Management of Intussusception in Children: A Literature Review

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ABSTRACT

Intussusception is one of the most prevalent causes of acute intestinal blockage in babies and toddlers, and maybe the second most common cause of stomach discomfort in newborns and toddlers after constipation. Intussusception was shown to be more prevalent in males less than 2 years of age. Invagination is an emergency case, so that urgent action is needed in the form of improving the patient's general condition, inserting a gastric sonde to decompress and prevent aspiration, rehydration, sedatives for pain relief. The basis of treatment for invagination is repositioning of the intestine into the lumen of the other intestine. Repositioning can be achieved by barium enema, pneumostatic repositioning or surgically. Complications (4%) would be fewer if no enterotomy or intestinal resection were required (26%). Adhesions in the small bowel may occur after surgery. Up to 20% of patients have recurrent intussusception. Most reoccur between 24 hours to 6 months. It frequently occurs after surgery and is idiopathic.
Keyword: External Repotition Intussusception; Laparoscopy; Lapartotomy; Resection

INTRODUCTION

Intussusception is one of the most prevalent causes of acute intestinal blockage in babies and toddlers, and maybe the second most common cause of stomach discomfort in newborns and toddlers after constipation. Today,

physicians, paediatric radiologists, and paediatric surgeons collaborate on the diagnosis and treatment of paediatric conditions. The majority of invagination in children cannot be attributed to a specific cause; this is known as primary invagination.[1,2]

In youngsters, viral infections and the development of intestinal tumours may serve as precipitating factors for invagination. In the past, rotavirus vaccination was connected with a few occurrences of invagination. Intussusception is the invagination of one portion of the intestine into the neighbouring portion of the intestine. Eighty to ninety-five percent of intussusceptions in children are ileocolic. Rare conditions include ileoileal, cecocolic, colocolic, and jejunojejunal. Internal proximal intestine prolapse inside the mesenteric groove of the distal bowel lumen is referred to as invagination.[3,4]

This causes restriction of intestinal content passage and decreased blood flow to the invaginated portion of the gut. It may eventually lead to intestinal blockage and inflammation ranging from bowel wall thickening to bowel wall ischemia. Invagination is an emergency, thus immediate treatment is required to improve the patient's overall health, implant a gastric sonde to decompress and avoid aspiration, rehydrate the patient, and provide sedatives for discomfort. Surgery is performed if there are evident indicators of intestinal blockage, or repositioning is performed if there are no contraindications.[1,5,6]

Invagination is treated by moving the intestine into the lumen of the opposite intestine. Repositioning may be accomplished using barium enema, pneumostatic repositioning, or surgery. In affluent nations, deaths caused by acute idiopathic intussusception in newborns and children are now uncommon. In contrast, in several poor nations, mortality related with intussusception remains significant. Greater rates of surgical intervention, bowel resection, and death are seen in poor nations, where patients often arrive to the health facility more than 24 hours after the beginning of symptoms.[1,5]

This review discusses the management of pediatric patients with intussusception.

METHODS

The data for this meta-analysis were culled from full-text English publications published in the preceding ten years (range 2012-2022). The purpose of this study is to assess the management intussusception in children. The databases that we utilized to produce this article are Pubmed and Google Schoolar. In this investigation, the PICO analysis was used to include pediatric patients with intussusception, index was management the patient with intussusception, without comparisons and the objective was patient outcame. The research comprised both clinical trials and randomized clinical trials.

This analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) paradigm, in which the researchers originally entered keywords into each database. The phrases "mannagement" and "intussusception in children" were used in the search. (("manage"[All Fields] OR "managed"[All Fields] OR "management s"[All Fields] OR "managements"[All Fields] OR "manager"[All Fields] OR "manager s"[All Fields] OR "managers"[All Fields] OR "manages"[All Fields] OR "managing"[All Fields] OR "managment"[All Fields] OR "organization and administration"[MeSH Terms] OR ("organization"[All Fields]

AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND ("intussuscepted"[All Fields] OR "intussuscepting"[All Fields] OR "intussusception"[MeSH Terms] OR "intussusception"[All Fields] OR "intussusceptions"[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields] OR "child s"[All Fields] OR "children s"[All Fields] OR "childrens"[All Fields] OR "childs"[All Fields])) AND (y_5[Filter]). The researchers received three articles, which will be discussed during the discussion **(Table 1)**.
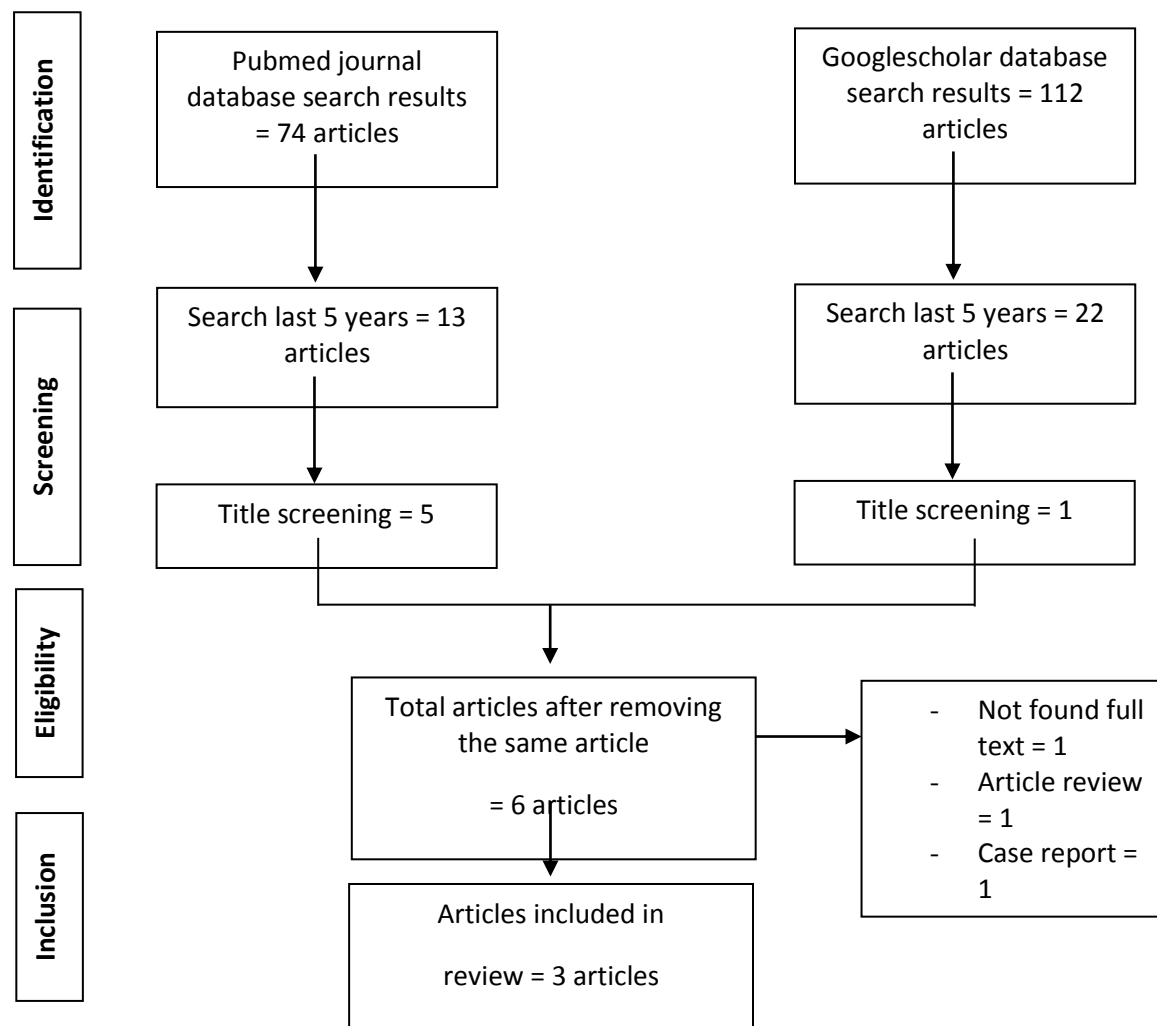

Figure 1. Article search flowchart

RESULT

Garcia, *et al* conducted a study with 95 cases (65.3% boys and 34.7% girls); 76.6% were younger than the age of 2 years. The association between intussusception and prior drug use varied depending on the exposure window: 15-day odds ratio (OR), 1.45 (95% confidence interval [95% CI], 0.86-2.43); 7-day OR, 1.46 (95% CI,

0.80-2.67); and 2-day OR, 2.26 (95% CI, 1.10-4.64). These associations were greater for children aged younger than 2 years and were usually

Table 1. The literature include in this study

Author	Origin	Method	Sample Size	Period	Result
Garcia, 2015[7]	Spain	Case-crossover	95 cases	2006 to 2009	76.6 percent were less than the age of 2 years out of a total of 95 cases chosen; 65.3% were male and 34.7% were female. The link with intussusception and past drug use varied by exposure window: odds ratio (OR) = 1.45 (95% CI = 0.86–2.43); OR = 1.46 (95% CI = 0.80–2.67); and OR = 2.26. (95% CI = 1.10-4.64). These relationships were more pronounced in children less than 2 years and were often attributable to the recent administration (within the previous 2 days) of antibiotics (OR = 8.00; 95% CI = 1.47-43.7).
Jamshidi, 2022[8]	Iran	RCT	52 cases	March 2015 to February 2018	They had 52 patients who needed surgical exploration (26 in each group). There were four (15%) and seven (27%) patients with self-reduced intussusception in LS and OS groups, respectively. The conversion rate was 31% (eight cases). Five cases (19%) in the LS group and four cases (15%) in the OS group needed bowel resections. Operating time was longer in the LS group (P ≤ 0.006), and the postoperative complication rate was higher in the OS group (P ≤ 0.021).
Wei, 2015[9]	Taiwan	Clinical trial	23 and 35 patients in LAP and OPEN group	January 2007 and July 2013	No significant difference was found on age, operative indication, surgical procedure, type of intussusception, level of intussusceptum, and presence of spontaneously reduced intussusception between both groups. In LAP group, mean OP time was significantly longer; mean PO time and LOS were significantly shorter. One surgical recurrence occurred in each group (p = 0.76). In comparison of LAP-

					IP (n = 15) and LAP-NIP (n = 8), OP time, PO time, and LOS were similar in both subgroups. One recurrence was noted in LAP-IP (p = 0.46). The overall conversion rate was 13.0 % (6.8 vs. 25 %, p = 0.21). Compared to patients with intussusceptum to ascending colon, the conversion rate was significantly higher in patients with intussusceptum to transverse and descending colon. With the exclusion of conversion, OP time was significantly shorter in LAP-NIP (p = 0.01).
Vazquez, 2012[10]	Spain	Prospective study	19 patients	August 2009 till January 2012	Complete reduction exclusively by external manual reduction was accomplished on 12 occasions (80%). In the remaining three procedures, partial reduction to the cecum was obtained. Subsequent enema achieved complete reduction in two. Overall non-surgical reduction rate was 93%.
Zhang, 2015[11]	China	Retrospective study	234 children	January 1, 2011 and December 30, 2013	They determined that the overall antibiotic use rate following successful air enema reduction was 41% (97/234), which decreased from 99% (67/68) in phase I to 18% (30/166) in phase II. In phase I, prophylactic antibiotic usage reached up to 84% (56/67). The quantity of aztreonam for injection accounted for 63% (45/71), and cefamandole nafate for injection accounted for 25% (18/71). In phases II, prophylactic antibiotic usage were reduced to 13% (4/30). The quantity of aztreonam for injection was decreased to 12% (4/33) and cefamandole nafate for injection was 3% (1/33).

due to the recent administration (preceding 2 days) of antibiotics (OR, 8.00; 95% CI, 1.47-43.7).[7]

Jamshidi, *et al* conducted a study with 52 patients who needed surgical exploration (26 in each group). There were four (15%) and seven (27%) patients with self-reduced intussusception in LS and OS groups, respectively. The conversion rate was 31% (eight cases). Five cases (19%) in the LS group and four cases (15%) in the OS group needed bowel resections. Operating time was longer in the LS group (P ≤ 0.006), and the postoperative complication rate was higher in the OS group (P ≤ 0.021).[8]

Wei, *et al* showed mean PO time and LOS were significantly shorter in laparoscopy group. One surgical recurrence occurred in each group (p = 0.76). OP time, PO time, and LOS were similar in both subgroups. One recurrence was noted in LAP-IP (p = 0.46). The overall conversion rate was 13.0 % (6.8 vs. 25 %, p = 0.21) compared to patients with intussusceptum to ascending colon, the conversion rate was significantly higher in patients with intussusceptum to transverse and descending colon. With the exclusion of conversion, OP time was significantly shorter in LAP-NIP (p = 0.01).[9]

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DISCUSSION

Intussusception was first described by Paul Barbette in Amsterdam (1674). Jonathan Hutchinson was the first to perform a successful intussusception operation on a 2-year-old child in 1873. The word intussusception comes from the Latin *intus* (in) and *suscipere* (to receive). Intussusception is the invagination of one part of the intestine into another. Three cylinders in the intestinal wall are involved. The inner cylinder and the middle cylinder are the invaded intestine (intussusceptum), and the outer cylinder is the recipient of the intestinal invagination (intussuscipiens).[12]

Most etiologies of primary invagination in children are unknown. Viruses and intestinal cancers may cause invagination in children. In the past, invagination was linked to rotavirus vaccination. Rotavirus causes diarrhoea, vomiting, fever, and dehydration. Tumors of the gastrointestinal system, intestinal adhesives, surgical wounds of the small intestine and colon, IBS, and Hirschsprung's may induce invagination. Payer's patch hypertrophy in the ileum may cause invagination by stimulating intestinal peristalsis. Invagination occurs often following upper respiratory infections and gastroenteritis, leading lymphoid tissue enlargement.[13–16]

Adenovirus is present in 50% of invaders. Because of their high viral vulnerability, children aged 6-36 months are most susceptible. Intussusception causes include an inverted appendix, Meckel's diverticulum, intestinal polyps, duplication, or lymphosarcoma. Intussusception may develop in dehydrated cystic fibrosis patients. Males had more reported instances of intussusception than women, generally 2:1 or 3:1, usually 78 percent of men at 9 months.[17]

Intussusception was shown to be more prevalent in males less than 2 years of age. When medicines were delivered 2 to 7 days before the development of symptoms in children younger than the age of 2 years.[7] Prescription medication use was related with intussusception, particularly in the shorter time range. The outcomes were larger for children under 2 years. The relationship between past prescription medication usage and intussusception was obviously positive for boys in the gender-specific analysis. The associations were not evident or substantial for girls.[18]

Invagination is an emergency case, so that urgent action is needed in the form of improving the patient's general condition, inserting a gastric sonde to decompress and prevent aspiration, rehydration, sedatives for pain relief. After the general condition is good, surgery is done, if there are clear signs of intestinal obstruction. Or do repositioning if there are no contraindications. The basis of treatment for invagination is repositioning of the intestine into the lumen of the other intestine. Repositioning can be achieved by barium enema, pneumostatic repositioning or surgically.[19]

Indications for manual reduction are in patients who are unstable, have an increase in temperature and leukocyte count, experience prolonged symptoms or are found to have advanced disease characterized by abdominal distension, bloody stools, severe intestinal system disorders until shock or peritonitis occurs. The patient is immediately prepared for a Laparotomy operation with a transverse interspinal incision. If an abnormality is found to have necroses, reduction does not need to be performed and resection is performed immediately.[8,9]

Initially, the use of laparoscopy in intussusception was used only for diagnosis also in cases with doubtful radiological examinations or the presence of suspected pathological lesions. Once the diagnosis was confirmed, the operation was changed to a laparotomy. Recent studies have shown variable success in laparoscopic reduction of intussusception. Various techniques have been reported, but the majority of minimally invasive approaches describe the use of three abdominal ports: one in the infraumbilical region with the other two ports along the left side of the abdomen.[5,12]

Laparoscopic reduction is completed by applying gentle pressure distal to the intussusceptum using atraumatic graspers. Although counterintuitive to conventional open methods, traction is usually required proximal to the intussuscipiens to complete reduction. A careful examination is then performed to evaluate for signs of ischemia, necrosis, or perforation. If a resection is required, this can sometimes be accomplished by removing the bowel through a periumbilical incision. If this cannot be completed safely, the operation should be changed to an open lalarotomy.[5,12]

Laparoscopy as a screening technique confirmed intussusception and excluded many instances requiring OS. Only a simple laparoscopic evaluation might obviate the need for more extensive surgery. Laparoscopy also helped minimise intussusceptions and pull the ilium out of the cecum using the Chinese fan method, with no recurrences. Laparoscopy eliminates the necessity for OS in all but tight intussusception instances. Laparoscopy reduces the incidence of OS and its complications. Less stress to the abdominal wall tissues and viscera means less problems such postoperative paralytic ileus, adhesion bands, and surgical site infection.[8,9]

Non-surgical therapy of paediatric intussusception has a lengthy history, dating back to the 18th century. Hirschsprung, Ravitch, and a host of other contemporary writers trace their roots back to Hippocrates and the beginnings of modern systematic medicine. Vazquez showed complete reduction exclusively by external manual reduction was accomplished on 12 occasions (80%). In the remaining three procedures, partial reduction to the cecum was obtained. Subsequent enema achieved complete reduction in two. Overall non-surgical reduction rate was 93%.[10]

The administration of an image-guided (fluoroscopic or sonographic) enema (air, water, saline, water-soluble contrast agent, or barium) is the usual non-surgical therapy for intussusception. Invasiveness is minimised,

the time of hospitalisation is reduced, and expenditures are saved by nonoperative reduction. There are less surgical and post-surgical hazards, such as the post-surgery sticky small intestinal blockage that occurs in 3–6 percent of patients following operational reduction, which has not been documented after non-operative reduction.[20]

Bowel perforation is a substantial enema reduction risk. Perforation by different procedures is rare, usually less than 1%. Most perforations are non-necrotic and do not necrosis. Pressures too strong or too fast to change are technical issues. Slowing down the enema and lowering the pressure may help prevent perforation. Infants under 6 months and symptoms lasting more than 36 hours are at risk for perforation.[21] Postoperative complications following laparotomy and laparoscopic intussusception include wound infection, fascial dehiscence, and small intestinal blockage.[5,22]

Complications (4%) would be fewer if no enterotomy or intestinal resection were required (26%). Adhesions in the small bowel may occur after surgery. Up to 20% of patients have recurrent intussusception. Most reoccur between 24 hours to 6 months. It frequently occurs after surgery and is idiopathic. Parents will recognise the signs of repeated intussusception and rush to the hospital. Multiple recurrences in the same kid indicate additional reasons, such as cancer. Ultrasound imaging is advised. When enema reduction fails or clinical problems continue after the operation, exploratory surgery is necessary.[5,22]

CONCLUSION

The patient's overall health must be improved, a stomach sonde placed to decompress and avoid aspiration, fluids and sedatives administered for pain management. Then, if there are evidence of intestinal blockage, surgery is performed. Up to 20% of patients have recurrent intussusception. Most reoccur between 24 hours to 6 months.

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