SELCUK MEDICAL JOURNAL
SELÇUK TIP DERGİSİ
DOI:http:/dx.doi.org/10.30733/std.2026.01899
Selcuk Med J 2026;42(2): 108-112

OPEN

RESEARCH ARTICLE

The Management of Intussusception in Children: When to Observe, to Non-Surgically Reduce, and to Operate?

Çocuklarda İnvajinasyona Yaklaşım: Acil Ameliyat mı edilmeli? Redüksiyon mu Denenmeli? Takip mi Edilmeli?

Canan Kocaoglu[1], Hasan Madenci[1]

[1]Necmettin Erbakan University, Faculty of Medicine, Department of Pediatric Surgery, Konya, Türkiye

ABSTRACT
Objective: To evaluate demographic characteristics, treatment approaches, and outcomes of children diagnosed with intussusception via ultrasound (US) and develop an algorithm for managing these children.
Materials and Methods: Sixty-five patients diagnosed between 2020 and 2023 were evaluated. Length of invaginated segment, clinical findings, treatment approach, time from onset of symptom to admission, and results were examined.
Results: Median age was 34 months (range 2-156) (27 females, 38 males). Patients were grouped as follows: Group 1: Medical follow-up and treatment (n=24), median presentation time: 30.5 hours (8-48), median invaginated segment length: 32.5 mm (12-65). Group 2: Hydrostatic or contrast reduction under US/fluoroscopy (n=21), median presentation time: 24 hours (8-48), median invaginated segment length: 50 mm (20-120). Group 3: Emergency surgery (n=20), median presentation time: 36 hours (12-100), median invaginated segment length: 46 mm (20-100). Segment lengths of Group 1 and Groups 2 and 3 differed significantly (p=0.001, p=0.002). There was a significant difference in presentation time between Groups 2 and 3 (p=0.035), but not between Group 1 and the rest. Hydrostatic reduction failed in six patients in Group 2, requiring surgery. In Group 3, most patients undergoing surgery were reduced manually, but four required resection.
Conclusion: Intussusception can be transient in some cases. Intermittent US is an appropriate approach, especially for intussusceptions shorter than 32.5 mm. For longer segments, if the patient's general condition is good, hydrostatic reduction should be the preferred approach. However, in cases having serious clinical findings such as late presentation, palpation of abdominal masses, or presence of "currant jelly" stool, surgical intervention should be performed without delay.

Keywords: Children, hydrostatic reduction, intussusception, ultrasound

ÖZET
Amaç: Ultrasonografi ile invajinasyon tanısı konulan pediatrik hastaların demografik özelliklerini, tedavi yaklaşımlarını, sonuçlarını değerlendirmek ve çocuklarda invajinasyon yönetimi için bir algoritma oluşturulması hedeflenmiştir.
Gereç ve Yöntemler: Ocak 2020- Haziran 2023 tarihleri arasında kliniğimizde invajinasyon tanısı alan 65 olgu retrospektif olarak incelendi. Olguların yaş, cinsiyet, klinik bulguları, başvuru süresi, invajine segment uzunlukları, uygulanan tedavi yöntemleri ve sonuçları değerlendirildi.
Bulgular: Hastaların medyan yaşı 34 ay (2–156 ay), 27'si kız, 38'i erkektir. Olgular tedavi şekline göre üç gruba ayrılmıştır: Grup 1 (n=24): Medikal izlem. Medyan başvuru süresi 30,5 saat (8–48); invajine segment uzunluğu 32,5 mm (12–65). Grup 2 (n=21): Ultrason veya floroskopi eşliğinde hidrostatik/kontrast madde ile redüksiyon. Medyan başvuru süresi 24 saat (8–48); invajine segment uzunluğu 50 mm (20–120). Grup 3 (n=20): Acil cerrahi. Medyan başvuru süresi 36 saat (12–100); invajine segment uzunluğu 46 mm (20–100). Grup 1 ile Grup 2 ve 3 arasında segment uzunluğu açısından anlamlı fark bulunmuştur (p=0,001 ve p=0,002). Grup 2 ile 3 arasında başvuru süresi açısından da anlamlı fark mevcuttur (p=0,035). Grup 2'de 6 hastada redüksiyon başarısız olmuş ve cerrahi gerekmiştir. Grup 3'te cerrahi uygulanan olguların çoğu manuel olarak redükte edilmiş, ancak 4 olguda rezeksiyon yapılmıştır.
Sonuç: İnvajinasyon bazı durumlarda geçici olabilir. Özellikle 32,5 mm'den kısa segmentli invajinasyonlarda, aralıklı ultrasonografi ile takip uygun bir yaklaşımdır. Daha uzun segmentlerde, hastanın genel durumu iyi ise, cerrahi dışı güvenli bir yöntem olan hidrostatik redüksiyon tercih edilmelidir. Ancak geç başvuru, batında kitle palpasyonu veya kanlı dışkı varlığı gibi ciddi klinik bulguların eşlik ettiği olgularda, cerrahi müdahale geciktirilmeden yapılmalıdır.

Anahtar Kelimeler: Çocuk, hidrostatik redüksiyon, invajinasyon, ultrasonografi

Received: 15 September 2025 **Accepted:** 10 November 2025 **Published Online:** 17 June 2026

Corresponding Author: Canan Kocaoglu, Necmettin Erbakan University, Faculty of Medicine, Department of Pediatric Surgery, Konya, Türkiye
e-mail: drckocaoglu@hotmail.com

Cite this article as: Kocaoglu C, Madenci H. The Management of Intussusception in Children: When to Observe, to Non-Surgically Reduce, and to Operate? Selcuk Med J 2026;42(2): 108-112

Disclosure: *Author has not a financial interest in any of the products, devices, or drugs mentioned in this article. The research was not sponsored by an outside organization. Author has agreed to allow full access to the primary data and to allow the journal to review the data if requested.*

INTRODUCTION

The protrusion of the proximal intestine segment into the more distal intestinal section is known as intussusception. One of the most common causes of acute intestinal obstruction in toddlers and infants aged between four and 10 months is intussusception. The incidence of intussusception ranges from one to four in 2000 infants and children, and decreases beyond the age of two. The majority of studies describe a 2:1 or 3:2 ratio of males to girls with intussusception (1).

Typical symptoms include a sudden start of vomiting, intermittent abdominal pain, and "currant jelly" stool. The delays in therapy can result in a series of potentially fatal consequences, including tissue ischemia, necrosis, intestinal perforation, and vascular congestion and edema of the intussuscepted intestinal wall (2). Although ileo-colic intussusception is the most prevalent variety, ileo-ileal or colo-colic forms can also occur (3).

The requirement for surgery has been greatly decreased by fluoroscopy or ultrasound (US)-guided intussusception reduction in recent decades (4,5). US-guided hydrostatic reduction is more advantageous, even when the success rates of non-surgical interventions are comparable, since it is safe, easy to use, and radiation-free (6). The treatment modalities for intussusception may involve medical follow-ups or surgical interventions, including bowel resection. The treatment algorithm varies greatly depending on the condition of the patient. Therefore, the current study aimed to assess our intussusception experiences from January 2020 to June 2023, and based on our findings, we aimed to develop an algorithm for managing children with intussusception.

MATERIALS AND METHODS

The data obtained from the patients (38 males and 27 females) presenting to the pediatric emergency department of our hospital between January 2020 and June 2023 and diagnosed with intussusception were retrospectively analyzed. The patients diagnosed with intussusception were also divided into three groups based on the following criteria:

Group 1: Patients receiving medical follow-up and treatment consisted of those diagnosed with intussusception based on clinical history, physical examination findings, and abdominal US examination, and demonstrating spontaneous reduction. Close observation, including physical examinations every two hours and US at least once every six hours, is the recommended course of treatment for cases of intussusception not exhibiting clinical worsening, intestinal blockage, or acute abdominal findings.

Group 2: Patients treated with US or fluoroscopy guidance, hydrostatic water pressure, or radiopaque material. The main characteristic of this patient group was that they were treated with reduction methods other than surgical methods.

Group 3: Patients treated with surgical methods. Regardless of the cause, patients treated with surgical methods were included in this group.

In terms of the inclusion criteria, all patients under 16 years of age admitted to the pediatric emergency department of our hospital with complaints such as abdominal pain, vomiting, and restlessness, and diagnosed with intussusception after physical examination and further testing, were included in the study. However, as for the inclusion criteria, patients diagnosed with intussusception who refused surgical treatment were excluded from the study, and their treatment was continued at another center.

The data of all patients were obtained from the digital information system of the hospital and the files of patients. Age, gender, clinical findings, intussusception segment lengths measured by US, time from the onset of symptoms to presentation to our clinic, treatment methods and outcomes, and length of hospital stay were evaluated and recorded. Approval was obtained from the local ethics committee of the institution for the study (Registration number and date: 2024-4897, 05/04/2024).

The Statistical Package for Social Sciences, version 22.0 (SPSS, IBM Corp., Chicago, IL, USA) was used for statistical analyses. Visual histograms and probability charts were used to assess the suitability of the variables for normal distribution rates by using analytical techniques such as the Shapiro-Wilk and Kolmogorov-Smirnov tests. Frequency tables for ordinal variables and median and interquartile range (IQR) for deviant variables were utilized to display the descriptive analyses. The threshold for statistical significance was set at $p < 0.05$.

RESULTS

A total of 65 patients, 38 males and 27 females, were included, and the median age was 34 months (ranging from 2 to 156 months). When the patients were grouped based on age (younger than one year old, age between one and three years, age between three and six years, and older than six years), the number of patients in the groups included was 16, 20, 14, and 15, respectively (Table 1). US was used to diagnose all cases, except for one; in other words, this case was diagnosed with computerized tomography (CT). Based on US and CT findings, three types of intussusception were detected: Ileoileal or jejunojejunal, ileocolic, and colocolic in 42 patients. Of 42

Table 1. Types of intussusception according to age groups

Age (years)	Group 1 (n)	Group 2 (n)	Group 3 (n)	Total (n)
<1	4	5	7	16
1-3	6	8	6	20
3-6	7	4	3	14
>6	7	4	4	15
Total	24	21	20	65

Table 2. Demographics and characteristics of the patients

	Group 1	Group 2		Group 3	Total	p
		successed	failed			
Number of Patients (%)	24 (37)	15	6	20 (30.7)	65	
Gender M/F	12/12	8/7	3/3	15/5	38/27	
Median Age (months) (range)	48 (2-127)	33 (8-109)		26,5 (7-156)	34 (2-156)	> 0.05
Median Length of Involved Segment, (mm) (range)	32.5 (12-65)	50 (20-120)		46 (20-100)	40 (12-120)	<0.05*
Median Presentation Time (hours) (range)	30.5 (8-48)	24 (8-48)		36 (12-100)	33.8 (8-100)	<0.05**
Reccurence (%)	4 (16.6)	4 (19)		-	8 (12)	

Group 1. Transient intussusception
Group 2. Hydrostatic/ radiopaque material reduction
Group 3. Surgery
* Group 1 and 2
Group 1 and 3
** Group 2 and 3, F: Female, M: Male

patients, 11 were reported as ileoileal, 29 as ileocolic, and 2 as colocolic. The location of intussusception was not specified in the US investigations of the remaining 23 patients. While 24 of 65 patients (37%) were reduced spontaneously, 21 (32.3%) were reduced hydrostatically (n=16) or with radiopaque materials (n=5), and 20 underwent surgery (30.7%).

The patients were also grouped by the treatment modalities: Group 1: Medical follow-up and treatment (n=24), median presentation time: 30.5 hours (8–48), and median invaginated segment length: 32.5 mm (12–65). Group 2: Hydrostatic or radiopaque material reduction under US/ fluoroscopy (n=21), median presentation time: 24 hours (8–48), and median invaginated segment length: 50 mm (20–120). Group 3: Emergency surgery (n=20), median presentation time: 36 hours (12–100), and median invaginated segment length: 46 mm (20–100). There was a significant difference in segment length between Group 1 and Groups 2 and 3 (p=0.001 and p=0.002). No significant difference in presentation time was found between Group 1 and the other groups; however, the difference between Groups 2 and 3 was significant (p=0.035) (Table 2). Recurrence was observed in four cases in Group 1 and four cases in Group 2. Hydrostatic reduction failed in six patients in Group 2 (28.6%), requiring surgery (mean invaginated segment length 57.5 mm), with a reduction success of 71.4%, and of these six patients, one has Meckel's diverticula. In Group 3, while most patients undergoing surgery were reduced manually, four required resection; additionally, there were cases with a long admission time and poor clinical condition. "Currant jelly" stool was detected in four of those in Group 3, and a mass was palpated in two of them. Meckel's diverticula were detected in two of the Group 3 patients.

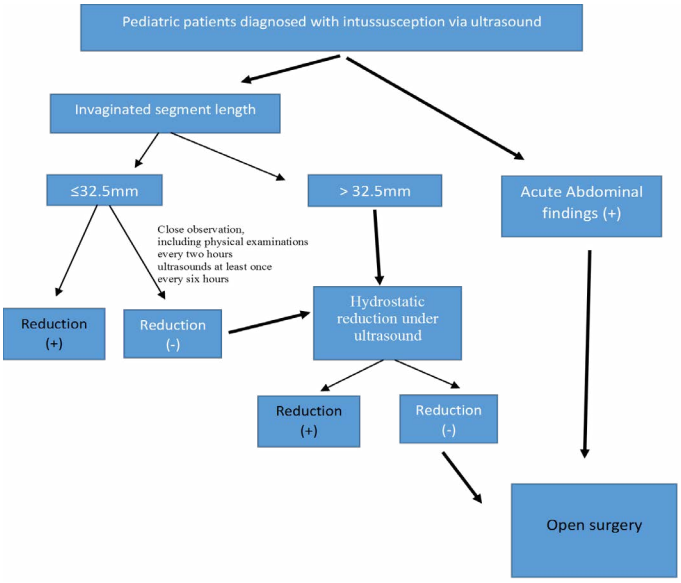

Figure 1. Intussusception management flow chart

DISCUSSION

Intussusception is one of the most common causes of intestinal obstruction in infants, and the majority of cases are identified earlier in recent decades as secondary due to the greater accessibility of US (7). Although intussusception is most commonly seen in infants aged between four and 10 months, the majority of cases occur before three years of age. In our case series, out of 65 patients, 36 (55.4%) were under the age of three. In most series, a higher incidence of intussusception has been reported in males, compared to females, typically with a male-to-female ratio of 2:1 or 3:2 (1). Consistent with the literature, our series also demonstrated a similar male-to-female ratio of 3:2.

Although the cause cannot be determined in most patients, the underlying leading point causing intussusception is detected in 2-50% of the cases, especially in older children (8). Mass lesions, including Meckel's diverticulum, lymphoma, intramural hematoma, or enlarged mesenteric lymph nodes, may be observed (9,10). Among the surgically treated cases, Meckel's diverticulum was identified in three patients in our series, suggesting that it was a potential leading point in these

cases.

In stable patients, intussusception can be treated with noninvasive methods without the need for surgical intervention. The first-line treatment is considered to be reducing the intussusception guided by fluoroscopy or US. This method is preferred when the condition of the patient is stable and there are no signs of complications, allowing for the treatment without resorting to surgery. This type of treatment is generally less invasive and offers a faster recovery time, compared to surgical interventions, which carry a higher risk of complications. However, if the intussusception becomes irreducible or if such complications as bowel perforation or ischemia occur, surgical intervention is necessary (11-14). For the majority of those with acute primary intussusception, nonoperative reduction should be tried. The reduction is carried out by rectal administration of air, liquid, or contrast material at controlled pressures (4,6,11,12).

US-guided hydrostatic reduction of intussusception seems to be a noninvasive therapeutic method because of its high success rates, ease of use, and no radiation exposure (6). Early presentation (<24 hours) and short intussusception segment (<3 cm) are favorably associated with successful outcomes (15). In our study, 21 patients with stable general conditions underwent hydrostatic or radiopaque material reduction under US or fluoroscopic guidance. Sixteen of these cases underwent US-guided hydrostatic reduction, while five were reduced using radiopaque material under fluoroscopic guidance. Six patients experienced recurrence and subsequently required open surgical intervention, with a success rate of 71.4%. Based on the literature, the reduction success was achieved at least at the rate of 80% and 95% (16). This relatively lower success rate may be attributed to the longer length of the intussuscepted segment, compared to other cases. US-guided hydrostatic reduction is considered a simple, highly successful, and radiation-free technique, particularly advantageous in the pediatric population.

When nonoperative approaches are unsuccessful, or if there is an intestinal perforation or indications of peritoneal irritation, surgery is recommended. If possible, manual reduction is the main goal during surgery. However, intussusception can result in problems such as intestinal necrosis, perforation, and sepsis, which call for more involved surgeries, like bowel resection. These situations are frequently linked to extended hospital stays and may potentially be fatal for patients whose diagnoses are delayed (17,18). Soleimanpour et al. found that younger children and those with bloody stools underwent open surgery more often (19). Twenty of our patients underwent open surgical intervention. The median age of these patients was 26.5 months, with a median invaginated bowel segment length of 46 mm. The median time from the onset of the symptom to hospital presentation was 36 hours. A statistically significant difference in segment length was observed between Groups 1 and 3, while a significant difference in presentation time was found between Groups 2 and 3. Three patients in Group 3 presented with characteristic "currant jelly" stools and underwent surgery due to the clinical signs of peritoneal irritation and the presence of a palpable abdominal mass.

Wang et al. defined transient intussusception as the spontaneous resolution of intussusception, usually without any intervention. In the same study, the researchers suggested that individuals with normal abdominal examination and radiograph results, no suspicion of a lead point, normal bowel circulation on US, and an intussusception segment of less than 3 cm were safe candidates for conservative follow-up (20,21). In our study, 24 of our patients were defined as transient intussusception (37%), and median presentation time and median invaginated segment length were 30.5 hours (8-48) and 32.5 mm, respectively (12-65).

The majority of authors believe that the judgment of attending surgeons, combining the clinical and radiological evidence with their own experience, is ultimately responsible for making the diagnosis, despite ongoing disagreements on the definition and clinical significance of transient intussusception (22,23). Based on previous reports, non-invasive techniques have a 10% risk of recurrence (24). Among our patients, recurrence was observed in four patients (16.6%) after transient intussusception.

A limitation of the present study was the retrospective nature of the data. Because just a small number of patients were involved and all procedures were carried out at a single institution, descriptive analyses rather than comparative ones were possible. Also, US investigations were not performed by a single radiologist.

CONCLUSION

Intussusception can be transient in some cases. Intermittent US is an appropriate approach, especially for intussusceptions shorter than 32.5 mm. For longer segments, if the general condition of the patient is good, it should first be monitored with intermittent US. If the invaginated segment does not reduce spontaneously, hydrostatic reduction should be the preferred approach. However, in cases accompanied by serious clinical findings such as late presentation, palpation of an abdominal mass, or the presence of "currant jelly" stool, surgical intervention should be performed without delay.

DECLARATIONS

Conflict of Interest: *The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.*

Financial Disclosure: *Author declares that he did not receive any financial support in this study.*

Acknowledgements: *The authors would like to thank Numan Duran for his invaluable assistance with English language editing and proofreading.*

Funding: *None.*

Author Contributions: *Concept: C.K., HM, Desingn: C.K., Data Collection or Processing: C.K., H.M., Analysis and Interpretation: C.K., H.M., Literature Search: C.K., H.M., Writing: C.K.*

Address correspondence to: *Canan Kocaoglu, Necmettin Erbakan University, Faculty of Medicine, Department of Pediatric Surgery, Konya, Türkiye*
e-mail: *drckocaoglu@hotmail.com*

REFERENCES

1. Columbani PM, Scholz S. Chapter 85—intussusception. In: Arnold G. Coran, editors. Pediatric Surgery, 7th Edition. Amsterdam: Elsevier Inc.; 2012. p.1093 1110.
2. Güney LH, Fakıoğlu E, Acer T, et al. Is every intussusception treatment an emergency intervention or surgery? Ulus Travma Acil Cerrahi Derg. 2016;22(2):139-44. doi: 10.5505/tjtes 2015.06013.
3. Charles T, Penninga L, Reurings JC, et al. Intussusception in Children: A Clinical Review. Acta Chir Belg. 2015;115(5):327-33. doi:10.1080/00015458.2015.11681124.
4. Okumus M, Emektar A. Pediatric intussusception and early discharge after pneumatic reduction. Acta Chir Belg. 2019;119(3):162-65. doi: 10.1080/00015458.2018.1487190.
5. Ülger FE, Ülger A, Karakaya AE, et al. An easy, safe, and effective method for the treatment of intussusception: ultrasound-guided hydrostatic reduction. Ulus Travma Acil Cerrahi Derg. 2014;20(2):127-31. Turkish. doi: 10.5505/tjtes 2014.37898.
6. Xie X, Wu Y, Wang Q, et al. A randomized trial of pneumatic reduction versus hydrostatic reduction for intussusception in pediatric patients. J Pediatr Surg. 2018;53(8):1464-68. doi: 10.1016/j.jpedsurg.2017.08.005.
7. Binkovitz LA, Kolbe AB, Orth RC, et al. Pediatric ileocolic intussusception: new observations and unexpected implications. Pediatr Radiol. 2019;49(1):76-81. doi: 10.1007/s00247-018-4259-9.
8. Banapour P, Sydorak RM, Shaul D. Surgical approach to intussusception in older children: Influence of lead points. J Pediatr Surg. 2015;50(4):647-50. doi: 10.1016/j.jpedsurg.2014.09.078.
9. Boluk SE, Bolu S. Intestinal Intussusception Seen in Adult Patients: Case Report. Selcuk Med J. 2022;38(3): 92-9.
10. Olatoke SA, Agodirin SO, Adenuga AT, et al. Primary jejunal melanoma as a cause of adult intussusception: A case report and review of the literature. Pan Afr Med J. 2019;33:214. doi: 10.11604/pamj.2019.33.214.18622.
11. Bouali O, Mouttalib S, Vial J, et al. Intussusception in infancy and childhood: Radiological and surgical management. Arch Pediatr. 2015;22(12):1312-17. French. doi: 10.1016/j.arcped.2015.09.002.
12. Tander B, Baskin D, Candan M, et al. Ultrasound-guided reduction of intussusception with saline and comparison with operative treatment. Ulus Travma Acil Cerrahi Derg. 2007;13(4):288-93.
13. Flaum V, Schneider A, Gomes Ferreira C, et al. Twenty years' experience for the reduction of ileocolic intussusceptions by saline enema under sonography control. J Pediatr Surg. 2016;51(1):179-82. doi: 10.1016/j.jpedsurg.2015.09.022.
14. Chew R, Ditchfield M, Paul E, et al. Comparison of safety and efficacy of image-guided enema reduction techniques for paediatric intussusception: A review of the literature. J Med Imaging Radiat Oncol. 2017;61(6):711-17. doi: 10.1111/1754-9485.12601.
15. Ayana CT, Feleke T, Bazezew A, et al. Treatment outcome of ultrasound-guided hydrostatic reduction of intussusception and its associated factors among pediatric patients in a resource-limited setting. Pediatr Radiol. 2025;55(9):1829-37. doi: 10.1007/s00247-025-06305-3.
16. Ko HS, Schenk JP, Tröger J, et al. Current radiological management of intussusception in children. Eur Radiol. 2007;17(9):2411-21. doi: 10.1007/s00330-007-0589-y.
17. Fallon SC, Lopez ME, Zhang W, et al. Risk factors for surgery in pediatric intussusception in the era of pneumatic reduction. J Pediatr Surg. 2013;48(5):1032-36. doi: 10.1016/j.jpedsurg.2013.02.021.
18. Betz BW, Hagedorn JE, Guikema JS, et al. Therapeutic enema for pediatric ileocolic intussusception: using a balloon catheter improves efficacy. Emerg Radiol. 2013;20(5):385-91. doi: 10.1007/s10140-013-1138-4.
19. Soleimanpour Z, Memarian S, Rajabi MM,et al. Clinical and paraclinical differences between pediatric patients requiring surgical versus Non-Surgical treatment for intussusception: A retrospective study at a referral center in Iran. BMC Surg. 2025;25(1):373. doi: 10.1186/s12893-025-03131-0.
20. Wang Q, Luo M, Xie X, et al. Can intussusceptions of the small bowel and colon be transient? A prospective study. Eur J Pediatr. 2019;178(10):1537-44. doi: 10.1007/s00431-019-03455-z.
21. Wang S, Wang Y, Jia L, et al. Transient and persistent small-bowel intussusception in children: a decision tree analysis model based on ultrasound and clinical findings. BMC Gastroenterol. 2025;25(1):294. doi: 10.1186/s12876-025-03839-6.
22. Edwards EA, Pigg N, Courtier J, et al. Intussusception: past, present, and future. Pediatr Radiol. 2017;47(9):1101-08. doi: 10.1007/s00247-017-3878-x.
23. Hong KD, Kim J, Ji W, et al. Adult intussusception: a systematic review and meta-analysis. Tech Coloproctol. 2019;23(4):315-24. doi: 10.1007/s10151-019-01980-5.
24 Lee DH, Kim SJ, Lee HJ, et al. Identifying Predictive Factors for the Recurrence of Pediatric Intussusception. Pediatr Gastroenterol Hepatol Nutr. 2019;22(2):142-51. doi: 10.5223/pghn.2019.22.2.142.