Demographic, Clinical and Radiological Characteristics of Pediatric Cases Diagnosed As Transient Intussusception As A Result of Spontaneous Reduction

Spontan Redüksiyon Sonucu Geçici İnvajinasyon Tanısı Alan Pediatrik Olguların Demografik, Klinik ve Radyolojik Özellikleri

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ABSTRACT

Objective: Transient intussusception (TI) is a condition in which part of the small intestine is identified to enter the anterior part of the intestine telescopically, but this condition spontaneously reduces during follow-up. The observation of this situation has increased with the widespread use of ultrasonography among diagnostic tools. In this study, the aim was to present cases of intussusception that resulted in spontaneous reduction in our clinic.

Material and Methods: The records of all cases diagnosed with intussusception between January 2014 and September 2022 were scanned. The files of the patients who were diagnosed with TI as a result of observation were investigated. Age, gender, clinical findings, duration of admission, ultrasonography findings, treatment options and results were analyzed retrospectively.

Results: A total of 71 cases diagnosed with intussusception included 50 boys and 21 girls, with a mean age of 22.3 months. Intussusception was ileo-colic in 36 patients, ileo-ileal in 32 patients, and jejuno-jejunal in three patients. Clinical observation with physical examination and ultrasonography was performed in 33 (21%) patients with SBI who did not have signs of peritoneal irritation and had short segment involvement. Surgical reduction was performed in four patients because intussusception persisted after observation. Control US performed on the remaining 29 patients showed that intussusception disappeared. The age range of 29 patients diagnosed with TI ranged from 10 to 122 months (mean 46.2 months). Of the cases, 19 (65.5%) were male and 10 (34.4%) were female. The length of the invaginated segment ranged from 1-2.2 cm (mean 1.8 cm).

Conclusion: Spontaneous reduction of SBI, which does not have acute abdominal findings and progresses with short segment involvement on US, may occur during clinical observation. For this reason, close follow-up of suitable cases that may develop spontaneous reduction is important to avoid unnecessary surgical interventions and consequences.

Key Words: Child, Intussusception, Transient, Spontan reduction

ÖZ

Amaç: Geçici invajinasyon, ince bağırsağın bir kısmının teleskopik olarak bağırsağın ön kısmına girdiğinin tespit edildiği ancak takip sırasında bu durumun kendiliğinden düzeldiği bir durumdur. Tanı araçları arasında ultrasonografinin yaygınlaşması ile birlikte bu durumun görünürlülüğü artmıştır. Bu çalışmada kliniğimizde spontan azalma ile sonuçlanan invajinasyon olgularının sunulması amaçlandı.

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Ethics Committee Approval / *Etik Kurul Onayı*: The study was approved by Health Sciences University in the Eskisehir City Hospital, Clinical Research Ethics Committee (Approval No: ESH/GOEK 2023/34, 20.06.2023)

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Gereç ve Yöntemler: Ocak 2014 ile Eylül 2022 tarihleri arasında invajinasyon tanısı alan bütün olguların kayıtları tarandı. Gözlem sonucunda geçici invajinasyon tanısı konulan hastaların dosyaları incelendi. Yaş, cinsiyet, klinik bulgular, başvuru süresi, ultrasonografi bulguları, tedavi seçenekleri ve sonuçları retrospektif olarak incelendi.

Bulgular: İnvajinasyon tanısı alan 50'si erkek, 21'i kız çocuğu olmak üzere toplam 71 olgunun yaş ortalaması 22.3 aydı. İnvajinasyon 36 hastada ileokolik, 32 hastada ileo-ileal ve 3 hastada jejuno-jejunaldi. Peritoneal irritasyon bulgusu olmayan ve kısa segment tutulumu olan 33 (%21) ince barsak invajinasyonlu hastaya fizik muayene ve ultrasonografi ile klinik gözlem yapıldı. Dört hastada gözlem sonrası invajinasyonun devam etmesi nedeniyle cerrahi redüksiyon uygulandı. Geri kalan 29 hastaya 12 saat sonra yapılan kontrol ultrasonunda invajinasyon görüntüsünün kaybolduğu görüldü. Geçici invajinasyon tanısı alan 29 hastanın yaş aralığı 10 ile 122 ay (ortalama 46.2 ay) arasında değişiyordu. Olguların 19'u (%65.5) erkek, 10'u (%34.4) kadındı. İnvaginasyonlu segmentin uzunluğu 1-2.2 cm (ortalama 1.8 cm) arasında değişiyordu.

Sonuç: Akut batın bulguları olmayan ve ultrasonda kısa segment tutulumu ile seyreden ince barsak invajinasyonlarında klinik gözlem sonucu spontan redüksiyon meydana gelebilir. Bu nedenle spontan redüksiyon gelişebilecek uygun vakaların yakın takibi, gereksiz cerrahi müdahalelerin ve sonuçlarının önlenmesi açısından önemlidir.

Anahtar Sözcükler: Çocuk, İnvajinasyon, Geçici, Spontan redüksiyon

INTRODUCTION

Intussusception is a serious condition in which part of the intestine invaginates into the intestine just in front of it (1). Incidence was reported as 0.2% (2). The mean age of children diagnosed with intussusception is between 6-18 months, and only 30% of the cases are seen in those older than two years (1,2).

The etiology of pediatric intussusception is usually idiopathic, and lead points are detected in only 10% of cases (3). Although the etiology has not been sufficiently clarified, Peyer's plaque hypertrophy, mesenteric lymph adenopathy and gastroenteritis due to rotavirus are thought to play a role (4,5). If treatment is delayed, intussusception may gradually cause vascular congestion, intestinal wall damage, tissue ischemia, necrosis, and intestinal perforation (5).

Intermittent colic abdominal pain, rectal bleeding in the form of currant jelly, and palpable abdominal mass are typical clinical signs of intussusception, but this clinical triad is seen in less than one-third of children with intussusception (6,7). The diagnosis of intussusception is made by the target sign and/or pseudokidney image detected on abdominal ultrasonography (US) performed by experienced radiologists, which is highly accurate (8-10).

Treatment in the pediatric population depends on the type of intussusception. For ileo-colic intussusception (IC), which is the most common type in children, if there are no signs of peritoneal irritation or intestinal perforation, ultrasound-guided or fluoroscopic pneumatic or hydrostatic enema reduction is attempted (11). If non-surgical reduction is not successful, a surgical procedure (manual reduction and/or resection or enterostomy) is performed.

Transient intussusception (TI) is a term used for spontaneous reduction of small bowel intussusception (SBI) during observation (9,12). There is no known non-surgical reduction method for SBI, but the possibility of spontaneous reduction during close follow-up was discussed in terms of criteria for determining treatment (surgery or follow-up).

In this study, the aim was to create an algorithm on this subject by discussing our cases diagnosed with temporary intussusception in the last 8 years in our clinic, in the light of the literature.

MATERIALS and METHODS

Between January 2014 and September 2022, 71 cases under the age of 18 who were followed up and treated with diagnosis of intussusception were analyzed retrospectively. The study was approved by Health Sciences University in the Eskisehir City Hospital, Clinical Research Ethics Committee (ESH/GOEK 2023/34, 20.06.2023).

Abdominal US and Doppler US were performed by a US team consisting of 8 faculty members in the radiology department, using high-frequency linear probes of 5-10 MHz. Intussusception was diagnosed with the appearance of a target sign (also known as a donut sign) and/or a pseudokidney sign on ultrasound. Additionally, the presence of lymph nodes (long axis greater than 1 cm) and/or other lead points within the intussusception were investigated. Invaginated segment length was measured. In the same session, the absence of blood flow to the intestines was checked using color Doppler US.

Patients diagnosed with invagination as a result of abdominal US were hospitalized. Among our patients diagnosed with ileo-ileal (IIL) and jejuno-ileal intussusception (JJ), those without acute abdomen findings (peritoneal irritation signs and intestinal perforation) were monitored. In these cases, a short invaginated segment (less than 3 cm) was found on abdominal US and there was no edema of the intestinal wall. Physical examination was performed at least once every 2 hours for our patients under observation. Abdominal US was repeated every 12 hours. Oral feeding was started in patients whose clinical findings regressed and with no invagination detected on repeated abdominal US. The patients whose clinical condition improved and symptoms disappeared after the second ultrasonographic evaluation were discharged 1 day later. Surgical reduction was performed in patients with clinical deterioration and/

or permanent US findings as a result of follow-up. Surgical reduction was performed in patients with clinical deterioration and/or permanent US findings as a result of follow-up and in patients with initial peritoneal irrigation findings.

Patients with ileocolic intussusception (IC) who were diagnosed with ileocolic intussusception and did not have acute abdominal symptoms underwent reduction with hydrostatic pressure enemas under fluoroscopy or ultrasound guidance. Surgical treatment (manual reduction and/or resection or enterostomy) was applied to irreducible cases and patients with signs of peritoneal irritation.

Age, gender, clinical findings, type of intussusception and treatment methods of the patients were recorded. Statistical assessment of data was conducted by the biostatistics department. SPSS software (version 28.0; SPSS Inc., Chicago, IL, USA) was used for data analysis. First, descriptive statistics were applied to all data of the study. Descriptive statistics for variables determined by measurement; given as mean and standard deviation. Firstly, the data used were tested for normal distribution (Shapiro-Wilk test). Kruskal-Wallis test was used for group comparisons. Categorical variables were compared with the Chi-square (Fisher's exact) test. P values <0.050 were considered statistically significant.

RESULTS

In the last 8-year period, 71 patients with diagnosis of intussusception were monitored and treated in the Pediatric Surgery Clinic, 50 male and 21 female. Mean age was 22.3 months (4–122 months). The common complaint of all patients was abdominal pain. Additional complaints included vomiting in 63 cases (88.7%), and blood in stool in 8 cases (11.2%). Abdominal mass was palpated in 7 cases (9.8%).

Figure 1: Ultrasonographic target sign of a patient with transient small bowel intussusception.

Table I: The management according to intussusception types

	Ileo-ileal	Jejuno-Jejunal	Ileo-colic
Hydrostatic reduction	-	-	21
Surgery	6	-	15
Follow-up	26	3	-
Total	32	3	36

The classic triad (colic pain, hematochezia, and palpable abdominal mass) was detected in only 7 (9.8%) patients. The diagnosis of intussusception was made by observing the target (donut) sign and/or pseudokidney findings on abdominal US (Figure 1). Based on USG findings, 3 types of intussusception were detected: IC, IIL, and JJ. Intussusceptions were IC in 36 patients, IIL in 32 patients, and JJ in 3 patients. No patient had colo-colonic intussusception (CC).

In addition, the presence or absence of lead points, which may predispose to intussusception, were screened. Enlarged lymph nodes (over 1 cm) were present in 22 (30.9%) patients. In the same session, Doppler US was performed in patients diagnosed with intussusception, and intestinal wall blood flow was evaluated. Intestinal wall vascularization was decreased in 5 (7%) patients with IC and 2 (2.8%) patients with IIL. Types of intussusception according to management is presented in Table I.

Emergency surgical procedures were performed in 2 patients with IIL whose invaginated segment was longer than 3 cm (4 and 7 cm) and with edema detected in the intestinal wall. Thirty-three patients with other SBI were observed. As a result of clinical follow-up, spontaneous reduction was detected in 29 patients on abdominal US performed 12 hours later, and they were diagnosed with TI. Manual surgical reduction was performed in 4 patients with persistent intussusception on US, and no resection was required in any of these cases. The mean age of our patients diagnosed with TI was 46.1 months (range 10-122 months). Of the cases, 19 were boys and 10 were girls. Palpable abdominal mass was detected in 12 patients (41.3%). Rectal bleeding was not present in any patient. The mean length of the invaginated segment, which was detected by abdominal US at the time of diagnosis and spontaneously reduced during follow-up, was calculated as 1.8 cm (range 1-2.2 cm). There was no edema in the intestinal wall in these patients and no lead point was detected in any of the patients. The duration of hospital admission was more than 24 hours in patients who underwent surgical reduction for small bowel intussusception.

Four of the 36 IC intussusception cases underwent immediate surgery due to acute abdomen. In 32 (45% of total) of the remaining cases, hydrostatic reduction was ensured with fluoroscopy. Surgery was performed as needed following unsuccessful hydrostatic reduction attempts in 11 IC intussusception cases. Mean age of patients who underwent surgery was 16.4 months (4-46 months). Manual reduction was performed in 21 patients

who underwent surgery, with intussuscepted segments ranging from 4 to 12 cm. Bowel resection or enterostomy was not required in any of the patients.

DISCUSSION

Intussusception is a major abdominal emergency in children with serious consequences if not diagnosed and treated in time. The etiology is not clear in most cases, but it is thought to develop secondary to lymphoid hyperplasia due to a nonspecific infection caused by adenovirus, enterovirus and rotaviruses (5,13). It is the most common cause of bowel obstruction in infants (under the age of three) and is more common in boys (14). In our study, the mean age was 22.3 months, and 50 of our cases were male.

The clinical manifestation of intussusception is variable, but patients usually present with colic abdominal pain, pulling the knees to the chest, excessive irritability, and crying (15). The child may return to normal activities between episodes of pain but may appear listless and lethargic as the pain becomes more intense. Vomiting may occur shortly after the onset of pain. Although clinical manifestations of intussusception are well defined, they do not cover all cases of intussusception. The classic pediatric triad of intermittent abdominal pain, palpable abdominal mass, and bloody stool is present in only 15% of cases (16). The classical triad was seen in 7 (9.8%) of our patients diagnosed with intussusception. Currant jelly stools were not detected in any of the patients diagnosed with TI.

While plain X-ray films are considered useful for the diagnosis of obstruction, they lack sensitivity and specificity for the diagnosis of intussusception. Therefore, abdominal US, barium radiography and computed tomography (CT) can be used for diagnosis (5). The sensitivity and specificity of US for the diagnosis of intussusception is close to 100%, especially in children (8-10). All of our patients were diagnosed with abdominal US. In 29 of the 33 patients under observation, intussusception findings disappeared on control abdominal US performed 12 hours later. Thus, unnecessary surgical procedures were avoided.

Considering the differences in clinical findings and treatment approach, childhood intussusceptions of IC/CC can be considered as 2 separate subgroups of intussusceptions and SBI (17). IC and CC cases can be easily treated with non-surgical (hydrostatic or pneumatic reduction) methods (18). However, the surgical approach is indicated by the failure of non-surgical methods or in patients with signs of intestinal perforation and peritoneal irritation. In a study that included patients from 14 countries, Tran et al. (19) reported the rates of surgically-treated intussusception ranged between 2.5% and 95%. Hydrostatic reduction was performed in 32 of our patients with IC, and reduction was achieved in 21 (65.6%) patients. Surgical reduction was performed in 11 patients (34.3%) who could not be reduced by non-surgical methods. Although CC transient intussusception cases were reported in the literature, it is very rare in children (20). There was no CC intussusception among our cases.

SBI is less common than IC intussusception and there is no known non-surgical reduction method (17). There are two different options in the approach to these patients; clinical and radiological follow-up of cases that are likely to develop spontaneous reduction or surgical manual reduction (21). During follow-up, patients with spontaneous reduction of intussusception are diagnosed with TI. There is no standard algorithm for the clinical and radiological findings of pediatric cases with TI and the general course of the disease. Therefore, the selection of patients for whom clinical follow-up is required should be done carefully. It was reported that SBIs without acute abdominal findings may spontaneously reduce and these cases should be observed and followed closely (22). We monitored patients with involvement of a short segment of the small intestine (less than 2.5 cm) and no intestinal wall edema. In the current study, ultrasonographic findings disappeared and clinical improvement was observed in 29 of the 33 patients under observation. The mean invaginated segment length in these cases was 1.8 cm. The mean age of these cases was higher than the treated group (46.1 months). Surgery may seem like the only treatment option, as there is no known non-surgical reduction method for SBI. However, close follow-up in appropriate cases, detection of spontaneously reduced cases, and avoidance of unnecessary surgical procedures are extremely important. In the literature, the rate of TI was reported as 84-96.2% (22,23). In the current study, the spontaneous reduction rate of the patients with SBI under observation was calculated as 87.8%.

The limitation of this study is that the data are retrospective. All procedures were performed in a single institution and the number of patients was limited, allowing descriptive rather than comparative analyses. US was performed by a team of academic staff in the radiology department with similar experience and educational background. The relatively specific and easily detectable signs of intussusception on US minimized potential radiologist-dependent variation in US accuracy.

CONCLUSION

For SBIs without signs of peritoneal irritation and no lead points, close observation is required if the segment length is less than 3 cm and the intestinal wall blood flow is normal on Doppler US. In these cases, disappearance of clinical findings during follow-up and detection of spontaneous reduction in abdominal US will prevent unnecessary surgical procedures. SBIs with no clinical improvement during the follow-up period and persistence of intussusception on ultrasound should be treated with surgical methods. The increase in publications

about spontaneous reduction of SBI necessitates a separate and more careful algorithm for the approach to these cases.

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