

# Leading Points in Infancy and Childhood Intussusception

Supatra Chareekaew, MD  
Rangsan Niramis, MD  
Varaporn Mahatharadol, MD

Department of Surgery, Queen Sirikit National Institute of Child Health, Bangkok, Thailand

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## Abstract

**Background:** The etiology of most intussusception is idiopathic. However, some cases may have leading points.

**Objectives:** The purpose of this study is to analyze and discuss the cases of intussusception in children with pathologic leading points.

**Materials and Methods:** A retrospective review of medical records of the patients who were treated at the Queen Sirikit National Institute of Child Health, formerly Children's Hospital, for intussusception during the 19-year period between January 1988 and December 2006 was carried out.

**Results:** There had been 1,025 episodes of intussusception in 956 children with 37 patients having leading points. The incidence of intussusception with leading points was 3.8%. Twenty three were males and 14 were females. The average age was 45 months (ranging from 14 days to 12 years). Barium enema study was done in 16 patients. Hydrostatic barium enema reduction was attempted in 12 patients and two cases were successfully reduced. Pneumatic reduction was used in 11 patients with 13 episodes and two had successful reduction. The non-operative reduction was not attempted in 12 patients due to poor condition or unavailability of non-operative reduction. All of the 37 patients underwent laparotomy except one case using colonoscopy and polypectomy. Intestinal polyps and Meckel's diverticulum were the most common leading points and found in 14 cases each. Duplication cysts and lymphoma were noted in 3, and 2 cases, respectively. The others were tuberculosis of the intestine, ectopic pancreatic tissue and pseudotumor of the colon. All of the leading points were resected and the postoperative courses were uneventful.

**Conclusions:** Children with intussusception having leading points could be present in all age groups. Attempted non-operative reductions were not successful in most cases. Surgical resection should be done in all of the cases when the leading point was seen.

**Keywords:** Intussusception, pathologic leading points, hydrostatic barium enema reduction, pneumatic reduction, intestinal polyps, Meckel's diverticulum

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**Correspondence address:** Supatra Chareekaew, MD, Department of Surgery, Queen Sirikit National Institute of Child Health, Bangkok 10400, Thailand; E-mail: varapornma@hotmail.com

## INTRODUCTION

The etiology of most intussusception is idiopathic. However, some cases may have pathologic leading points. In previously reported large series, the incidence of pathologic leading point causing intussusception in an infant or child ranged from 1.5% to 12%.<sup>1-12</sup> The incidence of pathological leading points also increases with age. They are present in 4% of infants and children who have one recurrent intussusception and up to 14% of those with multiple recurrences<sup>13</sup>. The most common cause of a pathological leading point in the literature is an inverted Meckel diverticulum, followed by polyps (mostly ileum) and duplication (mostly ileum and cecum). Other less common causes are periappendicitis, appendiceal stump, ectopic pancreas, ectopic gastric mucosa, hematoma from abdominal trauma, benign or malignant tumor (lymphoma, sarcoma, leukemia), Peutz-Jeghers (PJ) syndrome, familial polyposis and Henoch-Schonlein purpura.<sup>1-5,9,13-18</sup>

Many pediatric patients with intussusception were treated at our institute each year. Herein, the authors retrospectively studied these entities in a lot of patients. The purpose of this study was to analyze and discuss the cases of intussusception in children with pathologic leading points treated during the last 19 years.

## MATERIALS AND METHODS

A retrospective review of the medical records of the patients who were treated at the Queen Sirikit National Institute of Child Health, formerly Children's Hospital, for intussusception during the 19-year period between January 1988 and December 2006 was carried out. All patients were younger than 15 years old. Patients' data were collected from existing medical records. The demographics, clinical presentations, radiological data, interventional indications, management procedures, pathological reports and outcome of these patients were studied and analyzed.

## RESULTS

### Patients

Nine hundred and fifty six cases of intussusception were treated at this period with 1,025 episodes. Thirty seven cases had pathologic leading points. The occurrences of intussusception were noted in 41

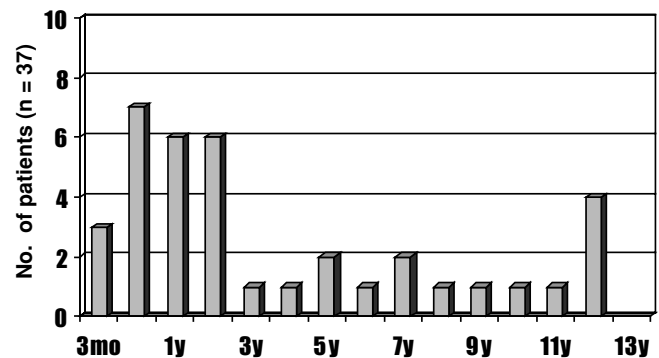


Figure 1 Age groups at the first presentation

Table 1 Clinical presentations of the first episodes (n = 37)

Clinical presentation	Cases (%)
<b>Symptoms</b>	
Vomiting	31 (83.8)
Abdominal pain	28 (75.7)
Bloody stool	19 (51.4)
<b>Signs</b>	
Abdominal mass	25 (67.6)
Bloody stool	19 (51.4)
Abdominal distension	8 (21.6)
<b>Others</b>	
Fever	5 (13.5)
Stupor	5 (13.5)
Convulsion	2 (5.4)
Prolapsed rectal mass	1 (2.7)

episodes, of which 4 cases had recurrence. The incidence of leading points was 3.8%. Twenty-three were male and fourteen were female (male:female = 1.6:1). The average age at the first presentation was 45 months (range 14 days to 12 years) and the distribution of age groups at presentation was shown in Figure 1.

### Clinical Presentations

The presence of three classic symptoms and signs were shown in Table 1.

The duration of symptoms in the most cases was a few days. The relation between the age groups and duration of symptoms showed that the older children had longer onset of clinical presentation than the younger one (Table 2).

### Radiological Findings

The radiological findings showed small bowel obstruction in 23 cases. Soft tissue haziness,

**Table 2** The relation of age groups and duration of symptoms

Age groups	Duration of symptoms (cases)				Total
	<1 day	1-7 days	>1 wk - 1 mo	>1 mo	
<3 mo	-	2	-	-	2
3 mo - 2 y	1	17	1	-	19
>2 y - 4 y	1	1	-	1	3
>4 y	2	4	3	4	13
<b>Total</b>	<b>4</b>	<b>24</b>	<b>4</b>	<b>5</b>	<b>37</b>

**Table 3** Radiological findings

Radiological findings	Cases (%)
Unremarkable	5 (13.5)
Paralytic ileus	2 (5.4)
Mass	7 (18.8)
Small bowel obstruction	23 (62.2)
<b>Total</b>	<b>37 (100)</b>

**Table 4** Management of 37 patients (41 episodes) with pathologic leading points

Procedures	No. of cases/episodes (%)	Pathologic leading points (cases or episodes)
<b>Non-operative management</b>	16 cases/16 episodes	
1. Barium enema (BE)		
Only diagnosis (Dx)	4	
• Positive findings	2 (50)	PJ polyp (1), colonic polyp (1)
• Negative findings	2 (50)	Meckel's diverticulum (1), PJ polyp (1) *
Dx and attempted reduction	12	
• Successful reduction	2 (16.7)	Colonic polyps (2)
• Unsuccessful reduction	12 (87.3)	Meckel's diverticula (2), colonic polyps (4), ileal lymphomas (2), ileal duplications (2), ileal polyp (1), cecal polyp (1)
2. Air enema (AE) or pneumatic Reduction	11 cases /13 episodes	
• Successful reduction	2 (15.4)	Meckel's diverticulum (1), colonic polyp (1)
• Unsuccessful reduction	11 (84.6)	Meckel's diverticula (6), ileal tuberculosis (1), ileal duplication (1), ileal polyp (1), colonic polyps (2)
<b>Operative management</b>		
1. Laparotomy without BE/AE for Dx or reduction	12 cases	Meckel's diverticula (4), ileal tuberculosis (1), ectopic pancreas (1), jejunal polyp (1), ileal polyp (1), PJ polyp (1), colonic polyps (2), pseudo-tumor of the colon (1)
2. Laparotomy after BE/AE for Dx or reduction	24 cases	The same as pathology in non-operative procedure
3. Colonoscopy and polypectomy after BE reduction	1 case	Colonic polyp (1)

\*Peutz-Jeghers polyp with adenocarcinoma

unremarkable and paralytic ileus were noted in 7, 5 and 2 cases, respectively (Table 3).

### Managements

Barium enema study was done in 16 patients. Hydrostatic barium enema reduction was attempted in 12 patients and 2 cases were successfully reduced. One case was definitely treated by colonoscopy and polypectomy and the other one underwent laparotomy and polypectomy.

Pneumatic reduction was used in 13 episodes of 11 patients and 2 had successful reduction. The non-operative reduction was not attempted in 12 patients due to poor condition or unavailability of non-operative reduction.

All of the 37 patients underwent laparotomy except one case undergoing colonoscopy and polypectomy (Table 4). Types of intestinal invagination were ileo-colic, colo-colic and entero-enteric intussusception in 27, 9 and 5 episodes, respectively.

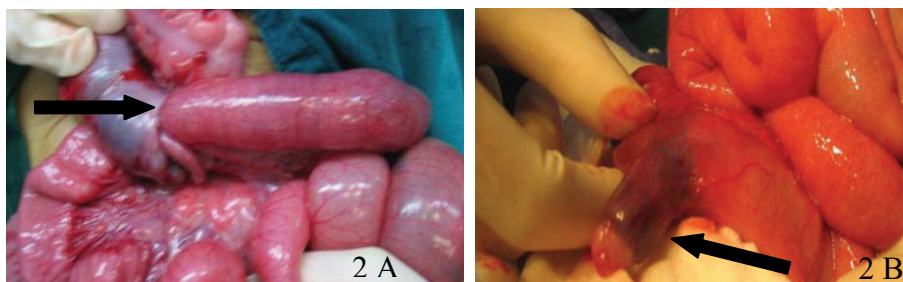
The indications for surgery of this study were 1) failure of non-operative reduction 2) poor condition such as stupor, convulsion 3) unavailability of non-operative reduction 4) radiological finding showed intraluminal mass or polyp 5) relative indication in some cases of older children.

Of the 919 cases with idiopathic intussusception, non-operative reduction was successful 495 in 694 episodes (71%) while the success rate of intussusception that causing by pathologic leading points was 4 in 25 episodes or 16 % ( $p < 0.05$ ). The recurrent intussusception was noted in 65 episodes of the 919 cases with idiopathic intussusception (7.1%) which was lower than 4 episodes of 37 cases with leading points or 10.8% ( $p = 0.33$ ).

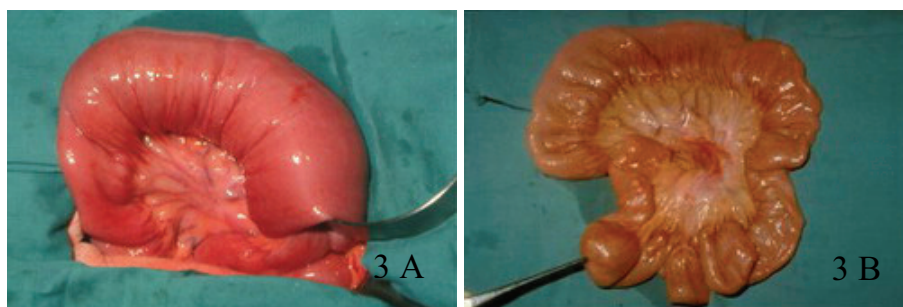
Intestinal polyps and Meckel's diverticulum were the most common leading points found in 14 cases in each of them (Figures 2-4). Duplication cysts and lymphoma were noted in 3, and 2 cases, respectively. The others were tuberculosis of the intestine, ectopic pancreatic tissue and pseudotumor of the colon (Table 5). All of the leading points were resected and the postoperative courses were uneventful.

## DISCUSSION

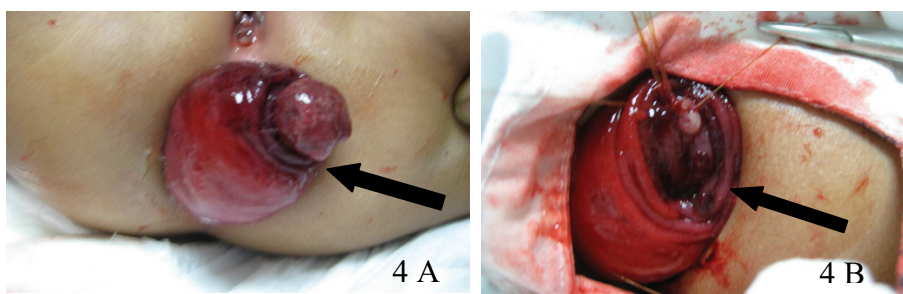
From the present study, 37 patients with intussusception caused by pathologic leading points over 19-year period have been described in 956 cases of intussusception with 1025 episodes. The incidence of



**Figure 2** Ileo-colic intussusception during manual reduction (2 A) and presenting of Meckel's diverticulum as a leading point after complete reduction (2 B)



**Figure 3** Entero-enteric intussusception with a leading point (3 A) and presenting of small intestinal polyp after complete manual reduction (3 B)



**Figure 4** The prolapsed colo-colic intussusception (4 A). After polypectomy (4 B)

leading points was 3.8%. In the series from Toronto and Melbourne, the incidence of intussusception with leading points was 5% (31 in 569 patients) and 9% (56 in 602 patients) respectively.<sup>2,16</sup>

The incidence of pathological leading point also increased with age. Blakelock and Beasley<sup>11</sup> showed

**Table 5** The pathological lesions of the patients with leading points

Leading points	No. of patients
Polyps	14
Peutz-Jeghers polyps	2
Peutz-Jeghers polyps with adenocarcinoma	1
Small bowel polyps	3
Cecal polyps	2
Colonic polyps	6
Meckel's diverticulum	14
Duplications	3
Ileum	2
Cecum	1
Lymphoma	2
Burkitt's lymphoma	1
Non-Hodgkin's lymphoma	1
Tuberculosis of the terminal ileum	2
Ectopic pancreatic tissue of the terminal ileum	1
Pseudotumor of the sigmoid colon	1
<b>Total</b>	<b>37</b>

that the percentage of intussusception secondary to a pathological leading point increased from 5% in the first year to 60% in the 5 to 14 year-old group. Turner<sup>12</sup> reported a 22% incidence in children older than 2 years, and Navarro<sup>9,10</sup> showed that 44% occurred within the first 5 years of life. The leading points were also present in 4% of infants and children who had one recurrent intussusception and up to 14% of those with multiple recurrences. The important factors that may be associated with the presence of a pathological leading point include an ileoileocolic intussusception, an older child, the association of a long duration of symptom of weight loss, the recurrent intussusception and the presence of an underlying disease that may predispose to the development of an intussusception.<sup>9,13</sup>

In our study, there were two peak incidences of age group at presentation, first peak age incidence was 3 months to 2 years (54%) and second peak was over 4 years of age (35%). The clinical presentation in first peak age group (<2 y) were predominantly vomiting and bloody stool but in the older children (>4 y) it was presented in the most cases with chronic abdominal pain. The recurrence rate of idiopathic intussusception was 7% and in the intussusception with pathologic leading point was 10% (p = 0.33). The success rate of non-operative management in idiopathic cases was higher than intussusception that causing by pathologic leading point (71% : 16%, p <0.05).

**Table 6** Comparison of intussusception with pathologic leading points from the literature

Demographic data	Hospital of Sick Children, Toronto Canada <sup>2</sup>	Royal Children's Hospital, Melbourne Australia <sup>16</sup>	Queen Sirikit National Institute of Child Health Bangkok, Thailand
Study period	16 years (1959-1974)	16 years (1969-1985)	19 years (1988-2006)
Number of total patients	569	602	956
Intussusception with leading point	31 (5%)	56 (9%)	37 (3.8%)
Male : Female	1.3 : 1	1.15 : 1	1.7 : 1
Average age	> 2 y	> 2 y	3 y 9 mo
Success rate of BE reduction	5/15 (33 %)	3/21 (14 %)	2/12 (16%)
Success rate of AE reduction	-	-	2 /13 (15 %)
Primary surgery without non-operative reduction	16 (51%)	32 (57%)	12 (32%)
Leading points	Meckel's diverticula 14 (45%) Polyps 8 (25%) Duplications 5 (16%)	Meckel's diverticula 27(48%) Polyps 14 (25%) Lymphosarcomas 5 (9%)	Meckel's diverticula 14 (37%) Polyps 14 (37%) Duplications 2 (8%)

Regarding review of the world literature with large case series, the authors mentioned many types of leading points of intussusception (Table 6).

### CONCLUSIONS

The children with intussusception having leading points could be found in all age groups but the incidence increase with the older age. The recurrent intussusception does not necessarily have leading points causing their intussusception. The three most common leading points in this study are intestinal polyps, Meckel's diverticula and duplications. Non-operative management obtains the success rate in idiopathic cases higher than intussusception caused by leading point. Surgical resection should be done in all of the cases when the leading point is detected.

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