Microcolon in Neonates: Clinical and Radiographic Appearance

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Microcolon (unused colon) is not a common problem in neonates. Radiographic contrast medium enema shows a small caliber colon. This report concerns 12 neonates with microcolon, all identified between January 1995 and June 1997 by contrast medium colon study. Gestational ages were between 28 to 38 weeks and birth body weight between 1,400 to 3,100 grams. Six neonates had jejunal atresia (50%), three ileal atresia (25%), two total colonic aganglionosis (17%), and one meconium ileus (8%), all proven by surgery or intestinal biopsy. The plain film and contrast medium enema presented some characteristic features are described. The major clinical findings including bilious vomiting in jejunal atresia, abdominal distention mainly in distal ileal atresia, total colonic aganglionosis and meconium ileus. Eight neonates (67%) did not pass meconium. The outcome of microcolon depends on its underlying disease or congenital anomaly. (Clinical Neonatology 1998;5(1): 14-18)

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A microcolon may be defined as a colon of abnormally small caliber. However, there is no absolute standard for this measurement. The finding of microcolon on contrast enema study in newborns with distended abdomen usually suggests jejunoileal obstruction, jejunoileal atresia, meconium ileus, or occasionally total colonic aganglionosis [1]. These conditions require immediate treatment, either surgically [2] or by hyperosmolar contrast enema [3,4].

We report on twelve neonates in which microcolon was detected because of bilious vomiting, abdominal distention and failure to pass meconium immediately after birth. All twelve neonates had contrast enema examinations showing a total microcolon. The purpose of this article is to describe the clinical presentations with radiographic imaging, which are important for accurate pre-operative diagnosis.

Subjects and Methods

The hospital charts of 12 neonates (6 boys and 6 girls) identified between January 1995 and June 1997 were reviewed. We recorded the birth weight, gestational age, age at referral, prenatal history of maternal polyhydramnios and ultrasonography, clinical signs and symptoms at presentation, radiographic examination, operative notes and outcome. All twelve neonates had abdominal plain films and contrast enema studies, using diluted watersoluble contrast material. Follow-up plain films and/or clinical records were available in all cases.

Results

The general information, clinical presentation, abdominal radiography, diagnosis and outcome of the twelve neonates are summarized in the Table.

Six of the twelve neonates were delivered prematurely (less than 37 weeks' gestation). Six had jejunal atresia, three ileal atresia, two total colonic aganglionosis and one meconium ileus.

There were two cases with congenital anomalies. One case (case 7) had gastroschisis and the other (case 9) associated with biliary atresia.
Fig. 1 (Case 3) Jejunal atresia. Plain abdominal film demonstrates the “triple bubble” sign; air outlines the stomach, the first part of the duodenum and proximal jejunum.

Fig. 2 (Case 9) Ileal atresia. Contrast enema reveals a small unused microcolon. Multiple air-filled distended loops of bowel filling the entire abdomen. The small ascending colon displaced medially by dilated small bowel.

Fig. 3 (Case 10) Total colonic aganglionosis. Contrast enema shows loss of normal sigmoid and splenic flexure redundancy and reflux of contrast medium into the terminal ileum.

Fig. 4 (Case 12) Meconium ileus. At the age of 2 weeks after surgery. There are many filling defects of meconium pellets within the dilated distal ileum. The microcolon is still present.

Fig. 5 (Case 12) At the age of 2 days. Abdominal plain film shows the huge dilated bowel loop crossing the upper abdomen resembling the transverse colon. The absence of gas in the rectum and irregular pattern of bowel gas distention suggest distal bowel obstruction.

Fig. 6 (Case 12) Meconium ileus. The colon is normal in length but markedly diminished in caliber (microcolon). No contrast refluxes into the obstructive terminal ileum.
The major clinical presentation including bilious vomiting in jejunal atresia, abdominal distention mainly in distal ileal atresia, total colonic aganglionosis and meconium ileus. Eight neonates did not pass meconium.

Two patients with maternal complications of polyhydramnios and antenatal ultrasonographic diagnosis of intestinal obstruction (case 4 and 6) presented with high site jejunal atresia.

Of the nine cases, five were type IIIb, two were type IIIa, and one was type I and one was Type II.

On the basis of radiography, four of the six patients with jejunal atresia had the triple bubble sign (Fig. 1), indicating a high site of obstruction. Abdominal distention was more common in patients with ileal atresia. Abdominal radiographs frequently demonstrated many dilated intestinal loops in cases of ileal obstruction (Fig. 2) but only a few dilated loops in cases of jejunal obstruction.

Loss of normal sigmoid redundancy and reflux of the contrast medium into the mega-ileum is a characteristic feature of total colonic aganglionosis (Fig. 3). There are many filling defects of meconium in the terminal ileum which is a characteristic feature of meconium ileus (Fig. 4).

Four patients died, one (case 2) with jejunal atresia, one (case 7) with ileal atresia, one (case 10) with total colonic aganglionosis, and one (case 12) with meconium ileus. These cases were associated with sepsis, necrotizing enterocolitis and congenital anomalies. The remaining eight neonates survived.

**Discussion**

Microcolon (unused colon) is seen with obstruction of the small bowel, such as jejunal and ileal atresia followed by total colonic aganglionosis and meconium ileus.
We had only one premature neonate with meconium ileus. This may be because the incidence of cystic fibrosis with meconium ileus is much lower than western countries.

Case no. 12 was a premature baby born at 28 weeks with progressive abdominal distention and no passage of meconium for 48 hours after birth. The abdominal plain film shows marked dilated bowel loops in mid-abdomen (Fig. 5, 6). It was misinterpreted as megalacolon because of misidentifying the dilated small bowel as a dilated transverse colon. In our experience it is difficult to differentiate a dilated small bowel from the colon in the newborns. The mucosal folds of the small bowel are not discernible when there is marked dilatation; and the haustra of the colon are usually not visible in the normal neonate.

He had surgery on the third day of life under the impression of ileal atresia. During surgery a hole was found at the terminal ileum 5 cm from ileocecal valve. The length of dilated small bowel was about 120 cm. The abnormal greenish meconium was thick and sticky in dilated small bowel. Resection of the perforated ileum and end-to-end anastomosis with a double barrel ileostomy was performed.

Meconium intestinal obstruction in the neonate results from variety of causes: (1) meconium ileus, a specific form of bowel obstruction in the terminal ileum in association with cystic fibrosis; (2) meconium plug syndrome, also known as meconium blockage syndrome, in which there is a failure to pass meconium in the first 24 hours of life, caused by blockage of the distal colon by meconium; and (3) inspissated meconium syndrome or a meconium ileus-like condition in the Chinese neonates [7]. In this disorder obstruction is not associated with cystic fibrosis [5-7]. This syndrome is more common in the premature baby. The explanation for meconium obstruction in these patients remains uncertain. The presence of an abnormally high albumin content in the meconium could increase viscosity and cause obstruction similar to that observed with meconium ileus associated with cystic fibrosis [8].

In our series, the most common cause of microcolon was jejunal atresia followed by ileal atresia. Jejuno-ileal atresia in the neonate is thought to be the result of focal ischemia during intrauterine life [9]. The affected neonate has the signs and symptoms of a complete small bowel obstruction. A plain abdominal film shows a dilated, air-filled bowel. If obstruction is present in the jejunum, only a few air-filled loops of dilated small bowel are present (Fig. 1). Further radiological studies are not usually necessary. A small amount of air may be injected to confirm complete or partial jejunal obstruction. Some would recommend a contrast enema to identify associated malrotation or concomitant colon atresia.

The diagnosis of distal ileal atresia purely based on abdominal radiographs is more difficult. A prone, horizontal beam lateral radiograph may disclose that there is no air in the rectum. However, it is usually impossible to determine that there is no air in the colon. Meconium ileus closely resembles ileal atresia. But the more distal the atresia, the more loops of dilated bowel will be present (Fig. 2). The differential diagnosis includes ileal atresia, meconium ileus, meconium plug syndrome and total colonic aganglionosis [10]. For these reasons, a contrast enema is indicated to establish an exact diagnosis. If a microcolon contains little or no meconium and the contrast medium stops abruptly in the terminal ileum, then atresia is the diagnosis. On the other hand, if it shows a microcolon with meconium plugging the terminal ileum (Fig. 4), then the diagnosis will be meconium ileus [4]. If the colonic wall is irregular, gross ileal reflux into the distended small bowel, loses normal redundancy of the flexures, meconium plugs are present or if there is delayed evacuation of contrast medium from the entire colon 24 hours later, the index of suspicion for total colonic aganglionosis is raised and multiple intestinal biopsies should be performed during surgery [11-13].

The classification of jejunileal atresia is as follows: type I is mucosal (membranous) atresia with an intact bowel wall and mesentery; type II has atretic blind ends connected by a fibrous tissue cord but intact mesentery; type IIIa has atretic blind ends without any connection and a V-shaped defect in the mesentery; type IIIb has apple-peel atresia; type IV has multiple atresia [2]. In our series, type IIIb was the most common type of jejunoleal atresia with microcolon.

Cases no. 4 and 6 had polyhydramnios and prenatal sonography diagnosis of intestinal obstruction. They both survived with a better prognosis, because of early diagnosis and treatment [14,15].

In summary, the clinical presentation and radiographic findings are essential for differentiation of microcolon and to provide an accurate pre-operative diagnosis.

References