



A SIMPLE TECHNIQUE OF PNEUMATIC REDUCTION, A STUDY OF 162 CASES

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ABSTRACT

Aims: Pneumatic reduction of intussusception is a well established technique. We had published a simple way to do it in 2006. Our aim was to analyse results with that technique over the last 10 years.

Materials & methods-Retrospectively reviewed the data of 162 patients who underwent pneumatic reduction in our institute. The diagnosis was confirmed by USG in all cases. Age, sex, duration of symptoms, success rate, pressure used and recurrence were studied. Categorical variables expressed as frequency and percentage. Chi-Square test was done to test the significance.

Results: Our technique of reduction has high success rate with no perforation. Delayed recurrence rate was 9.9%, which is comparable to other non-invasive reduction techniques.

Conclusion: Our technique of pneumatic reduction is simple and safe method, which can also be used in even in peripheral centres.

KEYWORDS : Intussusception, ileo-colic, Pneumatic reduction, Hydrostatic reduction

Nonoperative management of intussusception was first described in 1864^[1]. It was achieved by either pneumatic reduction or hydrostatic reduction. The latter used either saline or barium^[1].

The described technique of pneumatic reduction involves usage of pressure gauges, handpumps and transducers. This makes it a cumbersome technique and has the risk of inadvertent increase in pressure inside the colon when the child cries or struggles. This can lead to either reduction of a gangrenous segment or perforation. Our technique is easy to assemble from locally available materials like enema can and an intercostal tube bottle and is a safe and simple procedure. This can be used even in the peripheral setup. There is controlled release of air into the colon at a set pressure enabling reduction. Our initial results were published in Asian Journal of surgery^[2]. This is a review of our data since then.

Materials and Methods

This is a retrospective review of the data on children who underwent pneumatic reduction of intussusception in the department of Pediatric surgery for a period of 10 years, from Jan 2010 to Jan 2020. The diagnosis of intussusception was confirmed by Ultrasonography in all cases. Age, sex, type of presentation, duration of symptoms; pressure used for reduction of intussusception and any recurrence during the first 24 hrs, and delayed recurrence were studied.

The exclusion criteria were children presenting with perforation, peritonitis, shock, duration of symptoms more than 2 weeks and jejuno-jejunal or ileo-ileal intussusception. All other children presenting with intussusception were included in the study.

Technique:

The water filled enema can was kept at a height of 50 cm from the level of the patient and connected to the long tube of the empty Intercostal drainage bottle kept on the floor. The tubing from the enema can was kept clamped. Another tube was connected from the short tube of intercostal bottle to a Foley's catheter which was kept in the child's rectum with the balloon inflated with 20-30 cc of saline.



Fig 1

The entire system should be checked for any leak. This is done by unclamping the tubing of the enema can and clamping the Foley's catheter. There should not be any flow of water into the intercostal tube.

Once the arrangement (Fig 2) was ready, the child was positioned supine under fluoroscopy.

Position of the Foley's catheter bulb in the rectum was confirmed with fluoroscopy. Child was sedated if very uncooperative.

The clamp on the enema can tubing is released and the water flows into the ICD bottle. This displaces the air in the ICD bottle to the child's rectum and accomplishes the reduction. The pressure in the rectum will be the same as the height of the water in the enema can. If the child cries or struggles the pressure in the rectum exceeds the set pressure the water flow stops there by protecting the child from over distention. C-arm with image intensifier was used to monitor reduction. Brief exposures were given at intervals of one to two minutes. The fresh air filling the colon has a different contrast and can be seen reducing the mass, there may be slight delay at the ileocecal junction because of the valve. Once it is reduced fully, free flow of air into the terminal ileum and distension of the small intestine can be visualized. The reduction starts at 50 cm of water pressure and can be increased to 120 cm, by raising the level of the water filled enema can. If reduction does not occur, it can be repeated 3 times (Rule of 3), Three attempts of 3 minutes duration is the ideal standard.^[3]



Age, sex, duration of symptoms, type of procedure selected, pressure at which reduction was accomplished, recurrence in the first 24 hrs. post procedure and any delayed recurrence were studied.

Statistical analyses were performed using IBM SPSS 20.0 software. Categorical variables are expressed using frequency and percentage. To test the statistical significance of association of categorical factors with the type of procedure and duration of symptoms, Chi-square Test was used. A p-value less than 0.05 was considered as significant.

RESULTS

162 patients underwent pneumatic reduction using our technique in the

last 10 years. Diagnosis was confirmed by abdominal ultrasound in all cases. The duration of symptoms ranged from 4 hours to 10 days. Most (79%) of the children were brought for medical assistance in 0-3 days. Age range was from 2 months to 113 months with a mean age of 23.85 months. No neonatal intussusception was encountered in our series.

A male preponderance was observed with 104 males (64.2%) and 58 females (35.8%). The male to female ratio in our study is 1.79:1. In our series of 162 cases taken up for pneumatic reduction, intussusception could be reduced in 160 cases. The success rate was around 98.8%. It failed in 2 cases. (1.2%). There was no perforation in our series.

One was Meckel's diverticulum causing intussusception. Second one was a 6-month-old male child with ileocolic intussusception presented to us on day one. No pathological lead point was found in this case. More than half (56.8%) of the reductions were done in 50-70cms of water pressure range, 37.7% in 70-90cms and 5.6% in 90-110cms. One case of recurrence in the first 24 hrs after pneumatic reduction was present.

Delayed recurrence found in 16 cases of which 11 underwent repeat pneumatic reduction. The rest four cases underwent laparotomy and reduction since that was the 3rd recurrence and one underwent laparoscopy and reduction. Delayed recurrence rate was about 9.9% in our case series.

Regarding the association of duration of symptoms and irreducibility, there was no correlation found. The long duration of symptoms did not affect the outcome of pneumatic reduction. No correlation could be derived with age and outcome of pneumatic reduction.

DISCUSSION

Our technique of pneumatic reduction was published in Asian Journal of Surgery in 2006. We reviewed our cases of the last 10yrs. We had a success rate of 98.8% compared to 83.87% in other studies of pneumatic reduction^[4]. Studies on hydrostatic reduction showed a success rate of 85.2%. However, complication rate of caecal perforation was also reported^[5]. We used sedation in our patients which may also contribute to the high success rate^[6].

The main disadvantage of hydrostatic reduction is the missing of a perforation since peritoneum will always have some fluid due to associated peritoneal reaction to intussusception and leak of saline into peritoneal cavity due to perforation may be confused with it. Leak of air into the peritoneal cavity in the event of perforation is easy to identify. Second problem with hydrostatic reduction is that an incomplete reduction may be missed thinking it is a hypertrophied ileocecal valve.

Thirdly in some countries only a sonologist can do an ultrasound and report on it, an experienced sonologist may not be available when the patient comes as an emergency. In our technique the apparatus is easy to assemble and can be done by the Pediatric surgeon with a very low chance for error. We did not have perforation or missed incomplete reduction in our series. No secondary causes found in our series other than one reactive lymph node enlargement in one case.

This finding is important since non-invasive methods can be tried in all cases. Pathological lead point is uncommon in ileocolic intussusception regardless of age^[7].

The disadvantage with pneumatic reduction is the radiation exposure. Present day image intensifier uses digital technology which brings down the radiation to minimal. Moreover, it is only intermittent screening which reduces the exposure time further. Patients get more radiation when they get a CT scan or Barium meal or enema.

In conclusion, our technique of pneumatic reduction has a higher success rate and moreover it is a safe and simple technique as shown by this series of 162 cases.

Limitation of this study is that it is a retrospective study

COMPLIANCE WITH ETHICAL STANDARDS:

Permission from the ethical committee of the hospital was taken prior to the start of the study.

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

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