Thieme

# Potential of colonoscopy as a treatment for intussusception in children



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ABSTRACT

**Background and study aims** Invagination, which can occur in any part of the intestine, usually affects children and is the second most common cause of intestinal obstruction after pyloric stenosis. The cause of these intussusceptions in children is usually unknown and they typically occur within the ileocolic region. Management of pediatric patients with the condition often consists of surgical intervention. However, this retrospective study from the University Hospital of the University of São Paulo, Brazil, reports a series of cases of intussusception in children in whom a colonoscopy was used to reverse the intussusception.

**Patients and methods** From April 2010 to January 2015, 30 pediatric patients underwent a colonoscopy as an noninvasive method for treatment of children's intestinal intussusception.

**Results** Overall, treatment with colonoscopy was successful in reversing invagination in 66.7 % of the patients. However, 33.3 % of patients required surgery to resolve the intussusception.

**Conclusion** Noninvasive colonoscopy is a potential treatment for intussusception in children.

## Introduction

Intussusception is defined as a serious disorder in which an intestinal segment slides into an adjacent part of the intestine. Etiology, symptoms, diagnosis, and treatment differ between children and adults. In general, intussusception in children is idiopathic and etiology can be determined in only 10 % of the cases. Most cases typically occur within the ileo-colic region, but can occur in any part of the intestine. In children, male infants aged 6 to 18 months are most commonly affected. Intussusception is the second most common cause of intestinal obstruction after pyloric stenosis. Only 30 % of all cases occur in children older than 2 years [1, 2].

Certain anatomic features in the developing gastrointestinal tract contribute to invagination in children. These include anterior insertion of the terminal ileum with respect to the cecum, decreased rigidity of the cecum secondary to teniae coli absence, the ileo-cecal valve papillary arrangement, and the presence of longitudinal muscles fibers of the colon in the ileocecal valve. Decreased cecum rigidity secondary to absence or delayed development of the teniae coli allows intussusception of the thickened muscle of the ileocecal valve, which is located more anteriorly, and is more mobile and prone to prolapse [3, 4].

Other conditions, such as viral infections, allergies, celiac disease and Crohn's disease, with consequent hypertrophy of the Peyer plates, can also facilitate intussusception. The incidence is seasonal and usually occurs at the same time as gastroenteritis [4]. Approximately 30 % of intussusception is caused by viral diseases. The association between intussusception and immunization against rotavirus has been reported with an early type of vaccine (RRV-T), which has now been removed from the market [5]. Peristaltic disorders leading to areas of atony as well as neural dysplasia can promote invagination. Other causes of invagination are parasitic diseases, cystic fibrosis, rotation error (e. g., Waugh syndrome) and submucosal hemorrhages in the

Henoch-Schonlein purpura [6]. Meckel diverticulum, intestinal duplication, polyps, hamartomas, and lipomas account for less than 10 % of cases. Idiopathic causes or malignant diseases, such as lymphomas or carcinomas, or association with juvenile polyps and leiomyosarcoma, become prevalent in older children [7 – 11].

So far, non-operative techniques have been developed and advocated for treatment of intussusception in children. Reduction via contrast or pneumatic enemas under fluoroscopic with children radiation exposure and ultrasound guidance has been reported [12 – 15]. To our knowledge, this is the first series reporting the feasibility of colonoscopy as a treatment for children with intussusception.

## Patients and methods

This retrospective study included 30 patients in a university hospital who presented with intestinal invagination and were referred to colonoscopy treatment, from April 2009 to January 2015. The study was approved by the University Hospital Ethics Committee.

There were 20 male (66 %) and 10 female (34 %) patients, with a median age of 17 months, ranging from 3 months to 5 years. Initial care was provided by the emergency pediatric team. Clinical manifestations were nausea and vomiting (66.6 %), diarrhea (47.6 %), hematochezia (42.8 %), and abdominal distension (9.5 %). All patients were diagnosed by abdominal ultrasound. After colonic cleansing with saline enema (10 mL of water/kg of body weight) and intravenous (IV) scopolamine (0.3 mg/kg of body weight), a second ultrasound was performed (within 120 min) in 25 children to confirm the persistence of invagination. This procedure had treated intussusceptions in 5 previous children not included in this report. All these procedures were performed only after the exclusion of peritonitis.

Once the diagnosis was confirmed by ultrasound, surgery was subsequently indicated. If authorized by the person responsible for the child, a colonoscopy was performed in the operating room immediately before surgery, as a first treatment attempt. If the colonoscopy was successful, the patients were kept fasting for 24 hours, with IV scopolamine (0.3 mg/kg of body weight). A new abdominal ultrasound was performed after 24 hours and if there was no sign of intussusception a hospital discharge was scheduled. However, if the colonoscopy was unsuccessful, surgery was performed immediately.

A colonoscope and occasionally a gastroscope were used. Air and physiological solution (NaCl 0.9 %) rather than distilled water was used to avoid water intoxication. The colonoscopy time was limited to 30 minutes to avoid surgical difficulties due to abdominal distention.

During the colonoscopy, the best approach was to place the colonoscope near the central area of the intussusception, where it was possible to see a depressed linear area. Air and water was then injected to raise the intraluminal pressure and undo the invagination.

## Results

All patients were diagnosed by abdominal ultrasound, yet no cause of the intussusceptions was discovered. After colonic cleansing with a saline enema (10 mL of water/kg of body weight) and IV scopolamine (0.3 mg/kg of body weight), a second ultrasound was performed (within 120 min) in 25 children to confirm if the invagination persisted.

Colonoscopy was successful in 20 patients (66.7 %). If colonoscopy was successful, patients were kept fasting for 24 hours, with IV scopolamine (0.3 mg/kg of body weight). New abdominal ultrasound was performed after 24 hours and if there was no signal of intussusceptions hospital discharge was scheduled.

In 10 patients (33.3 %) colonoscopy was not successful and surgery was necessary. In 2 of the 10 patients (20 %), endoscopy was initially successful; however, a control ultrasound, 24 hours after endoscopic resolution, revealed a recurrence of the intussusceptions. In another patient, 9 months older, who had ileum-colon-rectal intussusceptions, the colonoscopy reduced rectal, descendent, and transverse colic invagination, but not the ileocecal intussusception. These segments remained irreducible by the colonoscopy, and therefore required surgical intervention. In this patient, colectomy was performed due to necrosis of the transverse colon. After surgery, the patient was diagnosed as having Waugh's syndrome. In another case, the colonoscopy was partially successful. It reduced almost all of the invagination, not just a part of the ileum wall that was kept in the cecum with necrosis signals. The surgery showed that the unreduced invagination – the part of the ileum wall – was the cecal appendix. In 2 other cases of colonoscopy failure, the surgery was performed with a terminal ileum segment enterectomy for necrosis and perforation. In the other 5 cases of colonoscopy failure, the surgery only reduced the invagination.

## Discussion

Colonoscopy is a noninvasive, cheaper treatment compared to surgery. Surgery in pediatric intussusception patients is usually avoided, unless there are serious infections or peritonitis present [12 – 17]. Some therapeutic procedures have been described, such as barium and gas enemas, and pneumatic and hydrostatic reductions guided by ultrasound [18 – 21]. Colonoscopy was recently reported for the treatment of intussusception in an adult patient. In our pediatric study, colonoscopy was always recommended to be undertaken in the operating room with the support of a surgical team. No serious complications, such as perforation and/or bleeding, were observed. Preparation was carefully considered in all cases, and invagination was clearly observed in all examinations.

Because colon preparation can undo invagination, a second ultrasound was performed after enema and IV scopolamine (0.3 mg/kg of body weight) to confirm the persistence of the disease. Tomography was not requested because the ultrasound has typical signals and avoids exposing children to radiation. After the confirmation, a colonoscopy was performed un-

der general anesthesia with endotracheal intubation to avoid aspiration.

Of the 10 patients treated by surgery, 8 exhibited the classical triad (i. e., pain, diarrhea or hematochezia, and palpable mass) [22 – 24]. It seemed the abdominal mass was associated with colonoscopy failure.

An important advantage of colonoscopy is to allow visualization of the invaginated area, and to confirm whether the problem has been resolved or not. Also, colonoscopy enables the observation of the mucus, and the diagnosis of perforation or necrosis. For example, a particular case with incomplete resolution was observed, which indicated that surgery would be necessary. During the surgery it was evident that invagination remained at the cecal appendix, which was only identified during the colonoscopy.

## Conclusion

To our knowledge there is no report in the literature regarding colonoscopy resolution in a series of intussusceptions in the infant population. Our study indicates that colonoscopy is a very efficient and safe method of treatment for intussusceptions in children.

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### Competing interests

None

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