Laparoscopic Assisted Pneumatic Reduction of Intussusception in Infants and Children


Pediatric Surgery Unit, Ain Shams University, Cairo, Egypt

**Purpose:** To assess the feasibility and effectiveness of laparoscopic assisted pneumatic reduction of intussusception in children.

**Materials & Methods:** During the period from January 2006 to March 2007, 89 patients were managed for intussusception at the Pediatric Surgery Unit, Ain-Shams University Hospitals. All data were retrospectively collected and analyzed regarding the method of reduction, success rate and incidence of complication.

**Results:** Sixty eight cases were successfully reduced using air enema reduction under fluoroscopic guidance. In fifteen patients, the laparoscopic-assisted pneumatic reduction technique was used. Ten of them had the procedure completed. Two patients had previous episodes of intussusception that were managed with previous pneumatic reduction. In patients whom laparoscopy was used, there was no significant complication related to the procedure. While conversion to open surgery was done in 5, all of them needed resection and anastomosis. In six, patients the conventional open reduction was used instead of laparoscopy due to abdominal distension and bad general condition. All patients were discharged within 24 hours except those who needed conversion.

**Conclusion:** Laparoscopic-assisted pneumatic reduction of childhood intussusception is both safe and feasible. It allows for video monitoring of the reduction of the mass, it is also very helpful in recurrent cases and in those in whom the diagnosis was either difficult or doubtful.

**Index Word:** Laparoscopy, Pneumatic reduction, Intussusception, Children.

**INTRODUCTION**

Intussusception is a common pediatric surgical emergency. Since Ravitch set the guidelines and popularized the use of barium enema reduction in 1948,1 a number of media including air, water-soluble contrast and saline have been used for reduction of intussusception with a reasonably high success rate ranging from 79-90 %.2-6 With the law complication rate and the high success rate, this non-operative approach has become the gold standard in the management of intussusception in children. Nevertheless, a significant proportion of patients still require operative reduction either because of contraindication or failed non-operative reduction. Traditionally this was done through a relatively large laparotomy incision with all its disadvantages. However, in the last decade, there has been tremendous development of laparoscopic surgery in children. Several reports previously described and suggested a role of laparoscopy in the management of childhood intussusception.7, 8
PATIENTS AND METHODS
The medical records of all patients with any form of intussusception who were treated in Pediatric Surgery Unit, Ain Shams University Hospitals - a tertiary referral centre for pediatric surgical patients- were retrospectively reviewed during the period between January 2006 and March 2007.

Data collected included age, sex, location (type) of intussusception, delay between onset of symptoms and diagnosis, operative duration, intraoperative and postoperative complications and length of stay.

Intussusception was diagnosed by the air enema during the procedure of reduction or by ultrasonography.

All patients but six were offered an attempt of reduction using air insufflation with pressures ranging from 70-120 mmHg depending on size of the patient. Only patients who showed radiological failure of reduction were referred to surgery.

The choice of laparoscopic (LAP) or open approach was based on surgeon’s preference and availability of laparoscopic equipments.

Laparoscopic technique: All patients had the catheter for air insufflation fixed transanally before the procedure started. A 5mm port was placed through the umbilicus for the camera and pneumoperitoneum was established at 10-12 mmHg. Two 5mm ports were placed for working instruments one in the left lower quadrant and the other in the upper left or right quadrant depending on site of the mass after inspection of the abdomen. After identification of the intussusception, air insufflation through the colon was carried out. With the help of atraumatic graspers, the invaginating loop was carefully pulled with some degree of gentle traction, the process of concomitant air insufflation and gentle traction was repeated until smooth transition along the serosa ensured complete reduction. The proximal bowel was then carefully inspected for the presence of a lead point. Elective appendectomy was carried out in most patients according to surgeon’s preference at time of operation.

Decision to convert to open procedure was made if there were signs of bowel necrosis, if the vascularity had been severely compromised, if the presence of a lead point was detected, or if the working space became more and more limited due to much bowel distension and the procedure time exceeded 30 min for safety reasons. Postoperative care was similar to the open procedure.

RESULTS
Eighty nine patients were included in this study. Their ages ranged from 4 months to 5 years (average 10 months), they were 67 males and 22 females, and the type of intussusception was ileocecal in 80 patients, while 9 patients had ileoileal intussusception.

The delay between onset of symptoms and treatment ranged from 6 hours to 5 days (average 2 days).

Air enema reduction was successful in 68 patients, while 6 patients were operated upon by the open approach from the start because of delayed presentation (3± 1 day) with bad general condition and marked abdominal distension. Fifteen patients underwent laparoscopic assisted pneumatic reduction; 5 (33%) were converted to open procedure due to the following reasons: poor visualization of the mass after air was pumped into the intestine with marked bowel distension (2 patients), vascular compromise of the bowel with impending gangrene (3 patients, who required resection and anastomosis done through enlarging the umbilical port incision, conversion was done after a mean of 25 ±6 min

Of the ten patients in whom the procedure was successfully completed laparoscopically, there were no major intra or post operative complications. Mean operative time was 30 ±10 min, mean hospital stay was 36 ± 6 hours in comparison to 4.2 days for the open procedure.Two patients who underwent the laparoscopic procedure were recurrent intussusception; one was 2 year-old who had a previous episode that was managed by previous open reduction and the other was 9- month old who had previous 4 episodes that were all managed successfully by pneumatic reductions and during the laparoscopic assisted reduction had his caecum fixed to the abdominal wall to prevent recurrence.

There was no mortality reported in the series. For all patients who underwent laparoscopic assisted pneumatic reduction, there were no procedure-related complications except for small serosal tear (5 mm in length) that occurred in 3 patients and required no intervention.

DISCUSSION
Pneumatic reduction is an established method for treatment of intussusception in children, with a high success rate up to 90 %. However, procedure-related complications such as bowel perforation and even mortality have been reported in the published reports.
The non operative reduction of intussusception is usually carried out under fluoroscopy. However, in the intussusception with a lead point, the non operative reduction with fluoroscopy is difficult and recurrence rate is high. Moreover, the image of the invaginated or reduced bowel may not be satisfactory during pneumatic reduction because of the decreased contrast effect of gases. On the contrary, the diagnosis and treatment of lead points are possible with laparoscopy (such as Meckel’s diverticulum or polyp) thus raising the success rate of the pneumatic reduction and the recurrence rate may decrease.

Another disadvantage of pneumatic reduction is the incomplete reduction; in about 5% of pneumatic reduction gas can’t pass into terminal ileum either because of competent or oedematous ileocecal valve. It is also impossible to rule out an ileoileal intussusception without reflux of gas into the ileum; these problems can be solved by laparoscopic assisted pneumatic reduction through using higher CO2 pressure and the use of atraumatic grasping forceps; and the reduction can be made complete.

Several reports have been published highlighting the role of laparoscopy in the management of intussusception in children. However, the present study emphasizes the role of incorporating laparoscopy to increase the success rate of pneumatic reduction and abate some of its disadvantages especially the incomplete reduction and the high recurrence rate. One of the main advantages of laparoscopic method is the visualization of the invaginated loop of intestine, and smooth and rapid postoperative recovery. Usage of combined laparoscopy and air enema facilitates the reduction under high pressure and visualization of the entire process.

A good indication for laparoscopy is the recurrent intussusception; multiple recurrences are associated with a higher incidence of lead point. In the current study, laparoscopy done after the fourth episode in one patient, and although no lead point was found, the cecum had long mesenteric attachment to the posterior abdominal wall which facilitate easy telescoping of the terminal ileum; in this patient the cecum was fixed to the lateral abdominal wall.

**CONCLUSION**

The minimally invasive laparoscopic approach can be safely incorporated to the management of intussusception after failure of pneumatic reduction to increase its efficacy and decrease its inherent pitfalls of incomplete reduction and higher recurrence rates. Also the laparoscopic method has the potential benefits of rapid recovery, shorter hospital stay, less risk of adhesive intestinal obstruction, and a better cosmetic results.

**REFERENCES**