# Intussusception in infants younger than 3 months: a single center's experience

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***Background:*** **The diagnosis and treatment of intussusception is often confusing in infants aged younger than 3 months. This study aimed to discuss the particularity of diagnosis and treatment of intussusception in this age group.**

***Methods:*** **From April 1983 to June 2008, 39 infants aged 3 months or younger who had been diagnosed with intussusception were treated and their clinical data were analyzed retrospectively.**

***Results:*** **Of the 39 infants (29 boys and 10 girls), ages ranged from 12 hours to 3 months, with a mean age of 52.6 days. The duration from onset to admission ranged from 7 to 142 hours (mean 39.6 hours). Three infants had intrauterine intussusception and 36 postnatal intussusception. The 3 infants with intrauterine intussusception had typical presentations of complete ileus after birth. Gap type ileal atresia was found in surgery in 2 of the 3 infants and primary anatomosis was performed therapeutically. The other infant was found to have ileal separation and a patent proximal end with diffused meconium peritonitis. The patient died 2 days after primary anastomosis. Most infants with postnatal intussusception had two or more manifestations of the tetralogy, namely intermittent screaming, vomiting, bloody stool, and abdominal mass. In 23 infants who underwent pneumatic reduction, 17 had a successful reduction and 6 converted to open surgery. Surgery was indicated for 19 infants, with maneuver procedure in 14. Meckel's diverticulum was noted as a leading cause in 2 infants, ileal duplication in 1 with necrosis of intussusceptum, and primary intussusception with lead point necrosis in 2. The 5 infants, on whom segmental resection was performed, underwent primary anastomosis. All infants with postnatal intussusception had a smooth recovery.**

***Conclusions:*** **Infants aged 3 months or younger may suffer from intussusception and most of them present with typical symptoms. Early diagnosis and treatment are needed for a good prognosis. Intrauterine intussusception may be an etiological factor for ileal atresia.**

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***Key words:*** **diagnosis;**
**infant;**
**intussusception;**
**neonate;**
**pneumatic reduction;**
**treatment**





## Introduction

Acute intussusception is one of the most common causes of intestinal obstruction in infancy and early childhood.[1] It is often seen in children aged between 4 months and 2 years, while the peak incidence is found during 4 to 9 months.[2] Infants of 3 months old or younger rarely suffer from this disease, and the recognition of disease in this age group is usually confusing and challenging. In this study we discussed the particularity of diagnosis and treatment of intussusception in infants aged 3 months or younger. A retrospective study was carried out on the infants in this age group with acute intussusception who were treated at the Department of Pediatric Surgery, West China Hospital of Sichuan University (Chengdu, China).

## Methods

From April 1983 to June 2008, 39 infants of 3 months old or younger were diagnosed with intussusception at the Department of Pediatric Surgery, West China Hospital of Sichuan University, Chengdu, China. Infants

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who met the following criteria were included in this study: (1) those who were diagnosed with the disease by ultrasonography and X-ray pneumatic insufflation, or surgery; (2) those who were 3 months old or younger. All the patients were treated at our institution; the information on history, physical examination, auxiliary examinations, treatment, and follow-up were obtained from their clinical records and analyzed retrospectively.

## Results

### Clinical presentations

Of the 39 infants, 29 were boys and 10 girls. Their age ranged from 12 hours to 3 months (mean 52.6 days). The duration from the onset of the disease to admission ranged from 7 to 142 hours (mean 39.6 hours). The infants with intrauterine intussusception showed typical presentations of complete ileus after birth. The infants with postnatal intussusception had two or more of the four manifestations of acute intussusception, i.e., intermittent screaming (abdominal pain), vomiting, bloody stool, and abdominal mass (Table).

### Diagnosis

The diagnosis of acute intussusception was based on clinical presentations in 33 infants. Ultrasonography for 31 infants revealed intussusception in 27 with an abdominal mass with target sign on transverse section or a pseudokidney sign on longitudinal section. In 23 infants with X-ray pneumatic insufflation, the diagnosis was defined when the air insufflated was arrested by a mass in the colon. In infants who underwent surgery (22 infants), intussusception was identified by invagination of part of the intestine into adjacent distal segment (19 infants) or a polyp-like rudimentary intestine within the distal end of the atretic intestine (3). In the latter condition, the 3 infants were confirmed with old intrauterine intussusception resulting in ileal atresia.

**Table.** Clinical presentations of 39 infants with acute intussusception

| | |
|---|---|
| Mean age (range) | 52.6 d (12 h-3 mon) |
| Male/Female | 29/10 |
| Mean duration (range) | 39.6 h (7-142 h) |
| Manifestation with percentage | |
| Vomiting | 33 (84.6%) |
| Intermittent screaming (abdominal pain) | 29 (74.3%) |
| Bloody stool | 24 (61.5%) |
| Abdominal mass | 12 (30.7%) |
| Treatment | |
| Pneumatic reduction (successful/failed) | 23 (17/6) |
| Surgery (primary/conversion) | 22 (16/6) |
| Manual reduction | 14 |
| Bowel resection and primary anastomosis | 8 |
| Categories confirmed surgically | 22 |
| Intrauterine small intestinal intussusception | 3 |
| Ileocolonic intussusception | 8 |
| Ileocecal intussusception | 6 |
| Ileocolonic intussusception | 4 |
| Ileoileal intussusception | 1 |
| Associated anomalies | |
| Meckel's diverticulum | 2 |
| Intestinal duplication | 1 |

### Pneumatic reduction

Pneumatic reduction was attempted in 23 infants with a duration of less than 48 hours from onset to admission, in good general condition and without signs of peritonitis, significant abdominal distension, obvious dehydration, signs of toxicity, and dramatic complications. Pneumatic insufflation was done by a pediatric surgeon, and was monitored intermittently and fluoroscopically by a radiologist. The procedure was performed with a machine of air/barium enema from 1983 to 2003 (Model JS-818, Guangzhou, China) and from 2003 to 2008 (Model JS-628, Guangzhou, China). The machine was connected with patient's anus through a Foley tube. First, it was to make a definite diagnosis with a low pressure of 5-6 kPa. The diagnosis was confirmed when the air was arrested by a mass in the colon (Fig. A). Then the pressure was elevated gradually, with the upper limit of 12 kPa in infants and 10 kPa in neonates, as monitored by fluoroscopy. The signs of successful reduction in 17 infants included disappearance of mass shadow, air inflation into the ileum (Fig. B), and orally administered medicinal charcoal observed in stool within 4 to 12 hours after air reduction. Pneumatic reduction failed in 5 infants with the intracolonic mass persisted when the pressure

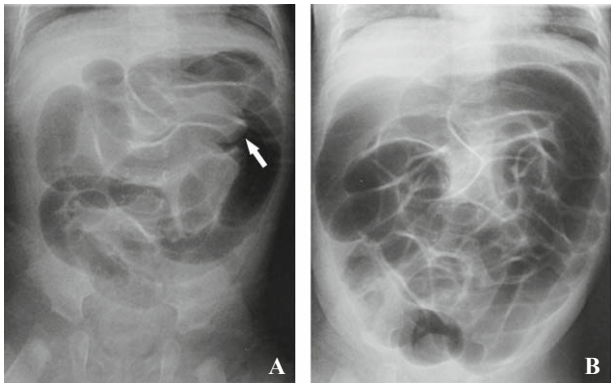


**Fig.** Pneumatic reduction for acute intussusception in a 73-day-old male infant. **A:** Air insufflated into the colon through the anus with a relatively low pressure. In the left upper quadrant, air was arrested by a mass in the transverse colon and formed a characteristic sign of intussusception—the cup rim sign; **B:** With the intussusception reduced, the mass in colon disappeared and air filled into the small intestine.

placed on the upper threshold for 10 to 15 minutes, and in 1 infant whose ileal intussusception was later confirmed by surgery. The entire colon of the infant was inflated while no air entered the distal ileum, and a repeat ultrasonography suggested persistency of the periumbilical mass with typical target signs. Conversion to open surgery was indicated in 6 infants.

### Surgery

#### *Indications of surgery*

Twenty-two infants underwent laparotomy. In 12 infants, acute intussusception was diagnosed by clinical presentations, whereas pneumatic insufflation was contraindicated, but surgery was indicated directly. Owing to the failure of pneumatic reduction, 6 infants were subjected to open surgery. One infant was operated on for acute intestinal obstruction with a long duration, nonspecific presentations, and negative ultrasonographic appearance. The 3 infants with intrauterine intussusception showed typical manifestations of complete ileus after birth, whereupon surgery was directly warranted. The definite diagnosis and further categorization of intussusception was made surgically or with other appropriate methods.

#### *Surgical findings and classification*

Intussusception was identified and categorized by surgical findings. Two subgroups, intrauterine and postnatal groups, were categorized with different pathological appearance and clinical findings.

Intrauterine intussusception was confirmed in 3 infants with manifestations of complete ileus after birth. Gap type ileal atresia was identified by surgery in 2 cases. The other intrauterine case was noted with separation of a distal atretic end and a proximal patent end, which resulted in intensive meconium peritonitis. A polyp-like residuum of intussusceptum was found within the lumen of the distal end.

The pathological diagnosis or classification of intussusception was unavailable in 17 of 36 infants of postnatal intussusception in whom successful pneumatic reduction achieved. In the other 19 infants undergoing surgery, 16 had primary intussusception and 3 had secondary intussusception (Meckel's diverticulum in 2 and ileal duplication in 1). Ileocolonic intussusception was confirmed by surgery in 8 infants, ileocecal in 6, ileoileocolonic in 4, and ileal in 1.

#### *Surgical procedures*

Primary anastomosis was made in the 3 infants with intrauterine intussusception. Additional drainages to the peritoneal cavity were placed in case of a patent proximal end and intensive peritonitis.

In the 19 infants with postnatal intussusception who accepted surgery, 14 accepted maneuver procedure only. Definite lesions and primary anastomosis were applied in 5 cases, including 2 primary cases (1 ileoileocolonic and 1 ileal) with the lead point inviable, 1 associated with ileal duplication and intussusceptum gangranous, and 2 associated with Meckel's divertivulum.

### Clinical outcome

One case of intrauterine intussusception associated with intestinal perforation and diffused peritonitis died 2 days after surgery. The other 38 infants recovered uneventfully and appeared normal during a follow-up for 2 weeks to 6 years (median: 2 months).

## Discussion

Intussusception, the invagination of a portion of the intestine into an adjacent segment, is one of the most common acute abdomens in children of 4 months to 2 years. The peak incidence of intussusception was found in those at age of 4 to 9 months. It is an unusual causes of intestinal obstruction in infants within the first 3 months of life. The incidence is very low for infants younger than 9 weeks (<5 per 100 000) and then increases rapidly.[3]

In our series, the infants were categorized into two subgroups as intrauterine intussusception (3 infants, 7.7%) and postnatal intussusception (36, 92.3%). In the 3 intrauterine cases the intussusceptum was confirmed to be the ileum and the infants were hospitalized for complications, including 2 who had old ileal atresia (gap type) and the other had intestinal perforation and intensive meconium peritonitis. Intrauterine intussusception is thought to be a possible cause of intestinal gap and cord atresia.[4] This theory is supported by our findings, especially in the fatal case of the patent proximal end and the atretic distal end separated. A polyp-like rudimentary intestine within the distal end of the atretic intestine was a sound evidence attributing atresia to intrauterine intussusception.

When infants are 3 months or younger, the symptoms and signs of intussusception are usually atypical.[5] Although it is debated that vomiting is an important predictor of intussusception and is frequently the first symptom of intussusception in infants of 4 months old or younger, diagnosis can be established in most cases in this age group by ultrasonography.[6] Most of our infants with postnatal intussusception came from remote areas. The relatively long period of transportation permitted thorough display of typical clinical presentations. By ultrasonography most of the infants had an immediate diagnosis on admission. It is easy to understand that the clinical manifestations of

intussusception in our series were similar to those of older infants.

Intussusception has a characteristic sonographic appearance, which is described as an abdominal mass with a target sign on the transverse section and a pseudokidney or sandwich sign on the longitudinal section.[7] Ultrasound has been recognized as an ideal imaging technique in detecting intussusception for its high accuracy and safety, low cost, and simultaneous exclusion of differential diagnosis.[8] Ultrasonography used as a primary investigation for patients with suspected intussusception prevents unnecessary radiological or surgical procedures and reduces radiation exposure while maintaining a high accuracy of diagnosis.[9] In addition, ultrasound-guided hydatic reduction becomes another conservative treatment of choice,[10,11] but we have no experience with this technique.

Fluoroscopically guided pneumatic reduction, with air enema, is a well-accepted technique for treatment of intussusception. It is proposed that pneumatic reduction, with a higher success rate than liquid-contrast techniques, should be attempted in all children with the exception of peritonitis because of the high success rate and low complication rate.[12-15] Currently, air insufflation for the diagnosis and treatment of intussusception in infants and children is replacing hydrostatic enema in an ever-increasing number of institutions.[12-16]

Whether conservative treatment is appropriate for infants younger than 3 months old is debatable. Usually, the higher incidence of pathological changes and ileal intussusception is considered in this age group, and surgical intervention should be feasible.[17-19] Meckel's diverticulum and intestinal duplication are the most common pathological factors. In our infants, these factors were noted in 2 and 1 infants, respectively, with an incidence of 8% (3/39). No significantly higher incidence of secondary intussusception was seen in our infants as compared with the gross incidence of 6%.[17] Additionally, even for the objective populations with a theoretically higher incidence of secondary intussusception and ileal intussusception, for which surgery was traditionally performed as the mainstay of treatment, cautiously advocated pneumatic reduction with inspiring outcomes.[20] Conservative treatment for emergency episodes needs a considerable time period for normal development, i.e., surgery, if inevitable for recurrence of intussusception, might be safer in older babies than in younger and physiologically less stable ones. We propose that cautiously indicated and operated pneumatic insufflation as a diagnostic and therapeutic modality should be considered for acute intussusception in infants younger than 3 months.

Our experience in diagnosis and treatment of the 39 infants showed that the diagnosis of intussusception in cases of acute abdomen as in our group should be considered. Prompt diagnosis and appropriate treatment are critical for achieving a good clinical outcome and avoiding mortality. Good prognosis can be expected when timely diagnosis and proper treatment are ensured.

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## References

1 Vestergaard H, Westergaard T, Wohlfahrt J, Pipper C, Melbye M. Association between intussusception and tonsil disease in childhood. Epidemiology 2008;19:71-74.
2 Huppertz HI, Soriano-Gabarró M, Grimprel E, Franco E, Mezner Z, Desselberger U, et al. Intussusception among young children in Europe. Pediatr Infect Dis J 2006;25(1 Suppl): S22-29.
3 Tate JE, Simonsen L, Viboud C, Steiner C, Patel MM, Curns AT, et al. Trends in intussusception hospitalizations among US infants, 1993-2004: implications for monitoring the safety of the new rotavirus vaccination program. Pediatrics 2008;121: e1125-1132.
4 Munden MM, Bruzzi JF, Coley BD, Munden RF. Sonography of pediatric small-bowel intussusception: differentiating surgical from nonsurgical cases. AJR Am J Roentgenol 2007; 188:275-279.
5 Fischer TK, Bihrmann K, Perch M, Koch A, Wohlfahrt J, Kåre M, et al. Intussusception in early childhood: a cohort study of 1.7 million children. Pediatrics 2004;114:782-785.
6 Newman J, Schuh S. Intussusception in babies under 4 months of age. CMAJ 1987;136:266-269.
7 Harrington L, Connolly B, Hu X, Wesson DE, Babyn P, Schuh S. Ultrasonographic and clinical predictors of intussusception. J Pediatr 1998;132:836-839.
8 Ko HS, Schenk JP, Tröger J, Rohrschneider WK. Current radiological management of intussusception in children. Eur Radiol 2007;17:2411-2421.
9 Justice FA, de Campo M, Liem NT, Son TN, Ninh TP, Bines JE. Accuracy of ultrasonography for the diagnosis of intussusception in infants in Vietnam. Pediatr Radiol 2007;37:195-199.
10 Ramachandran P, Gupta A, Vincent P, Sridharan S. Air enema for intussusception: is predicting the outcome important? Pediatr Surg Int 2008;24:311-313.
11 Kaiser AD, Applegate KE, Ladd AP. Current success in the treatment of intussusception in children. Surgery 2007;142:469-477.
12 Zulfiqar MA, Noryati M, Hamzaini AH, Thambidorai CR. Pneumatic reduction of intussusception using equipment readily available in the hospital. Med J Malaysia 2006;61:199-203.

13 Fragoso AC, Campos M, Tavares C, Costa-Pereira A, Estevão-Costa J. Pneumatic reduction of childhood intussusception. Is prediction of failure important? J Pediatr Surg 2007;42: 1504-1508.
14 Blanch AJ, Perel SB, Acworth JP. Paediatric intussusception: epidemiology and outcome. Emerg Med Australas 2007;19: 45-50.
15 Blakelock RT, Beasley SW. The clinical implications of non-idiopathic intussusception. Pediatr Surg Int 1998;14:163-167.
16 Li L, Tong R. Early diagnosis of small intestinal intussusception in neonates. Chin J Neonatol 2001;16:222.
17 Chua JH, Chui CH, Jacobsen AS. Role of surgery in the era of highly successful air enema reduction of intussusception. Asian J Surg 2006;29:267-273.
18 Pomerantz B, Anupindi S, Wales PW, Doody DP, Masiakos PT. Radiographic reduction of intussusception in patients with cystic fibrosis. Pediatr Surg Int 2007;23:763-765.
19 Simanovsky N, Hiller N, Koplewitz BZ, Eliahou R, Udassin R. Is non-operative intussusception reduction effective in older children? Ten-year experience in a university affiliated medical center. Pediatr Surg Int 2007;23:261-264.
20 Saxena AK, Seebacher U, Bernhardt C, Höllwarth ME. Small bowel intussusceptions: issues and controversies related to pneumatic reduction and surgical approach. Acta Paediatr 2007;96:1651-1654.

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