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Outpatient management of patients with uncomplicated intussusception after successful enema reduction

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Research Article

Keywords: intussusception, children, outpatient management

Posted Date: November 12th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11077713/v1

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Additional Declarations: No competing interests reported.

Abstract

PURPOSE

The purpose of this study is to search for risk factors associated with increased likelihood of recurrence and failure of the hydroenema reduction.

METHODS

Prospective observational study of children with II treated by enema reduction after implementation of an outpatient management protocol in the Emergency Department (ED).

RESULTS

During the study period, we treated 54 patients with II by enema reduction. The median time from symptom onset to deinvagination was 19.5 hours (P_{25}7-P_{75}36). Enema reduction was a successful procedure in 77.8%, achieving reduction in 95.2%. Of the 22% of patients who underwent surgery, 25% had complications, and none among those who underwent enema reduction. Among the patients in whom we achieved a successful enema reduction, 61.6% were managed on an outpatient basis. The median time from deinvagination to discharge from the ED was 6 hours (P_{25}4-P_{75}10.5). Recurrence occurred in 9.2%. Symptom onset > 12 hours significantly increased the likelihood of hospital admission (p = 0.017).

CONCLUSIONS

Outpatient management of patients with II after successful enema reduction is safe, improves patient and parental comfort, and decreases hospital length of stay in line with data from previus literature. Patients with > 12 hours since the onset of symptoms until treatment would benefit from hospital admission for close monitoring.

INTRODUCTION

Intussusception is the most common cause of gastrointestinal obstruction in children aged 6 months to 5 years, being most frequent in those under 1 year of age[1]. Approximately 90% of cases are idiopathic, with fewer cases resulting from a pathological lead point (e.g., polyps, lymphomas, Meckel's diverticulum)[2]. Consequently, most patients are managed conservatively through enema reduction techniques, with a reported success rate between 75% and 85%[3–9].

Currently, there remains some controversy over the optimal post-reduction management of these patients. Most centers in Spain continue to admit patients for 24–48 hours of observation after

successful enema reduction, based on the risk of recurrence and complications as reported in various publications[5, 10–16]. Nonetheless, an increasing number of authors have recently challenged this approach due to insufficient supporting evidence and questionable benefits.

Until 2017, the standard protocol in our hospital involved admitting patients for 24–48 hours of observation after successful hydroenema reduction, based on historical recommendations to monitor for recurrence or post-reduction complications. A follow-up ultrasound was routinely performed prior to discharge[10]. However, recent studies have shown that the risk of recurrence within the first 48 hours is low, and most cases of recurrence would not be detected during hospitalization[11]. Additionally, recurrent intussusception can be safely and effectively treated with repeat enema, without increased risk of complications[12,17].

As a result, there has been growing support in recent years for outpatient management of ileocolic intussusception that resolves successfully with enema. However, due to the lack of prospective studies identifying risk factors for recurrence and complications after successful enema reduction, many pediatric surgery units in our country still routinely admit these patients. Identifying patients who could benefit from hospitalization is critical, given the economic and psychological impact of inpatient care on both the healthcare system and the families.

Over the past 30 years, more studies have supported outpatient management after successful enema reduction in asymptomatic patients. Multidisciplinary guidelines have been developed to facilitate appropriate outpatient management in asymptomatic children following successful enema reduction[18,19]. Raval et al.[20] demonstrated that such protocols can be successfully implemented in ED, reducing costs without compromising care.

In 2017, our institution published a retrospective analysis of patients treated between 2011 and 2015, reporting outcomes similar to those in the existing literature[21].

We therefore conducted a prospective observational study of children with II treated by enema reduction after the implementation of an outpatient management protocol in the ED (October 2017 – January 2025). We searched for risk factors associated with increased likelihood of recurrence and failure of the enema reduction that could help to decide if we can choose an outpatient basis management safely.

MATERIAL AND METHODS

This is a prospective, observational study that includes those patients with ileocolic intussusception (II) confirmed by ultrasound in whom a satisfactory reduction is performed by enema with physiological saline and managed on an outpatient basis after the implementation of a new protocol in the ED (October 2017-January 2025). The criteria for discharging patients after uncomplicated enema reduction are: afebrile, hemodynamically stable, asymptomatic, tolerate semisolid diet, have no other

comorbidities requiring hospital admission, and have trusted caregivers with the means to return to the ED if symptoms recur.

The development of this study will not influence the treatment of the children participating in the study. Patients will be treated following the protocol for intussusception proposed in this study and agreed with the services involved.

After signature of the informed consent by the parents or guardians, the patient will be discharged from the ED and subsequently reviewed in the Surgery Department within 15 days. Clinical records will be checked through the digital application until one year after the episode.

Patient recruitment will be performed sequentially and unicentrically until the calculated sample size is reached. The study will be carried out over 8 years to minimize the influence of variables that may be related to the epidemiological changes typical of each season, starting on October 1, 2017.

The homogeneity of demographic variables, medical history, and other clinical parameters will be analyzed during the study. The description will be performed using the mean, median, standard deviation, and interquartile range for quantitative variables, as well as absolute and relative frequencies for qualitative variables. For quantitative variables, Student's t-tests will be applied when the assumption of normality is met, and non-parametric Mann–Whitney U tests will be used otherwise. Qualitative variables will be analyzed using homogeneity tests based on the χ^2 distribution when expected values allow, and Fisher's exact test otherwise. Clinical variables will be correlated with patient outcomes.

RESULTS

During the study period, a total of 58 patients were diagnosed with II. One male was excluded from the study because of spontaneous resolution of the condition. One patient underwent entry surgery without attempting intestinal deinvagination with hydroenema for radiologic findings of large intestinal wall edema, another for clinical dehydration, and another for rectorrhagia.

Of the 54 patients who underwent intestinal desinvagination with hydroenema in the ED of our center, we attended a total of 35 males (64.8%) and 19 females (35.2%), with a median age of 19 months (p25 10.75 - p75 26.5). There was one case of adenovirus infection, one case of seasonal influenza virus, one patient with MMR (measles, mumps and rubeola) vaccination < 24 hours before the onset of II and one patient with rotavirus vaccination 2 weeks before the episode.

The predominant clinical presentation was colicky abdominal pain with leg cramps (87%) followed by vomiting (70.4%), rectorrhagia (22.2%) and fever (22.2%). A total of 14.8% presented classic symptoms (abdominal pain, bloody stools and vomiting).

The median time from symptom onset to desinvagination was 19.5 hours (P257-P7536).

Hydroenema reduction was a successful procedure in 77.8% (Fig. 1), achieving reduction with one or two attempts in 95.2%. In 2 patients it was necessary to repeat the hydroenema a third time in less than 30 minutes to achieve desinvagination. No previous antibiotic prophylaxis was administered. The on-call surgeon was present in all cases.

A total of 22.2% of the patients in our series underwent surgery after failed hydroenema reduction. The procedure performed in all of them was laparotomy with manual intestinal disinvagination and prophylactic appendectomy. In 55.5% of the patients who underwent surgery, intestinal resection and anastomosis were also required, the cause in 60% of them being a Meckel's diverticulum as the head of invagination, and in the rest, the ischemic aspect of the intestinal wall with a high risk of perforation.

Regarding complications, none have been detected during REH. Regarding the operated patients, 25% suffered a type III complication according to the Clavien-Dindo classification: 2 suture dehiscences (one of them underwent entry surgery without attempting intestinal deinvagination with hydroenema due to fair general condition), and 1 mechanical intestinal obstruction; which required reoperation and prolonged their hospital stay (240; 288; 192 hours respectively).

After intestinal deinvagination with hydroenema, 61.1% were managed as outpatients, with a median time from deinvagination to discharge from the ED of 6 hours (p25-p75 10,5). The rest of the patients were admitted to the pediatric surgery ward due to surgeon preference (impression of poor general condition, unfavorable socio-familial environment, long distance from home to a hospital with pediatric surgery) and/or family preference (distrust of outpatient management or preference for admission due to the late hours of the night).

A follow-up telephone consultation was carried out 15 days after discharge to determine the degree of satisfaction of the parents with outpatient management, the result being 5/5 in all of them.

During the follow-up of the children in our cohort, 9.26% suffered a recurrence (2 patients in < 48 hours, during admission, and 3 in > 48 hours). In all cases, the resolution of the recurrence was performed by hydroenema desinvgination in the ED, and no patient required surgical intervention. The 2 patients who suffered an early recurrence had been admitted to the surgical ward. Both patients were readmitted in the second episode due to the preference of the family and the on-call surgeon. The patients who had a late recurrence were managed on an outpatient basis without incident on all occasions. One patient had a third recurrence one month after the last episode, and was managed by hospital admission by family preference after satisfactory reduction with hydroenema.

A total of 35.1% of the patients in our series reconsulted in the ED for suspected reinvagination after discharge: 8/19 patients < 30 days, 4/19 > 30 days and in both groups 7/19 patients. Of these, 5/19 had a true recurrence (26.3%). One patient, who reconsulted twice, presented a recurrence, resolved with hydroenema.

We performed an exploratory analysis of the observed frequency of recurrence in our cohort of patients, and found no statistically significant differences between the different factors collected (age, sex, symptoms, mechanism of disinvagination, time from diagnosis to discharge). We found a statistically significant difference between time > 12 hours from symptom onset to deinvagination and increased probability of requiring hospital admission ($p = 0.017$). We were unable to demonstrate that time > 12 hours from symptom onset is a risk factor for failure of the intestinal deinvagination with hydroenema procedure and need for surgery (success in < 12 hours 90.5% vs. success of 69.7% in > 12 hours; $p = 0.099$). Likewise, we cannot state that a time > 12 hours from symptom onset to treatment is statistically significantly associated with a higher probability of recurrence (recurrence in < 12 hours 60% vs. 40% in > 12 hours $p = 0.36$).

Clinical records were reviewed for all patients through May 2026 following their last II episode. The regional electronic health record system enabled comprehensive access to medical records across the entire public healthcare network of the Community of Madrid.

No additional clinical records were identified during follow-up for three patients. One patient experienced a new episode of II in February 2026, three years after the last episode documented during the prospective study. The episode was successfully managed with hydroenema reduction on an outpatient basis according to the institutional protocol, without complications.

Another child experienced seven additional episodes of recurrent intussusception and was treated with enema reduction at different healthcare institutions across several regions of the country. Ultimately, the patient underwent laparoscopic surgery in another region in 2024, six years after the initial episode. No further recurrences have been documented following surgical intervention to date.

DISCUSION

Until October 2017, patients with an II undergoing a hydroenema reduction in the ED of our center were admitted to the Pediatric Surgery ward for observation. Before discharge they were evaluated clinically and radiologically with abdominal ultrasound. We performed a retrospective study[21] recognizing that these patients were almost always discharged in the morning without any incidence and with normal ultrasound scans. Therefore, we thought that the implementation of a protocol that included observation in the ED could decrease admissions and not affect our rate of surgical intervention, complications or recurrence, improving the comfort of the patient and family and decreasing the hospital costs associated with the admission of a patient. The recommended initial treatment for stable patients without evidence of perforation is reduction by hydrostatic or pneumatic enema[22,23]. In our center, ultrasound-guided hydroenema is always used for intestinal deinvagination, with a high success rate according to this work of 77.8%, which is in line with the findings of previous studies that have reported success rates ranging from 70–85% for this non-surgical procedure[22,23,24] and with our previous experience collected 10 years ago (83.5%)[21]. It also avoids radiation exposure and the potential risk of allergic reactions associated with other contrast agents.

Many of these studies, however, emphasize the use of air or barium enema[23,24] and not hydroenema. This is probably due to the fact that they are performed in centers in the USA where the presence of a radiologist expert in ultrasound is less frequent, and reduction with hydroenema requires the presence of a professional expert in ultrasound to confirm the reduction dynamically.

In our series, we have performed incidental appendectomy in all cases when surgical intervention was necessary (12/54). The controversy surrounding the performance of an appendectomy during surgery for intussusception revolves mainly around the balance between potential benefits and risks[25,26,27]. One argument for performing an incidental appendectomy is to eliminate the future risk of appendicitis, which can be diagnostically challenging and may require further emergency surgery[25,26,27]. However, this practice is debated because of the potential for increased postoperative complications. According to a study by Wang et al.[26], patients who underwent appendectomy during surgical reduction for II had a longer mean hospital stay and associated total cost compared to those who did not undergo appendectomy.

In addition, there was a trend toward a higher rate of postoperative small bowel obstruction in the appendectomy group, although it did not reach statistical significance[25]. Therefore, the decision to perform an appendectomy should be carefully considered on a case-by-case basis, weighing the potential benefits against the risks[25,26].

In our study, 61.1% of patients were managed on an outpatient basis, with a median time from hydroenema reduction to discharge from the ED of approximately 6 hours. If the time of disinvagination was after midnight, the family was also offered to go home in the early morning, but on most occasions, they preferred to spend the night in the hospital and be discharged the following morning. For this reason, the resulting length of hospital stay was longer than expected, despite the fact that the patients met Aldrete's criteria for discharge home much earlier than the time recorded. We consider that the families convey an excellent degree of satisfaction with outpatient management, according to the telephone interview conducted 15 days after discharge (5/5). These findings are consistent with previous studies that have shown outpatient management to be safe and effective, with no significant differences in readmission or recurrence rate compared to inpatient management[22,24,28]. Litz et al.[29] also found that outpatient management does not increase the need for surgical intervention or the rate of post-treatment complications.

The recurrence rate in our cohort was 9.26%. All of them were resolved by hydroenema, without the need for surgical intervention. This is comparable with recurrence rates reported in the literature, which vary between 6% and 16%[22,24,30,31].

Exploratory analysis of our cohort found no statistically significant differences between the factors collected (age, sex, symptoms, time since symptom onset) and the frequency of recurrence. On the other hand, in the multivariate analysis, we detected that a time > 12 hours from symptom onset to enema reduction in the ED was associated with a higher admission rate ($p = 0.017$). Furthermore, although we

have not been able to demonstrate it in a statistically significant way, we suspect that a time > 12 hours may constitute a risk factor for failure of the hydroenema reduction procedure and need for surgery (p = 0.099), as well as the probability of early recurrence (< 48 hours) (p = 0.36). Other authors, such as Kelley-Quon et al[23], argue according to their analysis that age > 2 years would be a criterion for deciding hospital admission for surveillance given the increased risk of recurrence in < 48 hours.

Litz et al.[29] also found that ambulatory management does not increase the need for surgical intervention or the rate of post-treatment complications. In our series, no complications derived from hydrostatic enema reduction and outpatient management were detected. The child who suffered a total of 7 new episodes of recurrent II highlights the importance of considering rare conditions associated with recurrent intussusception, such as Waugh syndrome. Previous reports have suggested that failure of non-operative management may be related to this association, underscoring the need for increased awareness of this entity among clinicians.[32]

In total, 35.1% of the patients managed on an outpatient basis returned to consult the ED of our center in < 30 days, finding true recurrence in 26.3%. In comparison with the work published by Sujk et al[22], very similar to ours but with a much larger sample size (115 patients), 21% of the patients reconsulted in the ED, finding that 33% had a true recurrence. A higher rate of ED reconsult in outpatients would not be unexpected, as families are warned about the risk of early recurrence and instructed to return if symptoms appear. Inpatients can be examined and families reassured if symptoms recur in the first 24–48 hours, whereas outpatients must return to the ED for reevaluation. Another possible explanation is that inpatients may receive intravenous hydration for longer periods, addressing minor acid-base or electrolyte abnormalities that may be present.

Although it is difficult to compare rates and costs between centers and countries, several studies have reported significant cost savings from outpatient treatment[33]. Pilkington et al[31] reported in their multicenter retrospective study from Canada, a savings of $1771 among patients who were discharged from the ED. Espinoza et al[21] concluded that outpatient management of a selected population with good general condition and normal physical examination after successful reduction with an enema would result in a reduction of hospital costs of €1,723.75 per patient. In addition to reduced patient costs, other benefits to families include less missed work and school days and less disruption to routine that occurs when a child is hospitalized[22,31,33]. Unfortunately, we have not been able to compare the results of this study with the work published 10 years ago in our center due to the great time difference and lack of data available for an adequate statistical comparison. It is clear that there has been a decrease in the time from treatment to hospital discharge (from the ED in this study); median 35 hours in the retrospective study[21] versus 6 hours in our prospective cohort after the implementation of the outpatient management protocol. Given the marked decrease in admission and hospital stay, it can be assumed that our protocol represents a cost saving in the care of pediatric patients with intussusception.

As limitations of our study, it should be mentioned that only one hospital center was involved, resulting in a small sample size. On the other hand, given that the reasons for selecting patient admission were

based not only on the success or failure of the enema reduction, but of course always on family preference and social factors (proximity to a hospital center or unfavorable sociofamilial situation), even though the patients would otherwise have been candidates for outpatient management, a selection bias is generated that may affect the results of the study.

In conclusion, our results support the safety and efficacy of hydroenema as first-line treatment for II and reinforce the feasibility of outpatient management without increasing the rate of complications or recurrences. However, further research is required to optimize the selection of patients who may benefit from this strategy.

CONCLUSIONS

1- Outpatient management of patients with ileocolic intussusception after successful enema reduction is safe and decreases hospital length of stay without increasing the risk of complications or recurrence, in line with data from previous literature. Patients with > 12 hours since the onset of symptoms until treatment would benefit from hospital admission for close monitoring.

2- Outpatient management improves patient and parent comfort, with the highest satisfaction score in surveys.

3- Without negatively influencing patient safety or treatment success, outpatient management of intussusception can contribute to a significant decrease in hospital costs.

Declarations

ETHICS APPROVAL

Approval was obtained from the ethics committee of Hospital Infantil Universitraio Niño Jesús. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Consent to participte

Informed consent was obtained from all individual participants included in the study.

ACKNOWLEDGMENTS

I would like to thank the collaboration of all the authors who helped to write this article, and with whom I had long conversations regarding the subject of this work. I would especially like to emphasize the interest and involvement of doctors Espinoza-Vega and Maruszewski.

PROJECTS BENEFITS

The realization of this project will have appreciable contributions in the clinical practice of a frequent pathology in our environment. The hypothetical safety and cost-effectiveness of an outpatient

management protocol for a selected population of patients with intussusception satisfactorily resolved by enema with physiological saline may be of great help in the management of these patients, reducing the economic and psychological implications of hospital admission for both the health system and the patient.

The results derived from this project will serve as a basis for improving the management of intussusception in pediatric patients and the data will be disseminated in biomedical journals.

Author Contribution

Author ContributionsConceptualization: MEV, CGVMethodology & Project Administration: CGV, MEVData Curation: CGV, MRJ, PMFormal Analysis: AMV, CGVInvestigation / Literature Search: CGV, GAR, ALH, HSR, PMR, JLCWriting – Original Draft: CGVWriting – Review & Editing & Language Editing: PM, GAR, CGVSupervision: MEVAll authors read and approved the final version of the manuscript.

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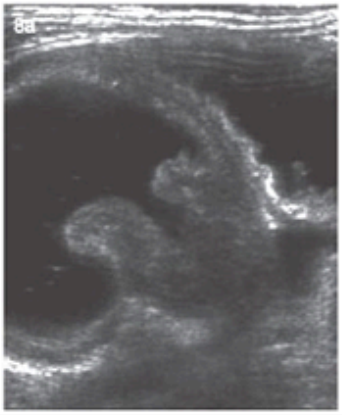
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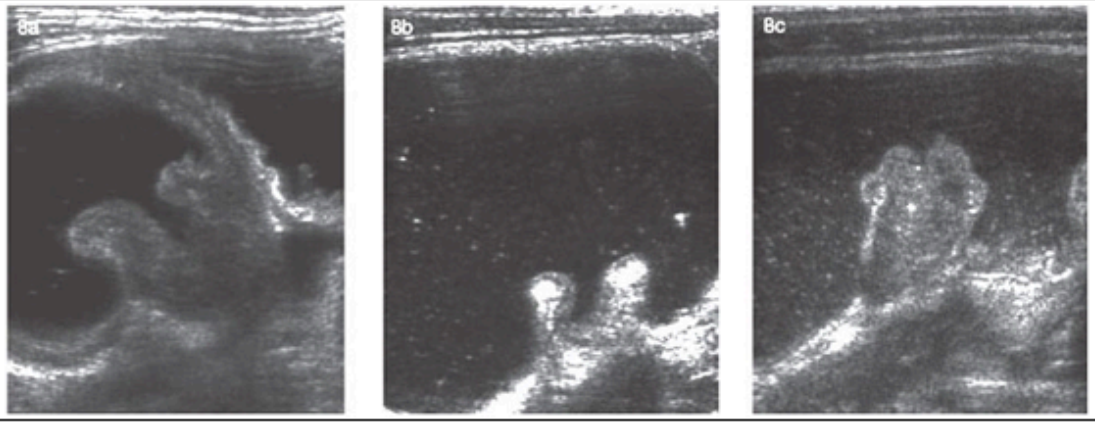
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Figures

Functional check: visualization of fluid in distal ileum loopsand passage of fluid through the ileocecal valve.



Anatomical check: Different forms of presentation of edematous ileocecal valve (thick-lipped sign).



Anatomical verification: loop of terminal ileum with thick wall due to edema.



Figure 1

images of reduction of intussusception with hydrostatic enema.