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The Study of Intestinal Obstruction in Neonates and their Outcome Excluding Anorectal Malformation

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Abstract

Context: Intestinal obstruction is one of the commonest diagnoses at admission in a neonatal surgical unit. The aim was to study various types of neonatal intestinal obstruction to determine pattern of presentation, diagnosis and their outcomes excluding anorectal malformation.

Materials and Methods: This retrospective study was conducted from January 2012 to January 2013. Data were collected from hospital records and analyzed for age, sex, religion, demographic location, birth history, mother's age, birth weight at admission, the maturity of neonates, the age of presentation, spectrum of anomalies, associated anomalies, types of operation and their outcomes.

Results: Out of 150 neonates admitted under surgical care, 150 neonatal intestinal obstructions were operated. Most common was Hirschsprung's disease 42(28%), followed by meconium ileus 26(17.3%), jejunoileal atresia 20(13.3%), malrotation of gut 18(12%), duodenal atresia 9(6%), idiopathic pyloric stenosis 9(6%), necrotizing enterocolitis 13(8.67%) and others 13(8.67%). Survival rate among them were in, idiopathic hypertrophic pyloric stenosis 100%, Hirschsprung's disease 86%, meconium ileus 85%, malrotation of gut 79%, duodenal atresia 66.6% and necrotizing enterocolitis 66%. Among them highest death incidence were found in duodenal atresia 33%, necrotizing enterocolitis 33% whereas least in idiopathic pyloric stenosis, meconium ileus, jejunoileal atresia and malrotation of gut.

Conclusions: Neonatal surgical outcome depend on many factors, it require dedicated surgical care as well as supportive infrastructure and manpower, early diagnosis and intervention are the crucial factors in improving operative outcome in neonatal surgery.

Keywords: Neonates; Intestinal obstruction; surgery; outcomes.

Introduction

In the neonatal period, intestinal obstruction is the most common surgical emergency. The incidence of intestinal obstructionis approximately 1 in 2000 live births.[1] Obstruction in the new-born was almost always fatal in the past. Only 125 successfully treated cases recorded in the literature until 1950. Ileal atresia was first described by Goeller in 1684. Congenital megacolon was first clinically described at the Berlin society of pediatrics in 1886 by Hirschsprung. Hirschsprung's disease causes a major proportion of cases of neonatal obstruction. Landsteiner in 1905 first described the meconium ileus. The first successful anastomosis for intestinal atresia in 1911 done by Fockens; Pierre Fredet (1907) and Conrad Ramstedt (1912) documented an effective operative procedure (pyloromyotomy) for hypertrophic pyloric stenosis and in 1914 duodenal

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atresia was first successful repaired by N.P. Ernst, which was published 2 years later.[2] Not until 1942 was there a single case report in which a patient with severe obstruction from this cause survived.[3]

The commonest reported causes of bowel obstruction in decreasing order includes anorectal malformations, duodenal atresia, jejunoileal atresia, Hirschsprung's disease, meconium ileus and meconium plug syndrome.[4] There are 4 cardinal signs of intestinal obstruction in newborns: (1) maternal polyhydramnios, (2) bilious emesis, (3) failure to pass meconium in the first day of life, and (4) abdominal distension. The obstruction is categorised into "high" when the level of obstruction become proximal to the ileum and "low'' when the level of obstruction is at the ileum or colon. Antenatal ultrasonography may show dilated bowel loops; maternal polyhydramnios might give a suspicion to an upper gut obstruction. The most informative postnatal investigation is a plain abdominal X-ray; double-bubble of duodenal obstruction, soap bubble appearance in meconium ileus, calcifications of prenatal bowel perforations are some of the findings which are suggestive. USG may be helpful in some cases. Early diagnosis and localization of the obstructive bowel segment guide timely and appropriate management of the underlying pathologic entity. Failure to recognize neonatal bowel obstruction can result in aspiration of vomit, sepsis, midgut infarction or enterocolitis.[5] Delay in carrying out surgery may result in the necrosis of intestine. Initial management strategies should focus on underlying metabolic, cardiac, or respiratory abnormalities although surgical intervention is necessary in most cases.

The aim of the present study was to study various types of neonatal intestinal obstruction and their outcomes excluding anorectal malformation.

Materials and Methods

This retrospective study was conducted in N.R.S. Medical College, Kolkata irrespective of sex and religion from January 2012 to January 2013. Data were collected from hospital records and analyzed for age, sex, religion, demographic location, birth history, mother's age, birth weight at admission, the maturity of neonates, the age of presentation, a spectrum of anomalies, associated anomalies, types of operation and their outcomes. A total of 150 neonates with intestinal obstruction were included in our study after resuscitation, nasogastric suction and prophylactic broad-spectrum antibiotics preoperatively. We kept blood ready for transfusion before surgery. Their ages ranged from 1 day to 28 days. X-ray abdomen in the erect posture was the most common radiological examination and for high intestinal obstruction, a contrast upper gastrointestinal study was performed. Ultrasound evaluation was done for malrotation, idiopathic hypertrophic pyloric stenosis etc. Despite all measure, the actual cause of obstruction was determined during exploratory laparotomy. In this study, the only an initial surgical procedure was considered, in case of staged operation.

Sample design: Sample with comprises neonates less than 28 days of the age of both sex excluding cases of intestinal obstruction due to anorectal malformation. Neonates those who admitted for intestinal obstruction due to non-surgical cause also excluded from the study.

Study design: To study

- Clinical presentation
- Radiological investigation
- Biochemical investigation
- Differential investigation
- Pathological types and finding
- Treatments including operative and non-operative management
- Mortality and morbidity

Parameters to be studied:

- Mean age of the patient at the time of operation /maturity/body weight
- Sex incidence
- Religion incidence of the patient (Hindu / Muslim)
- Preoperative and postoperative radiological investigation
- Operative complication
- Postoperative other complication measurements
- Hospital stay

Results

Out of 150 neonates admitted under surgical care, 150 neonatal intestinal obstructions were operated. Among them, 110 were males and 40 were females. The male-female ratio was 2.75:1. Gestational age varies from 32 weeks to 42 weeks and only 16 out of 150 neonates were premature. Age distribution varies among the disease. Most

common was Hirschsprung's disease 42(28%), followed by meconium ileus 26(17.3%), jejunoileal atresia 20(13.3%), malrotation of gut 18(12%), duodenal atresia 9(6%), idiopathic pyloric stenosis 9(6%), necrotizing enterocolitis 13(8.67%) and others 13(8.67%) as shown in Table 1.

Table 1: Frequency of disease and prematurity

Name of disease	No. of patient	Percentage	Premature
Hirschsprung's disease	42	28%	2
meconium ileus	26	17.33%	3
jejunoileal atresia	20	13.33%	3
malrotation of gut	18	12%	1
Duodenal atresia	9	6%	2
Idiopathic pyloric stenosis	9	6%	0
necrotizing enterocolitis	13	8.67%	5
congenital bands & adhesions	2	1.3%	0
Pyloric web	2	1.3%	0
Ileal duplication cyst with volvulus of terminal ileum	1	<1%	0
Hernia of the umbilical cord	2	1.3%	0
Annular pancreas	2	1.3%	0
Mackle's Diverticulum	2	1.3%	0
Mesenteric cyst	2	1.3%	0
Total	150	100%	16

Table 2 shows majority of neonates with meconium ileus, jejunoileal atresia and necrotizing enterocolitis were presented within first week of their life. On the other hand neonates with Hirschsprung's disease and malrotation presented later on.

Table 2: Age of presentation

Name of disease	0-7 days	>7days	Age range (day)	Total
Hirschsprung's disease	18	24	3–28	42
Meconium ileus	21	5	1–8	26
jejunoileal atresia	17	3	1–10	20
Idiopathic pyloric stenosis	0	9	15–28	9
Malrotation	7	11	8–25	18
Duodenal atresia	9	0	1–4	9
Necrotizing enterocolitis	11	2	2–7	13
Others	8	5	7–22	13

Maximum number of patient commonly presents with non-passage of stool, pain abdomen, vomiting and abdominal distension whereas abdominal mass was least common clinical presentation as shown in Table 3.

Table 3: Clinical presentation

Overall clinical presentation	Number of Patients (n)	Percentage
Non-passage of stool	90	100
Pain abdomen	49	54.44
Vomiting	47	52.22
Distention of abdomen	45	50
Fever	12	13
Bleeding per rectum	10	11
Mass abdomen	8	8.88

Table 4 shows that two cases of Down syndrome were found to be associated with Hirschsprung's disease and duodenal atresia, two and one cases of malrotation were associated with jejunoileal atresia and hernia of umbilical cord respectively whereas Gastroschisis was associated anomaly of one case of each jejunoileal atresia and malrotation of gut.

Table 4: Pattern and associated anomalies

Name of disease	Associated anomalies	Type
Hirschsprung's disease	2	Down syndrome
Meconium ileus	3	Ileal atresia
Jejunoileal atresia	3	Malrotation 2 case Gastroschisis 1 case
Malrotation of gut	3	Congenital dysplasia of hip–1 case Gastroschisis–1 case, Mid gut volvulus–1 case
Duodenal atresia	3	annular pancreas–1 case Down syndrome–2 case
Hernia of umbilical cord	2	Ileal atresia–1 case Malrotation–1 case

Table 5 shows the preoperative complication with number of diseases. Preoperative complications like perforation, volvulus, and septicemia, electrolyte imbalance, hypovolemia were present among those neonates where diagnosis of surgical condition was delayed and premature. Out of 150 neonates 92(61.33%) survived following initial surgical treatment.

Table 5: Preoperative complication

Name of disease	Number	Complication
Hirschsprung's disease	42	12
meconium ileus	26	9
malrotation of gut	18	7
Duodenal atresia	9	4
Idiopathic pyloric stenosis	9	1
jejunoileal atresia	20	9
necrotizing enterocolitis	13	7
Pyloric web	2	1

Ilea duplication cyst with volvulus of terminal ileum	1	1
Hernia of the umbilical cord	2	1
Annular pancreas	2	1
Mackles' Diverticulum	2	1
Mesenteric cyst	2	0
Congenital bands & adhesions	2	1
Total	150	55

Table 6 shows the surgical procures according to the disease associated. The maximum number of case operated was of Hirschsprung's disease whereas least number of cases was operated of ileal duplication cyst with volvulus of terminal ileum.

Table 6: Surgical procedures

Name of disease	Number	Surgical procedures
Hirschsprung's disease	42	Exploratory laparotomy Leveling colostomy Multiple biopsy Ileostomy
Meconium ileus	26	Santuli`s procedure Enterostomy Ileostomy
Malrotation of gut	18	Ladd's procedure Resection and end-to-end anastomosis in midgut Volvulus
Duodenal atresia	9	open duodeno duodenostomy
Idiopathic pyloric stenosis	9	open pyloromyotomy
Jejunoileal atresia	2	Resection and anastomosis ileostomy
Necrotizing enterocolitis	9	PVC drain Resection and end-to-end anastomosis
Pyloric web	2	Web excision
Ileal duplication cyst with volvulus of terminal ileum	1	Resection and anastomosis
Hernia of the umbilical cord	2	Primary closure
Annular pancreas	2	Duodenoduodenostomy
Mackle's Diverticulum	2	Wedge resection
Mesenteric cyst	2	Excision
Congenital bands and adhesions	2	Adenolysis band

Survival rate among them were in, idiopathic hypertrophic pyloric stenosis 100%, Hirschsprung's disease 86%, meconium ileus 85%, malrotation of gut 79%, duodenal atresia 66.6% and necrotizing enterocolitis 66%. Among them highest death incidence were found in duodenal atresia 33%, necrotizing enterocolitis 33% whereas least in idiopathic pyloric stenosis, meconium ileus, jejunoileal atresia and malrotation of gut.

Table 7: Outcome of surgical procedure

Name of disease	Total no. Patients	Survive (%)	Died (%)
Hirschsprung's disease	42	37(88.1%)	5(11.9%)
Meconium ileus	26	22(84.6%)	4(15.4%)
Jejunoileal atresia	20	16(80%)	4(22.2%)
Malrotation of gut	18	14(77.8%)	4(22.2%)
Duodenal atresia	9	6(66.6%)	3(33.3%)
Idiopathic pyloric stenosis	9	9(100%)	0
Congenital bands & adhesions	2	1	1
Necrotizing enterocolitis	13	9(69.2%)	4(30.8%)
Pyloric web	2	1	1
Ileal duplication cyst with volvulus of terminal ileum	1	1	0
Hernia of the umbilical cord	2	1	1
Annular pancreas	2	1	1
Mackles' Diverticulum	2	2	0
Mesenteric cyst	2	2	0
Total	150	122	28

Table 8 shows that out of 150 operated cases 86 were associated with postoperative complication among that septicemia, anastomotic leakage and burst abdomen were common complication.

Table 8: Distribution of postoperative complication

Overall complication	No. /(%)
Anastomotic leakage	17(19%)
Septicemia	22(25.5%)
Wound infection	10(11%)
Burst abdomen	15(17%)
Aspiration	5(5.8%)
Persistent jaundice	5(5.8%)
Non function stoma	7(8.1%)
Retraction of stoma	5(5.8%)
Total	86(100%)

Discussion

The present study described 150 neonates in which 91 neonates were in the first week of life who suffered from different types of intestinal obstructions and some were with associated congenital malformations. As observed in other reports [6-8], male preponderance was also observed in our study. Among 150 study population, 110(73.33%) were male and 40(26.67%) were female, with a male–female ratio 2.75:1. However, in the present study, the difference in sex is much higher than the others.

In this study, 16(10.67%) neonates were preterm (less than 37 completed weeks) and 134(89.33%)

were full term. The variation between gestational ages was 32 and 42 weeks. The important determinant in neonatal surgical outcome is a state of maturity.[9–11]

An early presentation with early onset of symptom and rapid deterioration of the patient's condition was observed in intestinal atresia and meconium ileus. On the other hand, it was present late in Hirschsprung's disease and malrotation due to variability in the onset of symptom and lack of specificity. Because of early diagnosis and externally evident abnormality, neonates presented with meconium ileus came directly to a surgical specialist. Increased improvement in survival in neonates may be due to early diagnosis and planned delivery.[11] Due to lack of infrastructure, prenatal diagnosis and early intervention may affect the outcome.

The most common cause of intestinal obstruction was Hirschsprung's disease (28%), meconium ileus (17.3%), and jejunoileal atresia (13.3%), malrotation of the gut (12%), duodenal Atresia (6%), idiopathic pyloric stenosis (6%), Necrotising enterocolitis (6%) and other 13% in our study which was similar as observed by Ademuyiwa AO *et al*.[11] In previous study[12], it was found that besides other causes, malrotation of gut was 3rd important (11.7%) cause of neonatal intestinal obstruction which was due to failure of normal rotation of bowel. Congenital anomalies were more frequent among duodenal atresia, jejunoileal atresia, meconium ileus and malrotation of the gut. Septicaemia was the most common preoperative complication, followed by perforation of gut and burst abdomen. This was due to late presentation and overcrowding of the patient. A late presentation may due to lack of definite diagnosis on initial admission elsewhere and due to socioeconomic difficulties. These factors also affect the surgical outcome[10.] To improve the survival rate repeat surgery is required for anastomotic leak and burst abdomen and also postoperative sepsis prevention required. In recent years, the survival of newborns after surgery has increased with advanced surgical techniques, better pediatric anesthesia support and improved neonatal intensive care. Out of 150 neonates in our study, 122(81.33%) survived and 28(18.77%) died following initial surgical treatment. Survival rate among idiopathic hypertrophic pyloric stenosis (100%) Hirschsprung's disease (88.1%), meconium ileus (84.62%), intestinal atresia (jejunoileal plus duodenal) 77.86%, malrotation of gut (77.78)%, Necrotising enterocolitis (69.23%) were found. So the highest survival was noted idiopathic pyloric stenosis, followed by Hirschsprung's disease and lowest in necrotizing enterocolitis followed by intestinal atresia. Mortality is highest in necrotizing enterocolitis as the patient presented to our center with a major part of the bowel was necrotic either we have undergone bowel resection or PVC drain given. In western literature, the mortality rate is at least 65% when more than 75% of the bowel is necrotic and intestinal atresia also have high mortality due to the type of atresia (Type IIIB, Type IV highest mortality) associated anomalies[13, 14].

Postoperative complications were observed in 86 events. But more than one complication was noted in a single patient. In order of frequencies, the complications were septicemia 25.5%, anastomotic leakage 19%, burst abdomen 17%, aspiration pneumonia 5.8%, wound infection 11%, non-functional stoma 8.1%, Stomal stenosis/ retraction 5.8% and persistent jaundice 5.8%. Those who died mostly had some risk factor like prematurity, late presentation, associated severe congenital anomalies and complications like anastomotic leakage and/or sepsis. Patients who presented with risk factors like prematurity, low-birth weight, late presentation and associated severe congenital anomalies were more prone to have bad prognosis even after surgery. The previous study showed that delayed neonatal transport (>1 hour) was associated with the increase in mortality among transported neonates.[15] The mortality rate in neonatal intestinal obstruction was from 21% to 45% in developing countries was which less than 15% in Europe[14,16]. Postoperative mortality in our study was 18.67% which was in between reported international publications.

Conclusion

The neonatal surgical outcome depends on many factors, it require dedicated surgical care as well as supporting infrastructure and manpower, early diagnosis and intervention are the crucial factors in improving operative outcome in neonatal surgery.

Key Messages

A late presentation may due to lack of definite diagnosis on initial admission elsewhere and due to socioeconomic difficulties. These factors also affect surgical outcome. High rate of death because of sepsis is observed and delayed diagnoses of cases were also prevalent.

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