

Intussusception in Children: A Prospective Cohort Study

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ABSTRACT

Introduction: Intussusception is one of the most frequent causes of bowel obstruction in infants and toddlers. Due to wide variety of clinical presentations and overlap with other abdominal conditions, the diagnosis of intussusception is often delayed. Delayed diagnosis and treatment leading to gangrene and perforation of the bowel increases the morbidity and mortality of this condition. Therefore, prompt diagnosis and treatment is warranted for better outcome.

Aim: To find out the possible aetiological factors, clinical presentation and treatment outcome of intussusception in children.

Materials and Methods: A prospective descriptive cohort study was conducted in the Department of General Surgery from October 2018 to November 2020, in which 30 patients with diagnosis of intussusception undergoing either hydrostatic

reduction or open surgical intervention were enrolled. Age and sex were the independent variables while surgical outcome was the dependent variable assessed.

Results: Thirty patients (males=17 and females=13) of intussusception with mean age 10.8±19.12 months were included in the study. In 83.33% patients, intussusception was idiopathic, while, pathological lead point was noted in 16.67% patients. Ileocolic (76.67%) was the most common type of intussusception detected. A 70% patient's required open surgery while hydrostatic reduction carried out in 30% patients. No mortality was observed in this study.

Conclusion: The commonly affected age group was 7 to 12 months. Surgery is the mainstay of treatment while hydrostatic reduction is effective in few properly selected patients.

Keywords: Bowel obstruction, Hydrostatic reduction, Open surgery

INTRODUCTION

Intussusception occurs when a portion of alimentary tract is telescoped into an adjacent segment [1]. First described by Paul Barbette of Amsterdam in 1674, most intussusceptions in children occur from 2 months to 2 years of age [2,3]. In children, more than 80% intussusceptions are ileocolic, beginning several centimetres proximal to the ileocaecal valve with their apex found in the ascending or transverse colon [2]. Incidence of intussusception is 1 to 4 per 1000 live births and has geographical variation [1]. Exact aetiology of intussusception cannot be determined in nearly 90% of cases and it is labeled as an idiopathic intussusception. The classical triad of Ombredanne seen in intussusception includes abdominal pain, abdominal lump and passage of "red currant jelly" stool. [4].

Diagnosis of intussusception is delayed as it mimics other acute abdominal conditions which increase morbidity and mortality. Therefore, prompt diagnosis and treatment are warranted for better outcome. In the literature, there is no consensus about the best procedure for non surgical reduction of intussusception. Singh AP et al., achieved 88% overall success rate for ultrasound guided pneumatic reduction in their study [5]. Xie X et al., in their randomised trial, compared pneumatic and hydrostatic reduction for intussusception in paediatric patients and reported high success rate in hydrostatic reduction group [6]. Ultrasound guided hydrostatic reduction is recommended because there is no radiation exposure and ultrasonography is useful in both diagnosis as well as reduction [7,8]. Hence, present study was conducted with the aim to assess the clinical presentation, possible aetiological factors and treatment outcome in patients having intussusceptions. Intussusception is a paediatric condition, but as there is no dedicated paediatric surgery unit in our institute hence, this study is first of its kind conducted in General Surgery Department in the institute.

MATERIALS AND METHODS

This prospective descriptive cohort study was carried out in the Department of General Surgery of Dr. Vaishampayan Memorial

Government Medical College and Shri. Chhatrapati Shivaji Maharaj Survopachar Rugnalaya tertiary care hospital, Solapur (Maharashtra), India from October 2018 to November 2020, after obtaining the approval of Institutional Ethical Committee dated 4/10/2018.

Thirty patients of intussusception were included out of which 17 were males and 13 were females. Informed consent was obtained from the parents or guardian of the children before enrolment in the study in prescribed proforma.

Inclusion criteria: Patients ≤12 years, irrespective of sex, with radiological diagnosis of intussusception.

Exclusion criteria: Patients above 12 years of age, patients not willing for the treatment and discharged against medical advice were excluded from the study.

Study Procedure

On admission, the patients were examined thoroughly, and history was recorded from the parents or caretakers in prescribed proforma. Patients who presented with shock were immediately admitted to the surgical ward, adequately resuscitated and when they become haemodynamically stable they were shifted for radiological investigations. Weight was recorded in all patients for calculation of antibiotics dosages and fluid requirements. Necessary laboratory investigations were performed in all patients. Depending upon the clinical condition of patient they were subjected to either hydrostatic reduction or open surgery. Stable patients not showing signs of perforation peritonitis, shock or gangrene of bowel were subjected to hydrostatic reduction. For hydrostatic reduction, patient was shifted to ultrasonography suit after taking written informed consent of the parents and explaining possible complications related to the procedure. Operation theatre staff were also informed about the procedure and necessary preparations for open surgery was made to tackle the situation in case perforation occurs or the reduction fails. In supine position, appropriate sized foley's catheter (no. 18-24) was inserted in rectum of patient and bulb inflated with normal saline. Foley's catheter

was connected to an enema can filled with 2 litres of normal saline and about 1 meter above the level of table. The normal saline flows into the rectum due to gravity. External force was not applied. Once the saline flow was started, the abdomen was scanned for signs of regression of intussusception. When the fluid flows freely through the ileocaecal valve into the terminal ileum and intussusception disappears, the procedure was considered successful.

After successful reduction, the fluid in the colon and rectum was drained out. Patient's vitals were monitored throughout the procedure. After successful reduction, patient was shifted to the ward for observation, if recurrence occurs in ward the same procedure was repeated once and, if failed, the patient was immediately subjected to open surgery. For open surgery, either right sided supra-umbilical transverse or vertical midline incision was used, depending upon the age of the patient. After laparotomy, depending upon the intraoperative findings, appropriate surgical procedure was performed. Depending upon intraoperative findings (the extent of intussusceptum into intussusciptens), the intussusception was classified into various types [9]. The patient was shifted to paediatric Intensive Care Unit (ICU), if required, for continuous monitoring after consultation with anaesthetist. In postoperative period the patients were observed for possible complications and if developed, treated accordingly. After discharge, patients were followed-up for first three months.

STATISTICAL ANALYSIS

All the statistical analysis was carried out by Statistical Package for Social Sciences (SPSS) version 16.0. Tables and graphs were created with the help of Microsoft Word and Excel. Statistical method used was t-test. The p-value <0.05 was considered statistically significant.

RESULTS

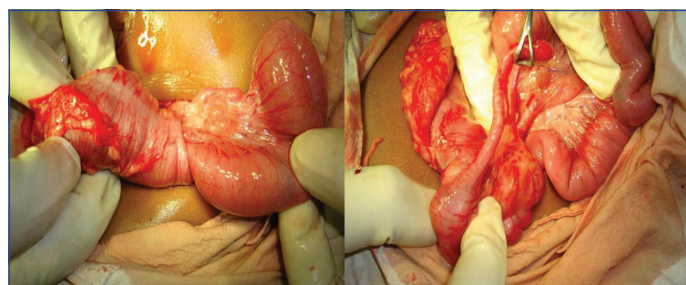
Out of the total 30 patients studied, 56.67% were males and 43.33% were females. Majority of patients were in age group of 7 to 12 months [Table/Fig-1]. Vomiting and abdominal pain were the predominant symptoms noted in these patients. In 83.33% patients, intussusception was labelled as idiopathic as no exact aetiological factor was detected [Table/Fig-2]. Pathological lead points (mesenteric lymph nodes, Appendix etc.) were noted in 16.67% patients [Table/Fig-2-4]. The mean time interval between onset of symptoms and admission to hospital in our study was 31.6 ± 15.28 hours [Table/Fig-5]. Laparotomy+manual reduction was the most common surgical procedure performed in open group (n=17) [Table/Fig-6]. Seasonal variation was observed in our study with most cases observed in summer [Table/Fig-7]. Hospital stay was more in open surgery group and was statistically significant ($p < 0.05$) [Table/Fig-8]. Classical triad of intussusception was present in 36.7% (n=11) of patients in our study. Surgical site infection was the most common complication noted in patients who had undergone open surgery [Table/Fig-9]. There were no complications noted in patients who had undergone hydrostatic reduction. Recurrence rate of 11.11% and 0% noted in hydrostatic reduction group and open surgery group, respectively [Table/Fig-10]. In present study, the rate of bowel resection was 13.33% (n=4). There was not a single case of death noted in our study.

Age group (Months)	Number of patients	Percentage	Mean age (Months)
0-3	9	30%	10.8±19.12
4-6	6	20%	
7-12	12	40%	
13- 24	1	3.3%	
25- 37	1	3.3%	
38- 48	0	0	
> 48	1	3.3%	
Total	30	100%	

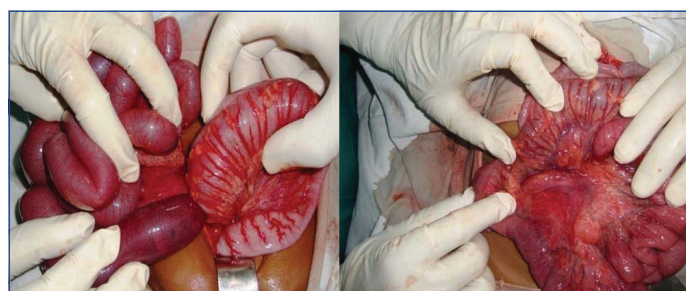
[Table/Fig-1]: Age distribution of the patients in study group.

Characteristics	No. of patients (n=30)	Percentage
Gender		
Male	17	56.67%
Female	13	43.33%
Clinical features		
Vomiting	27	90%
Abdominal colic pain	23	76.67%
Rectal bleeding	13	43.33%
Abdominal mass	16	53.33%
Irritability	11	36.67%
Fever	8	26.67%
Type of treatment		
Hydrostatic reduction	9	30%
Open surgery	21	70%
Types of intussusceptions [9]		
Ileocolic	23	76.67%
Ileocaecal	3	10%
Ileoileal	2	6.67%
Ileo-caeco-colic	1	3.33%
Colocolic	1	3.33%
Aetiology		
1. Idiopathic	25	83.33%
2. Pathological lead point	5	16.67%
a) Mesenteric Lymph nodes	1	3.33%
b) Meckel's diverticulum	1	3.33%
c) Hypertrophy of payer's patches	2	6.67%
d) Appendix	1	3.33%

[Table/Fig-2]: Patients characteristics in study population.



[Table/Fig-3]: Ileocolic intussusception with appendix identified as a lead point.



[Table/Fig-4]: Ileocolic intussusception with enlarged mesenteric lymph nodes as lead point.

Onset of symptoms- admission interval	Number of patients	Percentage
Up to 12 hours	5	16.67%
13- 24 hours	6	20%
25-36 hours	2	6.67%
37-48 hours	16	53.33%
More than 48 hours	1	3.33%
Total	30	100%

[Table/Fig-5]: Time of presentation to hospital from the onset of symptoms.

Procedures	Number of patients	Percentage
Laparotomy+Manual reduction	17	80.95%
Laparotomy+Bowel resection with primary anastomosis	3	14.28%
Laparotomy+Bowel resection with stoma	1	4.77%
Total	21	100%

[Table/Fig-6]: Distribution of patients according to surgical procedures in open group.

Seasonal variation	Number of patients	Percentage
Summer (Feb, March, April, May)	18	60%
Rainy season (June, July, August, Sept)	7	23.33%
Winter (Oct, Nov, Dec, Jan)	5	16.67%
Total	30	100%

[Table/Fig-7]: Distribution according to seasonal variation.

Treatment	Number of patients	Hospital stay		Unpaired t test	p-value
		Mean days	Standard deviation (SD)		
Hydrostatic reduction	9	4	1.11	5.6	0.000003
Open surgery	21	10.14	3.09		

[Table/Fig-8]: Mean hospital stay in hydrostatic reduction and open surgery group. $p < 0.05$ was considered statistically significant.

Postoperative complications	Number of patients	Percentage
Surgical site infection	3	10%
Wound dehiscence	1	3.33%
Incisional hernia	1	3.33%

[Table/Fig-9]: Postoperative complications in operated group.

Type of surgical procedure	Total patients	Number of patients with recurrence	Recurrence rate
Hydrostatic reduction	09	1	11.11%
Surgical reduction	21	0	0

[Table/Fig-10]: Distribution according to recurrence.

DISCUSSION

Intussusception is uncommon below three months of age and after three years of life and also the seasonal variations were observed in our study with the most number of cases observed in summer. [10-12]. Mean age of patients in our study was 10.8 ± 19.12 months. The mean age of patients in the national studies conducted by Chatterjee US et al., and Gupta M et al., studies were 11 months and 10 months respectively [13,14]. Mean age of patients in the international studies by Al-Bassam AA and Orfale N, Mensah Y et al., were 11.5 months and 11.7 months, respectively [15,16]. These findings in both national and international studies are comparable with our study. Male were more commonly affected than females in our study with male to female ratio of 1.3:1. Similar trend of male preponderance is also documented in the other studies by Archibong AE et al., Chalya PL et al., Guo W et al., [17-19].

In the present study, vomiting and abdominal pain were reported in 90% and 76.6% of patients respectively. While rectal bleeding and abdominal lump were noted in 43.3% and 53.3% patients respectively. Similar clinical presentation of intussusception was also observed in study conducted by Crankson SJ et al., where vomiting and abdominal pain were present in 78% and 65% patients respectively, while rectal bleeding and abdominal mass were detected in 81% and 62% patients respectively [20]. In the study conducted by Chalya PL et al., Ul-Hassan MF et al., the classical triad of intussusception was noted in 42.5% and 50% of patients, respectively [18,21]. These observations indicated that classic triad of intussusception was not present in all patients but present in

nearly half to 1/3rd of patients. Therefore, this condition should be suspected in all children under the age of three years presenting with acute colicky abdominal pain without delaying further treatment.

The mean time interval between onset of symptoms and admission to hospital in our study was 31.6 ± 15.28 hours. In the studies, conducted by Xuan NT et al., and Fernandes EG et al., mean time interval was 24 hours [22,23]. Time interval is more in our study because majority of patients presented late to hospital. Because of poverty, people from the villages prefer to take treatment from local doctors where they find it cheap. They don't mind the lack of expertise of the doctor. When the clinical state of patient deteriorated, then such patients were referred to the tertiary care centre for specialist management. Most common type of intussusception noted in our study was ileocolic. Similar findings were also noted in various other national and international studies [3,19,24]. In majority of patients in our study the exact aetiology of intussusception was not determined and is labelled as idiopathic intussusception. Similar findings were also observed in other studies [13,15,16,25,26].

In present study, the rate of bowel resection was 13.33% (n=4). In the study conducted by Al-Bassam AA and Orfale N the rate of bowel resection was 16.6%, while that in the Kuremu RT study the rate of bowel resection was 33% [15,25]. Bowel was resected when it was found gangrenous. In case of gangrene of small bowel segmental resection, an end to end anastomosis was performed. In case of gangrene of caecum or ascending colon, we performed right hemicolectomy with ileotransverse anastomosis. Bowel resection rate in our study is less as compared to these studies, this may be because of small sample size in our study. Maximum number of cases of intussusception in our study were detected during summer season. Similar trend was observed in the study conducted by Das MK et al., [26]. This may be because of increased incidence of Upper Respiratory Tract Infections (URTI) and gastrointestinal infections during summer in India predisposing patients to intussusception.

Limitation(s)

About 40% of patients, in this study did not report for follow-up for specified period after discharge, because of which it was not possible for the authors to document long term complications in these patients. Small sample size is also limiting factor of this study.

CONCLUSION(S)

Intussusception is common in children below one year. Classic triad of symptoms is present in only 1/3rd of cases, making the diagnosis a challenging task. Hydrostatic reduction is recommended in properly selected patients. It is safe and effective procedure with decreased hospital stay and free from morbidity associated with surgical treatment. Surgery is the ultimate solution for failed hydrostatic reduction cases with its own complications.

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