

# Study of Factors Influencing Pneumatic Reduction of Intussusception in Children in Tumkur, South India

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## Abstract

**Background:** Pneumatic reduction of intussusception, a non-operative treatment is better than saline or barium reduction.

**Aims & Objectives:** To study the factors affecting pneumatic reduction of ileo-colic intussusception in children.

**Materials and Methods:** A cross sectional study was done with 53 children aged <2 years with ileo-colic intussusception between January 2010 to December 2013.

**Results:** 38 (76%) early cases were pneumatically reduced and failed in 12 (24%) late cases. We studied 10 factors responsible for irreducibility seen.

**Conclusion:** Success of Pneumatic reduction is multifactorial, depending on clinical, radiological and sonological factors. It can be safely performed in selected patients and avoids operation and anesthesia in small children. Also predictors of irreducibility can avoid unnecessary pneumatic reduction in late cases and early operation can be done.

**Keywords:** Intussusception, Pneumatic Reduction

## INTRODUCTION

Ileo-colic Intussusception (ICI) in children is a common surgical emergency.<sup>1</sup> Majority of ICI (Primary/idiopathic) in children aged <2 years are non-specific (infective) Viral Gastro-enteritis induced ileal hyperplastic Payer's patches acting as lead points (LP) requiring urgent Laparotomy and Reduction. In 2-8% cases (Secondary), in children aged >2 years there are specific (non-infective) LP viz., Meckel's diverticulum, polyp, enterogenous cyst, hemangioma or adenoma<sup>2,3</sup> requiring Laparotomy and Resection. The intussusceptum drags its mesentery leading to lympho-venous congestion and ischemia. Delayed diagnosis and treatment leads to gangrene and perforation<sup>4</sup> mandating operation. Ultrasonography (USG) the imaging of choice<sup>2</sup> is 100% accurate<sup>5</sup> identifying 66% of LP<sup>6</sup> Non-operative treatment methods are Saline, Barium and Pneumatic reduction (PR)<sup>1,2</sup> with the latter having more success and less chances of perforation.<sup>1,2,4</sup> Non-operative reduction is not done for secondary ICI, as they have specific

LP requiring Laparotomy and Resection. Compared to ICI, small bowel (ileo-ileal, jejuno-ileal, or jejunojejunal) intussusception is less likely to be reducible by non-operative reduction.<sup>7,8</sup>

## MATERIALS & METHODS

Cross sectional study was carried out between January 2010 and Dec 2013. All children aged <2 year with clinically suspected ICI were confirmed sonologically and included. Children in shock and peritonitis were excluded. A proforma including age, gender, clinical features, Leukocyte count, radiological and sonological findings were recorded. Plain X-ray abdomen ruled out bowel obstruction, ascites and pneumoperitoneum. USG findings i.e., location of the intussusceptum, colonic wall thickness, entrapped fluid, color flow, small bowel obstruction, enlarged mesentric nodes, and ascites were recorded.

## Procedure

Child was made to lie on the Fluoroscopic table without any anesthesia. A tri-way 14F Foley's catheter was introduced per-rectally, bulb inflated, and buttocks were strapped. Second side tube of Foley's catheter was connected to sphygmo-manometer and third to an inflating bulb. Air was gradually inflated under fluoroscopic guidance and controlled pressure not exceeding >120 mm Hg. Initial location of intussusceptum was noted. PR was considered complete when air was observed entering the ileum (cecal reflux) upto 10 cm or more. A "nil cecal reflux" was considered as irreducible (IR) or failure and was operated. All the successful PR cases were reconfirmed by USG, admitted, maintained on IV fluids, observed for 24 hours, feedings were resumed the next day and later discharged. Parents were advised to report immediately if symptoms recurred.

## RESULTS

Of the total 59, 6 cases >2 years age were eliminated. In the remaining 53 aged <2 years, 5 were excluded (shock 4, perforation-2). Of the 47 included, 3 had recurrence making it 50 attempts. PR was successful in 38 (76%) early cases, and failed (IR) in 12 (24%) late cases who were operated. In PR group the children were referred early and easily reduced. Whereas 12 cases presented late were irreducible. The features of late presentation were dehydration/hypovolemia, illness/lethargy, abdominal lump, duration of symptoms for >24 hours, rectal bleed, bilious vomiting, fever, leukocytosis, sonological features suggesting tight intussusception and radiological features of bowel obstruction (Table 1).

## DISCUSSION

Majority were male (3:2)<sup>1-3</sup> with mean age of 11 months, successful PR in 76% cases (other studies 74%,<sup>1</sup> 51% - 95%<sup>9</sup>) and peak incidence during summer as in other studies.<sup>10</sup> We had 10 predicting factors of IR viz., Non-hydration/hypovolemia, ill look/lethargy, Lump abdomen, Colicky abdomen/Crying child for >24 hours, Rectal bleed, Emesis of bile, Fever, Leukocytosis, USG and X-ray finding. During PR, cecal reflux into ileum suggests complete reduction. A "nil cecal reflux" suggests IR whose predictors can be remembered by the mnemonic "NIL C REFLUX", also letters LCR stands for Lump, Colic and Rectal bleed which form the clinical triad of ICI (Table 1).

Nonhydration/Hypovolemia due to previous diarrhoea, vomiting, anorexia and third space loss due to ascites was seen all the 12 IR cases. Ill look/lethargy, a late sign was seen 8 of IR group, of which 3 were unconscious and 1 had convulsions due to dyselectrolytemia. In PR group all were active. Lump abdomen is an important sign, but its

absence does not rule out ICI. The ileum intussuscepts into the right colon, then into the transverse colon forming a sausage shaped lump making an empty right iliac fossa. Lump is unfelt in early cases and difficult to feel in crying child. It has to be felt when the child relaxes between the colics. In PR group only in 10 and in IR group lump was felt in all the 12. Symptoms for >24 hours duration, abdomen colic in older children and incessant or inconsolable cry in preverbal children is the most consistent factor as in other studies.<sup>1</sup> In our study, duration of symptoms was <24 hours in 35 cases and >24 hours (late presentation) in 15 cases. All among the 35 early cases and 3 among the late 15 had successful PR. Among the late 12 had symptoms for >36 hours were IR and operated with 3 gangrenous bowel requiring resection. Rectal bleed due to venous congestion of the intussusceptum, mixes with the excessively produced mucus resembling red currant jelly<sup>2</sup> predicting irreducibility. In the PR group with 8, but in IR group all had rectal bleed. 5 cases in IR group were referred late, as diarrhoea with blood and mucus which was confused to be desentry resulting in gangrene in 3. Also the rectal bleed is a sign of bowel ischemia, hence PR to be done meticulously as the bowel at risk for perforation. Emesis of bile, a late feature due to bowel obstruction was 2 in PR group 10 in IR group. Non-bilious vomiting is common in early cases which is reflex and non-specific,<sup>2</sup> was seen in 24 cases in PR group. Fever and Leukocytosis signs of early sepsis and IR predictor. Of the IR 8 had fever and 3 has leukocytosis. However after PR fever is noted due to release of endotoxins or bacterial translocation. USG is 100% accurate in diagnosing intussusception<sup>1,2,5,11</sup> with findings viz, location of intussusceptum, colonic wall thickness (intussuscepti) >10 mm, entrapped fluid, free fluid, reduced color flow, bowel obstruction are predictors of IR. Mirilas et al. achieved 100% successful hydrostatic reduction when colonic wall is <7.2 mm.<sup>12</sup> In our study 14 had IR findings on USG. Of which 2 had PR with difficulty and repeated attempts and 1 got perforated during the procedure requiring operation indicating failed PR. 11 were irreducible. Location of intussusceptum is important as Proximal (ascending and transverse colon) intussusception (30) are easy for PR. 20 were distal (descending and sigmoid colon) are difficult (8) and most of them (12) are IR (Table 2). X-ray abdomen rules out pneumoperitoneum and intestinal obstruction which are predictors of IR. 3 cases with pneumoperitoneum were excluded and 9 with bowel obstruction were irreducible, due to tightness between the intussusceptum and intussuscepti. Also the dilated bowel loops will interfere with visualisation of PR.

Operation was done for 12 IR cases, 7 were very tight intussusceptions with serosal splits requiring very meticulous manual reductions. Gangrenous bowel in 4 and perforation in 1, requiring resection and anastomosis.

**Table 1: Irreducibility factors in PR and IR group**

| Sl. no. | Irreducibility predictors (NIL C REFLUX) | No. of cases | PR group (n=38) | IR group (n=12) |
|---------|--|--------------|-----------------|-----------------|
| 1       | Non-hydrated/hypovolemia                 | 12           | Nil             | 12              |
| 2       | Ill look                                 | 8            | Nil             | 8               |
| 3       | Lump abdomen                             | 22           | 10              | 12              |
| 4       | Colicky abdomen/Cry >24 hr               | 15           | 3               | 12              |
| 5       | Rectal bleed                             | 20           | 8               | 12              |
| 6       | Emesis of bile                           | 2            | 10              | 12              |
| 7       | Fever                                    | 8            | Nil             | 8               |
| 8       | Leukocytosis                             | 8            | Nil             | 8               |
| 9       | USG features of IR                       | 14           | 2               | 12              |
| 10      | X-ray features of bowel obstruction      | 9            | Nil             | 9               |

**Table 2: Location of intussusception in PR and IR group**

| Location of intussusceptum | No. | PR group | IR group |
|----------------------------|-----|----------|----------|
| Proximal colon             | 30  | 28       | 2        |
| Distal colon               | 20  | 10       | 10       |

Recurrence was seen in 3 cases within a month in PR group, who again underwent successful PR. It is believed that recurrent ICI are loose and easy to reduce and operation is indicated only when PR fails.<sup>1</sup>

## CONCLUSION

Pneumatic reduction of ileocecal intussusception should be done in all children less than 2 years unless contraindicated (peritonitis, shock, sepsis). Our 10 factors (NIL C REFLUX) are not exclusion criterias, but are predictors of irreducibility. Even with these irreducible factors pneumatic reduction can be definitely attempted provided surgical team is ready for operation in case of irreducibility or perforation. Pneumatic reduction has the advantage of

avoiding an operation, anesthesia, and morbidity. It also reduces the hospital stay, recovery time and cost.<sup>13</sup> Also the surgeon should not unnecessarily delay the operation by doing pneumatic reduction in a child already presenting with multiple predictors of irreducibility.

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