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RESEARCH ARTICLE

ULTRASOUND GUIDED PNEUMATIC REDUCTION OF INTUSSUSCEPTION IN CHILDREN- A CASE SERIES

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ABSTRACT

Background

Intussusception is one of the most common paediatric emergencies, and an important cause of small bowel obstruction in children. Diagnosis and treatment of intussusception is a combined effort among the paediatrician, the paediatric radiologist, and the paediatric surgeon. For many years, open surgery has been its mode of treatment worldwide, but since few years, there is a paradigm shift in its management from immediate laparotomy after resuscitation to non-operative management.

Aim

To asses the USG-guided pneumatic reduction of intussusception in children.

Patients And Methods

A prospective case series study of 50 children admitted to a Tertiary care Hospital, at Hyderabad with a diagnosis of acute intussusception between May 2012 to April 2014 were included in the study. All children clinically suspected of having intussusception were evaluated by real time ultrasonography and those with positive findings were entered into the study.

Results

Out of 50 children enrolled in our study, 45 patients were subjected to pneumatic reduction and among the remaining 5 cases, 4 children had spontaneous reduction and one child was directly subjected to surgery due to septicaemia. Successful reduction was seen in 38 (84.4%) of the cases and failure of reduction was seen in 7 (15.55%) of cases.The cases with failed reductions were explored surgically. In two cases manual reduction was done and definitive lead point was noted in 5 cases, out of which two children had meckel's diverticulum, two had gut associated lymphoma and one child had appendix.These results clearly state that pneumatic reduction of intussusception can fail only in the presence of lead points or in cases of loss of bowel vascularity.

INTRODUCTION

Intussusception is a process in which a segment of intestine invaginates into the adjoining intestinal lumen causing bowel obstruction [1].The treatment modality of intussusception has always been a matter of debate [2].The identification of the fact that intussusception can be reduced by enema techniques has triggered the methodologies of non-operative reduction and shifted the management protocol of intussusception from operative to non-operative reduction. The current non-operative methods which are being used in the management include hydrostatic and pneumatic method, i.e. giving enema, by using fluid or air. Barium has been the gold standard for many decades. Ginai [3] in an experimental study of various contrast agents, found that barium causes long lasting granulomas in the peritoneal cavity, marked peritoneal reactions, and retroperitoneal lymphatic and lymph node involvement in rats. The use of air or saline solution helps to avoid this morbidity when perforation occurs. There was also a controversy which existed in the use of hydrostatic barium and pneumatic enema reduction technique, as to which technique was better. But whatever the controversy between barium enema and air enema reduction, these methods anyhow involved radiographic monitoring and the patient being exposed to the risk of ionizing radiation and its hazards.

USG has been proven to be a reliable and accurate method in diagnosis of intussusception in infancy and childhood. Due to its accuracy and with the advent of Real time USG , some have advocated new techniques of reduction of intussusception under USG guidance by using saline or air. The advantages of the USG guided pneumatic reduction techniques are , absence of radiation exposure, high accuracy and reliability for monitoring the reduction process, easy and early detection of perforation with minimal soiling of peritoneum and possible improvement of reduction rates[4].,in addition to less morbidity and less colonic perforations [5].

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Accurate estimates of conservative and surgical management of intussusception and study of best possible management modality are not available for most of the developing and developed countries [6]. (WHO/V & B/02.19).Hence to determine these and to confirm the role of ultrasound guided pneumatic reductions for acute intussusception, its success rates and complications, this study was initiated.

PATIENTS AND METHODS

This is a prospective case series study where in 50 children who were admitted in a Tertiary care Hospital, Hyderabad with a diagnosis of acute intussusception from May'2012 to April 2014 were included in the study.

After thorough history taking and physical examination including per rectal examination, all children clinically suspected of having acute intussusception were evaluated by real time ultrasonography and those with positive findings on sonography confirming intussusception were entered into the study.

Inclusion criteria

1. Ultrasonographically diagnosed case of intussusception.
2. Age below 12 years.

Exclusion criteria

1. Child presenting with signs of peritonitis.
2. Child with X-ray findings of bowel perforation.
3. Child presenting with features of shock.

Ultrasound criteria

1. Visualization of intussusceptum, seen as a doghnut shaped or target shaped configuration on transverse images with hypo-echoic edematous bowel surrounding a central area of increased echogenicity.
2. Pseudo-kidney appearance on longitudinal image.
3. The single concentric ring representing the swollen terminal ileum instead of the multiple concentric rings (TARGET SIGN) of intussusception.
4. The abrupt transition of bowel wall thickness between the swollen terminal ileum and the proximal normal ileum when scanned along the long axis of the ileum.
5. Additional ultrasonographic criteria were a double or multiple or concentric ring sign and an atypical target sign with fluid filled centre.

Pseudo-kidney sign

Procedure for USG guided pneumatic reduction

An appropriate sized three way Foley's catheter (20-22 Fr), is inserted into rectum of the patient till the bulb is in the rectum proper and balloon is inflated with air to its capacity. A portable sphygmomanometer dial is connected to one of the port and the air pump is connected to the other port of the foley's catheter.

Air is insufflated under USG control, the intra colonic pressure being maintained between 80-120 mm of Hg. The pressure chosen depends on patient age, low pressure in a young child. The pressure may fluctuate during insufflation or when the patient is crying or straining and it can also drop between insufflations.

The reduction process is then tracked by means of an ultrasound scanning probe throughout the procedure. The intussusceptum reduces gradually through the ileo-caecal junction with increasing intra-colonic pressure. The procedure is stopped once the clinical and ultrasonographic criteria for reduction of intussusception are met under ultrasound guidance.

If pneumatic reduction is unsuccessful even after maintaining pressure for half to one minute, the procedure is repeated again usually after a rest period of 5-10 minutes. The limit to number of attempts of reduction was based on the sonographic evidence of reduction process and patient's clinical condition. The limit of maximum number of attempts at one sitting was kept as five in our study. Patients with successful reduction were kept in the ward under observation for 24-48 hours with abdominal girth charting; nasogastric aspiration and antibiotic cover. A review USG is done after 48 hours to look for any recurrence of intussusception. Before discharge child had per rectal examination to rule out any intra-procedural complications like rectal tear. All cases were followed up on monthly basis.

Pneumatic reduction apparatus

USG-guided pneumatic reduction procedure

RESULTS

Out of 50 cases enrolled in our study 45 cases were subjected to pneumatic reduction under USG guidance and among the remaining 5 cases, 4 children had spontaneous reduction and one child was directly subjected for surgery due to septicaemia.

Successful reduction was seen in 38 (84.4%) of the cases and failure of reduction was seen in 7 (15.55%) of the cases.30 (78.9%) of the cases underwent successful reduction at the first attempt itself, 4 cases(10.52%) at second attempt, 3 cases (7.89%) in the third attempt, and I case (2,6%) in fourth attempt. No complications like intestinal perforations and rectal tears were observed in our study.

The cases with failed reductions were explored surgically. Among the 7 cases with failed reduction; Manual reduction was done in 2 cases (25%) as repeat pneumatic reduction failed probably due to delayed presentation of the child. In one case appendix was found to be the lead point for the development of intussusception so appendectomy was done after manual reduction of intussusception. In two cases ileo-caecal complex mass along with ileo-caecal junction was resected and continuity restored by an ileo-ascending anastomosis, both these cases presented with abdominal distension, electrolyte disturbance and anemia. Histopathology report came as gut associated lymphoma in both the cases, thus both the patients were referred for chemotherapy. In the remaining two cases, Meckel's diverticulum was found to be the lead point hence resection of the meckel's and end to end anastomosis was done after manual reduction of intussusception.

DISCUSSION

Out of 45 cases that were subjected to pneumatic reduction of intussusception under ultrasonographic guidance in our study, successful reduction was seen in 38 (84.4%) of the cases. That is a little lower than the previous results obtained by Hadidi *et al* in 1999 [7] and El Saket in 2004 [8] giving a success rate of 90%. However our success rates of 84.4% is higher than those of SupikaKritsaneepaiboon *et al* 74% [9] and M A Zulfiqar *et al* 73% [10], K M Kiran Kumar *et al* 76% [11] Niramis *et al* 67.1%

No perforations were seen in our study in contrast to perforations seen in various studies including those by SupikaKritsaneepaiboon *et al* [9],yoon *et al* [12], Niramis R *et al* [13].

Faliure of reduction was seen in 7 (15.55%) of the cases. The cases with failed reductions were explored surgically. In two cases manual reduction was done and definitive lead point was noted in 5 cases, out of which two children had meckel's diverticulum, two had gut associated lymphoma and one child had appendix. These results clearly state that pneumatic reduction of intussusception can fail only in the presence of lead points or in cases of loss of bowel vascularity.

CONCLUSION

With the review of available literature and observations made in our study, the standard mode of treatment in a child with intussusception is non-operative. The present study on USG-guided pneumatic reduction in children with acute intussusception, shows that USG is simple and reliable method of diagnosis of intussusception. The success rate achieved by USG-guided pneumatic reduction of intussusception is high with no or very few complications. The entire reduction process can be followed on real time USG and in cases of non-reduction or partial reduction repeated attempts can be safely performed in the same setting. The occurrence of surgical lead points increases with age and indicates that the probability of non-operative reduction is unlikely, however USG-guided pneumatic reduction can still be safely tried in such cases.

The use of USG for guiding reduction also has the added advantage of avoiding hazardous radiation exposure to the child as well as the attending surgeon, our data in this study suggests that pneumatic reduction performed under USG-guidance is simple safe reliable accurate and less messier technique for paediatric intussusception with high success rates.

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