Review Article

# Non-surgical management of childhood intussusception

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**Abstract**

The cause of intussusception in children is mainly idiopathic and non-surgical management is the first-choice treatment if there is no contraindication. There are various methods of non-surgical management and still in debate. We reviewed the currently used methods of these techniques, advantages and disadvantages, successful reduction rate as well as complication rate. The novel techniques are also discussed.

**Key words:** Childhood, Intussusception, Non-surgical treatment, Reduction

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## Introduction

Intussusception is invagination of one segment of the intestine into the adjacent distal intestinal segment[1]. It most commonly occurs in children age 2 months to 2 years in 90% of cases[2]. Boys are two-times more common than girls[2 - 4]. Abdominal pain, vomiting and bloody stool are the triad symptoms of intussusception[3] but complete triad of symptoms are found only 45%[3 - 5].

## Causes and types of intussusception

Most intussusceptions are idiopathic. Secondary intussusception is found about 6%[4, 6 - 7]. Meckel's diverticulum, duplication cyst and polyp are the most common pathologic lead points[2]. The proportion of secondary intussusception increases with age[5, 8]. Neoplastic lead points are found in children older than 3 years and the most common neoplasm is non-Hodgkin lymphoma[9].

From the operated cases in the study of Kobayashi *et al*[3], there are ileocolic, ileocecal, ileoileocolic, ileoileal, and ileocolocolic types. Ileocolic type is the most common type[2 - 4, 6].

## Diagnostic tools

Plain abdominal radiograph is not specific[5, 10]. The abnormalities found by plain radiographs are intestinal obstruction (35%), a soft tissue mass (34%) and non-specific abnormal gas pattern (29%)[5]. Barium enema (BE) was the standard technique for the diagnosis of intussusception[1]. Spiral ring or bedspring is characteristic finding of BE[1]. Ultrasound (US) has replaced BE nowadays because US has a high accuracy[10 - 11]. A target or bull's eye lesion with concentric hypoechoic and hyperechoic layers on cross section in US image is the appearance of intussusception[11]. US features can also predict the outcome of reduction[12]. In the absence of free fluid, small bowel obstruction and trapped fluid, the success rate of reduction is 93% while trapped fluid within the colon in the region of intussusception is the poor prognostic feature[12]. The maximum diameter of the interloop fluid that is equal to or greater than 9 mm has a strong correlation with failed pneumatic reduction[13]. Some institutions use air enema instead of BE for the reason that it can be used for therapeutic reduction in the same procedure[5, 14].

## Management

**Conservative treatment:**

In a small study from China found that 39 of 56 small bowel intussusceptions resolved spontaneously[15]. Serial US scanning is suggested in this group. The majority of these patients had mild clinical symptoms. Spontaneous reduction was reported in 4% - 8% in the literature[16 - 18].

**Hydrostatic enema reduction (HER):**

If the patient has no absolute contraindication to attempt enema reduction, HER by barium (or water-soluble contrast in high risk patients) under fluoroscopy is the gold standard of non-surgical treatment[1]. Two absolute contraindications are peritonitis and perforation[19]. Though this technique has become less popular, it still be used in many hospitals[20]. HER by liquid (saline or water) under US guidance has been a promising method because there is no radiation and high success rate[2]. However US is operator dependent. Less experienced ultrasonographer may be not confident enough to assure successful reduction. Confirmation by BE can solve this problem.

**Pneumatic enema reduction (PER):**

PER under fluoroscopy has replaced HER by barium because of higher success rate[5, 20 - 21] and less spillage at anus. But the perforation rate, though rare, is higher as well[7, 20]. Radiation risk is still in concern. Then PER under US guidance was proposed by Yoon *et al*[22] with 93% success rate. Nevertheless in the case of perforation, detection of free air by US is more difficult than free fluid. Some articles performed delayed repeated reduction (DRR) when the first attempt was partially reduced and the child was clinically stable[17, 23 - 24]. The interval between the reduction attempts is 15 minutes to 24 hours. The number of reduction ranged from 1 - 4[17]. The success rate after DRR is 50%[17].

**External manual reduction (EMR):**

This new technique was presented recently by Vazquez *et al*[25] performed in 13 children. This technique was performed under US guidance. Adequate sedation was needed to maintain abdominal wall relaxation. Eighty percent success rate was achieved.

## Patient preparations and techniques

In a U.K. study of 122 hospitals revealed wide variation of patient preparations. Most of them did not use prophylactic antibiotics (110/122) or antispasmodics (101/122) but sedation use varied considerably[20]. A recent article in 2012 used deep sedation by propofol and got 92% success rate as well as decreased fluoroscopic time[16]. However that study lacked of a control group. A study from France presented that general anesthesia (GA) significantly increased the success rate compared with sedation[18]. Interestingly, a small prospective study succeeded to perform PER under GA in the operating room in all 14 apparently non-reducible cases[26]. The types of catheter and to inflate balloon of the catheter is also controversial[20]. A retrospective study of 62 cases reported using inflated balloon shortened fluoroscopic time in PER and increased reduction rate in HER[7].

## Success rate/Perforation rate/Mortality rate

Success rate depends on the duration of symptoms[3, 14]. The rate of successful reduction is more than 95% in the patients with the duration of symptoms less than 18 hours[14] while longer than 24 hours has a higher rate of failed reduction[27]. Higher experience increased success rate[20, 23]. The pressure during reduction is also important factor for successful reduction with higher pressure getting more success rate[24].

Perforation is rare. From the 5,218 cases of Bai *et al*[2] using HER, there were only 9 cases (0.17%) while PER occurred 1.1%[28]. Tension pneumoperitoneum is the serious complication of PER. A recent article suggested to do immediate needle decompression procedure to avoid this complication[29]. Mortality was noted in the earlier article since 1987[3] and extremely rare after the year 2000[2]. The success rate and perforation rate of previous studies are summarized in table 1.

**Table 1** Success rate and perforation rate of various techniques

| | Year | No. of cases | Technique | Success rate | Perforation rate | Pressure (mm Hg) |
|---|---|---|---|---|---|---|
| Bai *et al*[2] | 2006 | 5,218 | HER-US* | 95.5% | 0.17% | 100 |
| Fragoso *et al*[27] | 2007 | 164 | PER | 85% | 0.61% | ≤ 110 |
| Purenne *et al*[18] | 2012 | 509 | PER | 90% | 0% | 90-120 |
| Ilivitzki *et al*[16] | 2012 | 131 | PER | 92% | 1.5% | ≤120 |
| Yoon *et al*[22] | 2001 | 52 | PER-US* | 92% | 4% | 60-120 |
| Vazquez *et al*[25] | 2012 | 15 | EMR | 80% | 0% | - |

HER-US* = Hydrostatic enema reduction under ultrasound guidance

PER-US* = Pneumatic enema reduction under ultrasound guidance

## Recurrence

Recurrent rate is vary from 5% to 14%[9, 16, 26, 30]. Though recurrence, attempt at reduction is still successful and no increased risk of surgical intervention[30]. The success rate of attempt at reduction after recurrence is 78%[9].

## Conclusion

There are wide variations of non-surgical management of intussusception. Each method has its own advantages and disadvantages. However successful reduction depends on duration of symptoms, adequate intracolonic pressure and operator's experience rather than technique.

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## บทคัดย่อ

**การรักษาภาวะลำไส้กลืนกันในเด็กโดยไม่ผ่าตัด**

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การเกิดภาวะลำไส้กลืนกันในเด็กส่วนใหญ่ไม่มีสาเหตุ วิธีการคลายลำไส้จึงมักเริ่มด้วยวิธีไม่ผ่าตัดก่อนถ้าไม่มีข้อบ่งห้าม วิธีการคลายลำไส้โดยไม่ผ่าตัดมีหลากหลายและยังไม่มีข้อสรุปว่าวิธีใดดีที่สุด คณะผู้เขียนได้รวบรวมและนำเสนอถึงเทคนิคของแต่ละวิธี ข้อดีข้อเสีย อัตราการคลายลำไส้ได้สำเร็จ อัตราการเกิดภาวะแทรกซ้อน และเทคนิคใหม่ๆ ที่ได้มีการนำเสนอ

**คำสำคัญ:** วัยเด็ก, ภาวะลำไส้กลืนกัน, การรักษาที่ไม่ใช่การผ่าตัด, การคลายลำไส้