CASE REPORT

Meckel's Diverticulum Induced Intrauterine Intussusception Associated with Ileal Atresia Complicated by Meconium Peritonitis

Chien-Heng Lin,[1] Shu-Fen Wu,[2] Wei-Ching Lin,[3] An-Chyi Chen[2]*

Intrauterine intussusception with a leading point of Meckel's diverticulum is a rare cause of ileal atresia, which may cause bowel obstruction and perforation. We report such a case complicated by meconium peritonitis. The fetal ultrasonogram revealed ascites, dilated bowel loops and intra-abdominal calcification at a gestational age of 30 weeks. The patient was delivered at 37 weeks and laparotomy was performed to manage the intestinal obstruction. The operative findings showed that Meckel's diverticulum had induced intussusception associated with the ileal atresia with meconium peritonitis. The ileum was resected with end-to-end anastomosis. The postoperative course was uneventful. In this patient, ascites and intraperitoneal calcification were caused by ileal atresia, which may have been induced by intrauterine intussusception. [*J Formos Med Assoc* 2007;106(6):495–498]

Key Words: fetal ascites, ileal atresia, intrauterine intussusception, Meckel's diverticulum

Meconium peritonitis, a sterile peritonitis caused by bowel perforation during the last 6 months of intrauterine life, can cause fetal ascites. Intrauterine intussusception, a rare cause of bowel obstruction seldom caused by Meckel's diverticulum, will result in intestinal atresia if time elapses, enough to cause gangreneous change of the bowel. We present a neonate in whom meconium peritonitis was diagnosed by fetal ultrasound. She presented with vomiting and abdominal distention. Intestinal obstruction was diagnosed and the patient underwent laparotomy. The operative findings revealed ileal atresia associated with intrauterine intussusception caused by Meckel's diverticulum.

Case Report

A 2320 g female (twin A) was born at 37 weeks' gestation to a 30-year-old mother by cesarean section. Antenatal examination revealed fetal ascites with intra-abdominal calcification and dilated bowel loop at a gestational age of 30 weeks (Figure 1). Meconium peritonitis was preliminarily diagnosed at that time. However, follow-up ultrasonography at 36 weeks of gestation revealed that the previously observed ascites were no longer present. There was no polyhydraminos during the pregnancy course. The infant had passed meconium within 24 hours after birth but presented with persistent bilious vomiting and abdominal

[1]Department of Pediatrics, Jen-Ai Hospital, Tali and Departments of [2]Pediatrics and [3]Radiology, China Medical University Hospital, Taichung, Taiwan.

Received: July 17, 2006
Revised: September 12, 2006
Accepted: December 5, 2006

***Correspondence to:** Dr Shu-Fen Wu, Department of Pediatrics, China Medical University Hospital, 2 Yuh-Der Road, Taichung 404, Taiwan.
E-mail: d0344@www.cmuh.org.tw

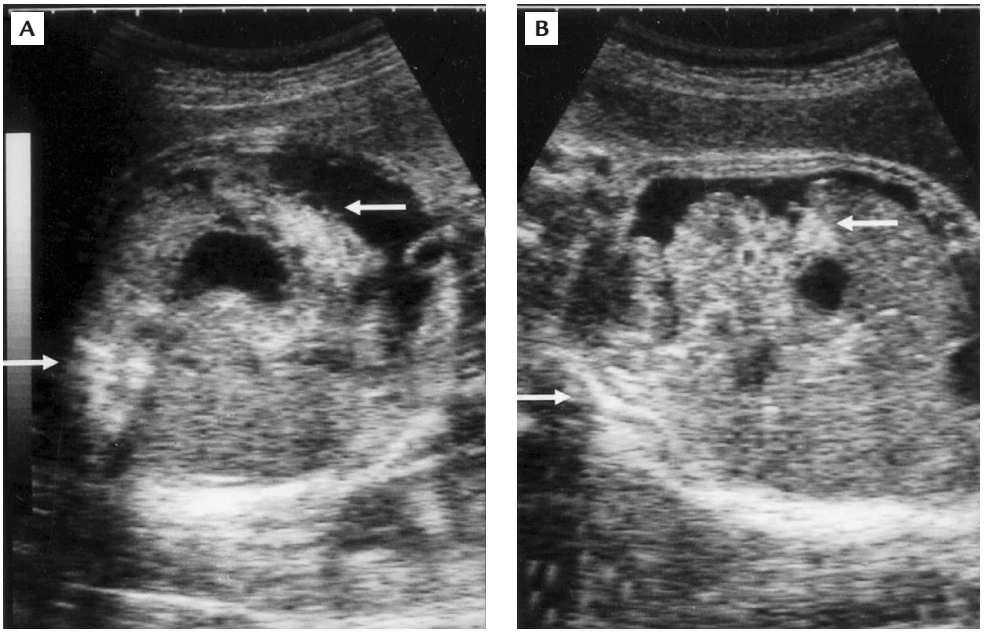

Figure 1. (A, B) Fetal ascites with intra-abdominal calcification (white arrows).

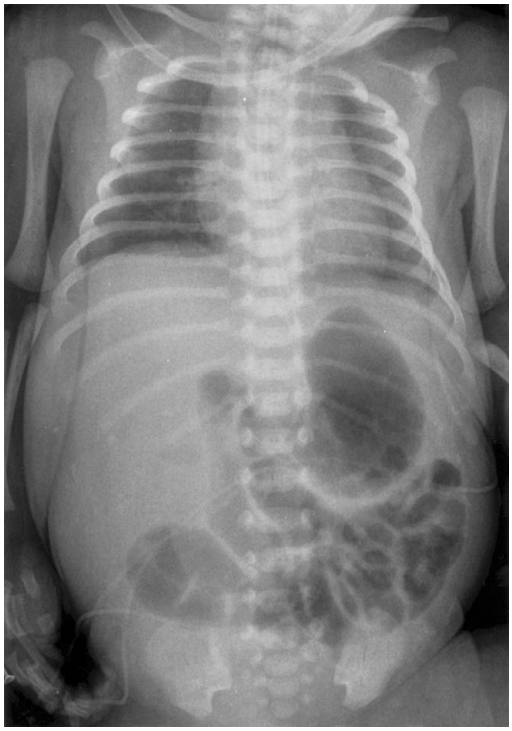

Figure 2. Abdominal radiography shows diffuse dilated small intestine with no bowel gas in colon.

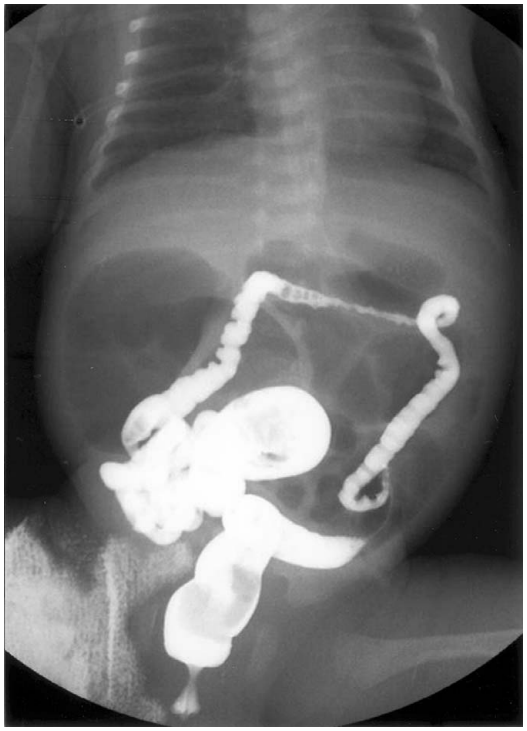

Figure 3. Lower gastrointestinal series shows microcolon.

distention after 10 hours. The radiogram of the abdomen showed a diffuse dilated small intestine and no bowel gas in colon (Figure 2). Lower gastrointestinal series examination revealed what appeared to be microcolon and ileal atresia was suspected (Figure 3); therefore, intestinal obstruction was preliminarily diagnosed and a laparotomy was performed on the 2nd day of life. Operative findings revealed one segment ileal atresia 25 cm proximal to the ileocecal valve and

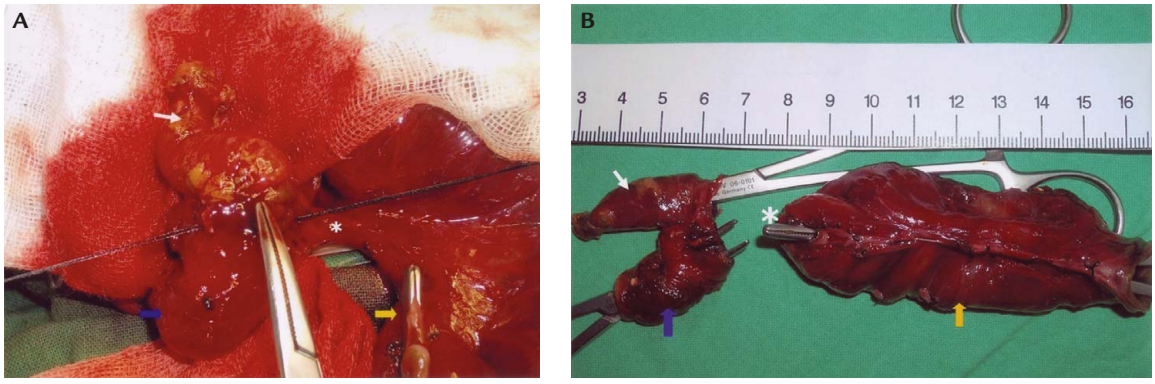

Figure 4. (A) Intussuscepted tubular structure after eversion was located at the antimesenteric border. (B) Resected ileum with Meckel's diverticulum. White arrow = Meckel's diverticulum; blue arrow = distal ileum; * = ileal atresia; yellow arrow = proximal ileum.

the intussusception caused by Meckel's diverticulum of the proximal atretic ileal segment (Figure 4). The Meckel's diverticulum invaginated into the distal narrowing segment and was about 6 cm in length. Resection of the affected distal ileal segment with ileo-ileal end anastomosis was performed. Pathology revealed that Meckel's diverticulum had induced intussusception and was associated with ileal atresia (type II). The postoperative course was uneventful and the patient was discharged in stable condition. No gastrointestinal symptoms were noted at the 1-year follow-up.

Discussion

The most common causes of fetal ascites are intestinal obstruction and congenital infection.[1] Most of them resolve spontaneously before birth and are not associated with fetal wastage or chronic illness.[2] Congenital infection was not likely in our patient because there was no evidence of maternal fever or anomaly in the other twin. However, not only ascites but also intraperitoneal calcifications were found by antenatal ultrasound, so meconium peritonitis was suspected.

Meconium peritonitis occurs when *in utero* bowel perforation results in leakage of meconium into the peritoneal cavity. The most common causes of meconium peritonitis are ischemic lesions of the small bowel associated with mechanical obstruction, such as atresia, volvulus, intussusception, and meconium ileus.[3,4] In Western countries, cystic fibrosis is the most frequent cause of meconium peritonitis and is present in 40% of cases.[4] However, cystic fibrosis is rare in the oriental.

Lower gastrointestinal barium serial examination in our patient revealed microcolon, so the differential diagnoses included ileal atresia, colonic atresia, meconium ileus and total colonic aganglionosis.[5] The radiogram of the abdomen revealed a diffuse dilated small intestine with no gas in the colon, so ileal atresia was highly suspected before surgical intervention.

It has long been suspected that intestinal atresia may be secondary to prolonged bowel ischemia *in utero*; Louw and Barnard[6] confirmed this hypothesis by observation and animal study in 1955. However, their theory does not explain all cases of atresia adequately. Other studies have proposed that ileal atresias are caused by mechanical disturbances such as volvulus, congenital bands and internal herniation of the intestine.[7]

The etiology of intrauterine intussusception is still unclear and obscure. Some authors have proposed that it is caused by increased peristalsis due to intrauterine strangulation or viscid meconium.[6–8] In our patient, the intrauterine intussusception caused by an invaginated Meckel's diverticulum was found incidentally during the laparotomy. It is a very rare occurrence with unknown incidence. Intrauterine intussusception,

which has rarely been detected by prenatal ultrasonography, usually occurs in the late stages of pregnancy.[9] It can cause impairment of blood supply to the intestine and result in cord or gap type ileal atresia.[9,10] The incidence of intrauterine intussusception has been reported to range from 0.6% to 13.1%; the prognosis is excellent.[9] However, Reed et al[11] reported a case of jejunal atresia secondary to intrauterine intussusception with perforation occurring after birth. The authors conclude that it may be secondary to air-swallowing and gastrointestinal secretions. If the perforation occurs in the prenatal period, it will result in meconium peritonitis as it did in our patient.

Intrauterine intussusception induced by Meckel's diverticulum is a rare condition and preoperative diagnosis is difficult. No "target-like" appearance was noted on serial fetal sonography in our patient. The previous three cases were all diagnosed postoperatively. [12–14] Our patient is further complicated by meconium peritonitis; therefore, we must diagnose meconium peritonitis by careful antenatal ultrasonographic examination.

In conclusion, meconium peritonitis with fetal ascites can be detected by ultrasound examination prenatally. Postnatal evaluation and optimal treatment are also important. Once the infant presents with symptoms or signs of gastrointestinal obstruction, early surgical intervention is required for good outcome.

Acknowledgments

We are deeply appreciative of Dr Chia-Lin Chang for providing the photograph of the operative findings.

References

1. Favre R, Dreux S, Dommergues M, et al. Nonimmune fetal ascites: a series of 79 cases. *Am J Obstet Gynecol* 2004;190:407–12.
2. Zelop C, Benacerraf BR. The causes and natural history of fetal ascites. *Prenat Diagn* 1994;14:941–6.
3. Ali SW, ul Hassan M. Meconium peritonitis—a leading cause of neonatal peritonitis in Kashmir. *Indian J Pediatr* 1996;63:229–32.
4. Foster MA, Nyberg DA, Mahony BS, et al. Meconium peritonitis: prenatal sonographic findings and their clinical significance. *Radiology* 1987;165:661–5.
5. Berdon WE, Baker DH, Santulli TV, et al. Microcolon in newborn infants with intestinal obstruction. Its correlation with the level and time of onset of obstruction. *Radiology* 1968;90:878–85.
6. Louw JH, Barnard CN. Congenital intestinal atresia. Observations on its origin. *Lancet* 1955;2:1065–7.
7. Parkkulainen KV. Intrauterine intussusception as a cause of intestinal atresia. *Surgery* 1958;44:1106–11.
8. Grosfeld JL, Clathworthy HW. The nature of ileal atresia due to intrauterine intussusception. *Arch Surg* 1970;100: 714–7.
9. Todani T, Tabuchi K, Tanaka S. Intestinal atresia due to intrauterine intussusception: analysis of 24 cases in Japan. *J Pediatr Surg* 1975;10:445–51.
10. Shimotake T, Go S, Tsuda T, et al. Ultrasonographic detection of intrauterine intussusception resulting in ileal atresia complicated by meconium peritonitis. *Pediatr Surg Int* 2000;16:43–4.
11. Reed DN, Polley TZ, Rees MA. Jejunal atresia secondary to intrauterine intussusception, presenting as acute perforation. *Can J Surg* 1987;30:203–4.
12. Senocake ME, Buyukpamukcu N, Hicsonmez A. Ileal atresia due to intrauterine intussusception caused by Meckel's diverticulum. *Pediatr Surg Int* 1990;5:64–6.
13. Gundogdu HZ, Senocak ME. Intrauterine intussusception due to Meckel's diverticulum as a cause of ileal atresia: analysis of 2 cases. *Eur J Pediatr Surg* 1996;6:52–4.
14. Kilic N, Kiristioglu I, Kirkpinar A, et al. A very rare cause of intestinal atresia: intrauterine intussusception due to Meckel's diverticulum. *Act Paediatr* 2003;92:756–7.