

Management of Intussusception: Follow-up or Reduction?

İnvajinasyonda Tedavi Yaklaşımı: Takip mi, Cerrahi mi?

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Özet

Amaç: Bu çalışmada, invajinasyon tanısı alan çocuk hastalarda ultrasonografik bulguların cerrahi yaklaşım ile sadece izlem yönetimi kararında etkinliğini analiz etmeyi amaçladık.

Gereç ve Yöntemler: 2012-2017 yılları arasında çocuk cerrahisi servisinde izlenen invajinasyon tanılı çocuk hastaların tıbbi kayıtları geriye dönük olarak incelendi.

Bulgular: Ortanca yaş 39.5 ± 35.9 (dağılım 2-171) aydı. Elli yedi (% 64) hasta takip edilmiş, geri kalan hastalar ($n = 32$, % 36) ameliyat edilmişti. Ameliyat geçirmemiş hastaların ortanca yaşı ameliyat geçirenlere göre anlamlı olarak daha yüksekti (52.2 ± 38.4 'e karşı 16.75 ± 12.6 ; $p < 0.001$). Ameliyatsız grupta 20 (%35.1) hastada taburcu olduktan sonra karın ağrısı gelişirken, ameliyat grubundaki hastaların hiçbirinde ameliyat sonrası karın ağrısı gelişmedi. İnvajine segmentin uzunluğu ameliyat edilen grupta anlamlı olarak daha fazla idi ($p < 0.001$). İnvajinasyonlu bağırsak segmentinin uzunluğuna dayanan bir ROC eğrisi analizi, % 68.8'lik bir duyarlılık ve % 96.5'lik özgüllük ile 41.5 mm' nin cerrahi sınırlı uzunluğu olduğunu ortaya koydu.

Sonuç: Çalışmamızda önceki çalışmalardan farklı olarak invajinasyon uzunluğunun cerrahi eşiği 4,15 cm olarak revize edildi. Bu nedenle, bu değerin altındaki hastalarda ameliyat için acil bir endikasyon olmayabilir.

Anahtar Kelimeler: İnvajinasyon, Takip, Ultrasonografi, Uzunluk.

Abstract

Objective: In this study, we describe the management and outcome of children with intussusception and analyze the sonographic findings that can be used to differentiate transient, self-limited small bowel intussusception from the cases with an indication for surgery.

Material and Methods: We retrospectively reviewed the medical records of pediatric patients with the diagnosis of invagination who had been followed up in the pediatric surgery service between 2012-2017.

Results: The median age was 39.5 ± 35.9 (range 2-171) months. Among these patients, 57 (64%) had been followed up without surgery, and the remaining patients ($n = 32$, 36%) had undergone surgery. The median age of patients who had not undergone surgery was significantly greater than that of the patients who had undergone surgery (52.2 ± 38.4 vs. 16.75 ± 12.6 ; $p < 0.001$). Twenty (35.1%) patients in the non-surgical group had developed abdominal pain after discharge, whereas none of the patients in the surgical group had developed abdominal pain postoperatively. An analysis of the differences between the groups with respect to the length of the invaginated segment revealed that length of that segment were significantly greater in the surgically managed cases ($p < 0.001$). A ROC curve based on the length of the invaginated intestinal segment revealed that, 41.5 mm was the best cutoff point for invaginated intestinal length, which resulted in a sensitivity of 68.8% and a specificity of 96.5%.

Conclusion: In our study, unlike other studies, the surgical threshold of the invagination length was revised as 4.15 cm. Thus, patients below this value may not have an immediate indication for surgery.

Keywords: Follow-up Intussusception, Length, Ultrasonography,

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INTRODUCTION

Intussusception is the invagination of the proximal bowel segment into the distal segment (1). It may cause bowel obstruction in infants, usually between 6 and 24 months of age. The incidence is 1.5-4 per 1000 live births (2). The diagnosis of intussusception is based on the characteristic target (doughnut) and/or pseudo kidney signs on ultrasonography (US) (3,4). The treatment options include non-surgical management (pneumatic/hydrostatic reduction), surgical management (surgical resection-anastomosis), or simply close follow-up, especially in transient intussusceptions. The term “transient” or “benign” intussusception is used for intussusceptions that are spontaneously reduced. There are highly varying views about the necessity of surgical exploration in the literature (5,6). Even in the presence of pathologic lead points, non-surgical management may be a treatment option (7-9). In cases with failed non-surgical reduction or when the affected bowel segment is non-viable or perforated, surgery is deemed inevitable. If an intussusception does not spontaneously resolve, the only alternative option is reductive surgery. Previous reports in the literature have determined the radiological factors and clinical factors predicting the need for surgical intervention (10-12). In this study, we describe the management and outcome of children with intussusception and analyze the sonographic findings that can be used to differentiate transient, self-limited small bowel intussusception from the cases with an indication for surgery.

MATERIAL AND METHODS

We retrospectively reviewed the medical records of pediatric patients with the diagnosis of invagination who had been followed up in the pediatric surgery service between 2012-2017. The evaluated patient information included demographic variables, radiological findings, and treatment outcomes. The US studies were performed and interpreted by an experienced radiologist who was blinded to all other clinical and imaging data. The US studies consisted of transverse and longitudinal imaging of all four quadrants. The patients were divided into two groups: patients who needed surgery and patients who did not need surgery.

Statistical Analysis

The IBM SPSS 25.0 software package was used for all statistical analyses. Independent samples t-test and Chi-square test were performed to compare two independent groups. The significance level was taken as $p < 0.05$ in all statistical analyses.

The ethics committee approval of the study was obtained from Kahramanmaraş Sütçü Imam University

Faculty of Medicine, Clinical Research Ethics Committee (Date:02/05/2018, protocol number: 11). Study procedures were performed likewise Helsinki Declaration. All participants signed a written informed form.

RESULTS

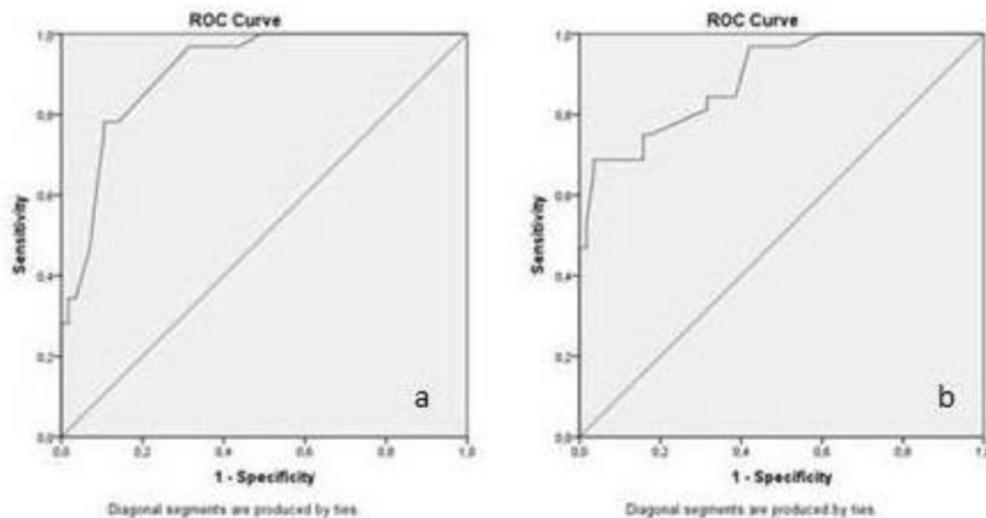
Eighty-nine pediatric patients (M/F=48/41) with intussusception were enrolled in this study. All patients had a complaint of abdominal pain at the time of imaging. The median age was 39.5 ± 35.9 (range 2-171) months. Among these patients, 57 (64%) had been followed up without surgery, and the remaining patients ($n = 32$, 36%) had undergone surgery. The follow-up period after surgery had ranged between 1 and 5 years. The median age of patients who had not undergone surgery was significantly greater than that of the patients who had undergone surgery (52.2 ± 38.4 vs. 16.75 ± 12.6 ; $p < 0.001$). The percentage of males was insignificantly greater in patients who had not undergone surgery ($p = 0.320$). Twenty (35.1%) patients in the non-surgical group had developed abdominal pain after discharge, whereas none of the patients in the surgical group had developed abdominal pain postoperatively. Considering the physical examination findings of the patients admitted to the hospital with abdominal pain, abdominal ultrasonography had been required in only five patients; additionally, only one patient had been operated on with the diagnosis of invagination one year after the initial diagnosis. None of our patients had a lead point nor henoch schonlein purpura (HSP). No mortality or morbidity was observed.

Ultrasonographic criteria and study results were also statistically analyzed. An analysis of the differences between the groups with respect to the length and width of the invaginated segment revealed that both length and width of that segment were significantly greater in the surgically managed cases ($p < 0.001$) (**Table 1**).

We performed a ROC analysis to determine the effect of the width and length of the intestinal segment on invagination in patients managed surgically for invagination. A ROC curve based on the width of the invaginated intestinal segment revealed an AUC of 0.907 ($p < 0.001$; 95% CI 0.848-0.967) (**Figure 1a**). According to Youden's Index, 23.5 mm was the best cutoff point for invaginated intestinal width, which resulted in a sensitivity of 78.1% and a specificity of 89.5% when a bowel width of at least 23.5 mm is considered an invagination. A ROC curve based on the length of the invaginated intestinal segment revealed an AUC of 0.891, ($p < 0.001$; 95% CI 0.824-0.959) (**Figure 1b**). According to Youden's Index, 41.5 mm was the best cut off point for invaginated intestinal length, which resulted in a sensitivity of 68.8% and a specificity of 96.5% when a bowel length of at least 41.5 mm is considered an invagination.

Table 1. Comparison of the two approaches in intussusception

	Patients without surgery N=57	Patients with surgery N=32	
Median age (months)	52.2±38.4	16.75±12.6	<0.001
Gender (male) n/(%)	33 (57.9)	15 (46.9)	0.320
Abdomen pain after discharge	20 (35.1)	0	
Surgery after discharge	1(1.8%)	0	
Width of the bowel segment	16.9±5.4	28.4±7.4	<0.001
Length of the bowel segment	27.4±9.1	52.7±19.1	<0.001

**Figure 1a, 1b.** ROC curve analysis to measure the effect of the width and length

DISCUSSION

There are no standard guidelines for the management of pediatric intussusception. Relatively a small proportion of patients need surgery, while most of these patients do not require surgical intervention. We should keep in mind that delays in diagnosis may lead morbidity and fatal consequences. At our institute, follow-up and empiric antibiotic treatment are accepted as the initial treatment of choice for recurrent intussusception. Herein, we showed that in our study that patients who had not undergone surgery have had a very low risk of recurrence. The recurrence rates of our patients both following operation and in transient intussusception were lower than the rates reported in the literature (13). The reductions had proved successful, and there had been no complications found in our study.

The age at presentation was greater in the non-surgically managed group than the surgically managed group. We suggest that this was caused by a greater bowel wall diameter, especially in the ileocecal region, where the quantity of lymphoid tissue is greatly reduced

after two years of age (14). In addition, Xiaolong et al showed that age of under 1-year-old, were risk factors for the failure of hydrostatic reduction of intussusception (15). As a result, intussusceptions of older children are 'looser' and less likely to bleed or to be obstructive.

The etiology of intussusception in older children is generally unknown, with the exception of children with a lead point or HSP (16). None of our patients, especially the relatively older patients, in the transient intussusception group had neither a lead point nor HSP.

The incidence of intussusception is 1.5-4 per 1000 live births, with a ratio of boys to girls of 3/2 (2). In another study, the corresponding ratio was found 52/29 (17). However, our study population had no such high male preponderance.

Previous reports have cited the length of the bowel affecting the need for surgery in intussusception. Our results showed a significantly greater mean cut off point for length for surgery decisions than the previous reports (4,18). Munden et al.4 reported that all but one of the intussusceptions that were surgically reduced

were longer than 3.5 cm. The exception was a 2.5-cm intussusception in a 3.5-year-old patient who underwent surgery due to the clinical suspicion of sepsis. The intussusception was easily reduced at surgery, and no lead point was found. They concluded that intussusception was detected with abdominal sonography, and an intussusception length greater than 3.5 cm was a sensitive and specific predictor of the need for surgical intervention, independent of other clinical and sonographic findings (sensitivity, 93%; specificity, 100%). In another study, Lvoff et al. (19) also found that intussusception detected incidentally was likely to be self-limiting if it was smaller than 3.5 cm long. In the present study, we found that an intestinal length greater than 41.5 mm was considered an invagination, with a sensitivity of 68.8% and a specificity of 96.5%. Unlike literature data, our study yielded a greater predictive value regarding the length of the invaginated segment to predict the need for surgery for invagination. Due to its retrospective nature, several clinical and radiologic data could not be obtained in our study.

Intussusception is a disease process with a highly variable clinical significance. Initial management of recurrent intussusception should be non-surgical. Although inconclusive, US measurement as a prior recognized factor (length and width of intussusception) was valuable for determining the indication of surgery. In our study, unlike other studies, the surgical threshold of the invagination length was revised as 4.15 cm. Thus, patients below this value may not have an immediate indication for surgery.

Ethical approval: The ethics committee approval of the study was obtained from Kahramanmaraş Sütçü İmam University Faculty of Medicine, Clinical Research Ethics Committee (Date:2.5.2018, protocol number: 11).

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