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Original Article

Untangling Intussusception: A Closer Look at Pediatric Risk Factors

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ABSTRACT

INTRODUCTION: Intussusception is the telescoping of one segment of bowel into the adjacent segment.{1} It is a major cause of acute abdomen in the paediatric age group. The majority of cases occur during the early weaning period, up to 3 years of life.{2} It can lead to complications such as bowel gangrene and necrosis, perforation, peritonitis, and even death if not promptly treated.
OBJECTIVE: The primary objective of this study is to identify the risk factors that contribute to the development of intussusception. To assess the safety and effectiveness of different approaches in the management of intussusception in children, which we encountered in our tertiary care centre.
MATERIALS AND METHODS: This is an institutional retrospective analytical study conducted from March 2024 to September 2025 in the Department of Paediatric Surgery, Government Mohan Kumaramangalam Medical College and Hospital, Salem. We aimed to enhance our understanding of the etiological factors that cause intussusception in the paediatric age group.
RESULTS: A total of 72 cases were included in our study population, with a median age group of 36 months & mean age group of about 38.38 ± 30.74 months. The majority of the children underwent hydrostatic reduction once the presence of intussusception was confirmed by ultrasound. Ileo-colic intussusception remains the most common type in our study group of about 84.7%, followed by the Colo-colic variant. The success rate of hydrostatic reduction is about 80.6%. Reduction failed in 12.5% of cases due to delayed presentation, & 6.9 % of cases in which hydrostatic reduction was not attempted due to clinical evidence of sepsis, they were proceeded with emergency exploratory laparotomy. Recurrence is uncommon in our study; only one case presented with recurrence, for which the reduction was repeated, and the patient is currently on follow-up.
CONCLUSION: In our study, Mesenteric adenitis is the most common pathology of majority of cases leading to intussusception. Timely intervention plays a major role in managing cases with non-surgical intervention rather than surgical exploration.

Keywords: *Intussusception, Mesenteric adenitis, hydrostatic reduction*

INTRODUCTION

Intussusception is considered one of the major causes of children's mortality and morbidity. As per theory, the two main aetiologies that lead to cause for intussusception are either infection or some anatomical variant occluding the lumen, causing invagination of one segment of bowel into another one, leading to obstruction.{3} The majority of children who are affected belong to the age group of less than 3 years of age.{2} Complications varied from abnormal bowel engorgement, bleeding, venous stasis, necrosis, gangrene & perforation. Ileo- colic being the most common variant of intussusception documented, there are various types of intussusceptions like jejuno- jejunal, ileo-ileal, ileo- Colo-colic & Colo- colic. In younger children, they are commonly associated with enlargement of lymphoid tissue due to Rota-virus infection, whereas in older children, there may be a leading point due to an anatomical variant causing either dynamic or adynamic obstruction, like mesenteric adenitis, submucosal lipoma, GI polyps, or growth.

MATERIALS AND METHODS

A retrospective analytical study was done in intussusception cases for the duration of one year. Data includes the type of intussusception, duration of symptoms, attempt of hydrostatic reduction, surgery indication, intraoperative findings, hospital stay, post operative complications.

Statistical analysis was performed using Microsoft Excel 2013 (codenamed Office 15) trialware, and variables were compared with the Chi-squared test.

RESULTS:

A total of 72 paediatric patients diagnosed with intussusception were included in the study. The Shapiro–Wilk test revealed that the distributions of age, number of reduction attempts, symptom duration before presentation, and length of hospital stay deviated from normality ($p < 0.001$ for all variables). Therefore, non-parametric statistical methods were employed when appropriate. (Table-1) The median age at presentation was 36 months (interquartile range [IQR]: 11–60 months), with a mean age of 38.38 ± 30.74 months. Most children required only a single reduction attempt, with a median of one episode (IQR: 1–1). The median duration of symptoms prior to hospital presentation was two days (IQR: 1–2), and the median hospital stay was also two days (IQR: 2–4), though the mean duration was 3.96 ± 3.49 days, indicating variability. (Table-2)

Ileocolic intussusception was the most prevalent anatomical variant, accounting for 84.7% of cases. Ileo-Colo-colic types constituted 11.1%, while Colo-colic, ileo-ileal, and jejuno-jejunal forms were rare, each observed in 1.4% of patients. Mesenteric adenitis was identified as the predominant cause (94.4%). Pathological lead points were infrequent and included Peutz–Jeghers syndrome (2.8%), Meckel's diverticulum (1.4%), and submucosal lipoma (1.4%). (Table-3) Hydrostatic reduction was attempted in most cases, with an overall success rate of 80.6%. Reduction failed in 12.5% of patients, and 6.9% were not eligible for reduction due to sepsis on admission. As a result, 19.4% required surgical intervention. Among surgically treated patients, 85.7% underwent bowel resection with anastomosis, while 14.3% were managed with manual reduction alone. (Table-4)

Treatment outcomes were generally favorable. Post-treatment complications were rare, occurring in only 4.2% of cases, all involving wound dehiscence. Intussusception recurrence was uncommon (2.8%), with 97.2% remaining recurrence-free during follow-up. A statistically significant relationship was found between intussusception type and hydrostatic reduction outcome ($p < 0.001$). Ileocolic cases showed a high success rate (93.3%), whereas ileo-Colo-colic and ileo-ileal types were more prone to reduction failure. Comparison between successful and unsuccessful reduction groups showed no significant difference in age ($p = 0.664$). (Table-5)

However, failed reductions were associated with more attempts, longer symptom duration before presentation, and extended hospitalization ($p < 0.001$ for all). Specifically, failed cases had a mean symptom duration of 3.44 ± 0.88 days and an average hospital stay of 8.44 ± 3.97 days, compared to 1.59 ± 0.56 days and 2.55 ± 0.82 days, respectively, in successful cases.(Table-6) Correlation analysis indicated a moderate positive relationship between symptom duration before presentation and hospital stay length ($r = 0.439$, $p < 0.001$), suggesting that delayed presentation contributed to prolonged hospitalization. No significant correlation was found between hospital stay and either age or the number of reduction attempts. (Table-7)

Multivariable linear regression identified duration of presentation as a strong independent predictor of hospital stay ($\beta \approx 0.71–0.74$, $p < 0.001$). Conversely, a greater number of reduction attempts was independently associated with a shorter hospital stay ($\beta \approx -0.30$, $p < 0.001$), while age had no significant predictive value. The analysis confirmed delayed presentation as the key determinant of prolonged hospitalization. (Table-8)

Table-1 Shapiro Wilk Normality Test

Variables	Shapiro-Wilk		
	Statistic	df	p value
Age	.887	72	<0.001*
Episodes of reduction	.584	72	<0.001*
Duration of presentation	.791	72	<0.001*
Hospital stay duration in days	.624	72	<0.001*

Table-2: Quantitative description of variables

Variables	Mean ± SD	Median (IQR)
Age	38.38±30.74	36.00 (11.00, 60.00)
Episodes of reduction	1.04±0.43	1.00 (1.00, 1.00)
Duration of presentation	1.93±0.97	2.00 (1.00, 2.00)
Hospital stay duration in days	3.96±3.49	2.00 (2.00, 4.00)

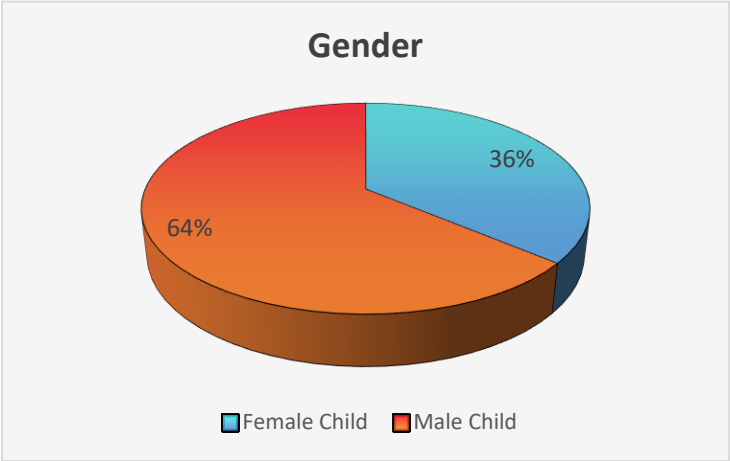

Fig-1: Gender Distribution

Table-3: Type and Cause of Intussusception

Variables		Frequency	Percent
Type of Intussusception	Colo colic	1	1.4
	Ileo colic	61	84.7
	Ileo Colo-colic	8	11.1
	Ileo- ileal	1	1.4
	Jejuno- jejunal	1	1.4
	Total	72	100.0
Cause of Intussusception	Meckel's diverticulum	1	1.4
	Mesenteric adenitis	68	94.4
	Peutz jeghers syndrome	2	2.8
	Submucosal lipoma	1	1.4
	Total	72	100.0

Table-4: Distribution of Procedures

Variables		Frequency	Percent
Hydrostatic Reduction	Attempted failed	9	12.5
	Not attempted due to sepsis	5	6.9
	Success	58	80.6
	Total	72	100.0
Surgery	No	58	80.6
	Yes	14	19.4
	Total	72	100.0
Procedure	Manual reduction	2	14.3
	Resection and anastomosis	12	85.7
	Total	14	100.0

Complication	No	69	95.8
	Yes (wound dehiscence)	3	4.2
	Total	72	100.0
Recurrence	No	70	97.2
	Yes	2	2.8
	Total	72	100.0

Table-5: Association between Reduction outcome & Type of intussusception

TYPE OF INTUSSUSCEPTION	**HYDROSTATIC REDUCTION**		**TOTAL**	**P VALUE**
	ATTEMPTED FAILED	**SUCCESS**		
Ileo colic	4	56	60	<0.001*
	6.7%	93.3%	100.0%	
Ileo Colo-colic	4	2	6	
	66.7%	33.3%	100.0%	
Ileo- ileal	1	0	1	
	100.0%	0.0%	100.0%	
Total	9	58	67	
	13.4%	86.6%	100.0%	

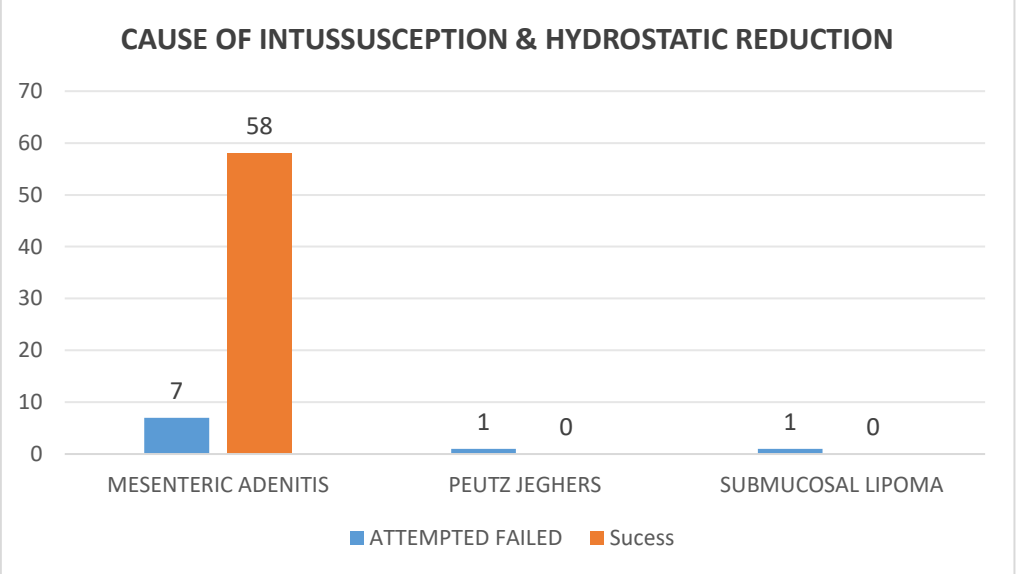

Fig-2: Distribution of Cause of Intussusceptions & Hydrostatic reduction

Table-6: Association between Reduction outcome and variables

Variable	**Reduction outcome**	**N**	**Mean ± SD**	**Mean Rank**	**Sum of Ranks**	**p value**
Age	Attempted failed	9	35.78±34.54	31.39	282.50	0.664
	Success	58	36.62±27.24	34.41	1995.50	
Episodes of reduction	Attempted failed	9	1.67±0.50	52.33	471.00	<0.001*
	Success	58	1.03±0.18	31.16	1807.00	

Duration of presentation	Attempted failed	9	3.44±0.88	60.67	546.00	<0.001*
	Success	58	1.59±0.56	29.86	1732.00	
Hospital stay duration in days	Attempted failed	9	8.44±3.97	58.44	526.00	<0.001*
	Success	58	2.55±0.82	30.21	1752.00	

Table-7 Correlation Analysis

Variables		**Hospital stay duration in days**
Age	Correlation Coefficient	.071
	p value	.556
Episodes of reduction	Correlation Coefficient	-.064
	p value	.591
Duration of presentation	Correlation Coefficient	.439**
	p value	<0.001*
Hospital stay duration in days.	Correlation Coefficient	1.000
	p value	

Table-8: Multivariable linear regression

Variables	Unstandardized Coefficients		Standardized Coefficients	t	p value	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
Duration of presentation	2.562	.303	.711	8.468	<0.001*	1.959	3.166
Duration of presentation	2.680	.278	.744	9.640	<0.001*	2.125	3.235
Episodes of reduction	-2.445	.633	-.298	-3.864	<0.001*	-3.707	-1.183
Duration of presentation	2.642	.281	.734	9.410	<0.001*	2.082	3.203
Episodes of reduction	-2.438	.633	-.298	-3.853	<0.001*	-3.701	-1.176
Age	.009	.009	.075	.971	.335	-.009	.026
a. Dependent Variable: Hospital stay duration in days							

Discussion:

In our study, the majority of intussusceptions are due to mesenteric adenitis, which occurs due to the enlargement of Payer's patches taking place in the ileo-cecal segments. Earlier diagnosis and intervention play a major role in managing intussusception by nonsurgical management. According to the literature, pathological lead points are the usual cause of intussusception in all age groups over 6 months {4}. Three methods of non-surgical management are used for intussusception: hydrostatic reduction under USG guidance, pneumatic reduction, & Barium reduction, which uses fluoroscopy. As per a study by Ahmad et al {5} and our study also stated that hydrostatic reduction is safer with no radiation exposure & very low chance of perforation because the pressure is shared out through the entire length of the bowel. Even in the case of perforation chance of Perforative peritonitis is less comparing the other modes of management.

By comparing the success rate of hydrostatic reduction with other studies, our study has 80.6 % success rate, while other documented studies also show success rates between 75% - 96% {5,6,7}. In our study, patients who presented within 48 hours has higher rate of success, which is similar to a study done by Soundharya et al {9}, but another study by Van den Ende et al {8} found no correlation between time of presentation and success rate. Patients presented with complaints of more than 48 hours have a lower chance of success rate and more chances of bowel non-viability. Our study had a failed reduction in 9 cases (12.5%), and 5 cases did not undergo reduction due to the features of sepsis on admission, which agrees with the study done by Gadgade et al {10} & Reijnen et al {11}. All 14 cases underwent emergency laparotomy, and one had successful manual reduction, while the rest underwent resection and anastomosis due to non-viability of the bowel.

We encountered two cases of Peutz-Jeghers syndrome, one presented as jejuno- jejunal intussusception and another one involving the proximal ileum, causing ileo-Colo-colic intussusception. A polyp causing small bowel intussusception should be kept in mind as one of the differential diagnoses causing small bowel intussusception {12,13}.

Recurrence was noted in only one case due to mesenteric adenitis, which was treated conservatively.

Conclusion:
The mesenteric lymph node is the lead point in most of our cases, leading to intussusception. Hydrostatic reduction is safer and feasible in most of the cases. Earlier intervention has a higher chance of treating it with non-surgical management. All hemodynamically stable, uncomplicated children, irrespective of age, should be given a trial of hydrostatic reduction.

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