INTRODUCTION

Intussusception is the most common cause of gastrointestinal obstruction in children aged 3 months to 5 years, but most commonly occurs in those younger than 1 year of age (1). The location of intussusception is ileocolic in 90% of cases, whereas the etiology is most often idiopathic. Pathologic lead points are uncommonly discovered, therefore, initial management is non-surgical, with air or barium enema. Operative reduction is reserved for those cases of failed enema reduction or in patients with presumed perforation, peritonitis, or sepsis.

The overall recurrence rate for intussusception is approximately 10%, with a range from 6.7% to 13% (2–14). Early recurrence rate within the first 24 h ranges from 0% to 5.3%, whereas the rate within the first 48 h ranges from 0% to 7.1% (2–8,10,14). Risk factors for recurrent intussusception have not been clearly defined, so standard practice at most children’s hospitals in North America has been to admit patients for 24–48 h of observation (9,11–13). However, the utility of such routine practice has not been clearly justified.

The objective of this study was to determine if children with successful enema-reduced intussusception can be routinely managed as outpatients after an observation period in the Emergency Department (ED). The main outcome measure was to determine the rate and timing of...
recurrent intussusception after successful enema reduction and describe any associated complications.

MATERIALS AND METHODS

This was a retrospective chart review performed at a tertiary care, free-standing children’s hospital with approximately 60,000 annual pediatric ED visits. The study was approved by the hospital’s Institutional Review Board. The International Classification of Diseases, 9th Revision, code 560.0 for intussusception was used to identify patients with intussusception during a 7-year period from January 2002 to December 2008.

All children ages 0–17 years that presented to the ED with confirmed and uncomplicated enema-reduced intussusception were eligible for study inclusion. Exclusion criteria included patients with an incomplete medical record, those with pre-existing chronic medical conditions that may have predisposed them to intussusception, patients who did not undergo reduction attempt, had unsuccessful enema reduction, or were found to have a normal enema.

Charts were reviewed using a standardized data collection form that included demographics, presenting signs and symptoms, physical examination findings, radiographic studies utilized and their findings, location of management after enema reduction (ED or inpatient unit), number and timing of any recurrences, and adverse events. Attempt was made to contact patients by telephone with confirmed enema-reduced intussusception to determine if they had presented to another institution for possible recurrence. Recurrence of intussusception was defined as early if it occurred before 48 h post-enema reduction and late if it occurred > 48 h after.

The audit followed the suggested guidelines for chart review in Emergency Medicine research (15). Data abstractors included one senior pediatric resident, two Pediatric Emergency Medicine fellows, and two board-certified Pediatric Emergency Medicine faculty. Several charts were jointly reviewed by the primary investigator and each abstractor to ensure an understanding of the data collection form. Subsequent charts were then reviewed by one abstractor, and a total of 10% of the charts were randomly re-reviewed by the senior investigator as a quality assurance measure. Abstractors were not blinded to the study goals.

RESULTS

During the 7-year study period, there were 202 patients identified with a diagnosis of intussusception. Eight patients had no enema reduction attempted and were taken to the operating room for surgical reduction. The remaining 194 patients had an attempt at enema reduction. Eight patients had a normal enema and were given a diagnosis of resolved intussusception, and another 88 patients had unsuccessful enema reduction. The remaining 98 patients had successful enema reduction and were eligible for our study (Figure 1).

The location of intussusception was ileocolic in 91 cases (92.9%). Four had ileoileal intussusception (4.1%) and three had colo-colonic intussusception (3.1%). Enlarged mesenteric lymph nodes were documented in 4 patients (4.1%), whereas 6 patients (6.1%) had pathologic lead points (three intestinal polyps, lymphoma, Meckel diverticulum, duplication cyst).

There were 10 total episodes of recurrence in 7 patients, for an overall recurrence rate of 7.1% (Table 1). Six of the 7 patients were female (85.7%), with a mean age of 24.4 months, median age of 13 months, and an age range of 5 months to 5.3 years. Three patients (42.9%) had two recurrences each, and the remainder had single recurrences (57.1%). Two patients had recurrence within 24 h, for a 24-h recurrence rate of 2.0%. The first of these patients had the earliest recurrence at 3 h after successful enema reduction demonstrating a colo-colonic intussusception. After reduction, this patient was initially asymptomatic, but later, while waiting for an inpatient bed, had return of abdominal pain that was different in character from her prior pain. Computed tomography of the abdomen/pelvis was performed to exclude other possible etiologies and showed a return of her colo-colonic intussusception. Enema reduction was again
successful without complication. This patient was also unique in that the recurrence occurred outside of the typical age range for intussusception. The second patient had recurrence at 5 h after successful enema reduction with abdominal pain, bilious emesis, bloody stools, and an abdominal mass superior to the umbilicus. Repeat enema was unsuccessful, and the patient was reduced surgically, with removal of an enlarged lymph node and a hemorrhagic appendix.

No additional recurrences occurred between the 24- to 48-h period after reduction. The remaining 5 patients had recurrences occurring > 48 h later, for a late recurrence rate of 5.1%. The majority of recurrences occurred within 1 month (5/7, 71.4%), although the remaining two occurred at a much later time period of 14 months and 29 months. Seven of the 10 recurrences were successfully reduced again by enema, and the remaining three required surgical reduction. Lymphoid hyperplasia was noted in one patient, and a pathologic lead point (large juvenile polyp) was found in one of the 7 patients (14.3%). No adverse events (bowel resection, sepsis, perforation) were noted in any of the recurrences. Of the 3 patients with colo-colic intussusception that underwent successful initial enema reduction, 2 had recurrences. The first recurred at the shortest interval of only 3 h, and the other recurred 4 days later. Telephone follow-up was successful in 33 (33.7%) patients with enema-reduced intussusception. None of these patients had any further recurrences.

Of the 98 patients, 90 (91.8%) were admitted to the hospital after enema reduction for a mean total length of stay of 35.2 h. The other 8 patients were observed in the ED for an average duration of 7.1 h after enema reduction. The mean age of those admitted patients was 17.0 months, vs. 11.6 months in those not admitted and observed in the ED. All of the recurrences occurred in the group chosen to be managed with inpatient hospital observation.

**DISCUSSION**

The management of patients after successful enema reduction of intussusception has been subject to debate. There is no validated evidence to support the inpatient management of children with enema-reduced intussusception, however, it has been common practice at most institutions to admit patients for an observation period. An early, often-cited case series of 35 patients by Eklof showed a 43% recurrence rate in the first 48 h after enema reduction (2). Another study reported an isolated case of post-reduction hypovolemic shock (16). Thus, early recommendations were to hospitalize for an observation period of 48 h. Our study demonstrated an early recurrence rate (<48 h) of 2.0%, whereas our late recurrence rate (>48 h) was 8.2%.

Several more recent studies have shown lower early recurrence rates compared to the study by Eklof (2). These studies demonstrated a 24-h recurrence rate between 0% and 5.3%, and a 48-h recurrence rate between 0% and 7.1%, which are similar to our study (2–8,10,14). In terms of late recurrence, the same aforementioned studies noted a > 48-h recurrence rate of 4.7% to 8.7%, with an overall recurrence rate of approximately 10%, also in accordance with the results of our study.

In our study, pathologic lead points were found in one of 7 patients (14.3%) with recurrent intussusception, compared with 5/91 (5.5%) patients without recurrent intussusception. This is in agreement with the reported 4–8% incidence of pathologic lead points, as well as the higher reported rates of pathologic lead points in those with recurrences (5,17). Our study provides further evidence to more highly consider a pathologic lead

---

**Table 1. Recurrences after Enema Reduction**

<table>
<thead>
<tr>
<th>Age (Months)</th>
<th>Gender</th>
<th>Recurrences</th>
<th>Location</th>
<th>Time after Enema</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>F</td>
<td>1</td>
<td>Colo-colic</td>
<td>3 h</td>
<td>Abdominal pain 1 h after successful enema reduction. Enema reduction successful again. Admitted × 24 h.</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>1</td>
<td>Ileocolic</td>
<td>5 h</td>
<td>Unsuccessful enema reduction. Reduced surgically. Lymph node hyperplasia. Admitted × 40 h.</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>1</td>
<td>Colo-colic</td>
<td>4 days</td>
<td>Successful enema reduction, large juvenile polyp. Admitted × 72 h.</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>1</td>
<td>Ileocolic</td>
<td>19 days</td>
<td>Successful enema reduction, no lead point. Admitted × 26 h.</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>2</td>
<td>Ileocolic</td>
<td>23 days</td>
<td>Successful enema reduction, no lead point. Admitted × 36 h.</td>
</tr>
<tr>
<td>36</td>
<td>F</td>
<td>2</td>
<td>Ileocolic</td>
<td>39 days</td>
<td>Successful enema reduction, no lead point. Admitted × 40 h.</td>
</tr>
<tr>
<td>35</td>
<td>F</td>
<td>2</td>
<td>Ileocolic</td>
<td>14 months</td>
<td>Successful enema reduction, no lead point. Admitted × 31 h.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ileocolic</td>
<td>18 months</td>
<td>Unsuccessful enema reduction. Reduced surgically. No lead point. Admitted × 29 h.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ileocolic</td>
<td>29 months</td>
<td>Unsuccessful enema reduction. Reduced surgically. No lead point. Admitted × 40 h.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ileocolic</td>
<td>55 months</td>
<td>Unsuccessful enema reduction. Reduced surgically. No lead point. Admitted × 72 h.</td>
</tr>
</tbody>
</table>
point in those with recurrences. However, although the incidence of a pathologic lead point is higher in those with recurrences, most patients with a pathologic lead point do not have a recurrence (5).

Interestingly, 2 of the 3 patients in our study with colocolonic enema-reduced intussusception had recurrences. One of these had the shortest interval to recurrence of 3 h, and was, further, the oldest at 5.3 years of age. This further suggests that those with colocolonic reduced intussusception have an increased risk for recurrence. No prior studies have made specific mention of recurrences other than ileocolic, making this a unique finding in our study.

Although most institutions tend to admit patients for observation, there are some that routinely manage most enema-reduced intussusception as outpatients after an observation period in the ED or observation unit (11, 12, 14). Bajaj and Roback managed 65% of their patients in an ED observation unit, whereas Gilmore et al. observed 82% of patients in the ED (11, 14). According to Gilmore et al., a patient post-reduction had to remain alert and asymptomatic, have a normal physical examination, tolerate oral feeds, and have means to return to the ED to meet discharge criteria (14). Neither study specifically stated a minimum ED observation period, although Bajaj and Roback noted an average length of stay in the ED observation group of 7.15 h, whereas Gilmore et al. documented an average of 7 h (11, 14). The 8 patients that were observed in the ED in our study were observed for a mean duration of 7.1 h after enema reduction. Of the few studies that specifically stated the timing of their early recurrences, most all were within several hours after reduction. Our study noted early recurrences at 3 and 5 h, Gilmore et al. at 30 min and 2 h, Bajaj and Roback at 5 h, and Daneman et al. at a “few hours” (5, 11, 14). It may thus be reasonable to suggest a 6-h observation period in the ED or observation unit post-enema reduction if patients can fulfill discharge criteria, such as those proposed by Gilmore et al.

Limitations

The greatest limitation of this study is its small study size and retrospective design. This limits the conclusions that can be drawn from this single study alone. Furthermore, although this is the only dedicated children’s hospital in the area, we cannot be certain that patients did not present to another facility with a recurrence or adverse event, given our inability to contact all of the families.

CONCLUSIONS

Given the low early recurrence rate for enema-reduced intussusception and the low occurrence of adverse events, ED observation for a 6-h period may be a safe alternative to inpatient management. These results fully support similar recent work and suggest that these patients can be managed on an outpatient basis. However, a large prospective study is warranted to further validate these results.

REFERENCES

ARTICLE SUMMARY

1. Why is this topic important?
   Standard practice has been to admit children for an observation period after enema-reduced intussusception. However, the utility of such routine practice has not been clearly justified.

2. What does this study attempt to show?
   Emergency department observation for a 6-h period seems to be a safe alternative to inpatient management for successful enema-reduced intussusception.

3. What are the key findings?
   There were 10 episodes of recurrence in 7 patients for an overall recurrence rate of 7.1%. Two patients had early recurrences at < 48 h, for an early recurrence rate of 2.0%. No adverse events were noted in any of the recurrences.

4. How is patient care impacted?
   Outpatient management of successful enema-reduced intussusception can minimize unnecessary hospitalizations and reduce societal costs and financial stress on the health care system.