

Original Research Article

Study on hydrostatic reduction of intussusception under general anaesthesia without ultrasound guidance

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ABSTRACT

Background: Currently the recommended treatment for intussusception is ultrasound guided hydrostatic reduction under sedation. The procedure is very safe due to real-time visualisation, but inadequate sedation and absence of muscle relaxation may cause difficulty during the procedure. Muscle relaxation under general anaesthesia will make reduction of mass easier. In this context, we conducted this study of hydrostatic reduction of intussusception under general anaesthesia without USG guidance.

Methods: In this prospective study eighty two children were treated for intussusception from January 2010 to December 2010. General anaesthesia was induced and lump was confirmed. Normal saline was infused through Foleys catheter and i.v. drip set into rectum from saline bottle kept 3 feet above operating table. Saline reduction was done, and if not reduced a second attempt was done. Partially reduced or failed cases underwent immediate surgery. In successful cases, reduction was confirmed by ultrasound.

Results: Hydrostatic reduction under general anaesthesia was done in 78 children. In 54 patients (68%) procedure was successful with no residual mass in check ultrasonogram. 24 (30.7%) patients required surgical treatment, immediate surgery in 18 and delayed surgery in 6 patients. Procedure was uncomplicated in 77 patients (98.7%). One patient developed peritonitis due to delayed presentation.

Conclusions: Hydrostatic reduction is treatment of choice in intussusception unless contraindicated. Hydrostatic reduction under general anaesthesia without ultrasound guidance is safe and effective. Hospital stay is less for hydrostatic reduction. Failure with hydrostatic reduction is more if mass extends distal to splenic flexure. Most failed cases were easily reducible by laparotomy.

Keywords: General anaesthesia, Hydrostatic reduction, Intussusception

INTRODUCTION

Intussusception is a common abdominal emergency in children which necessitates prompt diagnosis and management. It is the most common cause of bowel obstruction in children between 3-24 months.¹ Intussusception is the invagination of the proximal bowel into the distal bowel.² The classical triad of intussusception is abdominal pain, vomiting and rectal bleeding. This classical triad is present in only <25% cases.³ The diagnosis of intussusception is most

commonly done by ultrasonogram, which has 100% sensitivity and specificity in the diagnosis of intussusception.

Spontaneous resolution takes place only in less than 5% cases of intussusception. If treated early, almost all cases can be reduced by enema or surgery. If left untreated, lymphatic obstruction, venous congestion, arterial ischemia ensues leading to bowel gangrene of the intussusception, causing perforation, peritonitis, shock and death.

Intussusception can be treated by both operative and nonoperative methods. Nonsurgical reduction can be done if there are no absolute contraindications. Absolute contraindications are peritonitis, perforation and severe dehydration leading to shock.⁵ Now surgical methods are used in the treatment of intussusception only in less than 1% cases.⁶ Recently ultrasound guided hydrostatic reduction; with or without intravenous sedation; using saline or ringer lactate is recommended. In hydrostatic reduction pressure is exerted on the apex of intussusception in the colon until complete reduction is obtained pushing it from pathological to its normal position.⁷ Since the procedure is visualised real time, it is considered very safe. But the child may struggle during the procedure which may cause difficulty. When general anaesthesia is employed, muscle relaxation due to general anaesthesia will also aid in reduction of the intussusception mass. Hence hydrostatic reduction is better done under general anaesthesia. Our department did not have facility of ultrasound in the operation theatre at the time of this study.

The objective of this study was to assess the feasibility and effectiveness of hydrostatic reduction of intussusception under general anaesthesia without ultrasound guidance and to assess the morbidity, outcome, time of hospital stay related to the procedure and administration of general anaesthesia.

METHODS

This was a prospective case series study conducted in the department of pediatric surgery, Government Medical College, Kozhikode, a tertiary care hospital in South India. Total enumerative sampling of all consecutive children meeting the inclusion criteria was done. Inclusion criteria was all children aged 0 to 12 years admitted to our ward with clinical diagnosis of intussusception and confirmed by ultrasonogram during the period from January 2010 to December 2010. Exclusion criteria was previous history of laparotomy, presence of clinical features of peritonitis, shock not corrected by i.v. fluids or radiological features of perforation. Informed consent was taken from the patient's parents. Patient details including nature and duration of symptoms, physical findings and findings on abdominal x-ray and USG were prospectively recorded.

Patients were resuscitated with i.v. fluids, nasogastric suction and antibiotics. After induction of general anaesthesia, the presence of a lump was confirmed by the surgeon. Foleys catheter of the largest appropriate size (14-16F) for the patient was inserted into the rectum and the balloon was inflated up to 30 ml. Normal saline warmed to body temperature was infused through the Foleys catheter with an i.v. drip set, maintaining the saline bottle level at 3 feet above the operating table. Distension towards the left flank and extension towards the right was visible. The flow rate of saline enema was monitored. After initial rapid flow of saline, as the colon

dilates the pressure in the colon increases, progressively reducing the intussusception as evinced by the slowing rate of saline flow. With complete reduction of the intussusception, there was an increase in the flow rate of saline. The abdomen showed central distension when the small bowel became filled with saline. Once reduction was complete, the water was evacuated from the colon and abdomen was re-examined to determine whether there was any residual mass.

Usually one or two attempts each lasting 5-10 minutes are needed. Partially reduced cases of intussusception or complicated cases are to undergo immediate surgical treatment at the same setting. After the procedure, after recovery from GA the child was again subjected to a follow up ultrasound to assess and document the completion of reduction. Persistent mass or cases with features of perforation in the follow up ultrasound were subjected to laparotomy under general anaesthesia. The patients were discharged only when they tolerated regular diet and had normal bowel movement. The results were compared with the published reports of ultrasound guided saline reduction with or without IV sedation. Statistical analysis of various variables was performed using SPSS 17.

RESULTS

Eighty two infants were evaluated and treated for intussusception during the study period. One child was asymptomatic, hence did not undergo any procedure. Two children with peritonitis and one child with intestinal obstruction underwent primary surgical treatment. The remaining 78 children underwent hydrostatic reduction under general anaesthesia. Fifty patients (64.1%) experienced complete reduction of intussusception with saline enema under general anaesthesia which was appreciated by the surgeon conducting the saline reduction by observing the free flow of saline when the mass got reduced. In 14 cases the mass was not reduced even after reasonable attempts of blind reduction. In another 14 cases the status of reduction was doubtful to the surgeon. After evacuating the saline from the colon, abdomen was palpated again. In 18 patients residual mass was palpable (23.1%) including a child who developed perforation. In 60 cases (77%) mass was not palpable. Ultrasound examination was done to assess the completion of reduction in these patients. 53 children (68%) had no residual disease in the check sonogram. One child was reported as having doubtful residual mass, but child was asymptomatic and was just observed.

No further intervention was needed in this child and a repeat ultrasound after 12 hours showed no further evidence of mass. Mesenteric lymph nodes and thickening of ileal wall was reported in two children. Residual mass was reported in 6 children. They underwent delayed surgery after clinically and sonologically proven presence of residual mass (Table 1).

Table 1: Results of hydrostatic reduction of Intussusception without ultrasound guidance (n=78).

	N (%)
Hydrostatic reduction	
Successful	50 (64.1)
Not reduced	13 (16.6)
Doubtful	14 (17.9)
Uncomplicated	77 (98.7)
Perforation	1 (1.2)
Post procedure status clinical	
Mass palpable	17 (21.8)
No mass	60 (77.0)
Perforation	1 (1.2)
Post procedure USG	
Total	60 (77.0)
No residual mass	53 (67.9)
Residual mass	6 (9.0)
Doubtful	1 (1.2)
Recurrence after 24 hours	2 (2.5)
Surgery	
Total	24 (30.7)
Immediate surgery	18 (23.0)
Delayed surgery	6 (7.6)
Easy manual reduction	16 (20.5)
Difficult manual reduction	7 (8.9)
Resection	2 (2.5)

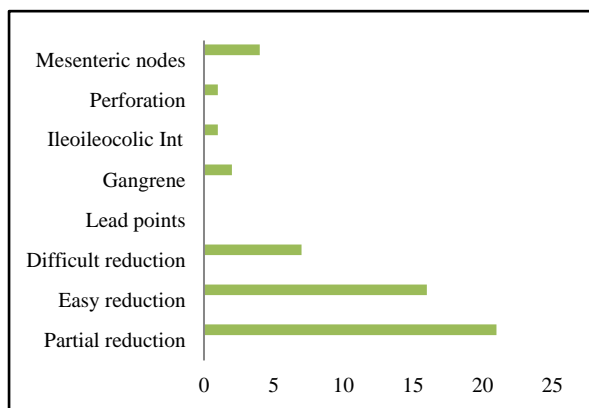


Figure 1: Operative findings in failed hydrostatic reduction.

One child developed perforation while undergoing saline reduction. The surgeon was able to recognize the perforation by noticing the sudden change in the rate of flow of saline and by clinical sign of free fluid in the abdomen. 77 patients (98.7%) did not experience any complication during the procedure. 23 patients (29.5%) required surgical treatment of intussusception. In 18 children immediate surgery was done. This included children in whom residual mass was palpable after evacuation of saline and the child with perforation. In 6 patients delayed surgery was done. Surgical treatment was manual reduction in 21 patients (26.9%), and resection anastomosis in 2 patients (2.6%). All patients

who needed resection and anastomosis presented late (four days after their symptoms started). One child underwent limited hemicolectomy and the child who developed perforation during hydrostatic reduction required extended hemicolectomy for extensive gangrene of bowel extending from ileum to mid transverse colon. During surgery partial reduction of intussusception was noted in 21 patients. Manual reduction was easy in 16 cases (69.6% of operated children) and difficult in 7 patients (30.4%). Pathological lead points were not identified in any of these cases. There were no recurrences in the children who underwent laparotomy (Figure 1).

In those children who underwent successful hydrostatic reduction, two children developed recurrence on 2nd day after being asymptomatic for nearly 24 hours. They underwent repeat hydrostatic reduction, which was successful. There were no major complications after the procedure except mild ileus in 10 cases. Two children had developed seizures on post-operative day 2. Two children had frequent loose greenish stools. There were no deaths in our series (Figure 2).

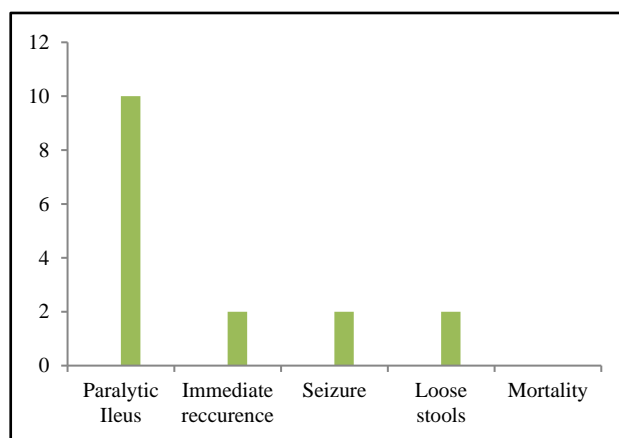


Figure 2: Post procedure and post laparotomy complications.

DISCUSSION

In our study hydrostatic reduction by saline enema without ultrasound guidance was done in 92.85% patients with a success rate of 67.9%. Ultrasound guided hydrostatic saline reduction is currently the most effective treatment modality for the reduction of intussusception. The reported success rate of ultrasound guided hydrostatic saline reduction is 76-95%.¹ Our success rate was lower because the treating surgeons were not aggressive in pursuing non operative method because we were doing by blind method. Joseph et al in their study reported that 81% of the children in their study were managed with saline hydrostatic reduction; the success rate of saline hydrostatic reduction in this study was 94%.⁹ In this study they have concluded that duration of symptoms, age and recurrence of intussusception are not contraindication for conservative

management of intussusception. Niramis et al in their study which addressed the issue how to manage recurrent intussusception has made similar observation.¹⁰ They concluded that recurrent intussusception should be initially treated with non-operative reduction. Laparotomy is needed in cases with failure of enema reduction, suspicion of pathological lead point and in cases with several episodes of recurrence. Bai et al in their study of 5218 patients treated with ultrasound guided hydrostatic reduction reported a success rate of 95.5%. In this study 4.5% patients required surgery.¹¹ Considering the factors influencing outcome of saline reduction, we have observed that age, gender or duration of symptoms did not influence the outcome of saline reduction. We have observed that masses situated distal to splenic flexure has less chance of reduction. Similar observation was made by Takahashi et al in their study which analysed the radiographic signs which predicted the success rate of intussusception.¹² Their study proved that success rate was low if the tip of intussusception was distal to splenic flexure.

In our study surgical intervention was needed in 24 (30.7%) patients. Simple manual reduction was done in 22 patients and resection and anastomosis was done in 2 patients. In majority of cases intussusception was ileocolic which was similar to the finding in many studies. Pathological lead point was found only in one patient. There were no deaths in our series. The reported mortality of patients with intussusception from various reviews ranged between 0 and 3.4%.¹³ The complications observed in our series were ileus, electrolyte imbalance leading to seizure (2 patients) and perforation of colon (1 patient) which was due to delayed presentation. In our series 2 patients had recurrence. The overall recurrence rate after hydrostatic reduction reported in various studies was 4-14%.¹⁰

Our study is limited by the fact that better comparison of efficacy and feasibility of blind hydrostatic reduction under general anaesthesia versus hydrostatic reduction under i.v. sedation with ultrasound guidance would have been possible in a randomised control trial design. Most of the failed cases were easily reducible on laparotomy and manual reduction. Hence increasing the number of repeated attempts allowed in the study protocol, when there are no signs of complications like perforation could have resulted in better success rate.

CONCLUSION

Hydrostatic reduction is the treatment of choice in all cases of intussusception unless contraindicated. Hydrostatic reduction under general anaesthesia without ultrasound guidance is safe and effective. The period of hospital stay is less compared to patients undergoing surgery. Intussusception extending distal to splenic flexure has more incidence of failure by hydrostatic reduction. Repeated attempts of hydrostatic reduction

may be successful in cases with initial failure. Most of the failed cases are easily reducible by laparotomy.

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