

Separated Fetus-in-fetu in Retroperitoneum

Sung Hye Park, Jin Suk Suh, Je G. Chi, Sung Il Chung* and Kwi Won Park*

Department of Pathology and Pediatric Surgery*
Seoul National University Children's Hospital
and Seoul National University College of Medicine, Seoul 110-460, Korea.

Abstract—Fetus-in-fetu is an extremely rare enigmatic condition, every case of which should be carefully examined, particularly for the distinction between it and a mature teratoma and the determination of its embryopathogenesis. This report deals with a case of fetus-in-fetu that was found in two parts. The host (autosite) was a 14-month-old boy who first presented with a back mass. A large round mass, 7×6×6cm, was removed from the left upper retroperitoneum. The mass was cystic containing 200ml of yellow serous fluid and consisted of two separate masses. One part resembled a stunted dysmorphic fetus, while the other was an amorphous lump, which disclosed a sacrococcygeal bone with five vertebrae. Histologically, both masses showed largely regressed digestive, respiratory, and musculoskeletal tissue. However, the parenchymal organs were missing. Definite vertebral bones, intervertebral discs, and spinal cord remnant were found.

Key Words: *Fetus-in-fetu, Twin pregnancy, Vertebral axis, Malformation, Teratoma*

INTRODUCTION

Fetus-in-fetu is an extremely rare congenital abnormality that is now widely believed to represent an aberration of monozygotic twinning (Lord, 1956; Broghammer *et al.*, 1963; Chi *et al.*, 1984). It presents with an abdominal mass in infancy, which should be carefully differentiated from the more common, retroperitoneal teratoma. The main mass bears many resemblances to a stunted and poorly molded fetus and most importantly, possesses a vertebral column that means having passed through a primitive streak stage. It also shows evidence of organogenesis without neoplastic types of growth or malignant potential.

Teratomas, on the other hand, lack an axial ske-

leton and show no evidence of organogenesis of a whole fetus. They manifest some degree of progressive uncoordinated growth and may undergo malignant change (Willis, 1962).

Until now, many cases of fetus-in-fetu were reported and possible pathogenesis has been described (Gross and Clatworthy, 1951; Lord, 1956; Potter, 1961; Janovski, 1962; Broghammer *et al.*, 1963; Grant and Pearn, 1969; Tada *et al.*, 1974; Grosfeld *et al.*, 1974; Chi *et al.*, 1984).

Monozygosity can be supported by the findings of identical blood histocompatibility types and identical sex karyotypes (Grosfeld *et al.*, 1974) in fetus-in-fetu.

In view of its rarity, compartmentalization, and retroperitoneal location, we report a fetus-in-fetu occurring in a 14-month-old boy.

passage of stools before obstructive symptoms develop. Based on the clinical history in the protocol case, I can easily exclude the diagnosis of inspissated milk syndrome.

Regarding the differential diagnosis of functional intestinal obstruction in the protocol case, another diagnosis which should be mentioned is chronic idiopathic intestinal pseudoobstruction besides these meconium diseases. I'd like to also comment briefly on the chronic idiopathic intestinal pseudoobstruction syndrome, a condition that, a little more than a decade ago, was not yet characterized. Chronic intestinal pseudoobstruction syndrome (CIPS) in children has been reported under a variety of names: hypoganglionosis, chronic adynamic ileus, pseudo-Hirschsprung's disease, adynamic bowel syndrome, and colonic neuronal dysplasia. Since the report by Maldonado in 1970, this syndrome of chronic intestinal pseudoobstruction has been characterized by recurrent bouts of abdominal pain and distention resembling mechanical obstruction, but in reality due to underlying intestinal dysmotility. Onset generally occurs in adolescence or early adulthood, and only a few cases are described with symptoms beginning in the neonatal period. Before this in 1963, Sieber already described infants with functional intestinal obstruction, noting similarities with Hirschsprung's disease despite the presence of ganglion cells on biopsy. Bagwell's reported 10 neonates with intestinal pseudoobstruction, in whom meconium ileus and Hirschsprung's disease were excluded. The underlying cause of idiopathic intestinal pseudoobstruction is unknown. I've discussed the clinical characteristics of a number of diseases or conditions which can show delayed meconium passage without anatomical obstruction.

Before proceeding to the comments on another major finding of urologic abnormality including megacystis, I can tell at this point that Hirschsprung's disease of extensive involvement including total colon and/or small bowel and the neonatal pseudoobstruction syndrome are the two most likely diagnoses in this neonate. For, from the findings of the persistence of poor peristalsis without surgical findings of anatomical obstruction, no response to gastrographin enema, clinical history and disci-

ptions of X-ray findings, the mild form of meconium diseases such as meconium plug syndrome, small left colon syndrome, neonatal meconium blockage in the ileum and proximal colon, inspissated milk curd syndrome and congenital megacolon with transitional zone, can be ruled out. Considering no case reports in this country and no information on a sweat test, it is hard to say that cystic fibrosis with meconium ileus is the cause of the intestinal obstruction in this neonate.

Let me have a brief comment on the urologic abnormality, megacystis, that was confirmed by exploratory laparotomy. It is clinically important to know whether megacystis is a coincidental finding or an associated finding with this patient's major problems i.e., intestinal hypoperistalsis.

I'd like to introduce the recent papers on this subject. Megacystis have been reported in the literature associated with mechanical obstruction of the urinary flow, prune belly syndrome, neurogenic bladder, myasthenia gravis, muscular dystrophy, megacystis-megaureter syndrome and megacystis-microcolon-hypoperistalsis syndrome. Occasionally megacystis is the result of neurologic defects. However, this is usually associated with megacolon and entails a common defect in parasympathetic innervation at the level of S-2, S-3, and S-4. Bonsib reported the urologic manifestations of patients with visceral myopathy, an uncommon disease characterized by degeneration and fibrosis of the smooth muscle of the digestive tract and sometimes of the urinary tract. Patients with visceral myopathy may show symptoms of chronic intestinal pseudoobstruction and megacystis. Its occurrence in infancy is rare. There are recent case reports of visceral myopathy of the gastrointestinal and genitourinary tracts in infants who had the chronic intestinal pseudoobstructions and marked dilated bladders. In a recent review paper on the chronic intestinal pseudoobstruction syndrome in pediatrics, associated urological abnormalities of varying degrees were found in 33% of the cases, with a dilated and atonic bladder being the most frequent finding.

Now, it is clear that megacystis in the neonate is not a coincidental finding but a part of the major problem of intestinal hypoperistalsis. The embryo-

logic origin of the genitourinary and gastrointestinal tracts is the endodermal layer. Either a genetic defect common to both the gastrointestinal and genitourinary tracts or some deleterious event during the first trimester can explain the development of the pseudoobstruction syndrome.

I'd like to talk now about the microcolon of this patient shown on barium enema. There have been a couple of recent papers on the microcolon associated with intestinal pseudoobstruction in a neonate. In general, for the small calibered colon of disuse, the terminology 'microcolon' is used rather than small colon as in small left colon. A contrast enema aids in the differential diagnosis, showing an unused microcolon in meconium ileus and a normal caliber colon in the inspissated meconium syndrome. The most helpful differential point is the fact that an aganglionic bowel is rarely reduced to the caliber of a microcolon; rather, it is usually normal in caliber. This is in striking contrast to the "small left colon," which has a caliber of less than 1 cm. Infants with megacystis and microcolon have all had persistent intestinal hypoperistalsis. According to a recent concept, microcolon and megacystis, which were major findings in the protocol case with delayed meconium passage, are only a part of the major problem of intestinal hypoperistalsis in the absence of aganglionosis.

A neonatal syndrome of intestinal hypomotility associated with megacystis and microcolon was first described in 1976 by Berdon who reported 5 affected female infants. In 1979 Wiswell reported the syndrome of megacystis-microcolon-intestinal hypoperistalsis in a total of 7 female infants. Massive abdominal distention secondary to a distended urinary bladder was the major presenting characteristic. More than 20 additional cases have been added to the literature since then. Intestinal hypoperistalsis, apparent in the early neonatal period, persists without improvement. Almost all cases with MMIHS (megacystis microcolon intestinal hypoperistalsis syndrome) die in early infancy. Exploratory laparotomy reveals malrotation and malfixation of a small microcolon.

From the associated findings of megacystis-microcolon with no peristalsis, I think the case in this protocol is one of MMIHS (megacystis-microcolon-

intestinal hypoperistalsis syndrome). Progress has been made in defining the pathogenesis of the chronic intestinal pseudoobstruction syndrome and classification has been attempted into myopathic and neuropathic forms with the standard and special histological stains including specific silver stains according to the Smith technique. Myopathic and neuropathic forms of MMIHS have been described in the literature. At this point I can't say whether the MMIHS of this patient is myopathic or neuropathic form because there are no mentions in this protocol, on the findings of the special histochemical stain which can clarify this issue.

Finally I'd like to comment on the hyperbilirubinemia in this patient. The total bilirubin level was 13.3 (direct 4.3, indirect 9.0) mg/dl. By definition it is conjugated hyperbilirubinemia which in general suggests liver disease. This is the only one laboratory datum on the bilirubin level and no other follow up test for the liver function was shown in this case record. Therefore, cause of the hyperbilirubinemia remains undetermined. However, a relatively high proportion of indirect bilirubin and normal aminotransferase level of this newborn in a first few days suggest that most of the indirect portion of the bilirubin came from factors associated with intestinal obstruction and systemic illness such as sepsis rather than the parenchymal liver disease. In the neonate, unconjugated hyperbilirubinemia occurs in association with upper bowel obstruction probably due to the diminished enzyme activity of uridine diphosphoglucuronyl transferase and increased enterohepatic circulation. If jaundice of the patient had persisted until death, TPN cholestasis from the longstanding hyperalimentation of the patient might have been the cause of direct hyperbilirubinemia, as in the literature cases with neonatal intestinal pseudoobstruction. Of the 10 neonate intestinal pseudoobstruction reported by Bagwell, four infants died, 2 from sepsis and 2 from TPN-related hepatic failure.

Clinical Diagnosis (Dr. Seo)

1. MMIHS (megacystis microcolon intestinal hypoperistalsis syndrome)
2. Staphylococcal septicemia
3. Jaundice associated with intestinal obstruction

initially. Later, TPN cholestasis ?

4. Intestinal malrotation, Ladd's band

Students diagnosis : 1. Congenital megacolon

PATHOLOGY DISCUSSION

Dr. Chi : At autopsy the baby weighed 2100gm. A markedly emaciated body showed mild jaundice and abdominal distention. Upon opening the peritoneal cavity, there was no ascites. The stomach was markedly dilated. The small bowel was dilated and malfixed as seen at the time of surgery (Fig. 2). There was no volvulus. Although it was not measured, the small intestinal segment appeared definitely shorter than normal. The colon as it started from the ileocecal valve was of generally small caliber with a mean diameter of 0.4cm (Fig. 2). The anus was patent and the rectum unremarkable.

The liver (128gm) was enlarged and firm with yellow-green discoloration (Fig. 2). Cut sections showed a finely nodular appearance with marked cholestasis. There was no evidence of extrahepatic biliary obstruction. The gallbladder was not dilated. The dilated urinary bladder was another prominent abnormality that distended the abdomen. The bladder was diffusely dilated into a round shape (Fig. 3), and the inner surface was finely trabeculated. The urethra was patent. However, the urethra was segmentally dilated bilaterally. Both kidneys weighed 17gm together and showed a considerable hydropelvis (Fig. 3) bilaterally. No evidence of obstruction was present in any portion of the genitourinary tract. The testes were descended and vasa were normal. The thoracic cavity contained a normal heart and both lungs that showed patchy consolidations. The cardiac chambers were slightly dilated particularly in the right ventricle. The for-



Fig. 2. Liver and gastrointestinal tract at autopsy. Note the microcolon, dilated stomach, and small bowel loops. The liver is enlarged and shows streaky fibrous strands on cut section.



Fig. 3. The urinary system of this patient. The kidneys are cut to show the dilated pelvocalyceal system. The urinary bladder is dilated and so are both ureters.

men ovale and ductus arteriosus were closed. The remaining organs including the brain were grossly normal.

Histopathologically, sections from the small and large intestine showed moderate autolysis. However, both Auerbach plexus and Meissner plexus were clearly identified throughout. The plexuses consisted of an adequate number of mature ganglion cells with its prominent nucleolus and abundant cytoplasm along with an adequate amount of nerve fibers. Although the ganglion cells were not numerically evaluated, their distribution and number in the submucosa and muscularis externa were unremarkable. No sign of degeneration or inflammatory change was present (Fig. 4). Bodian stain of the large bowel showed well-formed axons around the neurons. Serial sections of the small-calibered colon showed a diffuse hypertrophy and hyperplasia of myenteric plexus and Meissner's plexus. Both ganglion cells and nerve fibers were found often and prominently. They seemed excessive in num-

ber and extent. The smooth muscle wall of the intestine showed a mild hypoxic change consisting of a contraction band probably related to the septicemia. However, no vacuolation or fibrosis was encountered in the hematoxylin and eosin and Masson trichrome stains. The sections from the stomach showed no remarkable change except for distended wall and autolyzed mucosa. Sections from the urinary bladder and ureter were also unrevealing. The kidneys were normal. The liver, however, showed diffuse septal fibrosis connecting the portal tracts, and a marked bile duct proliferation, together with a severe bile stasis (Fig. 5). Bile thrombi were frequent. These findings were suggestive of early biliary cirrhosis. No obstructive lesions were seen in the extrahepatic biliary system. The lung sections showed confluent bronchopneumonia with multiple abscess formation. The heart, adrenal, spleen, and pancreas were unremarkable. The brain and spinal cord sections were examined particularly for degenerative changes in the neurons. But

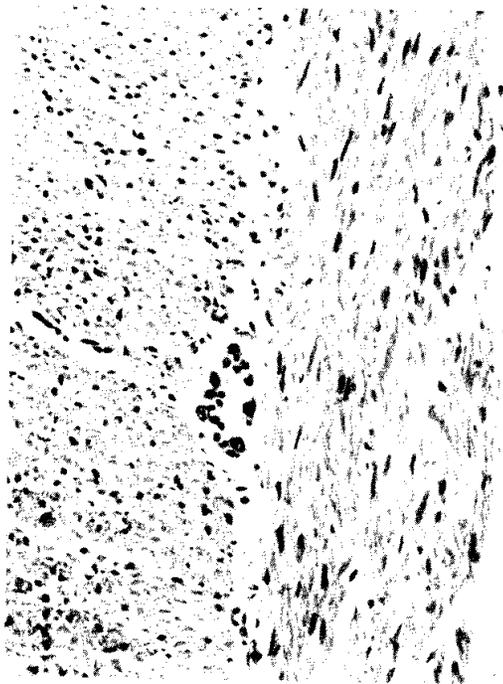


Fig. 4. Photomicrograph of the large intestine, showing a well-formed myenteric plexus. No evidence of neuronal or smooth muscle degeneration is noted. H&E X200

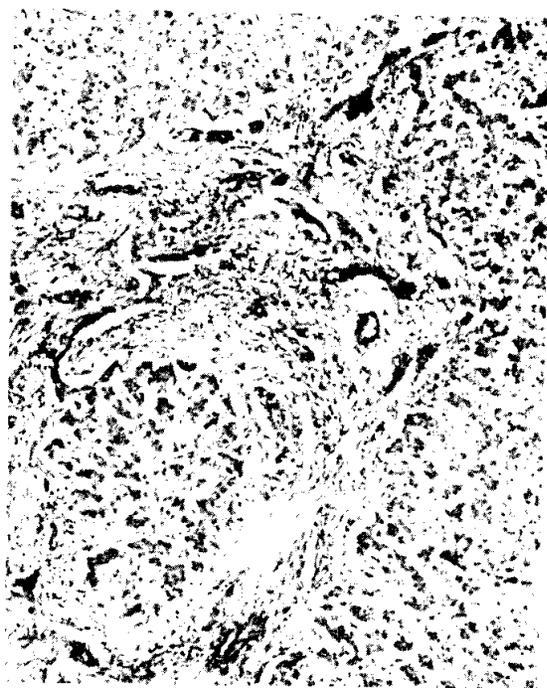


Fig. 5. Microscopic picture of the liver, showing portal widening due to fibrosis and bile duct proliferation. H&E X100

other than autolysis, no other definite changes could be seen.

Pathological Diagnosis :

1. Megacystis-Microcolon-Intestinal Hypoperistalsis syndrome, myopathic type
2. Intestinal malrotation
3. Early biliary cirrhosis
4. Bronchopneumonia
5. Septicemia

REFERENCES

Amoury RA, Fellows RA, Goodwin CD, et al. Megacystis-microcolon-intestinal hypoperistalsis syndrome : A cause of intestinal obstruction in the newborn period. *J. Pediatr. Surg.* 1977, 12: 1063-1065

Bagwell CE, Filler RE, Cutz E, Ein SH, et al. Neonatal Intestinal Pseudoobstruction. *J. Pediatr. Surg.* 1984, 19: 732-739

Berdon WE, Baker DH, Blanc WA, et al. Megacystis-microcolon-intestinal hypoperistalsis syndrome : A new cause of intestinal obstruction in the newborn. Report of radiologic findings in five newborn girls. *Am. J. Roentgenol.* 1976, 126: 957-964

Berdon WE, Baker DH, Santulli N, et al. Microcolon in newborn infants with intestinal obstruction. *Radiology* 1968, 90: 878

Berdon WE, Slovis TL, Cambell JB, et al. Neonatal small left colon syndrome: its relationship to aganglionosis and meconium plug syndrome. *Radiology* 1977, 125: 457-462

Bonsib SM, Fallon B, Mitros, FA, Anuras S. Urological manifestations of patients with visceral myopathy. *J. Urol.* 1984, 132: 1112

Faulk DL, Anuras S, Christensen J. Chronic intestinal pseudoobstruction. *Gastroenterol.* 1978, 74: 922-931

Glassman M, Spivak W, Mininberg D, Madara J. A clinical idiopathic intestinal pseudoobstruction : A commonly misdiagnosed disease in infants and children. *Pediatr.* 1989, 83: 603

Hen J Jr., Dolan TF Jr., Touloukian. Meconium plug syndrome associated with cystic fibrosis and Hirschsprung's disease. *Pediatr.* 1980, 66: 466-469

Krook PM. Megacystis-microcolon-intestinal hypoperistalsis syndrome in a male infant. *Radiology* 1980, 136: 649-650

Maldonado JE, Geregg JA, Green PA, et al. Chronic idiopathic intestinal pseudoobstruction. *Am. J. Med.* 1970, 49: 203-212

Mitros FA, Schuffler MD, Teja K, Anuras S. Pathologic

features of familial visceral myopathy. *Hum. Pathol.* 1982, 13: 825-833

Olsen MM, Luck SR, Lloyd-Still J, Raffensoerger JG. The spectrum of meconium disease in infancy. *J. Pediatr. Surg.* 1982, 17: 479-481

Patel R, Carty H. Megacystis-microcolon-intestinal hypoperistalsis syndrome : A rare cause of intestinal obstruction in the newborn. *Br. J. Radiol.* 1980, 53: 249-252

Puri P, Lake BD, Gorman F, O'Donnell B, Nixon HH. Megacystis-microcolon-intestinal hypoperistalsis syndrome : A visceral myopathy. *J. Pediatr. Surg.* 1983, 18: 64-68

Redman JF, Jimenez JF, Golladay ES, Seibert JJ. Megacystitis-microcolon-intestinal hypoperistalsis syndrome : Case report and review of the literature. *J. Urol.* 1984, 131: 931-983

Scauffler MD, Pagon RA, Schwartz, Bill AH. Visceral myopathy of the gastrointestinal and genitourinary tract in infants. *Gastroenterol.* 1988, 94: 892

Schuffler MD. Chronic intestinal pseudoobstruction syndromes. *Med. Clin. North Am.* 1981, 65: 1331-1375

Schuffler MD, Jonak Z. Chronic idiopathic intestinal pseudoobstruction caused by a degenerative disorder of the myenteric plexus: The use of Smith's method to define the neuropathology. *Gastroenterol.* 1982, 82: 476-486

Sieber WK, Girdany BG. Functional intestinal obstruction in newborn infants with morphologically normal gastrointestinal tracts. *Pediatr. Surg.* 1963, 53: 357

Siegel MJ, Shackelford GD, William J. McAlister WJ. Neonatal meconium blockage in the ileum and proximal colon. *Radiology* 1979, 132: 79-82

Smith B. The neuropathology of the alimentary tract. London: Edward Arnold, 1972

Sumner TE, Crowe JE, Klein A. Radiologic case of the month: Megacystis-microcolon-intestinal hypoperistalsis syndrome. *Am. J. Dis. Child.* 1981, 135: 67-68

Vargas JH, Marvin PS, Ament E. Chronic intestinal pseudoobstruction syndrome in pediatrics. *J. Pediatr. Gastroenterol. & Nutr.* 1988, 7: 323-332

Wiswell TE, Rawlings JS, Wilson JL, Pettett G. Megacystis-microcolon-intestinal hypoperistalsis syndrome. *Pediatr.* 1979, 63: 805

Young LW, Yunis EJ, Girdany BR, et al. Megacystis-microcolon-intestinal hypoperistalsis syndrome: Additional clinical, radiologic, surgical, and histopathologic aspects. *AJR* 1981, 137: 749-755