

Clinical features and factors leading to early recurrence of intussusception after saline reduction

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Abstract

Objective: To investigate the clinical characteristics of early recurrent intussusception after ultrasound-guided saline reduction, and to explore the factors leading to early recurrence.

Method: The retrospective observational case-control study was conducted at Weifang People's Hospital, Shandong, China, and comprised data from January 2015 to December 2017 related to paediatric intussusception patients aged 0-12 years who underwent ultrasound-guided saline enema reduction. The patients were divided into two recurrent and non-recurrent groups. Clinical characteristics of the patients with early recurrence were analysed. Factors compared between the groups were gender, age, onset season, onset-to-treatment time interval, blood in stool, fever, diarrhoea, abdominal pain and vomiting, weight and pathology. Data was analysed using SPSS 22.

Results: Of the 672 subjects, 86(13%) were patient with early recurrence while 586(87%) had no early recurrence and acted as controls. Among the patients, 70(81.4%) were aged 6-36 months. In 52(60.5%) patients, recurrence was once, and in 23(26.7%) twice. There were 141 episodes of intussusception; 24(17%) occurring in <12 hours, 85(60.2%) in 12-24 hours. Also, 5(6%) patients required surgery for reduction. Compared to the controls, the second quarter, heavier body weight and pathology were the factors leading to early recurrence of intussusceptions ($p < 0.05$).

Conclusion: The second quarter, heavier body weight and pathological leading points were found to be factors leading to early recurrent intussusception.

Keywords: Intussusception, Short-term recurrent, Risk factors. (JPMA 70: 1727; 2020)

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Introduction

Intussusception is one of the most common causes of acute abdominal pain in paediatric surgical emergency. It may present with abdominal pain or paroxysmal crying, bloody stool or a palpable abdominal mass. Ultrasound has been widely used to diagnose intussusception because of the high sensitivity and specificity of the modality.¹ During the last 70 years, enema reduction has become the primary choice for treatment, whether by air or saline as the mediator, with excellent outcome.^{2,3} Compared with air enema reduction, hydrostatic enema can avoid radiation exposure and has an equivalently high success rate.⁴

Recurrence is the most common complication after enema reduction. Most episodes are idiopathic and repeat enema can work efficiently.⁵ Patients with pathological leading points (PLP) who can present with

recurrent intussusception (RI) or reduction failure should be treated surgically. Intussusception may recur in 8-15% of patients following initial non-operative reduction; the time interval between each recurrence ranging from 1 day to 3.2 years.⁶ Early recurrences account for a large proportion of patients, and they also impose repeated physical misery and mental stress on patients, but studies focussing on early recurrences are rare.

The current study was planned to identify the clinical characteristics and factors leading to early RI.

Patients and Methods

The retrospective observational case-control study was conducted at Weifang People's Hospital, Shandong, China, and comprised data from January 2015 to December 2017 related to paediatric intussusception patients aged 0-12 years who underwent ultrasound-guided saline enema reduction. The Paediatric Surgery Department of the hospital was the first facility in China to reduce intussusception with ultrasound-guided saline enema.

The sample included both outpatients and inpatients.

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Saline enemas were performed in the Paediatric Surgery ward, and data for each case was recorded by the staff. Outpatients received follow-up telephone calls 3 days after the reduction to determine whether or not the intussusception was recurrent. Inpatient data was obtained from the hospital medical record system. Patients who were hospitalised after outpatient treatment were counted as inpatients. Data was gathered and analysed anonymously to protect patient identity.

Those included were patients diagnosed with intussusception by ultrasonography (USG) or computed tomography (CT) who were successfully reduced with USG-guided saline enema, and those in whom intussusception recurred within 72 hours of the most recent reduction. Those excluded were intussusception patients treated with something other than saline enema, those in whom intussusception reduction was unsuccessful, and those who had successful reduction but there was no early recurrence.

Data collected comprised gender, age, the number of intussusception attacks, recurrence intervals, clinical manifestations after recurrences and treatment methods. The data related to the patients was compared with the data of those who did not have short-term recurrences.

To identify the factors leading to early recurrences after successful reduction, the patient data was compared with that of patients who had no early recurrence. Factors compared between the groups comprised gender, age, onset season, onset-to-treatment time interval, blood in stool, fever, diarrhoea, abdominal pain and vomiting, weight and pathological indications. Data was analysed using SPSS 22. The analysis of count data was expressed as frequencies and percentages, and the measurement data was expressed as mean $\pm$ standard deviation (SD). Univariate analyses were used for the risk factors. Measurement data was analysed using t-test after normality and variance tests while count data was analysed using Chi-square or Fisher's exact tests. Factors with statistical significance were analysed using logistic regression analysis. $P < 0.05$ was considered statistically significant.

Results

There were 691 intussusception patients with a total of 1,003 episodes during the three-year study period. Of them,

Table-1: The basic characteristics of the studied patients.

Characteristics	Early RI N=86	Characteristics	Early RI (N=86)
Gender		Age	
Male	51 (59.3%)	~1 y	14 (16.2%)
Female	35 (40.7%)	~2 y	28 (32.6%)
Recurrent Interval		~3 y	28 (32.6%)
<12 hours	24 (17.0%)	~4 y	8 (9.3%)
12-24 hours	85 (60.3%)	>4 y	8 (9.3%)
24-48 hours	28 (19.9%)	Recurrence Times	
48-72 hours	4 (2.8%)	Once	52 (60.5%)
Management		Twice	23 (26.7%)
Repeat enema	81 (94.2%)	3 times	5 (5.8%)
Surgery	5 (5.8%)	4 times	3 (3.5%)
		5 times	2 (2.3%)
		6 times	1 (1.2%)

RI: Recurrent intussusception.

Table-2: Clinical Manifestations.

Clinical manifestation	First attack N=86	Recurrent attack N=86
Abdominal pain	80 (93.0%)	79 (91.9%)
Vomiting	28 (32.6%)	3 (3.5%)
Diarrhoea	4 (4.7%)	Nil
Bloody stool	8 (9.3%)	Nil
Lethargy	Nil	2 (2.3%)
No signs	Nil	2 (2.3%)

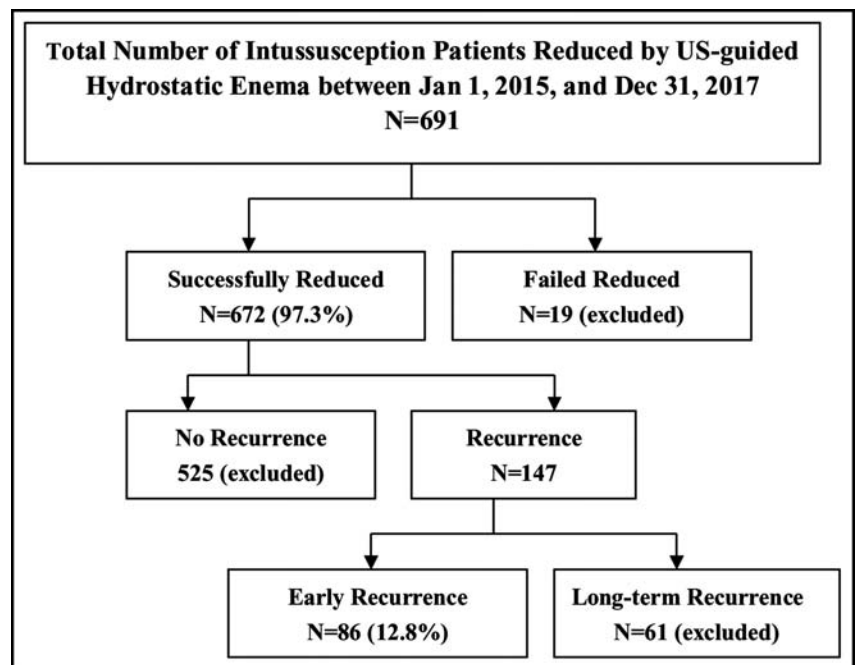


Figure: Flow chart for eligibility.

Table-3: Univariate analysis of the factors leading to early recurrence.

Factor	Early recurrence N=86	No early recurrence N=586	P value
Gender			0.38
male	51 (59.3%)	376 (64.2%)	
female	35 (40.7%)	210 (35.8%)	
Age (years)	2.2 ± 1.2	1.7 ± 1.5	0.01
Onset season			0.003
Onset to treatment interval			0.087
Bloody stool			0.4
No	66 (76.7%)	483 (82.4%)	
Yes	20 (23.3%)	103 (17.6%)	
Fever			0.28
No	77 (89.5%)	544 (92.8%)	
Yes	9 (10.5%)	42 (7.2%)	
Diarrhoea			0.27
No	81 (94.2%)	566 (96.6%)	
Yes	5 (5.8%)	20 (3.4%)	
Complaints			0.01
Abdominal pain	47 (54.7%)	225 (38.4%)	
Vomiting	7 (8.1%)	68 (11.6%)	
Abdominal pain and vomiting	32 (37.2%)	293 (50%)	
Weight	13.40 ± 3.63	11.05 ± 3.05	<0.001
Pathological factor			<0.001
No	81 (94.2%)	584 (99.7%)	
Yes	5 (5.8%)	2 (0.3%)	

Table-4: Logistic regression analysis of the factors leading to early recurrence.

	P value	Exp (B)	95% CI
Second quarter	<0.01	2.96	1.48-5.89
weight	<0.01	1.24	1.13-1.36
Pathologic factor	0.03	7.68	1.19-49.42

CI: Confidence interval.

672(97.2%) patients had successful reduction, while 19(2.7%) patients had to undergo surgery. Of the 672 successful cases, 86 (12.8%) had recurrence in <72 hours (Figure). Among these 86 recurrences, 75(87.2%) patients recurred 2 or fewer times, and 11(12.8%) patients recurred 3 or more times.

Of the 141 intussusception episodes, 137(97.2%) took place in <48 hours. Overall, 81(94.2%) patients were treated with saline enema, and 5(5.8%) eventually underwent surgery (Table-1).

The clinical manifestations of RI were primarily abdominal pain (Table-2).

Univariate analysis showed significant differences in terms of age, onset season, complaints, weight and pathological factors (Table-3). The factors were then subjected to logistic regressive analysis ((Table-4).

Discussion

The overall early recurrence rate in the current study was 12.8% as against 6.6-14.5% reported earlier.^{7,8} However, most previous studies used air enema or barium enema under X-ray guidance. Studies focussing on early RI after USG-guided saline enema are rare, therefore, the findings of the current study are not directly comparable. In the current study, the sample size was 8 times the number of influencing factors studied, which conforms to the principle that the sample size in multi-factor analysis should be 5-10 times the number of factors being studied.⁹

According to earlier studies, the incidence of PLP in all children with intussusceptions was approximately 3.9%.¹⁰ Daneman et al. found that PLP were present in 14% of the children who had two or more recurrences compared to 4% of those children who had only one recurrence.¹¹ Another study reported that 78.5% (51/65) of pathological intussusception patients had recurrent intussusception.¹² Nevertheless, the two studies reduced intussusception with barium enema or air enema guided by fluoroscopy, not by saline enema guided by ultrasound as was the case with the current study. A study reported that 66% of PLP cases were identified at ultrasound and 40% were diagnosed upon liquid enema, while air enema had a lower rate of detection (11%).¹³ USG provides more accurate definition for diagnosing PLPs than does fluoroscopy, especially in saline enema procedures when the enteric cavity is full of saline. In our study, there were only 5 early RI patients who had PLPs, 3 of whom were diagnosed by USG during the reduction process, and 2 were diagnosed at surgery. Therefore, we can say that the majority of early RI patients were idiopathic, and did not need to be transferred to surgery precipitously, unless the caregivers found PLPs by USG or there were many recurrences. Nevertheless, the current study did not touch the question about how many recurrences warrant a surgery.

Previous studies showed that age, symptoms, bloody stool and PLPs were risk factors for RI,¹⁴⁻¹⁷ but these tend to vary. The current study concluded that the second quarter of the year, weight and PLPs were factors leading to early recurrence.

There is universal consensus that PLPs are risk factors for recurrence. Many studies have reported the seasonality of intussusception.¹⁸⁻²⁰ The reason may be that in our country, the second quarter of the year is a warm season, and diet may make children gastrointestinally dysfunction.²¹ The majority of intussusception patients who presented during the second quarter, were brought

after having eaten cooler fruits that caused gastrointestinal disorders. After the intussusception was reduced, the gastrointestinal function still not completely recovered, and was likely to cause recurrences. Obese children were found to be more prone to early recurrence, a finding not yet reported to the best of our knowledge. We believe the reason may be that obese children have more visceral fat at the end of the ileum mesentery,^{22,23} and it is easy to cause recurrence as a leading point.

The current study has its limitations. It was a retrospective study and might have missed some data, and the overall sample size was not large enough.

Conclusion

Early RI was found to have some special features, as the second quarter of the year, higher body weight and PLPs heightened the risk of early recurrences.

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Conflict of Interest: None.

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