

CURRENT TRENDS IN PAEDIATRIC INTUSSUSCEPTIONSKeshava Murthy M¹, Basawaraj N. G², Tulsi T³, Vivekananda Kustagi⁴, Hari Prasad T. R⁵**HOW TO CITE THIS ARTICLE:**

Keshava Murthy M, Basawaraj N. G, Tulsi T, Vivekananda Kustagi, Hari Prasad T. R, "Current Trends in Paediatric Intussusceptions". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 76, September 21; Page: 13195-13203, DOI: 10.14260/jemds/2015/1899

ABSTRACT: Intussusception is the major cause of acute intestinal obstruction in infants. The classic clinical triad of intussusception is colicky abdominal pain, vomiting and bloody stools. However, only 20% of patients present with this triad. **OBJECTIVES:** The objective of this article with a series of cases of intussusception is to review the spectrum of clinical presentation of this disease entity and also to study the effectiveness of non-surgical intervention in children with intussusception using barium enema reduction under fluoroscopy. **METHODS AND RESULTS:** This prospective study spread over a period of 3 year and six months from October 2010 to march 2014 was carried out in tertiary care hospital in south Bangalore. Complete review of medical records for clinical and demographic information was only performed for those cases fulfilling diagnostic certainty (Definite intussusception). During the surveillance period, A total of 40 patients, diagnosed cases were included in this study. The majority (78.4%) of the cases occurred in the first year of life. The male: female ratio was 2.4: 1. Intussusception cases occurred round the year with no distinct seasonality. No intussusception-associated death was recorded. Cases identified in the study were similar in presentation and demographics as those observed in other south East Asian settings. Clinical presentation of the patients were pain abdomen, vomiting, blood in stools, fever and loose stools. Among the patients who were admitted the time between the onset of symptoms and hospitalization was between 36 to 48 hours, After stabilizing them haemodynamically they were subjected to definitive procedure, Barium enema reduction was tried in all patients, exclusion criteria was patients with clinical and radiological sign and symptoms of peritonitis, duration of symptoms more than 30hours and massive abdominal distension. Out of forty cases, thirty seven (81.8%) were reduced by fluoroscopic guided barium enema, those who failed among them, one (2.5) was reduced by pneumatic reduction, one (2.5) was reduced by ultrasound guided pneumatic reduction and only one (2.5%) patient required surgical interventions, reduced manually during surgery. No mortalities were recorded during the study. There was one recurrence noted in our study 15 days after discharge and was subsequently treated with fluoroscopic guided contrast reduction. **CONCLUSION:** Surgical intervention in intussusception can be prevented by non-operative reduction especially if presented early and no signs of peritonitis.

KEYWORDS: Intussusception, Barium Enema, Fluoroscopy guidance, Hydrostatic Reduction.

INTRODUCTION: Intussusception is the most common cause of acute intestinal obstruction in infants and young children,¹ with approximately two-thirds of all intussusceptions in children occurring among infants aged less than one year. Some cases of intussusception resolve spontaneously and, if treated early, most can be reduced by enema or surgery, and if untreated, most have fatal outcomes.⁽²⁾ Rotavirus is the most common cause of severe diarrhoea among infants and young children resulting in approximately 600,000 to 850,000 deaths annually worldwide.

In India, rotavirus-associated acute gastroenteritis accounts for 5–70% of all hospitalizations. About 20–30% of total hospitalizations are due to rotavirus-associated diarrhoea in early childhood

ORIGINAL ARTICLE

As a result of substantial morbidity and mortality worldwide caused by rotavirus, the WHO and Global Alliance for Vaccines and Immunization (GAVI) have identified rotavirus vaccines as a priority for development and subsequent introduction.^{3,4} Mortality caused by intussusception in infants and children is now uncommon in developed countries due to better access to healthcare facilities. In contrast, intussusception-associated mortality remains high in some developing countries. This study outlines the clinical presentation, detection, management, and outcome of intussusception in infants and young children in one of the south Indian city.

MATERIALS AND METHODS: This prospective hospital-based study to review cases of intussusception was carried out at tertiary care hospitals in South India which occupies a prominent places among healthcare in India. This prospective study spread over a period of 3 year and six months from October 2010 to March 2014 was carried out in tertiary care hospital in south Bangalore. Complete review of medical records for clinical and demographic information was only performed for those cases fulfilling diagnostic certainty (Definite intussusception). During the surveillance period.

A total of 40 patients, diagnosed cases were included in this study. The majority (78.4%) of the cases occurred in the first year of life. The male: female ratio was 2.4: 1. Intussusception cases occurred round the year with no distinct seasonality. No intussusception-associated death was recorded. Cases identified in the study were similar in presentation and demographics as those observed in other south East Asian settings. All patients were referred from periphery to emergency department and later admitted to pediatric surgery. All investigations were done in periphery admitted with intussusception. Along with ultrasound, in case of doubt u/s and relevant investigations were repeated. Patient's Intravenous line was already established and I/v fluids were started and After stabilizing them haemodynamically they were subjected to definitive procedure was shifted to procedure theatre, temperature of the room was maintained around 37 degree Celsius, fluoroscopic guided Barium enema reduction was tried in all patients, exclusion criteria was patients with clinical and radiological sign and symptoms of peritonitis, duration of symptoms more than 30hours and massive abdominal distension.

Under general anaesthesia in lithotomy position a Foleys catheter number 16 was passed per rectum and balloon inflated, barium enema under fluoroscopy control was given from height of 3 feet, 3 attempts were made and each attempt was for 3 minutes. The claw sign was identified and stasis of dye was noted at that point, by further active push of barium through a 50cc syringe very gently the reduction was achieved, we finally confirmed the flow of contrast into the distal small bowel and thus indication use to stop further push of contrast. During the procedure we encountered two cases (5%) of sudden reflux of stomach content into esophagus which was appropriately managed by the anaesthetist which prevented aspiration risks in the children. All this procedure was carried out with anesthesia. But during this procedure operation theatre was ready for any surgical intervention, in case of perforation or failure of the procedure.

CONCLUSION: Surgical intervention in intussusception can be prevented by non-operative reduction especially if presented early and no signs of peritonitis.

RESULTS: Out of forty cases in the age-group of 0–5 year(s) the median age of subjects was nine (range 1–36) months. The majority (78.4%) of these cases were infants with a peak between 6 and 12

ORIGINAL ARTICLE

months of age the male: female ratio was 2.5: 1. All the subjects were Indians. Amongst them thirty seven (81.8%) were reduced by fluoroscopic guided barium enema, those who failed among them, one (2.5) was reduced by pneumatic reduction, one (2.5) was reduced by ultrasound guided pneumatic reduction and only one (2.5%) patient required surgical interventions, reduced manually during surgery.

No mortalities were recorded during the study. one recurrence was recorded in our study.

DISCUSSION: IN 1836 THERE APPEARED in the American Journal of the Medical Sciences an account¹ of "A Case of Intussusception in Which an Operation Was Successfully Resorted to by John R. W. Wilson, M. D., of Rutherford County."⁵

In 1876 Hirschprung first reported the confirmed if there is free flow of barium into technique of hydrostatic reduction, and after terminal ileum, expulsion of faeces and flatus with monitoring a series of 107 cases, reported 35% barium, disappearance of mass and clinically child mortality rate in 1905. His results were so superior to those previously reported that his contemporaries doubted his conclusions.^{6,7}

Intussusception, a common gastrointestinal (GI) emergency in children, develops when a proximal segment of the gastrointestinal tract (Intussusceptum) telescopes into a distal portion (Intussusciens), most commonly located near the ileocecal valve. Intussusception occurs in approximately 17.7 children per 100,000 per year in the india.⁸ Population-based incidence of intussusception and a case-control study to examine the association of intussusception with natural rotavirus infection among indian children.⁹

Of these, 60% of cases occur before 1 year of age and 80% before 2 years. Its incidence is highest between 5 and 9 months of age, being uncommon in neonates. There is a male predominance of 3:2.¹⁰

The majority of pediatric cases involve the ileocolic (or ileocecal) portion of the intestine. The most common location of idiopathic intussusception is at the hepatic flexure. When the intussusceptum invaginates and pulls along the mesentery, there is compromise of venous return. This is followed by engorgement of the intussusceptum, edema and bleeding from the mucosa which lead to currant jelly stools. Finally the arterial blood supply of the intestine gets compromised leading to necrosis, perforation and/or shock.

Children less than 3 months and greater than 2 years old are most likely to have a "lead point" or specific identified cause, such as (In decreasing order of incidence): Meckel diverticulum, duplications, polyposis and lymphomas. Hyperplasia of the intestinal Peyer's patches have been identified as the leading point in infant cases. Most cases are reported during summer and spring which favor a not fully understood infectious mechanism. Peyer's patches hyperplasia can occur secondary to viruses such as adenovirus, enterovirus, echovirus and human herpes virus.⁶ The most common surgical complication of patients with Henoch Schönlein Purpura is intussusception.^{11,12}

Its incidence is also increased in the postoperative period probably due to edema or adhesions.¹³ in 1999, the Rotashield rotavirus vaccine was removed from the US market due to its increased association with intussusception, especially between 3-14 days post-placement of the vaccine.¹⁴ subsequently vaccines such as Rota Teq and Rotarix have been developed.¹⁵

The Clinical Presentation having typical triad of severe intermittent abdominal pain, currant jelly stools and vomiting is seen in less than 20% of cases.¹⁶

ORIGINAL ARTICLE

Bouts of abdominal pain may be evidenced by pulling of knees against the abdomen with an interim asymptomatic healthy child. In ileocolic intussusception palpation of the abdomen may reveal a sausage-shaped mass which is located in the RUQ. A wide spectrum of symptoms may range from painless intussusception to constipation, dehydration, diarrhea, intestinal prolapse, rectal bleeding, sepsis, shock, syncope, vomiting and altered mental status (lethargy and irritability).¹⁷

Lethargy is seen most frequent in infants and young children with or without history of gastrointestinal symptoms. Altered mental status has been hypothesized to be secondary to a combination of factors such as dehydration, electrolyte imbalance, and endorphins or toxic metabolic products released from the ischemic bowel which can affect the brain.¹⁸

Recurrent intussusception is present in only 5-8% of children and is most common after hydrostatic versus surgical reduction. Fifty percent of recurrent intussusception cases occur within 48 hours of a prior episode (but have been reported up to 18 months later).¹³ Most postoperative intussusception cases are located in the small bowel.¹⁹

A recent and extensive review by the World Health Organization (WHO) on intussusception concluded that, in developed countries, the baseline incidence of intussusception is between 0.5 and 4.3 cases per 1,000 livebirths or 0.7–1.2 cases per 1,000 children aged less than one year. Accurate estimates of the incidence of intussusception are not available for most developing countries.

Standard Diagnostic Modalities includes Ultrasound which is a fast, non-invasive and simple reproducible test. It's sensitivity (98-100%) and specificity (88-100%) is high, but is clearly operator dependant. At some centers it has displaced radiographs as the initial imaging test of choice. Other indications for its use are: suspected cases of intussusception where abdominal x-rays are non-conclusive, evaluation for reducibility, presence of a lead point mass, potential incomplete reduction after enema and intussusception limited to small bowel. Classic findings include: the target lesion or doughnut sign on transverse imaging and the pseudo kidney sign on longitudinal imaging.^{20,21}

Computed tomography (CT) scan is usually not indicated in children, since the diagnosis is generally confirmed by ultrasound or enema. The CT scan involves high costs, radiation exposure and sedation risk which is overall less convenient for this population group.

Medical Therapy includes Expeditious diagnosis and management is essential to successful outcomes in infants with intussusception. Once the diagnosis of intussusception is entertained, surgical personnel should be notified, an intravenous line inserted, and intravenous hydration started. A nasogastric tube should be inserted and placed to suction. If the patient is markedly distended or has a dilated loop of bowel, an abdominal radiograph should be obtained. Antibiotics should be administered based on clinical suspicion of peritonitis or infection (sepsis) or in patients with a markedly elevated WBC count.

Preoperatively, intravenous crystalloid resuscitation is begun (10mL/kg x 2, plus 1.5 x maintenance fluid). A Foley catheter is placed to guide fluid resuscitation. A nasogastric tube is placed. Broad-spectrum intravenous antibiotics are administered. Body temperature must be preserved in the operating room. A type and screen of the patient's blood should be obtained. As with any patient with a bowel obstruction, careful induction (i.e., rapid sequence) of anesthesia should take place because of the risk of regurgitation and aspiration.

Diagnosics and Therapeutics: Contrast enemas (Barium, water-soluble and air) are diagnostic and therapeutic techniques, with reduction rates of 70 to 90%. Barium enema is considered the gold standard for non-surgical treatment, this should be considered only after stabilizing the child,

ORIGINAL ARTICLE

adequate hydration, and consultation with a pediatric surgeon. The only current absolute contraindication for barium enema is full bowel necrosis.^{22,23}

Air enema's use has increased due to its lower perforation risk, less radiation exposure, faster and better reduction rate. Intussusception recurrence rates for air versus liquid enema are reported to be similar, approximately 10%.²⁴

Surgical intervention is needed only in unstable patients with non-operative reduction contraindications or in prior unsuccessful reduction attempts. Barium enemas should be avoided in children with evidence of peritonitis, severe shock, sepsis, perforation or extreme ages.²⁵

Enema reduction should be attempted 3 times at the most before considering it unsuccessful and submitting the patient to surgery. Poor enema reduction rate is determined by (In descending order): symptoms longer than 24 hours, age less than 3 months, dehydration and intussusception of the rectum. Repeat enema is both safe and effective in recurrent intussusception. Spontaneous reduction occurs in approximately 10-17% of patients, being most common in the small bowel.

Finally, barium enema has been the gold standard in confirming the diagnosis and nonsurgical reduction of an intussusception. Water-soluble contrast has been used and more recently air enema reduction has been introduced. There are several reasons why radiologists have different preferences for which type of contrast they choose to use for the procedure. After the radiologist reduces the intussusception, they look for the contrast to reflux into the ileum. This is necessary to eliminate the possibility of an ileoileal intussusception. This is more difficult to see with an air contrast enema compared to a barium or water-soluble contrast enema. Air leaking into the peritoneal cavity because of intestinal perforation may also be difficult to see. Those in favor of using the air contrast enema technique argue that with perforation, the sudden loss of pressure would signal to the radiologist to stop the procedure.

If a tension pneumoperitoneum results, this should be decompressed immediately with an 18-gauge needle. Barium leaking into the peritoneal cavity may cause a chemical peritonitis. Using a water-soluble contrast may decrease this complication. An air contrast enema is advocated as the preferred method by many pediatric surgeons, but since there is no clear consensus among radiologists of the best contrast enema option, this decision is best left to the pediatric surgeons performing the contrast enema procedure.²⁶

Laparoscopy in the management of intussusception was initially limited to a diagnostic role. It was used to confirm unreduced bowel following an enema with prompt conversion to an open procedure. The laparoscope allowed the surgeons to avoid unnecessary open procedures in cases of spontaneous reduction following enema and enhanced the efficacy of hydrostatic or pneumatic reductions, reducing the need for an open procedure in approximately 30% of cases. Continued experience with laparoscopy and improved technology has led some centers to successfully utilize the technique for therapeutic reduction in confirmed cases of pediatric intussusception.

The role of laparoscopy in intussusception is evolving and will be better defined as technology progresses and experience with the minimally invasive approach to this disease grows.

Postoperative Details Intravenous fluid resuscitation is continued and calculated, taking into consideration maintenance requirements and third-space losses. Upon resolution of ileus, diet is advanced at the discretion of the surgeon.

ORIGINAL ARTICLE

Follow-up: In older children and in cases of recurrent intussusception (after 3-4 episodes) successfully reduced with an enema, consider evaluating the patient for a lead point (e.g., upper GI series, Meckel scan).

Complications: Intussusception results in bowel obstruction; thus, complications such as dehydration and aspiration from emesis can occur. Ischemia and bowel necrosis can cause bowel perforation and sepsis. Necrosis of a significant length of intestine can lead to complications associated with short bowel syndrome. Whether treated by operative or radiographic reduction, late stricture (4-8 weeks) may occur within the length of intestine involved.

Outcome and Prognosis: The overall mortality rate of intussusception is less than 1%. Recurrence rates following non-operative reduction and surgical reduction are approximately 5% and 1%-4%, respectively.

The following Criteria are Associated with a Higher Failure rate of Non-operative Reduction:

- Ileoileocolic intussusception.
- Long duration of symptoms.
- Raised neutrophils percentage.
- Rectal bleeding.
- Failed reduction with barium at another institution.
- Age older than 2 years or younger than 3 months.
- Duration of symptoms longer than 24 hours.
- Small-bowel obstruction on radiograph.
- Dehydration of greater than 5%.
- Inexperienced radiologist.

Factors significantly predictive of bowel perforation are younger age and a longer duration of symptoms. The risk of postoperative adhesive small-bowel obstruction following non-operative reduction is 0%; for operative reduction, it has been reported in as many as 5% of patients.

CONCLUSIONS/SUMMARY: This article highlights the diverse signs and symptoms pediatric patients with intussusception can present with. Only 20% of children will present with the triad (Abdominal pain, currant jelly stools and vomiting). Clinical suspicion is the key factor in making a diagnosis of intussusception and should be considered by the ED physician even in absence of typical signs and symptoms. Delay in diagnosis increases risk for bowel obstruction, perforation, necrosis and death.

ACKNOWLEDGEMENTS: We thank the tertiary care hospitals in south Bangalore, India for their valuable contribution. We also express gratitude with anaesthesia, pediatric team and hospital staff for their coordination AND ACTIVE PARTICIPATION.



Fig. 1: Fluoroscopic Guided Contrast Study Showing Claw Sign

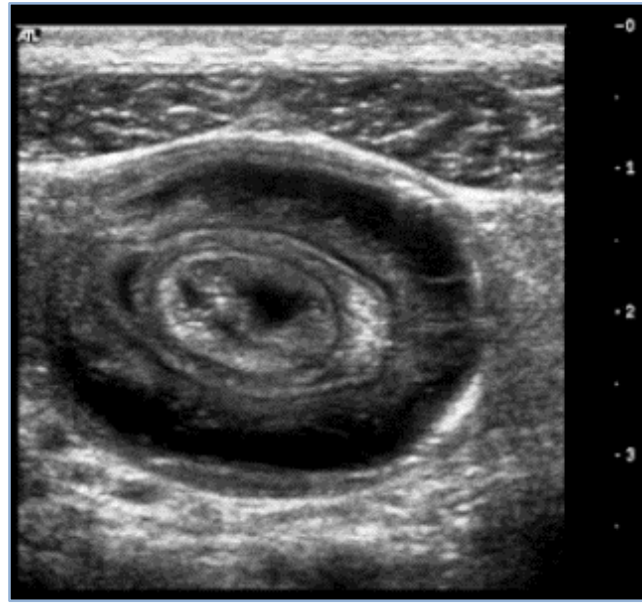


Fig. 2: Ultra Sound Showing Target Sign



Fig. 3: Operative findings of Intususception

REFERENCES:

1. WHO vaccines and biologicals. Geneva: World Health Organization; 2002. Acute intussusception in infants and children. Incidence, clinical presentation and management: a global perspective; pp. 1-98.
2. Parashar UD, Holman RC, Cummings KC, Staggs NW, Curns AT, Zimmerman CM, et al. Trends in intussusception-associated hospitalizations and deaths among US infants. *Pediatrics*. 2000; 106:1413-21. [PubMed].
3. Glass RI, Bresee JS, Turcios R, Fischer TK, Parashar UD, Steele AD. Rotavirus vaccines: targeting the developing world. *J Infect Dis*. 2005; 92(Suppl 1):S160-6. [PubMed].
4. Global initiative to fast-track vaccine for world's leading cause of severe diarrhea among children. Project expected to speed rotavirus vaccine availability to developing countries by 15-20 years. (<http://www.globalhealth.org/news/article/2805>, accessed on 8 December 2006).
5. Wilson, J. R. W. reported by W. W. Thompson: *Am. J. Med. Sci.*, i8: 262, 1836. Tennessee in December, 1831."
6. Hirschsprung, H.: Tilfaelde af Subakut Tarminvagination. *Hospitalstidende*, 3: 321-327, 1876.
7. Hirschsprung, H.: 107 Falle von Darminvagination bei Kindern, behandelt in Konigin Louisen-Kinderhospital in Kopenhagen wahrend der Jahre 1871-1904. *Mitteilungen aus den Grenzgebieten den Medezin und Chirurgie*, 14: 555, 1905.
8. *J Infect Dis*. 2009 Nov 1; 200 Suppl 1:S277-81. doi: 10.1086/605045.
9. Bahl R., Saxena M, Bhandari N, Taneja S, Mathur M, Parashar UD, Gentsch J, Shieh WJ, Zaki SR, Glass R, Bhan MK; Delhi Intussusception Study Hospital Group. clinical seminars may 2013.
10. Sorantin E, Lindbichler F. Management of intussusception. *Eur Radiol*. 2004; 14(suppl 4): L146-L154.
11. Behrman RE, Kliegman RM, Jenson HB: *Nelson Textbook of Pediatrics*, Ed 18: Chapter 330-Intussusception. 2007, 1569-1570.
12. Chen SY, Kong MS. Gastrointestinal manifestations and complications of Henoch-Schonlein purpura. *Chang Gung Med J*. 2004; 175-181.
13. Difiore JW. *Semin Pediatr Surg*. 1999 Nov; 8(4):214-20.
14. Bines J. Intussusception and rotavirus vaccines. *Vaccine*. 2006 May 1; 24(18):3772-6. Epub 2005 Jul 28.
15. Hyser JM and Estes MK. Rotavirus vaccines and Pathogenesis: 2008. *Curr Opin Gastroenterol*. 2009 Jan; 2005(1):36-43.
16. Fleisher G. In: *Textbook of Pediatric Emergency Medicine*, Fourth Edition: Chapter 118: Abdominal Emergencies; 2000:1611-1613.
17. Hickey RW, Sodhi SK, Johnson WR. Two children with lethargy and intussusception. *Ann Emerg Med*. 1990; 19:390-392.
18. Goetting MG, Tiznado-Garcia E, Bakdash TF. *Pediatric neurology*. 1990 Nov-Dec; 6(6):419-421.
19. Navarro O, Daneman A. Intussusception part 3: diagnosis and management of those with an identifiable or predisposing cause and those that reduce spontaneously. *Pediatr Radiol* 2004 Apr; 34(4): 305-312.
20. Sargent MA, Babyn P, Alton DJ. Plain abdominal radiography in suspected intussusception: a reassessment. *Pediatric Radiology* 1994; 24:17-20.

ORIGINAL ARTICLE

21. Byrne AT, Goeghegan T, Govender P, et al. The imaging of intussusception. *Clinical Radiology* 2005; 60: 39-46.
22. Daneman A and Navarro O. Intussusception, Part 1: A review of diagnostic approaches. *Pediatric Radiology* (2003)33:79-85.
23. Beasley S. Intussusception. *Pediatr Radiol.* 2004; 34:302-304.
24. Meyer JS, Dangman BC, Buonomo C, et al. Air and liquid contrast agents in the management of intussusception: a controlled, randomized trial. *Radiology* 1993; 188: 507-511.
25. Waseem M and Rosenberg HK. *Pediatric Emergency Care.* 2008 Nov; 24(11):793-800.
26. Case Based Pediatrics for Medical Students and Residents, Department of Pediatrics, University of Hawaii John A. Burns School of Medicine, Chapter X.4. Intussusception Lynette L. Young, MD, December 2002.

AUTHORS:

1. Keshava Murthy M.
2. Basawaraj N. G.
3. Tulsi T.
4. Vivekananda Kustagi
5. Hari Prasad T. R.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Paediatric Surgery, RRMCH, Bangalore.
2. Associate Professor, Department of Radiology, BGS-GIMC, Bangalore.
3. Assistant Professor, Department of Anaesthesia, BMC, Bangalore.
4. Consultant Paediatrician, Bangalore.

FINANCIAL OR OTHER

COMPETING INTERESTS: None

5. Associate Professor, Department of General Surgery, RRMCH, Bangalore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Keshava Murthy M,
14/1, 2nd Cross, AT Street,
Yediyur, Jayanagar, 6th Block,
Bangalore-560082.
E-mail: drkeshav_2000@yahoo.com

Date of Submission: 01/09/2015.
Date of Peer Review: 02/09/2015.
Date of Acceptance: 14/09/2015.
Date of Publishing: 19/09/2015.