

Efficacy of Ultrasound Guided Hydrostatic Reduction of Intussusceptions in Children

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How to cite this article:

Ravindra Devani, Nandkishor Shinde, Abu Hasim Abdul Aziz. Efficacy of Ultrasound Guided Hydrostatic Reduction of Intussusceptions in Children. *New Indian J Surg.* 2019;10(3):331-35.

Abstract

Aim: To study the efficacy of hydrostatic reduction of childhood intussusception using normal saline under US guidance. **Materials and Methods:** This prospective study was conducted over a period of 3 years from February 2016 to January 2019. All Children between three months to five years whose ultrasound scan shows Intussusception, symptoms of intussusception less than 48 hours and no features of peritonitis or intraperitoneal free gas were included in the study. Informed written consent was taken from the patient's guardian for hydrostatic reduction. The child was sedated with midazolam and ketamine. A Foley's catheter of size 14 Fr to 18 Fr were used according to the age of the child. Catheter was lubricated with 2% lignocaine gel and introduced into the rectum. The balloon of Foley's catheter inflated with 10-15 ml distilled water, Catheter was connected with warm normal saline bag and flow of saline was allowed into the rectum. The saline bag was suspended on a drip stand at approximately 100 cm from the patient's bed level. The ultrasound was then used to guide the reduction till the intussusception went beyond the ileocaecal valve. Complete reduction was assumed once intussusceptum was disappeared and passage of saline through the ileo-caecal valve into the ileum seen. **Results:** This study was done on total 35 patients diagnosed with intussusceptions, 21 males (60%) and 14 females (40%), the age ranged between 3 month and 5 years. Abdominal USG and

plain X-ray were done for all patients. Abdominal pain was seen in 32 patients (91.4%), bilious vomiting in 30 patients (85.7%), rectal bleeding in 12 patients (34.3%), abdominal distension in 18 patients (51.4%), palpable abdominal mass was seen in 14 patients (40%) and absent bowel sound was seen in 12 (34.3%) patients. Volume of Normal saline required for reduction ranged from 300ml to 1300ml. Three of the children had recurrent intussusceptions. Two occurred a day after the procedure and one recurrence was noted four months later. In three patients (8.6%), US Guided hydroreduction of intussusception failed and they underwent surgical exploration. **Conclusion:** Ultrasound guided reduction of intussusception with saline is safe and effective method with high success rates with minimal morbidity or mortality due to the procedure.

Keywords: Intussusception; Hydrostatic Reduction; Ultrasound.

Introduction

Intussusception is the telescoping of the portion of intestine into the adjacent portion of the intestine. It is one of the common causes of bowel obstruction in children [1,2,3].

The triad of vomiting, pain abdomen and per rectal bleeding occurs in every third case. There are no signs and symptoms that are classic to the all the patients of intussusception, which may leads to delay in the diagnosis [4].

Ultrasound has been used to diagnose this condition with a high specificity and sensitivity of nearly 100% [2]. In 1982, Kim and his group did the first ultrasound guided hydrostatic reduction (USGHR) with normal saline [2].

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Received on 20.02.2019, Accepted on 26.03.2019

Operative and non-operative reduction used for the management of intussusception, there is a long history supporting non-surgical reduction of intussusceptions [5]. With widespread of ultrasonography (USG), many centres start using hydrostatic reduction with ultrasound guide for treatment of intussusception, the perforation risk of hydrostatic reduction has been reported as 0.1%–3% [5,6].

Liquid reduction of intussusception is done with barium, iodinated contrast material, or saline and having the risk of electrolyte disturbances and contamination [7,8,9].

Pneumatic reduction is performed with air, CO₂, or oxygen through a rectal catheter at a mean pressure ranging between 80 to 120 mm Hg. This type of reduction causes less radiation exposure and lower risk of peritoneal contamination if perforation occurs [10,11].

Pneumatic reduction perforation causes less morbidity than Ultrasound guided hydrostatic reduction which causes significant peritoneal soiling following perforation. However, the benefits of using air for treatment of intussusception has been questioned recently, with a greater risk of perforation and the possibility of developing a tension pneumoperitoneum [2,10,11].

We studied Ultrasound guided hydrostatic reduction of childhood intussusception with normal saline, with the idea of reducing exposure to radiation and decreasing the risk of peritoneal contamination if iatrogenic perforation occurs during reduction.

Materials and Methods

This prospective study was conducted over a period of 3 years from February 2016 to January 2019.

All Children between three months to five years whose ultrasound scan shows Intussusception, symptoms of intussusception less than 48 hours and no features of peritonitis or intraperitoneal free gas were included in the study.

Children with symptoms of intussusception more than 48 hours, recurrent intussusceptions, features of peritonitis or intraperitoneal free gas and haemodynamically unstable were excluded from the study.

Informed written consent was taken from the patient's guardian for hydrostatic reduction. An intravenous line was set up and blood samples were

taken for electrolytes and cross-matching. Then the patient was resuscitated and the naso-gastric tube was inserted. Blood pressure and pulse rate were monitored during the procedure. Intravenous antibiotics (Ceftriaxone & Metronidazole) were administered and all the preparations needed for the surgery was made as a safety, in the case of emergency, when the procedure failed. Vital signs were recorded. The children were sedated with midazolam and ketamine.

A Foley's catheter of size 14 Fr to 18 Fr were used according to the age of the children. Catheter was lubricated with 2% lignocaine gel and introduced into the rectum (5 cm. from the anal verge). The balloon of Foley's catheter inflated with 10- 15 ml distilled water, Catheter was connected with warm normal saline bag and flow of saline was allowed into the rectum. The saline bag was suspended on a drip stand at approximately 100 cm from the patient's bed level.

The ultrasound was then used to guide the reduction (Fig. 1) till the intussusception passed beyond the ileocaecal valve. Complete reduction was considered once intussusceptum was disappeared and passage of saline through the ileo-caecal valve into the ileum seen.



Fig 1: USG showing Target Sign of Intussusception.

Successful reduction was evaluated as the saline administered through Foley's catheter being visualised under USG passed to the proximal of the invaginated segment. In unsuccessful cases, if some movement of the mass was present and child had no abdominal signs 2nd attempt was taken after minimum 30 min interval. Afterwards, Foley's catheter was removed and saline drained through the anus.

Clinical condition of the patient was closely and carefully monitored throughout the procedure. After 48 hours review US was done for follow-up and if no intussusceptions, oral feed started.

Antibiotic was administrated to all patients before and after hydrostatic reduction to prevent bacterial translocation; IV administration was done before hydrostatic reduction and the patients continued on oral antibiotics for 5 days.

Statistical analysis was performed using SPSS software.

Results

This study was done on total 35 patients diagnosed with intussusception in Paediatric Surgery Unit, 21 males (60%) and 14 females (40%), the age ranged between 3 month and 5 years (Table 1). Abdominal USG and plain X-ray were done for all patients. Abdominal pain was seen in 32 patients (91.4%), bilious vomiting in 30 patients (85.7%), rectal bleeding in 12 patients (34.3%), abdominal distension in 18 patients (51.4%), palpable abdominal mass was seen in 14 patients (40%) and absent bowel sound was seen in 12 (34.3%) patients (Table 2).

Table 1: Age Distribution

Age group	Number	Percentage
3months to 1 years	10	28.57%
>1 years to 3 years	16	45.71%
>3 years to 5 years	9	25.71%

Table 2: Presenting complaints

Presentation	Number	Percentage
abdominal pain	32	91.4%
Vomiting	30	85.7%
Blood in stool	12	34.3%
Abdominal distension	18	51.4%
Abdominal mass	14	40%
Absent bowel sound	12	34.3%

In three patients (8.6%) the intussusception was seen up to the descending colon, 12 of the patients (34.3%) up to the transverse colon, 14 patients (40%) up to the hepatic flexure, and 6 patient (17.1%) had the intussusception up to the ascending colon. The duration of the procedure were ranged between five minutes to twenty minutes. Volume of Normal saline required for reduction ranged from 300ml to 1300ml (Table 3).

Table 3: Volume of fluid needed for reduction

Volume	Number	Percentage
300- 500ml	12	34.3%
500-1000ml	20	57.14%
1000-1300ml	3	8.6%

Three children had recurrent intussusception. two occurred within 24 hours after the procedure and both on surgical exploration found Meckles diverticulum as leading point and one recurrence was four months later which on surgical exploration found intraluminal polyp as leading point.

In three patients (8.6%), US Guided Hydroreduction of intussusception failed and underwent surgical exploration (Fig. 2). Of these three patients two had meckles diverticulum as leading point with ischemic changes in bowel which was managed by bowel resection and anastomosis. For the remaining one had inflamed payer's patches as leading point which was reduced manually during surgery. In all of these patients the intussusception was up to the transverse colon.



Fig. 2: Intraoperative showing telescoping of small bowel into the colon.

Discussion

It is commoner in males than females. In our study the male to female ratio was 1.5:1 which

compares with other studies [2,3].

The majority of findings in intussusception patients are non-specific, but in our study, most of the patients presented by abdominal pain, bilious vomiting and abdominal distension. These results match with other results in literature [4,12].

Ileocolic intussusception is the most common type of intussusception in our study, There were no case of colo-colic, ileo-ileo-colic intussusceptions, this compares with other studies [2,13].

For diagnosis and guidance for hydrostatic reduction of intussusceptions, most institutes use high resolution ultra-sound. It has sensitivity between 98–100% in various series [14]. On ultrasound signs like target sign, pseudokidney sign and doughnut sign are described in intussusception. The absence of blood-flow in mesenteric vessels on Doppler and presence of free fluid in abdomen suggest intestinal ischemia and perforation respectively; hydrostatic reduction should be avoided in such cases. The small amount of fluid within the head of intussusceptum ('crescent' sign) and thickness of the outer portion of intussusceptum measuring more than 14 mm suggest unsuccessful reduction [14]. The use of barium enema under fluoroscopic guidance for reduction has the disadvantage of radiation exposure. Sonography has no risk of radiation, is cheaper than costly barium, it can be done at bedside and is repeatable [14].

Duration of symptoms and success of hydrostatic reduction has been studied previously; which has concluded that the duration of symptoms does not influence the success rate with hydrostatic reduction [5]. In our study, we found that short duration of symptoms were associated with better outcome.

In our study, successful reduction was 91.4% which was similar with the findings of the other studies [8,15,16,17,18] where ultrasound guided hydrostatic reduction had the success rate more than 82% [8,15,16,17,18].

Recurrence rate after non-operative reduction of intussusceptions were between 5 to 20% with a mean of 10% [19,20]. Recurrent intussusceptions due to pathologic lead point had higher incidence of recurrence about 8 to 9%. Most of the recurrent intussusceptions occurred within 48 hours but recurrences up to 1.5 years had been documented [19,20]. In our study also recurrence rate was 8.5%, which was similar with the other studies [8,15,16,17,18].

Surgery is indicated for recurrence of intussusception, many surgeons would only

operate on second recurrence [21]. In our study, we also operated all cases of recurrence within one year follow up.

There is a risk of bacteremia and sepsis after nonsurgical reduction of intussusceptions [22] but in our series no child had developed sepsis. A course of antibiotic was administered post-reduction as a precaution.

Hydrostatic reduction using normal saline for intussusceptions in children was a safe, simple, cost-effective, prevents the exposure of children to radiation and was associated with almost no complications and a less hospital stay.

We reported 91.4% success rate, with no morbidity or mortality due to the procedure. This procedure is recommended as the preferred treatment over surgery in selected patients which avoids surgery related complications.

Conclusion

Ultrasound guided reduction of intussusception with saline is safe and effective method with high success rates with minimal morbidity or mortality due to the procedure.

Conflict of Interest: Nil

Financial Support: Nil

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