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Diagnostic Radiological Findings in Adult Intussusception: A Retrospective Observational Study

Erişkin İnvaginasyonda Tanısal Radyolojik Bulgular: Retrospektif Gözlemsel Bir Çalışma

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Diagnostic Radiological Findings in Adult Intussusception: A Retrospective Observational Study

ABSTRACT

Objective: This study aimed to characterize computed tomography (CT) imaging features of adult intussusception, identify underlying lead points, and correlate morphological findings (segment length, transverse diameter) with clinical presentation.

Material and Method: Nineteen surgically confirmed adult intussusception cases were retrospectively analyzed. Demographic data, CT findings, intussuscepted segment length, transverse diameter, presence of a lead point, and obstruction status were recorded.

Results: The mean patient age was 57.1 ± 14.1 years. The ileum was the most commonly affected segment (57.9%). A lead point was identified on CT in 94.7% of cases, with lipoma being the most frequent lesion. Malignant lesions were found in 21.1% of patients, consistent with the literature. The transverse diameter was significantly greater in cases with obstruction (*p=0.002*). Although segment length was higher in the obstruction group, the difference was not statistically significant (*p=0.052*).

Conclusion: CT is not only effective in diagnosing adult intussusception but also provides valuable information on its etiology and severity through parameters such as lead point detection and signs of obstruction. CT-derived measurements like transverse diameter and segment length may have predictive value in clinical decision-making. Further large-scale, prospective studies are needed to validate these findings.

Keywords: Adult intussusception, Computed Tomography, Intestinal obstruction.

ÖZET

Amaç: Bu çalışmanın amacı, erişkin intussusepsiyon olgularında BT'nin tanı, etiyoloji ve hastalığın ciddiyetini belirlemedeki rolünü değerlendirmektir.

Gereç ve Yöntem: Çalışmaya cerrahi olarak doğrulanmış erişkin intussusepsiyon tanılı 19 hasta dahil edildi. Hastaların demografik verileri, BT bulguları, intussusepsiyon segmentinin uzunluğu, transvers çapı, lead point varlığı ve obstrüksiyon durumu değerlendirildi.

Bulgular: Hastaların yaş ortalaması 57,1 ± 14,1 yıl idi. En sık tutulan segment ileum (%57,9) olarak belirlendi. Olguların %94,7'sinde BT ile lead point saptandı; en sık görülen lezyon lipom idi. Malign lezyon oranı %21,1 olup, bu oran literatür ile uyumluydu. Obstrüksiyon saptanan olgularda transvers çap anlamlı olarak daha genişti (*p=0,002*). Segment uzunluğu obstrüksiyon grubunda daha fazla olmasına rağmen istatistiksel olarak anlamlı bulunmadı (*p=0,052*).

Sonuç: BT, erişkin intussusepsiyon olgularında yalnızca tanı koymakla kalmayıp, lead point varlığı ve obstrüksiyon gibi parametreler yoluyla hastalığın ciddiyeti hakkında da bilgi sağlamaktadır. Transvers çap ve segment uzunluğu gibi BT temelli ölçümlerin klinik yönetimde öngörücü olabileceği düşünülmektedir. Bu bulguların daha büyük ve prospektif çalışmalarla desteklenmesi gerekmektedir.

Anahtar Sözcükler: Erişkin invaginasyonu, Bilgisayarlı Tomografi, Bağırsak tıkanıklığı.

Introduction

Intussusception refers to the invagination of a proximal intestinal loop, along with its mesentery, into an adjacent distal segment, resulting in the characteristic 'bowel-within-bowel' configuration (1). This anatomical alteration produces the classic radiological appearances known as the 'target sign' and the 'sausage sign' on computed tomography (CT) (2). In adults, intussusception is a rare condition, accounting for approximately 1–5% of all cases of intestinal obstruction. Unlike pediatric cases, where most are idiopathic, adult intussusception is typically associated with an underlying pathology that serves as a lead point for the invagination (2,3). With the increasing use of abdominal CT for evaluating abdominal pain and other medical indications, the incidental detection of intussusception in adults has become more common. Although sometimes transient and asymptomatic, such findings may indicate an underlying serious pathology and should be carefully evaluated (4).

CT is the most sensitive imaging modality for detecting intussusception, with characteristic findings such as the 'target sign' and 'crescent sign' considered pathognomonic. Several studies in the literature have also highlighted CT's high diagnostic accuracy in identifying the lead point responsible for intussusception (4,5). Furthermore, CT plays a crucial role in evaluating potential mass lesions as the underlying cause, determining the presence of bowel obstruction or possible strangulation, and guiding clinical management and surgical planning (1).

This study aims to evaluate the morphological and demographic features of adult intussusception on preoperative CT, with a focus on the detectability of underlying lead point lesions, and to investigate the value of CT measurements in predicting obstruction, supported by radiologic–pathologic correlation.

Material and Method

The study was granted approval by the institutional ethics committee (E-54022451-050.04-194685). Informed consent was obtained from all patients or their legal guardians prior to data inclusion, in accordance with institutional and ethical guidelines. It was structured as a retrospective analysis involving adult individuals (18 years and older) who had a diagnosis of intussusception confirmed through surgical evaluation between 2010 and 2025 and had preoperative abdominal CT imaging available. Relevant patient information was collected from the hospital's electronic medical records and the PACS system. Cases with incomplete data or suboptimal CT image quality were excluded from the study.

Radiological evaluations were jointly conducted by two radiologists with 5 and 9 years of professional experience, both of whom were blinded to clinical and pathological data. A separate analysis of interobserver variability was not carried out. We did not perform a separate interobserver analysis because the cohort was modest; instead, to keep measurements consistent and reduce noise, two radiologists with 5 and 9 years of experience reviewed all scans together under a predefined, standardized protocol, and we will assess reproducibility in a larger multicenter cohort.

Contrast-enhanced abdominal CT scans were acquired during the portal venous phase, following intravenous injection of an iodinated contrast agent. Image acquisition included axial slices covering the region from the diaphragm to the symphysis pubis, with multiplanar reconstructions (MPR) in sagittal and coronal planes. No oral contrast was administered.

CT Evaluation

A bowel-within-bowel configuration demonstrating telescoping of bowel loops, including mesenteric fat and vascular structures, was considered consistent with the target sign. Eccentric localization of mesenteric fat within the intussusceptum, forming a crescent-shaped area of fat attenuation, was defined as the crescent sign (Figure I) (4). The localization of intussusception was determined based on CT images. Focal lesions identified within the bowel wall at the site of intussusception were considered lead points, and their largest dimension was measured along the longest axis. Lesions with fat attenuation originating from the submucosal layer of the bowel wall, distinct from the herniated mesenteric fat within the intussusceptum, were identified as lipomas (Figure II). At the level of intussusception, bowel diameter and the length of the invaginated segment were assessed on CT in three orthogonal planes, and

measurements were taken from the level where they appeared largest, including transverse diameter and invagination length (Figure III). Bowel obstruction was defined as proximal small bowel dilation ≥3 cm or colonic dilatation ≥5 cm, accompanied by air-fluid levels and collapsed distal bowel loops on CT. Radiological findings were evaluated in comparison with surgical notes and pathological reports.

Statistical Analysis

Statistical evaluations were conducted utilizing IBM SPSS Statistics version 25.0 for Windows (IBM Corp., Armonk, NY, USA). To examine distribution characteristics of continuous data, the Shapiro-Wilk test was applied. Variables showing normal distribution were reported as mean ± standard deviation (SD), whereas those lacking normality were described using median values alongside interquartile ranges (IQR). Categorical data were represented in terms of count and percentage.

Group comparisons, such as between individuals with and without bowel obstruction, were analyzed using either the independent samples t-test or the Mann–Whitney U test, selected based on the data distribution characteristics. Categorical variables were compared using the Chi-square test or Fisher's exact test when appropriate. A two-tailed *p-value of <0.05* was considered statistically significant.

Results

Nineteen adult patients who underwent surgery for intussusception were included in the study. The mean age was 57.1 ± 14.1 years (range: 19–77 years). The most common site of intussusception was the ileum, observed in 11 patients (57.9%), followed by the jejunum and colon, each in 4 patients (21.1%). Lipoma was the most identified lesion, present in 6 patients (31.6%). Malignant causes were found in 4 patients, including metastatic malignant melanoma in 2 (10.5%), lymphoma in 1 (5.3%), and adenocarcinoma in 1 (5.3%). Additional lesions included inflammatory fibroid polyps in 2 patients (10.5%), leiomyomas in 2 (10.5%), hemangioma in 1 (5.3%), and heterotopic pancreas in 1 (5.3%). No underlying pathology was identified in one patient (5.3%), and the case was considered idiopathic (Table I).

The target sign was observed in 18 patients (94.7%), while the crescent sign was present in 13 patients (68.4%). In 18 out of 19 cases, a focal lead point was identified on CT, and lesion size measurements were obtained (Table II).

Table I. Patient Demographics, Anatomical Localization, and Pathologic Diagnoses (n = 19)

Characteristic	Value
Number of patients (n)	19
Age (mean ± SD)	57.1 ± 14.1 years
Age range	19–77 years
Sex	
Male	10 (52.6%)
Female	9 (47.4%)
Intussusception Localization	
Ileum	11 (57.9%)
Jejunum	4 (21.1%)
Colon	4 (21.1%)
Pathologic Diagnoses	
Lipoma	6 (31.6%)
Leiomyoma	2 (10.5%)
Hemangioma	1 (5.3%)
Inflammatory fibroid polyp	2 (10.5%)
Heterotopic pancreas	1 (5.3%)
Malignant melanoma metastasis	2 (10.5%)
Colonic adenocarcinoma	1 (5.3%)
Lymphoma	1 (5.3%)
Idiopathic (no lead point found)	4 (21.1%)

SD: standard deviation

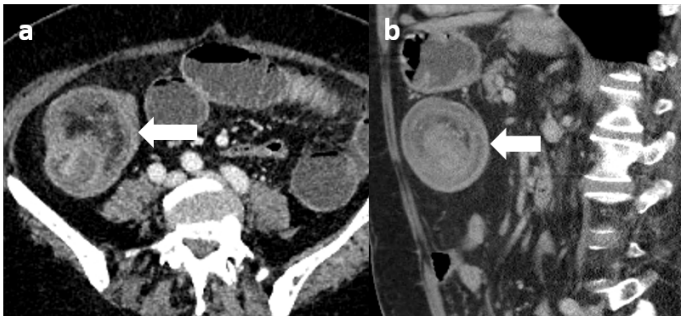

Figure I. Axial contrast-enhanced CT image shows the crescent sign, characterized by herniated mesenteric fat appearing as a crescent-shaped structure between the invaginated bowel loops (a). Sagittal contrast-enhanced CT image reveals a jejunojejunal intussusception with the classic "bowel-within-bowel" appearance, also referred to as the target sign (b).

The single idiopathic case involved an intussusception

located in the distal ileal loops. Although Meckel's diverticulum-like structure was considered the lead point during surgery, no underlying lesion was detected in the postoperative histopathological evaluation. Consistent with this, no distinct focal lesion was observed radiologically in this patient.

Bowel obstruction secondary to intussusception was observed in 8 patients (42.1%), while no signs of obstruction were detected in the remaining 11 patients (57.9%). In a total of 18 cases, the size of the lesion identified as the lead point on CT could be measured. The mean lesion size was 37.8 ± 15.1 mm, with a median of 41 mm (IQR: 20.75 mm). The median lesion size was larger in patients with bowel obstruction [47 mm (IQR: 38–54 mm)] compared to those without obstruction [30 mm (IQR: 25–35 mm)]; however, this difference did not reach statistical significance (*p=0.056*).

Table II. Imaging Findings and Measurements

Finding / Measurement	Number of Patients	% or mean ± SD
Target sign	18	94.7%
Crescent sign	13	68.4%
Mesenteric herniation	16	84.2%
Pathological lead point	18	94.7%
Obstruction	8	42.1%
Segment length (mm)	—	89.5 ± 34.4
Transverse diameter (mm)	—	37.9 ± 8.9

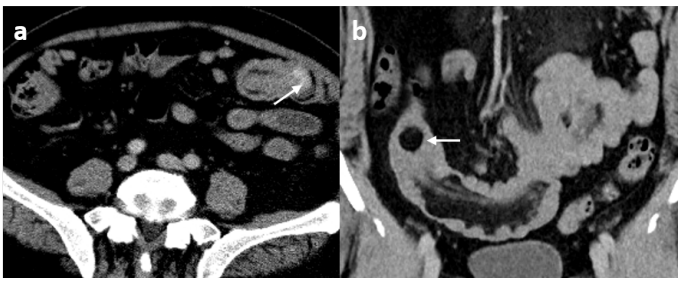

Figure II. Axial contrast-enhanced CT image shows a jejunojejunal intussusception with a hyperdense intraluminal lesion (arrow), consistent with a hemangioma, serving as the leading point (a). Coronal contrast-enhanced CT image demonstrates a colocolic intussusception, with a lipoma identified as the lead point, associated with traction on adjacent mesenteric vessels (b).

According to CT measurements, the mean length of the invaginated segment was 89.5 ± 34.4 mm, and the mean transverse diameter at the level of intussusception was 37.9 ± 8.9 mm. The transverse diameter was significantly greater in the obstruction group (45.4 ± 6.2 mm) compared to the non-obstruction group (32.5 ± 6.4 mm) (*p=0.002*). The mean length of the intussuscepted segment was also greater in patients with obstruction (106.6 ± 29.9 mm) than in those without obstruction (77.0 ± 33.2 mm), although the difference did not reach statistical significance (*p=0.052*).

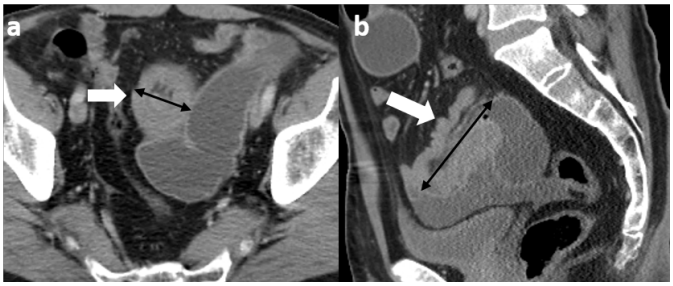

Figure III. Axial contrast-enhanced CT image demonstrates an ileoileal intussusception (white arrow) and the measurement of its transverse diameter (black arrow) (a). Sagittal contrast-enhanced abdominal CT image shows the ileoileal intussusception (white arrow) with measurement of its longitudinal length (black arrow) (b).

Discussion

CT is effective and highly reliable in the diagnosis of intussusception, with the target sign observed in nearly all cases (94.7%), consistent with previous reports in the literature (4-6). The only case in which the target sign was not observed involved a short-segment intussusception caused by a lipoma, a finding consistent with previous reports indicating that subtle or transient cases may lack classic radiological signs (6). In our study, a lead point lesion was identified in 18 of 19 intussusception cases (94.7%), which aligns with the literature reporting a pathological lead point in approximately 70–90% of adult cases (2,4,7). Idiopathic intussusception is considered rare in adults, as also noted by Marinis et al.; similarly, only one case (5.3%) in our series was classified as idiopathic (1). The mean age of patients was 57 years, consistent with previously reported data (4). In line with the literature, the majority of cases in our study were of the intestinal type, with colonic intussusception observed in only 21.1% of patients (4). Malignant tumors were less common than benign

lesions as the underlying cause, in agreement with previous studies. Metastatic malignant melanoma was identified in two cases, while lymphoma and adenocarcinoma were each seen in one case (8,9).

In our study, the transverse diameter at the level of intussusception was significantly greater in patients with bowel obstruction compared to those without. To our knowledge, this specific association has not been previously reported in adult intussusception. The increased transverse diameter may be explained by factors such as luminal accumulation of bowel contents and bowel wall edema secondary to obstruction (10,11). Bowel obstruction is a clinically significant finding in intussusception, as delayed or inadequate intervention may result in severe complications such as strangulation and perforation (11). In a study by Park et al., strangulated intussusception cases showed more prominent mesenteric vascular changes and longer invaginated segment lengths (4). Although our study did not specifically assess strangulation, the length of the intussuscepted segment was greater in obstructed cases than in non-obstructed ones, though this difference was not statistically significant. Early recognition of obstruction and its potential complications—such as mesenteric ischemia—is critical for appropriate clinical management. CT imaging plays a key role in this process. Therefore, the CT-based measurements used in our study, particularly transverse diameter and segment length, may have predictive value in identifying obstruction and ischemia in intussusception cases. Further studies with larger patient populations are warranted to validate these findings.

The study is subject to certain constraints. Since it was carried out retrospectively at a single center, its findings may not be widely generalizable. Furthermore, the limited number of patients included may have decreased the sensitivity of the statistical analysis in identifying less apparent associations. However, adult intussusception is a rare clinical entity, and the inclusion of surgically and histopathologically confirmed cases in our series enhances the reliability of the findings. Despite the limited number of patients, the study provides meaningful radiological and pathological insights that contribute to the growing body of literature on this uncommon condition. Future multicenter prospective studies with larger cohorts are needed to validate and build upon these results.

Adult intussusception is a rare clinical condition, with CT serving as a crucial tool for both diagnosis and treatment planning. Our findings highlight that CT not only confirms the diagnosis but also offers valuable insights into the underlying etiology and severity of the condition, particularly through features such as lead point detection and obstruction assessment. Effective management requires a multidisciplinary approach involving radiology, gastroenterology, and surgery. Early identification of malignancy on imaging is essential for appropriate surgical planning. CT-derived parameters like transverse diameter and segment length may have potential clinical utility. In practice, a larger transverse diameter at the level of intussusception is a practical red flag for obstruction; when considered alongside symptoms and laboratory data, it should prompt faster diagnostic confirmation, closer in-hospital observation, and early surgical input with a lower threshold for timely intervention to avoid ischemia or perforation. Future large-scale, prospective—ideally multicenter—studies are needed to validate these observations, define generalizable thresholds for CT-based measurements, quantify interobserver agreement, and test whether integrating these metrics into triage pathways shortens time-to-surgery and improves patient outcomes.

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