

GASTROINTESTINAL PERFORATIONS IN CHILDHOOD*

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From the point of view of location, cause and surgical management gastrointestinal perforations (GIP) in children differ from those in adults. Even within the various pediatric age groups there are considerable differences¹⁻⁹. Here we set out our experiences of GIP, in all pediatric age groups, over the last five years.

Material and Methods

One hundred and fifty-six children with the diagnosis of GIP are studied. Appendix perforations are excluded. Patients are divided into three groups as follow :

Group A : Neonates; Group B : Infants aged 1–12 months; Group C : Children aged 1–14 years.

Sex, etiologic factors, localization of the perforation, surgical procedures, and mortality are dealt with in each group.

Results

Group A. Of the 38 newborns 31 (81%) were boys and seven of them (19%) were girls. Obstructive lesions were the most dominant factor (31/38) in the etiology (Table I). In this group, most of the perforations were located in the lower gastrointestinal tract. There were only five perforations in the stomach, duodenum and jejunum, compared to twelve colonic, eight cecal and seven ileal perforations. There were six intrauterine perforations (Table II). As to the surgical procedures there were 13 cases of resection and anastomosis, 18 of ostomy procedures, four of primary suturing and two of proximal ostomy in addition to primary suturing (Table III). The mortality rate in this group was 74% (Table IV).

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TABLE I
Etiologic Factors in Gastrointestinal Perforations

<u>Age group</u>	<u>Etiologic factors</u>	<u>No. of patients</u>
A <i>0–1 month</i>	Intestinal and colonic atresia	12
	Imperforate anus	7
	Meconium ileus	5
	Congenital megacolon	4
	Idiopathic	3
	Necrotizing enterocolitis	2
	Malrotation	1
	Annular pancreas	1
	Neoplasm	1
	Postoperative complication	1
	Unknown	1
B <i>1–12 months</i>	Necrotizing enterocolitis	19
	Intussusception	5
	Unknown	4
	Strangulated inguinal hernia	1
	Duplication	1
	Congenital band	1
C <i>1–14 years</i>	Blunt abdominal trauma	44
	Penetrating abdominal trauma	16
	Typhoid fever	5
	Unknown	5
	Tumors	5
	Meckel's diverticulum	3
	Band ileus	2
	Peptic ulcer	2
	Strangulated inguinal hernia	1
	Amebiasis	1
	Congenital band	1
	Complication of other disease	1
	Esophageal dilatation	1

Group B. There were 31 patients in this group. Fourteen of them were boys (45%) and 17 were girls (55%). Necrotizing enterocolitis (NEC) was the etiologic factor in 19 of the patients (61%). Intussusception, strangulated inguinal hernia, intestinal

duplication and congenital band were the other causes of the perforations (Table I). While 18 of the perforations were localized in the ileum, ten were in the colon (Table II). Resection and anastomosis was carried out in 15 cases; colostomy in nine; primary suturing in four; and ileostomy in three patients (Table III). The mortality rate in Group B was 71% (Table IV).

Group C. Sixty-five boys (75%) and 22 girls (25%) had GIP in Group C. In 60 patients (68%) abdominal trauma was the dominant etiologic factor (Table I). Typhoid fever, intestinal tumors and Meckel's diverticulum were the other causes of the perforations. Most of the lesions were localized in the jejunum and ileum (Table II). In contrast to the other groups, primary suturing was the surgical technique most frequently used in Group C. While 46 children had primary

TABLE II
Localization of Gastrointestinal Perforations

<u>Age group</u>	<u>Localization</u>	<u>No. of patients</u>
<i>A</i> <i>0–1</i> <i>month</i>	Colon	12
	Cecum	8
	Ileum	7
	Intrauterine perforation	6
	Duodenum	2
	Jejunum	2
	Stomach	1
<i>B</i> <i>1–12</i> <i>months</i>	Ileum	18
	Colon	10
	Jejunum	1
	Jejunum and ileum	1
	Cecum	1
<i>C</i> <i>1–14</i> <i>years</i>	Ileum	27
	Jejunum	24
	Colon	7
	Rectum	5
	Stomach	4
	Duodenum	4
	Cecum	3
	Meckel's diverticulum	2
	Others	11

suturing, 21 had resection and anastomosis and 11 had colostomy (Table III). The mortality rate for this group was 20% (Table IV).

TABLE III
**Surgical Procedures Used in the Therapy of
Gastrointestinal Perforations**

<u>Age group</u>	<u>Surgical procedures</u>	<u>No. of patients</u>
<i>A</i> <i>0–1</i> <i>month</i>	Resection and anastomosis	13
	Colostomy	8
	Cecostomy	6
	Ileostomy	4
	Primary suture	4
	Primary suture and proximal ostomy	2
	Bishop – Koop	1
<i>B</i> <i>1–12</i> <i>months</i>	Resection and anastomosis	15
	Colostomy	9
	Primary suture	4
	Ileostomy	3
<i>C</i> <i>1–14</i> <i>years</i>	Primary suture	46
	Resection and anastomosis	21
	Colostomy	11
	Ileostomy	3
	Primary suture and proximal colostomy	2
	Primary suture; resection and anastomosis; colostomy	2
	Cecostomy	1
	Excision of Meckel's diverticulum	1

TABLE IV
Mortality Rate

<u>Age group</u>	<u>No. of patients</u>	<u>Mortality</u>
0–1 month	38	28 (74%)
1–12 months	31	22 (71%)
1–14 years	87	17 (20%)
Total	156	67 (43%)

Discussion

Antepartum GIP are generally secondary to distal obstructions i.e. atresia, volvulus, meconium ileus, Hirschsprung's disease^{5,10,11}. On the other hand, selective intestinal ischemia is the main cause of postpartum perforations^{3,12,13}. In our newborn group, 82% of the perforations were secondary to the distal obstructions (Table I). Since only six of the newborns in this group had intrauterine perforation, our findings do not correlate with the reports in the literature. This is also true for the postpartum group. There was only one patient with an NEC perforation which is very surprising. It could be that here the newborns with NEC are either misdiagnosed or they die before they reach the surgical wards.

The surgical treatment of GIP in newborns mainly depends on localization and peritoneal contamination^{1,2,14}. In Group A, the most preferred procedure was resection and anastomosis, and this was performed on 13 newborns with little peritoneal contamination. In the same group ostomy procedures – i.e. eight colostomies, six cecostomies and four ileostomies – were carried out on the neonates with lower gastrointestinal tract perforations.

GIP, in the first year of life, are usually secondary to obstructive and inflammatory lesions such as intussusception, intestinal duplication and Meckel's diverticulum¹⁵⁻¹⁸. Although it is not as common as in the newborn period, NEC is a cause of the problem in Group B too. In this group perforations in 19 patients were due to NEC (Table I). Perforations in five patients with intussusception were the outcome of bowel necrosis. These data underline some of the problems we have : 1. NEC is an important clinical entity even after the newborn period. 2. While most of the perforations from intussusception are due to barium reduction in other countries, patients in Turkey tend to reach the surgical wards only after the necrosis has started¹⁹⁻²¹. All five patients with intussusception perforation in Group B died as a result of septicemia.

There are no differences between our findings and the literature when the localization of the perforations and the surgical treatments of them are considered. Since NEC was the predominant etiologic factor and most perforations were localized in the distal part of the digestive canal, resection and anastomosis and ostomy procedures were the ones mostly used in Group B (Tables I -"II).

Etiologic factors are generally different in older children. Peptic ulcer, typhoid fever, granulomatous diseases of the bowel, and trauma are usually the causes of the GIP in this group of patients^{9,22-25}.

In Group C, perforations were due to trauma in 60 of the 87 patients. Gunshot wound was the cause of the perforation in 12 of the 16 children with penetrating abdominal trauma (Table I). Most of the perforations in Group C were located in the jejunum and the ileum and 46 of the children had only primary suturing (Tables

II, III). In addition to the localization factor, the numbers and types of the perforations called for primary suturing.

In this study, the overall mortality rate of 156 children with GIP is 43% (Table IV). Group C had the highest survival rate (80%). The mortality rates of the first two groups are almost the same.

Emanuel et al⁷ noticed that there was only a slight difference in mortality rates when the figures of the last two decades are compared. They found that while 14/31 patients survived in the earlier decade, progress in medical sciences could only bring this figure up to 35/57 in the following decade. For the two decades the mortality rate was 55.6%. Freeark et al² reported that in their series only two of the 15 newborns survived the GIP. There was only one survivor from among Thelander's¹² 85 cases. Lloyd¹ made an extensive search through the literature and found 402 cases of newborns with GIP. Of these there were only 120 survivors. Grund and Dzieniszewski¹¹ report that their mortality rate for 48 newborns treated for GIP was 63%. These data demonstrate that at the end of the 20th century GIP in children is still a major problem.

Summary

One hundred and fifty-six children with gastrointestinal perforations (GIP) are presented in this study. Of these 24% were neonates, 20% were infants and 56% were in the 1–14 age group. While 33% of the perforations were located in the ileum, 70% of the perforations were in the jejunum, ileum and colon. The leading etiologic factors were, in newborns, obstructive lesions, in infants necrotizing enterocolitis and in the 1–14 age group, trauma. Resection and anastomosis, primary suturing and colostomy were carried out in about 85% of the children by way of surgical treatment. The overall mortality is 43%. It is high in the first two groups (74% and 71%) and low in the last one (20%).

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