Section: Pediatrics

Case Series

CASE SERIES IN THE MANAGEMENT OF UNCOMPLICATED MECONIUM RELATED ILEUS IN NEONATES- INDIAN PERSPECTIVE

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ABSTRACT

Background: Objective: Meconium ileus is a type of neonatal intestinal obstruction due to blockage of thick tenacious meconium, usually in the ileum, and accounts for 30-33% cases. Immature intestinal hypomotility and increased meconium viscosity remain the major pathological factors. The usual presentation of MI is feed intolerance during the first 2 weeks of life, progressive abdominal distension, and scarce or absent meconium passage. Delay in initiating active management could be associated with difficulty in achieving full enteral feeds and severe complications like bowel perforation.

Materials and Methods: This study is a retrospective observational study of records from July 2020 to Jan 2024 in the NICU and Paediatrics department at Hindustan Hospitals, Coimbatore. We initially managed babies with findings suggestive of MI with orogastric tube for stomach decompression, IVF, IV Abs, X-ray abdomen, and USG abdomen to R/O complicated MI, NNEC, and any bowel abnormality. If the babies did not pass meconium with a warm saline rectal wash, abdominal distension persisted, or a bilious aspirate persisted, the babies were given oral Mucinac therapy or an upper GI contrast series based on clinical findings.

Results: Out of the 31 neonates of MI recruited for the study, 93.5% had simple MI, and the remaining 6.5% had complicated MI who failed conservative management. Most neonates (67.7%) responded to warm saline rectal wash. 32.3% of them underwent a Gastrografin Upper GI series, followed by Mucinac therapy (19.4%).

Conclusions: In most cases, we can manage MI conservatively and achieve a good outcome. Surgical management is reserved for those who fail conservative management or for whom perforation is suspected.

Keywords: MeSH- Meconium ileus, Mucinac, Warm saline.

INTRODUCTION

Meconium ileus in newborns is a type of intestinal obstruction due to blockage of thick tenacious meconium usually in the ileum and accounts for 30-33% cases. It could be a simple type due to intraluminal obstruction by sticky meconium or a complicated type in which GI pathology, such as atresia, volvulus, perforation, necrosis, meconium peritonitis, or pseudocyst formation causes obstruction, with radiological x-ray abdomen showing marked air-fluid levels or intra-abdominal calcifications. One of the major causes of bowel obstruction in extreme preterm neonates is meconium obstruction. Recent studies have shown that meconium ileus can occur even in the absence of cystic fibrosis. As we cure more ELBW and VLBW babies successfully, the incidence of meconium ileus is on the rise. There are many challenges in the recognition, diagnosis, and management of meconium obstruction. Several terminologies, including MRI meconium-related ileus, meconium ileus of prematurity,[1] meconium disease, meconium obstruction of prematurity, premature gut syndrome,

microcolon of prematurity, and functional isolated bowel obstruction (FIOP), are in use.

Immature intestinal hypomotility and an increase in meconium viscosity (esp. in extreme preterm) remain the major pathological factors that have been consistently demonstrated.[2,3,4] Possible Maternal risk factors investigated were Magnesium sulphate usage, PPROM, caesarean section, diabetes, placental abruption, prenatal steroids, oligohydramnios, and opioid administration, but none have proven consistently.

The classical presentation of MI is feed intolerance in the initial 2 weeks of life, with progressive abdominal distension and scant or absent meconium passage despite rectal stimulation, often mimicking NEC. Delay in initiating active management could be associated with difficulty in achieving full enteral feeds and severe complications like bowel perforation. On examination, there is a distended abdomen with stable hemodynamic status and with no signs of peritoneal irritation. Clinical suspicion is fundamental, and strict monitoring is mandatory during conservative management. We performed appropriate clinical, biochemical, and radiological investigations to rule out differential diagnoses, including NNEC, SIP,[5] bowel atresia, and Hirschsprung disease.

MATERIALS AND METHODS

This study is a retrospective observational study of records from July 2020 to Jan 2024 in the NICU and Paediatrics department at Hindustan Hospitals, Coimbatore. We evaluated the patient records of all neonates from July 2020 to Jan 2024. Various clinical and radiological parameters were analysed.

We entered the data manually, and variables were analysed using SPSS Statistics. The diagnosis of MI was made on clinical examination of the following criteria: 1) abdominal distension and bilious or non-bilious vomiting, 2) non- passage or reduced passage of meconium, 3) radiological, either X-ray or USG, suggestive of distended small intestinal loops without pneumatosis or air fluid levels, 4) a normal-sized colon or microcolon with multiple filling defects on GI contrast series.

We managed the babies with findings suggestive of MI initially with orogastric tube for stomach decompression, IVF, IV Abs, X-ray abdomen, and USG abdomen to R/O complicated MI, NNEC, and any bowel structural abnormality. Then we started the babies on a twice-a-day warm saline rectal wash. If the babies do not pass meconium with the above measures, or abdominal distension persists, or bilious aspirate continues, the babies were given oral Mucinac therapy,[6] or an upper GI contrast series based on clinical findings.

We performed an Upper GI series in neonates after ensuring adequate hydration. Gastrografin,[7] diatrizoate meglumine and diatrizoate sodium is an ionic iodinised contrast for oral as well as rectal administration. It exerts a mild laxative effect attributable to their high osmolarity and the contrast medium leads to a propulsive hyperactive gastrointestinal motility.15ml of contrast is equally diluted with 15 ml sterile water out of which 10-15 ml was given through 6 Fr orogastric tube slowly followed by Xray series 0 min, 15 min,45 min, 2 hour, and 24 hour and as clinically indicated. The passage of contrast into the distal large intestine or the evacuation of meconium, whichever occurred first, determined the timing of the X-ray series. We continuously monitored the baby's vitals and urine output to ensure adequate hydration. Water-soluble contrast media can loosen a tenacious meconium by their hyperosmolarity, drawing large volumes of fluid into the GIT, decluttering the meconium, which then passes through the rectum.

Mucinac (N-acetyl cysteine 20% W/V): 2 ml diluted with 2 ml sterile water, then 4ml (400mg) every 6 hours for 3-7 days was given to babies, until they pass yellow stools or abdominal distension reduces. Most babies passed meconium within 6-24 hours of Mucinac therapy. In case of non-passage of meconium even after 24-48 hours of Mucinac therapy, then only exploratory laparotomy was considered, which resulted in more babies being cured with medical treatment. The primary outcomes of this study were feed tolerance and meconium evacuation, followed by a decrease in abdominal distension and the time to reach full feeds.

We recorded the timing of initial symptom onset, initiation of feeds, other symptoms such as bilious vomiting, abdominal distension, and scanty or absent meconium passage, duration of conservative management, and the time to reach full enteral feeding. We obtained demographic data, maternal histories like PIH, gestational diabetes mellitus [GDM], Preterm premature rupture of membranes (PPROM), magnesium sulphate infusion, antenatal steroids, NVD or LSCS, and neonatal problems like respiratory distress syndrome [RDS], patent ductus arteriosus [PDA], apnea, ROP, and IVH from medical records.

RESULTS

The duration of this study was 3 1/2 years from July 2020 to Jan 2024. Records of 31 neonates with MI were recruited for the study. Most of the neonates were preterm, with <28 W (32.3%), 28 W-32 W (22.6%), 32-37 W (38.7%), and > 37 W (6.5%). Of them, 93.5% had simple MI, and the remaining 6.5% had complicated MI. The male-to-female ratio was 48.4:51.6. Radiography, abdominal x-ray, and USG abdomen revealed multiple distended bowel loops without air-fluid levels. The number of LBW infants were 45.2%, VLBW infants 16.1% and, ELBW infants 6.5%, and term babies 32.3%. Most of the babies in this study were born by LSCS (61.3%) and the remaining by NVD (38.7%). Most babies had symptom onset within 48 hours, and a few (3.2%)

also had symptom onset beyond 7 days. Most neonates (67.7%) responded to warm saline rectal wash. 32.3% of them underwent a Gastrografin Upper GI series, followed by Mucinac therapy (19.4%). Those neonates (6.5%) who failed conservative management underwent exploratory laparotomy with creation of a stoma and were found to have complicated MI and had thick tenacious meconium filling the terminal ileum. Santulli Loop ileostomy was made. Two babies who underwent surgical exploration had symptom onset within 24 hours of birth.

The mean duration of conservative management was 5 days, and the time to achieve full feeds was 5 days in many neonates (71.1%), slightly higher in ELBW than in VLBW or Term babies, likely attributable to their prematurity, which slowed advancement of feeds. Associated systemic illnesses, such as RDS and PDA, in both ELBW and VLBW also played a major role in feed advancement and influenced the clinical course of MI.

Table 1: Demographic parameters

Parameters	**Percentage (%)**
Sex	
Male	48.4%
Female	51.6%
GA (week)	
< 28 weeks	32.3%
28-32 weeks	22.6%
32-37 weeks	38.7%
More than 37weeks	6.5%
B wt (kg)	
Term	32.3%
LBW	45.2%
VLBW	16.1%
ELBW	6.5%
PPROM	22.6%
PIH	29%
GDM	9.7%
UTI	6.5%

Table 2: Clinical Parameters of newborn

RDS	**64.5%**
PDA	32.3%
Apnea	51.6%
Antenatal steroids	48.4 %
ROP	NIL
IVH	NIL
Symptom onset	
<24hr	51.6%
24-48 hr	35.5%
>48hr	12.9%
FEED initiation	
<24 hr	61.3%
24-48 hr	22.6%
>48hr	16.1%
Abdominal distension	80.6%
Bilious vomiting/ bilious GI aspirate	83.9%
Meconium passage	
Not passed	25.8%
Minimal passage	74.2%

Table 3: Outcome of the study

Time to achieve full feeds after conservative management	
2 days	51.7%
3-5 days	19.4%
6-10 days	22.5%
10-15 days	6.4%
Upper GI series	32.3%
Mucinac therapy	19.4%

DISCUSSION

Milla reported that a more mature migrating motor complex of the intestine was evident only after 34-35 weeks,[8,9] and Yoo et al. proposed that a delay in the maturation of interstitial cells of Cajal was the reason for meconium obstruction. Obstruction of the bowel by tenacious meconium frequently leads to gastric residuals, a distended abdomen, and delayed emptying of feeds. Recent data support the concept that faster meconium passage plays a vital role in the development of feed tolerance.[10] Paradiso et al.

found that neonates <1500g tend to present in the 2nd week of life, whereas those >1500g are often diagnosed within the 1st week.

In our study, 51.7% of babies achieved full feeding within 2 days.[11] In previous studies by Paradiso et al. and Carlyle et al., they found that initiating conservative management within 10 days of symptom onset can be effective, and delaying its initiation can lead to surgical intervention.[12,13,14] Clinical and radiographic features are sufficient for establishing a diagnosis, and testing for Cystic Fibrosis may not be indicated.[12,15]

Cho HH et al,[16] reported that, in VLBW infants with meconium obstruction, the perforation rate with water-soluble contrast enema was 9.1%. Although the use of contrast enemas has increased widely in preterm neonates, the overall success rate is only 36% to 54.5%, and large amounts of contrast media are usually required.[16] If medical management fails or a bowel perforation occurs, surgical management is required. Hong et al found that a standard contrast enema is less effective in treating infants with distal ileal obstructions because the contrast may not reach the obstructed areas, and in their study, oral contrast media relieved obstruction in five out of seven ELBW clinically diagnosed patients with MOP whose obstructions were not relieved via conventional sonography-guided contrast enema.[17] Our findings are similar to Kadigolu Simsek G,[6] study, which showed that orally administered N-acetyl cysteine is tolerable and more effective for MRI. We appropriately selected Gastrografin and surgical treatments based on the underlying pathologies of small bowel meconium obstruction.[18] Moreover, we opted for upper GI series in 32.3% of neonates, and it was effective in relieving meconium obstruction in the majority of cases, as compared with previous studies in which it was performed as enemas.[19,20] Moreover, it was diagnostic in the remaining cases. No cases of perforation or dehydration due to oral contrast were observed in our study. Solaz-Garcia A et al,[21] 57.1% of their VLBW neonates spontaneously ejected meconium, while 42.9% received various treatments. Of these, 72.2% received saline enemas, 16% received acetylcysteine enemas, 16% received Gastrografin, and none required surgical treatment.

Kim YJ et al. reported that RDS was more common in the MO group than in the control group, and 77% were relieved with medical management; the remaining patients underwent ileostomy.[22] Currently, the preferred treatment of meconium ileus is conservative, especially using gastrograffin upper GI series and Mucinac therapy, as inferred from our study, with surgical management reserved for those with perforation or those who failed conservative management.[23,24]

CONCLUSION

In most cases, we can manage MI conservatively with a good outcome. Surgical management is reserved for those who fail conservative management or for whom perforation is suspected. The relatively high success rate, minimal invasiveness, and lack of complications make warm saline rectal wash the initial choice in simple MI in 67.7% of babies, followed by oral Mucinac therapy/upper GI series in 25.8% of babies. Both upper GI series and Mucinac therapy are safe, minimally invasive, and effective, and they are the best options for conservative management of simple MI. All our recruited newborns were followed up until 2 years of age, and none had features suggestive of Hirschsprung disease (or cystic fibrosis). One of them had a GI problem suggestive of small left colon syndrome at birth, but showed a normal long-term GI function. A quick evaluation of the neonate, along with the proper application of conservative management principles and timely surgical intervention, may yield good results.

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