

Sonoguided Hydrostatic Reduction - An Effective Treatment Even in Recurrent Intussusception- A Study of 460 Cases

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ABSTRACT

BACKGROUND

Intussusception is the most common cause of intestinal obstruction in young children under 36 months of age. We wanted to analyse the mode of presentation & the effectiveness of sonoguided hydrostatic saline reduction in the management of intussusception in paediatric cases.

METHODS

Cases admitted with a diagnosis of intussusception from January 2016 to December 2018 in the Department of Paediatric Surgery, Medical College Hospital, Trivandrum, were studied. Patients with sonological diagnosis of intussusception were included in the study & those with no clinical/sonological features of intussusception were excluded from the study. The mode of presentation, ultrasound finding, hydrostatic reduction findings, operative findings & final outcome were analysed.

RESULTS

460 cases were included in the study. 383 cases underwent successful hydrostatic reduction. Transient intussusception / sonological misdiagnosis was seen in 36 cases. 56 cases had primary recurrences which were all treated with hydrostatic reduction. 37 cases underwent Laparotomy. Pathological lead point was present in only 4 cases.

CONCLUSION

Sonoguided hydrostatic saline reduction is an effective and safe management in the treatment of uncomplicated intussusception. Even recurrent cases can be treated successfully with hydrostatic reduction.

KEY WORDS

Sonoguided, Hydrostatic Reduction, Recurrent Intussusception

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BACKGROUND

Intussusception is the most common cause of intestinal obstruction in young children under 36 months of age. Approximately 60% of affected children are infants and 80-90% are younger than two years.¹

Intussusception occurs when a segment of the bowel (the intussusceptum) telescopes into a more distal bowel (the intussusciens), resulting in venous congestion, bowel oedema and later intestinal obstruction.² The incidence is from 20 to 100 per 100,000 children per year.³ The classic triad of abdominal mass, colicky abdominal pain and red currant jelly stool is rarely present always and was only found in 2.9% of a previous series of patients with intussusception.⁴ Timely diagnosis and treatment are crucial, as any delay may lead to intestinal ischemia, perforation, bowel resection and mortality.⁵ In majority of cases, hydrostatic reduction or pneumatic reduction is successful⁴, but operative reduction, with or without bowel resection may be required in difficult cases in which non operative reduction fails.^{6,7}

Recurrence of intussusception is relatively common regardless of the method of reduction.⁸ Some authors have reported that approximately 10% of patients (range: 8%-15%) suffer from recurrent intussusception.^{9,10} Clinically, the early diagnosis and management of recurrent intussusception is challenging to paediatricians, radiologists and paediatric surgeons. Although a previous study reported that lead points can precipitate recurrent intussusception, reliable risk factors for most cases of recurrence have not been identified.¹¹

Our study was conducted to analyse mode of presentation & the effectiveness of sonoguided hydrostatic reduction in management of paediatric intussusception and its role in recurrent intussusception in paediatric cases.

METHODS

A data based descriptive study of patients with a sonological diagnosis of intussusception at paediatric surgery department, MCH Trivandrum for a period of 3 years from January 2016 – December 2018 was done. The admission notes, saline reduction findings, operative findings and pathological reports were reviewed. Patient demographics, duration of symptoms, hydrostatic reduction findings, and operative findings, presence of pathological lead point and pathology of the bowel were recorded. Statistical analysis was performed using SPSS software. P value of <0.05 was considered significant.

All these children underwent sonoguided hydrostatic reduction and children with sonologically diagnosed intussusception but with features of peritonitis or bowel gangrene underwent laparotomy.

All children once diagnosed and confirmed as intussusception were kept Nil per Orally. Under I.V sedation and analgesics (injection midazolam 50 mcg/Kg, injection for twin 0.3 mg/Kg + injection Phenergan 0.5 mg/Kg)

hydrostatic reduction performed. 16 F Foley’s catheter introduced into rectum with minimal lubrication & bulb inflated to 20-25 cc. Normal Saline infused at a height of 3 feet from patient. Watch for reduction of intussusception with USG. Once reduction is complete, fluid from the colon is emptied and Foley is removed. Child is then kept NPO for 6 hours and closely monitored.

Checklist During Procedure

- Insert a Ryle tube for children below 6 months before procedure.
- Visualize Foley bulb in a Transverse Suprapubic view.
- Look for leak, double check all connection points.
- If saline leaks per rectum, perform a per rectal examination and confirm whether the tip of Foley is pointed up, if not, then reinsert.
- If in doubt about position of bulb, deflate and reinsert.

Watch for Features of Reduction of Intussusception

- Saline flows freely from the bottle & is seen filling the colon.
- Disappearance of the 'target' sign.
- Appearance of filled small bowel loops ('honey comb' sign).
- Previously filled colonic loops are seen less prominent.
- Normal ileocaecal valves seen.

Signs of Non-Reduction

- Saline stops flowing and back filling seen.
- Persistence of target sign.
- None visualized ileocaecal valve.
- Absence of honeycombing.

Outcomes

- Unsuccessful reduction – failed reduction even after 3 attempts.
- Surgery -
 - Primary laparotomy was done in peritonitis cases.
 - Laparotomy in failed hydrostatic saline reduction.
- Post procedure discharged after 24 hours.
- Recurrence.

RESULTS

64% of study population belonged to age group 6 months to 2 years. In the study there were 282 males and 178 females. Male Female distribution was 1.58:1

Age	Transient N (%)	Hydrostatic Reduction	Surgery
< 6 months	5 (13.88)	45 (11.62)	16 (43.24)
6 months - 2 yrs.	9 (25.00)	213 (55.03)	10 (27.02)
2 yrs. - 5 yrs.	12 (33.33)	97 (25.06)	8 (21.62)
5 yrs. - 11 yrs.	10 (27.77)	32 (8.26)	3 (8.10)

Table 1. Age Distribution (P Value <0.0001)

Of the patients who underwent surgery 43% were less than 6 months of age. Of the patients who underwent successful saline reduction 55% were in age group (6 months- 2 year). Transient intussusception had almost similar incidence in all age groups except below 6 months where it was least reported (Table 1).

Variable	Transient	Hydrostatic Reduction	Surgery	Total
Pain	20 (5.23)	327 (85.60)	35 (9.16)	382
Mass	8 (5.51)	103 (71.03)	34 (23.44)	145
Blood in stools	2 (1.40)	107 (75.35)	33 (23.23)	142
Vomiting	9 (2.86)	274 (87.26)	31 (9.87)	314

Table 2. Symptom Association (P Value <0.00001)

Most common symptom was cry with abdominal pain (83%). Vomiting was the next frequent symptom (68%). Only 30% of children with intussusception presented with mass abdomen. Red currant jelly stools were also an infrequent presenting symptom which was seen in only 30% of children with intussusception (Table 2).

Mass	Transient	Hydrostatic Reduction	Surgery
Present	8 (22.22)	103 (26.61)	34 (91.89)
Absent	28 (77.77)	284 (73.38)	3 (8.10)

Table 3. Mass Symptom Association (P Value < 0.0001)

Of the children who underwent surgery 90% presented with mass abdomen. (Table 3)

Blood in Stool	Transient	Hydrostatic Reduction	Surgery
Present	2 (5)	107 (27.64)	33 (89.18)
Absent	34 (95)	280 (72.35)	4 (10.81)

Table 4. Blood in Stools Symptom Association (P Value < 0.0001)

Blood in stools was among the presenting symptom in 90% of children who underwent surgery (Table 4).

Duration	Transient	Hydrostatic Reduction	Surgery
<12 hours	6 (16.66)	116 (29.97)	8 (21.62)
12-24 hours	11 (30.55)	158 (40.82)	8 (21.62)
1-3 days	11 (30.55)	105 (27.13)	7 (18.91)
4-6 days	8 (22.22)	8 (2.06)	14 (37.83)

Table 5. Duration of Symptoms (P Value <0.0001)

Majority of children (70%) who underwent saline reduction presented within 24 hours of onset of symptoms. Children with transient intussusception had symptoms ranging from one day to 4 days prior to presentation. Majority of children who presented within a period of 3 days had successful saline reduction. After 3 days a significant percentage (46.6%) of children had to undergo surgery (Table 5).

Attempts	Frequency	%
Single	387	86.96
Double	34	7.64
>2 attempt	24	5.39

Table 6. Attempts at Hydrostatic Reduction

While majority (86%) of hydrostatic reductions was successful in the first attempt, 7% needed a second attempt of reduction and 5% needed more than 2 attempts. Overall 96.7% of children had successful outcome with hydrostatic reduction (Table 6).

Intra-Op Findings	Frequency	%
Simple reduction	22	59.45
Lead point (Meckel's diverticulum)	4	10.81
Resection EEA	5	13.51
Mesenteric lymphadenopathy	22	59.45
Ileo-ileocolic	4	10.81

Table 7. Intraoperative Findings

Among the 460 cases of intussusception 15 cases (3.26%) were taken up for primary laparotomy. 22 cases underwent simple reduction of intussusception under anaesthesia. Compound intussusception was (ileo-ileocolic) seen in 4 cases. Mesenteric lymphadenopathy was an incidental finding in 22 cases. Of the children who underwent surgery 4 cases (10.81%) had lead point and all the four cases were Meckel's diverticulum (Table 7).

3 cases had Apnoea during procedure revived by bag and mask ventilation & supportive measures. 56 cases had primary recurrence treated successfully by saline reduction. One case had aspiration during procedure which was treated medically. There was no perforation during procedure.

Post Procedure	Frequency	%
No recurrence	389	87.41
Recurrence	56	13.23

Table 8. Recurrence

Recurrence in the study population is 56 cases among children who underwent saline reduction. Majority of recurrences occurred within 24 hours following first saline reduction. 12% of cases underwent more than one reduction in the first hospital admission. None of the recurrent cases had to be taken up for laparotomy (Table 8).

DISCUSSION

Approximately 60 percent of children with intussusception are younger than one year old, and 80 to 90 percent are younger than two years.¹² In our study only 64% of children were 6 months to 2 years and we had a significant number of children above 2 years which may be because of the ease with which an ultrasound could be performed nowadays compared to olden times. In a review by Bekdash et al,¹³ the overall success rate of non-operative reduction of intussusception ranged from 46 to 94%, while recent studies reported that the success rate for hydrostatic reduction with saline ranges from 55.6 to 90%.^{14,15,16} A much more recent study from Ethiopia found a successful reduction rate of 87.2%.¹⁷ Our study has a success rate of 95% for saline reduction. Saline reduction could be successfully performed even in children presenting after 48 hours. Even when the symptom duration was more than 3 days 26% could be successfully treated with hydrostatic reduction contrary to other study finding.¹⁸

Recurrence rate after non-operative reduction of intussusception ranges from 5 to 20% with a mean of 10%.¹⁹ Recurrence rate in our study was 12.17%. Gray et al.²⁰ in a meta-analysis of recurrence rate of non-operative reduction of intussusception found a recurrence rate of 7.5% with saline reduction of intussusception. Recurrent

intussusception is amenable to treatment via Ultrasound guided hydrostatic reduction, even if it has to be done several times.¹⁹ Non-operative hydrostatic reduction under ultrasound guidance was successful in all recurrent cases in our series. This significant finding stresses the fact that most intussusception are idiopathic and that non operative reduction should be entertained in patients with several late recurrences provided they meet the inclusion criteria for this procedure.

Daneman et al reported 69 recurrent intussusception cases over 17 years. They compared patients with recurrence that underwent air enema and barium enema, and they found that the rates and patterns of recurrence did not change with the different management strategies. Furthermore, they emphasized that the presence of pathological lead points should always be considered in children with recurrent intussusception.¹¹ In our series none of the recurrent cases had to be taken up for laparotomy and hence we propose that recurrence is not a sign of pathological lead point and all with pathological lead point in our series failed to reduce. Champoux et al reported 23 recurrent intussusception cases and attempted to determine the risk factors associated with recurrent intussusception. They found that although recurrent intussusception cannot be predicted by presenting features or symptoms, operative reduction after failed reduction using a barium enema reduced the risk of recurrent intussusception.²¹ In our study all the 37 patients who underwent surgery did not have recurrence but the risk factors associated with recurrence were not analysed in the present study.

Eklöf et al.²² in a series of 658 radiologically diagnosed childhood intussusception reported a markedly reduced rate of successful reduction in infants compared with older children. They concluded that the ileocaecal valve for reasons unknown may be more competent in the very young, and makes it practically difficult to allow the flow of contrast into the terminal ileum infants. In our study also a significant percentage (45%) of children below 6 months needed surgery for intussusception reduction. While the other age groups 6 months to 2 years and above 2 years needed only 25% and 23% surgical correction respectively. The incidence of intestinal perforation during Ultrasound guided saline reduction appears to be low ranging from 0 to 10% in some series.^{14,23,24,25} In our study there was no perforation during procedure. In our department hydrostatic reduction started as early as 1998²⁶. In the initial period we had 1 perforation which was due to inadvertent increase in pressure of inflowing saline and we never had such a complication after wards.

Advantages of Saline Reduction

- Easy and reproducible technique.
- No radiation exposure to the patient or doctor.
- Lesser risk of bowel perforation.
- High success rate comparable to other techniques of non-operative treatment.
- Repeated attempts are easier.

- Residents can be easily trained to perform the procedure.

CONCLUSIONS

Sonoguided hydrostatic reduction has a success rate of 95% in uncomplicated cases of intussusception. An attempt of hydrostatic reduction should be done in all cases except those with features of peritonitis or gangrene, irrespective of duration of presenting symptoms. Even recurrent cases could be successfully managed with hydrostatic reduction. Risk factors associated with recurrence, should be analysed further.

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