ORIGINAL RESEARCH PAPER

Surgery

KEY WORDS: neonatal, intestinal, obstruction

A RETROSPECTIVE STUDY ON INTESTINAL OBSTRUCTION IN NEWBORN

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ABSTRACT

INTRODUCTION: Intestinal obstruction is one of the commonest diagnosis on admission in newborn surgical unit. Intestinal obstruction is still a challenging and commonly encountered acute condition in paediatric surgical practice and it is more difficult in the management in newborn age group. Early diagnosis and treatment is more important because delay in management may lead to mortality and morbidity. The common causes are congenital malformation like atresia of small and large intestine, duplication cyst, congenital pyloric stenosis, malrotation, Hirshsprung's disease, meconeum ileus, congenital bands, Anorectal malformations etc.

AIM OF THE STUDY: To evaluate various aetiologies of neonatal intestinal obstruction, clinical presentations, associated anomalies, surgical techniques and its duration employed in the management and to identify the high risk factors contributing to the morbidity and mortality in newborn intestinal obstruction.

MATERIAL AND METHODS: This retrospective study conducted at Raja Mirasdhar Hospital attached with Thanjavur Medical College, Thanjavur from January 2017 to December 2019 evaluating the prognostic factors in neonatal obstruction. The Study identified 48 cases of newborns with intestinal obstruction those who have undergone laparotomies during the study period. Neonates less than 28 days were included in this study with history of abdominal distension, vomiting, failure to pass meconium etc. Newborns more than 28 days and diseases such as Esophageal Atresia, Hirschsprung's disease and Anorectal malformation were excluded from our study.

OBSERVATION: A total of 48 cases evaluated during the period of study. The following data were collected from the case sheets of for evaluation. Demographics like age, sex and weight of the newborn baby was recorded. Special care was taken to identify antenatal history of polyhydramnios and maternal diabetes. Antenatal ultrasonogram if available is taken into consideration. Presence of associated congenital malformation at birth if any was recorded. The general condition of the newborn on admission, presence of dehydration, sepsis and hypothermia were noted. The clinical presentation on admission and any associated conditions like prematurity, jaundice and electrolyte imbalance were recorded. Routine and specific investigations were done for the diagnosis of various aetiology of intestinal obstruction. Surgical technique employed and duration of surgery was noted. Postoperative course of the case and the complications were recorded. The length of the hospital stay of the newborn baby was recorded.

CONCLUSION: The commonest cause of neonatal intestinal obstruction was jejunoileal atresia presenting as bilious vomiting and abdominal distension. The commonest associated condition in neonatal intestinal obstruction is malrotation, prematurity and congenital heart disease. Surgical outcome depended on complexity of the disease and duration of surgery. Low birth weight, prematurity, congenital heart disease and sepsis are high factors for morbidity and mortality in neonatal intestinal obstruction.

INTRODUCTION:

Intestinal obstruction is one of the commonest diagnosis on admission in newborn surgical unit. Intestinal obstruction is still a challenging and commonly encountered acute condition in paediatric surgical practice and it is more difficult in the management in newborn age group. Early diagnosis and treatment is more important because delay in management may lead to mortality and morbidity. Intestinal obstruction is the common cause of mortality and morbidity in newborn children. The common causes are congenital malformation like atresia of small and large intestine, duplication cyst, congenital pyloric stenosis, malrotation, Hirshsprung's disease, meconeum ileus, congenital bands, Anorectal malformations etc.

AIM OF THE STUDY:

1. To evaluate various aetiologies of neonatal intestinal obstruction.
2. To analyse various clinical presentations of neonatal intestinal obstruction.
3. To identify the associated anomalies in neonatal intestinal obstruction.
4. To evaluate various surgical techniques employed in the management of newborn intestinal obstruction and the outcome.
5. To identify the high risk factors contributing to the morbidity and mortality in newborn intestinal obstruction.

MATERIAL AND METHODS:

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Demographics: The age of the patient ranged from preterm babies of less than 37 weeks to term babies up to 28 days of birth. Out of the 48 cases male babies were 27 and females were 21. The birth weight of the babies ranged from 1.6 kg to3.4 kg. Out of the 48 cases studied, 9 cases were less than 2 kg, 25 cases were between 2 to 3 kg and 14 cases were more than 3 kg.

Antenatal history: Antenatal ultrasonogram was available for 18 patients (37%), which showed duodenal atresia in 3(16%), pyloric atresia in 5(27%) and small intestinal atresia in 10(55%) of cases. Associated anomalies were identified in 12(25%) cases which included congenital cardiac defects in 6(50%), renal anomalies in 4(33%) and Down's syndrome in 2(16%) of cases. Clinical Presentation: out of the 48 cases evaluated in the study 45(93.75%) cases presented with bilious vomiting, 40(83.3%) cases presented with abdominal distension and 38(79.1%) cases presented with failure to pass meconium. In 12(25%) case jaundice was an associated finding. Some of the babies presented with dehydration (7), electrolyte imbalance (5), sepsis (9) and hypothermia (12).

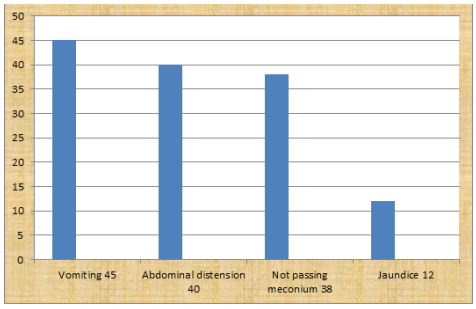


Fig.2 Clinical presentation

Vomiting:
Vomiting was the commonest and earliest presenting symptom and it was bile stained in cases of obstruction distal to the second part of duodenum. It was copious, forceful, frequent and early in duodenal or jejunal atresia, malrotation with volvulus and proximal jejunal atresia. Vomiting was delayed and was associated with progressive abdominal distension in distal ileal atresia, meconium ileus. If vomiting is nonbilious the obstruction is proximal to ampulla of duodenum and seen in pyloric atresia and pre ampullary variety of duodenal atresia as upper abdominal distension.

Abdominal distension:
Abdominal distension is a significant symptom it is present at birth in meconium ileus, large duplication cysts and large ovarian cysts. The degree of abdominal distension was dependant on the level of obstruction. Distension is progressive in distal bowel obstruction, higher the level of obstruction lesser is the abdominal distension with only gastric distension and visible gastric peristalisis. Late presenters had massive abdominal distension of which perforation was seen in a considerable number of cases. Abdominal distension is sudden and rapid in malrotation with volvulus, vitello intestinal band obstruction and bowel perforation.

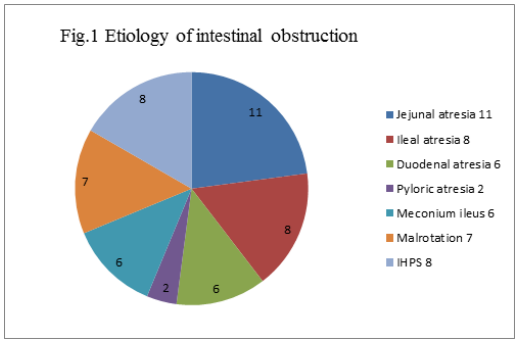
Passage of meconium: Normal newborn babies pass meconium within 24 hrs of birth in 94% of cases and 98% by 48 hours. Delayed passage or late passage of meconium was seen in cases of distal atresias, meconium plug syndrome, small left colon syndrome and meconium ileus. In babies with incomplete obstruction few and far separated in time of passage of meconium was seen. Delayed presenters presented with dilated veins over abdomen, periumblical flare, oedema and erythema of the abdominal wall, respiratory distress, dehydration, hypothermia and sepsis due to bowel perforation.

Diagnosis: All the cases were investigated thoroughly. In addition to clinical diagnosis, imaging studies especially plain x-ray abdomen was taken for confirmation of diagnosis and to identify the level of obstruction. Upper gastro intestinal contrast studies were done in three doubtful cases. Ultrasonogram abdomen was done in suspected cases of malrotation and IHPS. Out of the 48 cases, 8 cases were diagnosed as IHPS, 7 cases as malrotation, 6 as meconium ileus, 2 as pyloric atresia, 6 as duodenal atresia, 11 as jejunal atresia and 8 as ileal atresia.

Pre operative management: Though the treatment was primarily surgical, sick neonates needs stabilisation before surgery to correct hypoglycaemia, hypothermia and electrolyte imbalance. All babies are treated under open care warmer system with low grade nasogastric aspiration. Pre-operatively all the babies were stabilised by nil by mouth, intravenous fluids, intravenous antibiotics, vitamin k injections. Estimation of serum electrolytes, Hb%, random blood sugar and complete blood count was done. Hourly temperature, heart rate, respiratory rate, $SpPO_2$ monitoring and abdominal girth measurements was done.

Operative procedure: Muscle cutting right supraumblical transverse incision was used to enter the abdomen the incision was extended across the midline whenever necessary. On laparotomy fluid in the abdomen, flakes, bowel distension, atretic segments, position of caecum, congenital bands, thick meconium pellets, volvulus, malrotation and pyloric thickening were looked for meticulously to identify the cause. Surgical options were planned depending on the aetiology as follows. For IHPS Ramsted's pyloromyotomy, Kimura's duodeno duodenostomy for duodenal atresia, Ladd's procedure for malrotation and resection and end to end/back anastomosis for jejunoileal atresia was done. For meconium ileus enterotomy saline irrigation followed by either Bishop-koop or Santulli ileostomies were done. Post operatively baby was managed with nil by mouth, NG aspiration, IV fluids, IV antibiotics. Hypothermia, hypoglycaemia and electrolyte were monitored. +Post operatively the patients were evaluated on the basis of need for mechanical ventilation, return of bowel movements, time for starting of oral feeds, length of stay, need for reoperations, wound complications as infection, wound dehiscence, sepsis, mortality etc.

DISCUSSION:
In our study of 48 cases there was a slight male preponderance with 27 males and 21 females. Similar preponderance had been reported earlier by Adeyemi D. Et al.



Etiology: In the present series on newborn intestinal obstruction the commonest cause was jjejunoileal atresia (39.5%) followed by IHPS(16%), malrotation(14.5%), meconium ileus(12.5%), duodenal atresia (12.5%), and

pyloric atresia (4.1%)atresia. This is similar to the study by Sumit dave and DK Gupta who stated that with a occurrence of 1/330-3000 live births jejunoileal atresia are the commonest cause of neonatal intestinal obstruction1. Similar observations were noted by Evan CH in his series.

Antenatal ultrasound diagnosis: Out of the 48 cases only 18(37%) cases were diagnosed antenatally by ultrasound. This included duodenal atresia cases(3), pyloric atresia (5) and jejunoileal atresia (10). History of polyhydromnios antenatally were noted in 2 cases of duodenal atresia, 1 case of jejunoileal atresias and 1 cases of malrotation. Prenatal diagnosis provided the opportunity for delivery in a tertiary care centre and early intervention.

Symptomatology: In our series bilious vomiting was the commonest symptom seen in about 45(93.75%) cases. This is similar to the observations made by James Lister et al. The next commonest symptom was abdominal distension which was early and marked in distal small obstruction seen in 40(83.3%), followed by failure of passage of meconium in 38(79.1%). Similar statistics was has been reported in various studies.

Low birth weight: Depending on their birth weight babies were grouped into three groups as I, II & III. Babies in group I less than 2 kg, in group II the weight ranged between 2-3 kg and in group III more than 3 kg. 77 % mortality was seen in the less than 2 kg neonates, 52 % mortality in 2 to 3 Kg babies whereas only 14% mortality was seen more than 3 kg babies. The results show that the mortality was highest in the less than 2 kg group in our study. This is similar to Nixon and Tawes study which showed the worst survival in babies less than 1.8 kg with or without severe anomalies.

Table.1 Birth weight in relation to mortality

Birth weight	No. of cases	No. of deaths	Percentage
< 2 Kg	9	7	77 %
2 - 3 Kg	25	13	52 %
>3 Kg	14	3	14 %

Prematurity: The total number of premature neonates born before 37 weeks of gestation was 13 cases. The mortality in this group was 7(53%) and 6 survived. This is comparable to Fonkalsrud's survey of 503 infants on the survival of babies with intestinal obstruction mortality was related to associated malformations and prematurity in 50 % of cases.

Associated anomalies: Associated anomalies were identified in 12(25%) cases which included congenital cardiac defects in 6(50%), renal anomalies in 4(33%) and Down's syndrome in 2(16%) of cases. This association of congenital heart disease is comparable to the series by Sumit Dave and D.K Gupta who showed a 17-22% association 24. There was 50% mortality in both associations comparable to Fonkalsrud's series.

Operative time and type of procedure: The surgical technique and the duration of surgery was the important determinant of the outcome of the case. Hence it was taken into consideration. The total number of cases were divided into three groups as less than one hour, one hour to one and half hours and more than one and half hours. Most of the cases of pyloric stenosis were operated within one hour with early post op recovery and least hospital stay of 3 days. Out of the 48 procedures 15(31.2%) were completed in less than one hour period as they were uncomplicated. 11(22.9%) neonates were operated in more than one and half hour time as they were complicated with gangrene, adhesion and peritoneal soiling. The postoperative course of these neonates was stormy with a slow recovery of bowel function there by prolonging the stay in the hospital.

Fig.3 Malrotation with volvulus

Fig.4 Apple Peal jejunal atresia

Mortality: In our study maximum number of neonatal deaths occurred in meconium ileus 66%, followed by ileal atresia 62.5%, jejunal atresia 54.5%, duodenal and pyloric atresia 50% each, malrotation 42.8% and IHPS 12.5%. The contributory factors for the mortality and morbidity were dehydration, electrolyte imbalance, sepsis and hypothermia. Prematurity and respiratory distress contributes significantly to the mortality. In addition the mortality increase with the increased complexity of the surgical procedure and the postoperative complication associated with it. The admission to operation time is also an important factor in predicting the morbidity of the cases, as late referral has a poor prognosis. The aetiology of the neonatal obstruction is the most important determinant of the outcome of the case. Our study is similar to Milissa A. McKee who observed high mortality in cases jejunoileal atresia.

CONCLUSION:

1. From our study we conclude that the commonest cause of neonatal intestinal obstruction was jejuna atresia followed by ileal atresia and duodenal atresia.
2. The commonest presenting symptom in neonatal intestinal obstruction is bilious vomiting with abdominal distension. Failure of passage of meconium is more common in distal atresias
3. The commonest associated conditions in neonatal intestinal obstruction is malrotation 38.4% followed by prematurity 27.6 % and congenital heart disease 21.3%
4. Irrespective of the surgical procedure done, complicated surgical procedures with increased operating time, peritoneal soiling and length of the resected bowel determines the outcome of the babies with newborn intestinal obstruction.
5. low birth weight , prematurity , congenital heart defects and sepsis are high risk factors for morbidity and mortality in neonatal intestinal obstruction.

REFERENCES

1. Sumit Dave , D.K Gupta: Neonatal Intestinal Obstruction. D.K.Gupta (1st Ed). Textbook of Neonatal Surgery, Modern, 2000, 150-54.
2. Marshall Z. Schwartz: Hypertrophic pyloric stenosis. Jay L. Grosfeld, James A. O Neill, Arnold G. Coran et al. Pediatric Surgery (6th edn). Mosby, 2006, 1218.
3. Samuel D.Smith : Disorders of Intestinal rotation and fixation. Jay L. Grosfeld, James A. O Neill, Arnold G.Coran et al. Pediatric Surgery (6th edn). Mosby, 2006, 1352.
4. George B. Mychaliska: Introduction to neonatal intestinal obstruction. Oldham, Keith T; Colombani Principles and Practice of Pediatric Surgery, 4th Edition. Lippincott Williams & Wilkins, 2005 , 1222
5. Reyes HM, Meller JL, Loeff D. Neonatal intestinal obstruction. Clin Perinatol 1989;16(1):85 – 96.
6. Sumit Dave ,D.K. Gupta : Duodenal atresia and stenosis .D.K.Gupta Textbook of Neonatal Surgery (1st Ed) , Modern, 2000, 172-79 .
7. Arnold G.Coran et al. Pediatric Surgery (6th edn). Mosby, 2006, 89.
8. Santulli TV. Intestinal obstruction in the newborn infant. J Pediatr 1954;44:317-37.
9. Dalla Vecchia LK, Grosfeld JL, West KW, et al. Intestinal atresia and stenosis: a 25-year experience with 277 cases. Arch Surg 1998;133(5):490- 496; discussion 496- 97.
10. Bailey PV, Tracy TF Jr, Connors RH, et al. Congenital duodenal obstruction: a 32-year review. J Pediatr Surg 1993;28(1):92 -95.
11. Hancock BJ, Wiseman NE. Congenital duodenal obstruction: the impact of an antenatal diagnosis. J Pediatr Surg 1989;24(10):1027-31.
12. Harberg FJ, Pokorny WJ, Hahn H. Congenital duodenal obstruction. A review of 65 cases. Am J Surg 1979;138(6):82528.
13. Ford EG, Senac MO Jr, Srikanth MS, et al. Malrotation of the intestine in children. Ann Surg 1992;215(2):172-78.
14. Stewart DR, Colodny AL, Daggett WC. Malrotation of the bowel in infants and children: a 15 year review. Surgery 1976;79(6):716 -720.
15. Torres AM, Ziegler MM. Malrotation of the intestine. World Jsurg 1993;17(3):326-31.
16. Corteville JE, Gray DL, Langer JC. Bowel abnormalities in the fetus"a correlation of prenatal ultrasonographic findings with outcome. Am J Obstetr Gynecol 1996;175:724-29

17. Moore CC. Congenital gastric outlet obstruction. J Pediatr Surg 1989;24(12):1241-46
18. Farrant P, Dewbury KC, Meire HB. Antenatal diagnosis of duodenal atresia. B J Radiol 1981;54:633-35.
19. Kimble RM, Harding JE, Kolbe A. Does gut atresia cause polyhydramnios? Pediatr Surg Int 1998;13:115-17.
20. Agostino Pierro, Simon Eaton, Evelyn Ong: Neonatal physiology and Metabolic considerations. James A. O Neill,
21. Grosfeld JL, Rescorla FJ. Duodenal atresia and stenosis: reassessment of treatment and outcome based on antenatal diagnosis, pathologic variance, and long-term follow-up. World J Surg 1993;17:301.
22. Adeyemi D. Neonatal intestinal obstruction in a developing tropical country: Patterns, problems and prognosis. J Trop Pediatr 1989;35:66-70.
23. Nyberg DA, Resta RG, Luthy DA, et al. Prenatal sonographic findings of Down syndrome: review of 94 cases. Obstet Gynecol 1990;76:370.
24. Nixon H H, Tawes R: Etiology and treatment of small intestinal atresia. analysis of a series of 127 jejunoileal atresias and comparison with 72 duodenal atresias. Surgery ;1971;69:41-51.