (26%) developed 17 complications (Table 2). The complication rate was highest in neonates and infants. Wound infection was the commonest complication (41%) and followed resection for typhoid perforation in five patients older than five years. Out of six patients who had right hemicolectomy, two developed anastomotic dehiscence twice and were treated by re-laparotomy, resection and anastomosis after the first dehiscence; following the second dehiscence, resection and re-anastomosis was performed in one and exteriorisation ileostomy and colostomy in the other. Anastomotic dehiscence also occurred in a two year old following ileal resection for congenital strangulating band and was treated by re-laparotomy, resection and anastomosis. The anastomotic dehiscence in the three patients occurred after two, three and five days respectively. Abdominal wound dehiscence followed anastomotic dehiscence in two of the patients above and resection and anastomosis for typhoid perforation in an eight year old and were managed by tension suturing. Intra-abdominal abscess requiring re-laparotomy and drainage and stitch sinus occurred in one patient each respectively following resection for typhoid perforation.

The hospital stay for surviving patients was twelve days to five weeks (median 20 days). The longer stay was in patients who had complications. Mortality was nine out of 45 patients (20%), highest in neonates and infants (38%). The deaths followed resection for typhoid perforation in four (16% of resection for typhoid peroration), right hemicolectomy for intussusception in three (60% of resection for intussusception), extensive resection for gastroschisis in one and intestinal atresia in one (Table 3). One neonate who had resection for gastroschisis with bowel gangrene was taken away from hospital by the parents two days after surgery.

DISCUSSION

In Zaria, Nigeria, bowel resection in children is performed most commonly for typhoid ileal perforation. In this hospital, it has since been found that segmental ileal resection is the most effective treatment for typhoid perforation, irrespective of the number of perforations(4,5). Intussusception remains an important indication for bowel resection in children, particularly infants in our environment. In developing countries, the bowel resection rate for intussusception is high, in the region of 62%(6,7), due mostly to late presentation. Heavy ascaris infestation is a common cause of intestinal obstruction in children in southern Nigeria(8) and other developing countries(6,9,10) and is an important indication for bowel resection in these areas due to intestinal volvulus and ischaemia. In the present report, this infestation does not feature as an indication for bowel resection. The common indications for bowel resection in developing countries above differ from the situation in developed countries where necrotising enterocolitis, gastroschisis(1,2) and midgut volvulus from malrotation(11,12) are the most common indications, especially in neonates and infants. Crohn's disease(13) is also an indication for resection in these countries. These differences may well be due to the fact that many premature and very low birth weight neonates in our environment do not survive so that necrotising enterocolitis is not yet a clinical problem. Also, malrotation is not a common cause of volvulus in childhood in our environment(14).

The morbidity of intestinal resection in this report is high, occurring in 26% of patients. The complications were mostly wound infections and anastomotic dehiscence, the former following resection for typhoid perforation most frequently and the latter after right hemicolectomy for intussusception. The hospital stay was unduly long (median 20 days) due to these complications. Massive or extensive resection was rarely performed and short bowel syndrome was therefore not a problem, unlike in developed countries where short bowel syndrome is a common problem after massive resection(1-3). Mortality was high (20%) in the present report, particularly in neonates and infants, in which the mortality was 38%, and followed complications of right hemicolectomy for intussusception and congenital anomalies. The mortality of 16% following resection for typhoid perforation may also be from the primary disease itself. In order to reduce the morbidity and mortality from intestinal resection, especially in children <5 years, the procedure must be approached with meticulous attention to technical details; tissue handling must be gentle and use of intestinal clamps avoided as much as possible(15) to prevent ischaemia. Single-layer, extramucosal suturing may also prevent ischaemia. Also, a formal right hemicolectomy is usually not necessary for intussusception in infants(15).

In conclusion, bowel resection in children in this environment could have been avoided in 34 of the 46 (74%) patients (typhoid perforation 25, intussusception 8, strangulated inguinal hernia, one); typhoid perforation can be prevented by improvements in sanitation and provision of safe, portable drinking water. Resection for intussusception and strangulated inguinal hernia can be avoided if patients present early.

REFERENCES

1. Cooper A., Floyd T.F., Ross A.J., Templeton J.M. and Ziegler M.M. Morbidity and mortality of short bowel syndrome acquired in infancy: an update. *J. Paediat. Surg.* 1984; **19**:711-718.
2. Bohane T.D., Bigger W.D. and Gall G.D. A clinical study of young infants after intestinal resection. *J. Pediat.* 1979; **94**:552-558.
3. Shanbhogue L.K.R. and Molenaar J.C. Short bowel syndrome: metabolic and surgical management. *Brit. J. Surg.* 1994; **81**:486-499.
4. Ameh E.A., Dogo P.M., Attah M.M. and Nmadu P.T. A comparison of 3 operations for typhoid perforation. *Brit. J. Surg.* 1997; **84**:558-559.
5. Ameh E.A. Typhoid ileal perforation in children: a scourge in developing countries. *Ann. trop. Paediat.* 1999;**19** :267-272.
6. Rao P.L.N.G., Sharma A.K., Yadav K., Mitra S.K. and Pathak I.C. Acute intestinal obstruction in children as seen in Northwest India. *Indian Pediat.* 1978; **4**:1017-1023.
7. Nmadu P.T. The changing pattern of infantile intussusception in Northern Nigeria: A report of 47 cases. *Ann. trop. Paediat.* 1992; **12**:347-350.
8. Archibong A.E., Ndoma-egba R. and Asindi A.A. Intestinal obstruction in Southeastern Nigerian children. *East. Afr. Med. J.* 1994; **71**:286-289.
9. Maung M. and Saing H. Intestinal volvulus: An experience in a developing country. *J. Pediat. Surg.* 1995; **30**:679-681.
10. Ochola-abila P. and Barrack S.M. Round worm intestinal obstruction in children at Kenyatta National Hospital, Nairobi. *East Afr. Med. J.* 1982; **59**:113-118.
11. Welch G.H., Azmy A.F. and Ziervogel M.A. The surgery of malrotation and midgut volvulus: A nine-year experience in neonates. *Ann. roy. Coll. Surg. Engl.* 1983; **65**:244-246.
12. Powell D.M., Othersen H.B. and Smith C.D. Malrotation of the intestines in children: The effects of age on presentation and therapy. *J. Pediat. Surg.* 1989; **24**:777-780.
13. Wesson D.E. and Shandling B. Results of bowel resection for Crohn's disease in the young. *J. Pediat. Surg.* 1981; **16**:449-452.
14. Ameh E.A. and Nmadu P.T. Intestinal volvulus: Aetiology, morbidity and mortality in Nigerian children. *Pediat. Surg. Int.* 2000; **16**:50-52.
15. Wright V.M. Intussusception. In: Spitz L., Coran A.G. (eds). Rob and Smith's operative surgery (Paediatric Surgery), Chapman and Hall Medical, London. 1995:398-401.