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RESEARCH ARTICLE

OUR EXPERIENCE IN ULTRASOUND GUIDED SALINE REDUCTION IN CHILDHOOD INTUSSUSCEPTION.

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Abstract

To study the feasibility and efficacy of ultrasound guided saline reduction of acute intussusception in children who present early. Materials and Methods: Thirty five children with intussusception were subjected to saline reduction. Results: Of the thirty five patients who underwent this procedure, all had complete reduction of ileo-colic intussusception. Two had recurrence after total reduction and re-reduction failed. The patients then underwent laparotomy. Conclusion: Ultrasound guided saline reduction for childhood intussusception is safe and may be an effective alternative method in the non-operative management of intussusception.

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Introduction:-

Intussusception is a common abdominal emergency in infants and children. A lot of debate exists regarding the best method for diagnosis and treatment. In our set up, most children with intussusception come to us late and only a few satisfy the criteria for non-operative hydrostatic reduction. Whenever hydrostatic reduction of intussusception is feasible, barium enema has been considered the gold standard. However recently, alternative methods using air [1], oxygen [2] and ionic water soluble iodinated contrast media [3] have been reported.

As the diagnosis of intussusception can be easily made out by ultrasound, we tried hydrostatic reduction of childhood intussusception using water under US guidance, with the idea of reducing exposure to radiation, lessening absorption of radiation by the contrast media and decreasing potential peritoneal contamination in the event of iatrogenic perforation during attempted reduction

Materials and Methods:-

In 2016, 50 patients in the age group of three months to 11 years presented to us with signs and symptoms suggestive of intussusception of which 32 were boys and 18 were girls. US guided saline reduction was attempted in 35 of these patients. Only those patients who did not have signs of peritonitis, perforation and/or shock were taken up for hydrostatic reduction. The diagnosis was made by visualization of a doughnut or target-shaped mass on transverse images (hypoechoic edematous bowel surrounding a central area of increased echogenicity) and a pseudo-kidney appearance on the longitudinal images.

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The technique of ultrasound guided saline reduction used by us was the same as that for conventional hydrostatic barium reduction, in which barium and fluoroscopy were replaced by water and real-time ultrasonography. All US examinations were performed with a 5-MHz curvilinear pediatric probe (Hitachi, Japan). The reduction was attempted with the reservoir at a height of 4-5 feet (equivalent to 90-110 mm of Hg) above the table, occasionally taking it upto 5.75 feet (equivalent to 130 mm of Hg) to achieve the maximum pressure. (A 1-foot saline column is equivalent to a 22.6 mm Hg column. The pressure values at the distal end of the rectal tube were calculated by multiplying the total length of the water column by its specific gravity i.e. 1). Through an appropriately sized Foley's catheter 500 to 1000 ml of saline under US control. The intussusceptum was observed to move backward gradually to the ileocecal region with increasing pressure. The procedure was continued till the intussusceptum disappeared completely and the distal ileum was filled with water.

The four distinct findings on US suggesting successful reduction were:-

- Disappearance of the intussusceptum,
- Visualisation of reflux of water and air bubbles through the cecum and ascending colon into the ileum through the ileocecal valve
- Demonstration of water distended ileum and
- Absence of intussusceptum noted during the post-evacuation US examination.



(target sign in ultrasound)



(ultrasound image after saline reduction)

Once reduction was complete, the saline was evacuated from the colon and the abdomen was re-examined to determine whether there was any residual lesion or recurrence of intussusception. Usually one or two attempts each lasting 5-10 minutes were needed. After successful reduction, the patients were discharged only when they tolerated a regular diet and had normal bowel movement.



(colon cut off sign in x ray abdomen)

Results:-

Thirty five patients were subjected saline reduction of the intussusception. Complete reduction was possible in all 35 patients. Two had recurrence after total reduction and re-reduction by saline reduction failed. The patients then underwent laparotomy with findings of a partially reduced ceco-colic intussusception for which manual reduction was done. None of the patients had any complications during or after hydrostatic reduction.

Discussion:-

Intussusception is a common cause of intestinal obstruction in infancy and early childhood. Use of an enema for nonsurgical reduction of ileocolic intussusception in infants and children was initiated more than 80 years ago [4],[5]. For a long time, the enema was given only under general clinical and local palpatory guidance. Reports on pressure and fluoroscopy-guided methods did not start appearing until 40 years ago. In Western countries, the main contrast media used for this procedure were barium sulfate suspension and, later, water-soluble contrast medium mixtures [6],[7]. Rectal insufflation of air is preferred in China and Argentina, where intussusception is particularly frequent [8],[9]. The use of air or oxygen to reduce intussusception was accepted in North America and Europe a little more than 10 years ago [10],[11].

The initial management of intussusception has changed and new methods are being continuously investigated to avoid radiation exposure and barium peritonitis. Hydrostatic reduction under US guidance was first described by Kim et al in 1982 [12].

The first large series comprising of 377 children treated with this methodology was reported in 1988 [13]. The technique of saline reduction is essentially the same as that for conventional hydrostatic barium reduction, with barium and fluoroscopy replaced by water and real-time US. The use of color Doppler US has also been reported recently [14],[15].

Many workers prefer to use a combination of Ringer lactate/saline with a water soluble contrast medium, so that sonographic reduction is quickly reconfirmed by a short fluoroscopic and radiographic documentation. The fluoroscopic confirmation does not significantly add to radiation doses but on the contrary raises one's confidence levels significantly [16].

Unlike the patients seen in developed countries, many of our patients display clinical and/or radiologic contraindications to non-surgical reduction. The absolute contraindications to hydrostatic reduction are:-

Severe dehydration

Marked abdominal distension

Clinical features of peritonitis or demonstration of free intraperitoneal air on a plain abdominal radiograph.

Relative contraindications Are:-

History longer than 48 hours

Extremes of age - patient less than three months of age or more than two years

Dehydration more than five percent.

Small bowel obstruction on plain radiographs [12],[17]

US demonstration of a thick irregular rim of the target measuring more than 10 mm [18],

Absent Doppler signal on a color Doppler signifying non-viable bowel [15].

Ultrasonic demonstration of a lead point [19].

The advantages of using saline reduction for reduction of intussusception are:-

There is no risk of x-ray exposure.

It can trace the change of the mass closely, both on transverse and longitudinal scans and can provide a clear echogram: definite criteria of reduction can be obtained.

Ileo-ileo-colic intussusception can be diagnosed during reduction.

The reduction process can be directly watched in a lit room and at the same time changes in the child's general condition, including breathing and abdominal distension can also be assessed.

Intestinal perforation during reduction can be accurately and promptly recognised, when the management is simple, reliable and safe.

In cases where partial reduction is achieved, the operating time is markedly reduced.

Conclusion:-

Acute intussusception is a surgical disease managed by the pediatric surgeon and radiologist as a team. We believe that with more experience in the use of saline reduction for reduction of intussusception, we will be able to avoid the use of barium. Saline reduction is an effective alternative method of non-operative treatment of childhood intussusception.

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