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## The Clinical Features of Patients Requiring Surgical Treatment for Pediatric Intussusception

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*Key words* : Intussusception, surgical treatment, lead points, appendiceal intussusception.

**Abstract Purpose** : This study was conducted to examine the clinical features of pediatric intussusception requiring surgical treatment.

**Patients and Methods** : Between January 1, 1989 and June 30, 1999, a total of 140 children with intussusception were referred to Yamaguchi University Hospital, 13 (9.3%) of whom underwent surgical treatment. The age, sex, duration of symptoms and signs, types of intussusception, lead points, and other clinical features were examined.

**Results** : The median age of onset was 1 year and the median duration of symptoms was 21 h. Ileo-ileo-colic, ileo-colic, and ileo-ileo type intussusception were present in 6 (46.2%), 5 (38.5%), and 2 (15.4%) patients, respectively. Accompanying appendiceal intussusception, a marked ileocecal band, polyps, and Meckel's diverticulum were present in 6 (46.2%), 7 (53.8%), 1 (7.7%), and 1 (7.7%) patients, respectively. One patient also had anaphylactoid purpura and three patients (23.1%) underwent bowel resection for bowel necrosis or lead points.

**Conclusion** : Pediatric intussusception necessitating surgical treatment was often associated with accompanying appendiceal intussusception or a marked ileocecal band, or both, apart from organic lesions.

### Introduction

Intussusception is a frequent cause of bowel obstruction in infancy and early childhood and one of the most common abdominal emergencies in pediatric surgery<sup>1-3</sup>), however, the majority of intussusceptions can be successfully reduced without surgery<sup>3,4</sup>). Patients requiring operative intervention include those with signs of peritonitis or perforation, evidence of a pathological lead point, the presence of profound shock, chronic or neonatal intussusception, a history in excess of 48 h, or evidence of small bowel obstruction, and children older than 2 years<sup>2</sup>). While the causes of pediatric intussusception are generally con-

sidered to be idiopathic, a review by Stringer et al<sup>2</sup>) revealed that 2-12% of patients had a distinct pathological lead point or underlying abnormality. In this study, we examined the clinical features of patients with intussusception requiring surgical treatment.

### Patients and Methods

Between January 1, 1989, and June 30, 1999, a total of 140 pediatric patients with intussusception were referred to Yamaguchi University Hospital, 13 (9.3%) of whom underwent surgical treatment. Patients who had already undergone reduction through a laparotomy were excluded from this study.

Table 1. Characteristics of the Patients

No.	Age	Sex	Month of onset	duration of symptoms (h)	Types	Accompanying features
1	4M	M	June	22	I-I-C	Band, LN
2*	5M	F	January	48	I-C	
3	6M	M	June	12	I-I-C	Appendiceal, Band, LN
4	7M	M	December	19	I-I-C	Appendiceal, Band, LN
5	8M	M	October	30	I-I-C	Appendiceal, Postpyeloplasty
6	9M	M	January	22	I-I-C	Band, LN
7	1Y	M	November	20	I-I	Polyp
8	1.5Y	M	March	21	I-C	Appendiceal, Band, LN
9*	1.7Y	M	February	24	I-C	Meckel, LN
10*	2Y	F	March	6	I-I	LN, Postileostomy
11	2Y	F	October	7	I-C	Anaphylactoid purpura
12	2.1Y	M	June	21	I-I-C	Appendiceal, Band, LN
13	3.7Y	M	November	14	I-C	Appendiceal, Band, LN, P ostherniorrhaphy

\*; resection performed

M; male, F; female, I-I-C; Ileo-ileo-colic, I-C; Ileo-colic, I-I; Ileo-ileo, Band; a marked ileocecal band, LN; mesenteric lymph node swelling, Appendiceal; accompanying appendiceal intussusception  
Meckel; Meckel's diverticulum

The patients ranged in age from 4 months old to 3.7 years old, with a median age of 1 year and there were 10 boys and 3 girls (Table 1). We analyzed the season of onset, duration of symptoms, signs and symptoms, types and causes of intussusception, and other factors.

## Results

The season of onset was October to March in 10 patients and June in 3 patients and the duration of symptoms ranged from 6 to 48 h, with a median duration of 21 h (Table 1). The symptoms and signs included bloody stools, vomiting, irritability, abdominal pain, pyrexia, dehydration, and shock in 13 (100%), 10 (76.9%), 10 (76.9%), 5 (38.5%), 1 (7.7%), 1 (7.7%), and 1 patient (7.7%), respectively (Table 2). Ileo-ileo-colic, ileo-colic, and ileo-ileo type intussusceptions were present in 6 (46.2%), 5 (38.5%), and 2 patients (15.3%), respectively (Table 1).

The presence of mesenteric lymph node

Table 2. Frequency of symptoms and signs

Symptoms and signs	Number (%)
bloody stool	13 (100)
vomiting	10 ( 76.9)
irritability	10 ( 76.9)
abdominal pain	5 ( 38.5)
pyrexia	1 ( 7.7)
dehydration	1 ( 7.7)
shock	1 ( 7.7)

Some of these patients had more than one symptom or sign.

swelling, a marked ileocecal band with lymph nodes, accompanying appendiceal intussusception, polyps, and Meckel's diverticulum were found in 9 (69.2%), 7 (53.8%), 6 (46.2%), 1 (7.7%), and 1 patient (7.7%), respectively (Fig. 1, Table 1). Postoperative intussusceptions developed following ileostomy, inguinal hernia, or pyeloplasty in one

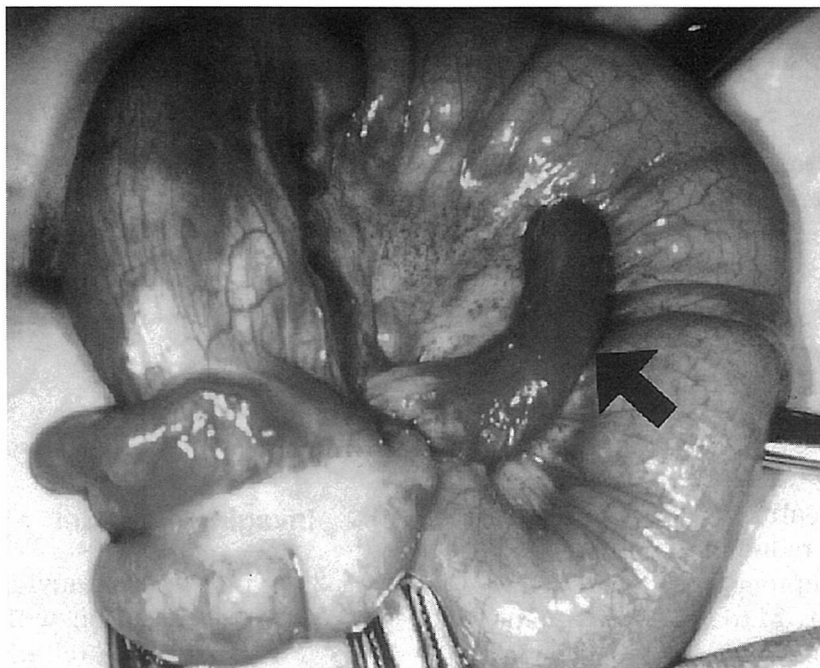


Fig 1. Operative appearance of an intussuscepted segment of bowel after reduction. The arrow indicates a reduced accompanying appendiceal intussusception.

patient each, respectively (27.3%), and resection of intussuscepted bowel was required for bowel necrosis in three patients (23.1%) (Table 1).

### Discussion

In Japan, successful hydrostatic and pneumatic reductions are performed in 81%-94.4% and 94% of cases, respectively<sup>5-7</sup>. Surgery is required for patients in whom nonsurgical therapy is contraindicated or has failed<sup>2,3,8-10</sup>. According to a review by Stringer et al<sup>2</sup>, successful hydrostatic and pneumatic reductions were performed in 18% - 78% and 75% - 94% of cases, respectively. West et al<sup>11</sup> reported a high incidence of 58% of patients with intussusception who required surgical treatment, while Liu et al<sup>12</sup> reported 37.9% (25 patients), Eshel et al<sup>13</sup> reported 25.6% (23 patients), and Bruce et al<sup>14</sup> reported only 8%. In our series, surgical treatment was fortunately required for only 9.3% of the patients.

The clinical features of intussusception requiring surgical treatment have been described in general<sup>2,11-13,15</sup>. Noguchi et al<sup>16</sup>

reported that patients requiring surgical treatment are significantly younger than those able to be treated conservatively. According to West et al<sup>11</sup>, the vast majority (>80%) of patients requiring surgical reduction are aged between 3 months and 2 years old. In our series, the number of children requiring surgical treatment after the age of 1 and 2 years old were 7 (53.8%) and 4 (30.8%), respectively.

Eshel et al<sup>13</sup> reported that there was no significant difference in the symptoms and signs between patients who underwent successful conservative treatment and those who required surgical reduction. Liu et al<sup>12</sup> stated that the presence of rectal bleeding or shock on admission did not result in a significant difference in outcome between patients who underwent successful reduction and those who underwent failed reduction. Moreover, Noguchi et al<sup>16</sup> reported 65% of patients presented with three symptoms including bloody stools, vomiting, and abdominal pain. In our series, all patients requiring surgery had bloody stools. We believe that the patients with bloody stools had severe bowel ischemia, and were more

likely to require surgery. A prolonged duration of symptoms has also been reported to be associated with the need for surgical treatment<sup>12,14,15</sup>. Liu et al<sup>12</sup> documented that patients presenting with a history of symptoms of longer than 48 h had a poorer chance of undergoing successful nonsurgical reduction. Bruce et al<sup>14</sup> stated that children presenting with symptoms of longer than 24 h are more likely to require intestinal resection. On the other hand, Eshel et al<sup>13</sup> reported that the duration of signs and symptoms before hospitalization was similar in patients who underwent successful conservative treatment and those who required surgical reduction. In our series, the duration of symptoms was 0 to 24 h in 10 patients (76.9%), 24 to 48 h in 2 patients (15.4%), and greater than 48 h in 1 patient (7.7%). Thus, our data indicated that surgical treatment is not necessarily dependent upon the prolonged duration of symptoms.

According to a review by Stringer et al<sup>2</sup>, 2%-12% of patients had a distinct pathological lead point or underlying abnormality. West et al<sup>11</sup> reported that 11 of 83 patients (13.2%) had pathologic lead points, including Hodgkin's lymphoma in 2, hamartomatous polyps in 2, bowel wall hematoma in 2, and submucosal hemangioma, small bowel carcinoid, juvenile polyposis coli, *Ascaris lumbricoides*, and Meckel's diverticulum in 1 patient each, respectively. Eshel et al<sup>13</sup> reported that one patient (4.3%) had a polyp and Gudeta<sup>17</sup> stated that only two patients (3.3%) had underlying intestinal pathology. Our study indicated that two patients (18.2%) had a pathologic lead point, being a polyp in one and a Meckel's diverticulum in one; however, six patients (46.2%) had accompanying appendiceal intussusception, which is a relatively uncommon condition<sup>18-20</sup>. McSwain<sup>18</sup> presented an anatomic classification of intussusception of the vermiform appendix (IVA) into primary and secondary types. Kegelaers et al<sup>19</sup> reported that appendiceal intussusception occurring as a result of abnormal peristalsis caused by local irritation seems to be similar to ileo-colic pediatric intussusception.

According to a review by Lawrence et al<sup>20</sup>, the etiology of appendiceal intussusception is

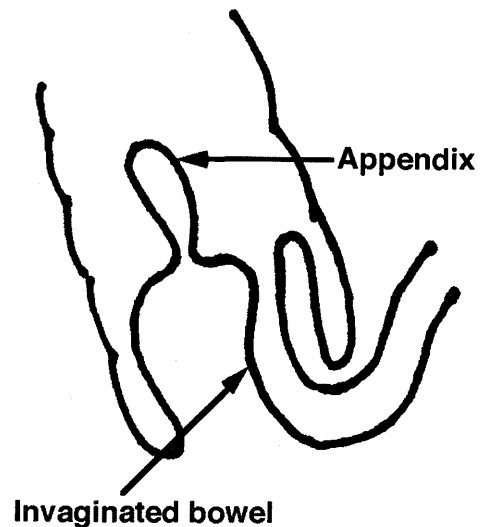


Fig 2. Type 4 accompanying appendiceal intussusception with ileocecal intussusception (citation from References 20).

an anatomic condition that must exist in order for the appendix to be able to turn "inside-out". They also<sup>20</sup> stated that compound ileocecal or ileocecocolic intussusceptions occurred following appendiceal intussusception in over 50% of the cases reported. In our study, all the accompanying appendiceal intussusceptions presented as Type 4 secondary IVA (Fig. 2)<sup>20</sup>. We speculate that accompanying appendiceal intussusceptions impede the reduction of ileo-colic type intussusceptions due to the action of the reflux-preventing valve role, and that patients with accompanying appendiceal intussusception are more likely to require surgical treatment.

Postoperative intussusception is uncommon<sup>21,22</sup>. In fact, according to West et al<sup>21</sup>, it accounted for 30% of all their patients, and 80% occurred within 2 weeks after surgery, being too soon for obstruction due to adhesions. Blair et al<sup>22</sup> reported the case of a premature infant who developed postoperative intussusception, and stated that gastrointestinal dysmotility can predispose to intussusception in premature infants postoperatively. In our series, three patients (27.3%) had a history of surgery, in the form of ileostomy, repair of an inguinal hernia, and pyeloplasty in one each, respectively. In the patient who had undergone ileostomy, lymphoid hyperplasia was responsible for the

lead point.

In conclusion, we treated thirteen (9.3%) patients with intussusception required surgical treatment for approximately 10 years in our hospital. Our experience indicated that pediatric intussusception necessitating surgical treatment is often associated with accompanying appendiceal intussusception or a marked ileocecal band, or both, apart from organic lesions.

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