

Adult intussusception : A 14-year retrospective study of clinical assessment and computed tomography diagnosis

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Abstract

Background and study aims : Intussusception in adults often remains unrecognized. Our aim was to report our experience with this entity to determine the usefulness of CT scan in its preoperative diagnosis.

Patients and Methods : The medical records and imaging studies of all patients ≥ 16 years of age with intussusception, who were managed at our hospitals, were retrospectively reviewed.

Results: 17 cases of adult intussusception (7 males, 10 females; mean age 35.9 years; age range of 16-78) were identified. The diagnosis was possible in all patients using CT scan. The underlying etiologies were colon cancer (n=2), lymphoma (n=2), small bowel polyps (n=2), jejunal lipoma (n=1), metastatic melanoma (n=1), Meckel's diverticulum (MD) (n=1) and idiopathic (n=1). In the remaining 7 patients, the intussusceptions were of the transitory form and were treated conservatively and no significant sequela occurred after a follow-up of 2-60 months. CT scan findings in transient cases characteristically showed that the intussusception was localized to the proximal intestine and all of them had a short segment (2-4 cm) of intussusception.

Conclusions : The important role of the CT in the preoperative diagnosis of intussusception and characterizing its causes cannot be overemphasized. All transient cases had a short segment of intussusception. (*Acta gastroenterol. belg.*, 2018, 81, 367-372).

Keywords : Adult intussusception, Computed Tomography (CT), Intestinal obstruction, Transient intussusception.

Introduction

Intestinal intussusception was first defined by Paul Barbette (1) as the telescoping of proximal bowel segment into an adjacent distal segment, and further presented in a detailed report in 1789 by John Hunter (2). Although it is a well-recognized entity and a relatively common cause of intestinal obstruction in the pediatric age group, it is infrequent in adults, representing less than 1% of intestinal obstruction in this patient population, where it often remains unrecognized or misdiagnosed (3-5). It is estimated that approximately 5-10% of all cases of intussusception occur in adults and in 90% of these cases, there is a lead point, a well-definable pathologic abnormality (3-6). This is in contrast to intussusception in the pediatric age group, where approximately 90% of the cases are idiopathic. However, most patients are diagnosed late as a result of a poor index of suspicion and misdiagnosis (7).

Herein, we report our experience with adult intussusception to highlight its clinical features and determine

the usefulness of abdominal computed tomography (CT) scanning in the preoperative diagnosis of this condition. In addition, the pertinent clinical and diagnostic features of this condition will be presented in order to increase the awareness of the radiologists and surgeons about this rare entity.

Methods

The present study has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki). The medical records and imaging studies of all patients aged 16 years and above, who were radiologically diagnosed with intestinal intussusception using CT scan and managed at our hospitals during the period from 2002 to 2016, were retrospectively reviewed. Data regarding age and gender of the patients, mode of clinical presentation, diagnostic workup including radiological investigations, underlying causes and treatment options of the intussusception were collected and analyzed.

CT was the initial examination to suggest the diagnosis in 10 patients and it was the only radiologic examination of the intussusception in 7 of them. On the other hand, US was the first diagnostic tool to evaluate the intussusception in the remaining 7 patients and confirmed by a CT assessment. CT images of the 17 patients were collected using three different CT systems (Somatom; Siemens Medical Systems, Erlangen, Germany (n=5); Xvision GX (n=3) and Aquillion (n=9) Toshiba Medical Systems, Tokyo, Japan) using a 8-10 mm slice thickness.

CT images were reviewed and evaluated by two radiologists who performed the readings side by side to obtain a consensus. All CT images were reviewed for the appearance of intussusceptions, type of the bowel involved (enteroenteric, enterocolic, colocolic), diameter and length of the intussusception, the presence of proximal bowel dilatation, mesentery within the intussusceptions and lead point.

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Table 1. — The clinicopathological and radiological characteristics of all patients presented with adult intestinal intussusception

Case No.	Sex	Age (years)	Clinical data	CT findings							Pathology	
				Diameter (cm)	Length (cm)	Target or Sausage-shaped	Fat crescent	Rim of contrast material	Air bubbles in periphery	Bowel dilatation		
1	F	36	Abdominal pain, mass	9	14	+	+	-	+	+	+	Adenocarcinoma of descending colon
2	F	16	Abdominal pain, mass	4.5	10	+	+	-	+	+	+	Burkett's lymphoma ascending colon
3	F	27	Abdominal pain, obstruction	6.5	12	+	+	+	+	-	+	Ileal polyp
4	M	22	FMF, chronic abdominal pain, mass	4	7	+	+	-	+	+	-	Ileal adenomatous polyp
5	M	28	Prolonged RIF pain, vomiting	5.5	15	+	+	+	+	+	-	Meckel's diverticulum
6	M	45	Prolonged abdominal pain, obstruction	4.5	9	+	+	-	+	-	+	Metastasis melanoma
7	M	35	Prolonged abdominal pain, obstruction	4	7	+	+	+	+	-	-	Idiopathic
8	M	25	Abdominal pain, pelvic fracture	4	2.5	+	+	-	+	-	-	Transient
9	F	43	Prolonged abdominal pain	4.5	13	+	+	-	+	-	-	Lipoma seen on CT confirmed at surgery
10	F	32	Known Hodgkin lymphoma, no abdominal symptom	3	2	+	+	-	+	-	-	Transient
11	F	27	Known lymphoma	3.5	2	+	+	-	+	-	-	Transient
12	F	39	Pheochromocytoma	3	2.5	+	+	-	+	-	-	Transient
13	M	59	Wt loss, anemia, Right lumbar mass	7	20	+	+	+	+	+	-	Adenocarcinoma of ascending colon
14	M	58	Abdominal pain	3	2	+	+	-	+	-	-	Transient
15	F	6	Lymphoma, incidental	2	4	+	+	-	+	-	-	Transient
16	F	78	Abdominal mass	6.5	15	+	+	+	+	+	+	Cecal lymphoma
17	F	35	Esophageal stricture, Jejunostomy catheter	3	2.5	+	+	-	+	-	-	Transient

Abbreviations: FMF, familial mediterranean fever; RIF, Right Iliac Fossa; CT, Computed Tomography

While all patients received 700-800 mL of orally administered contrast media, fifteen of them received additional 100 mL of intravenously administered iohexol (Omnipaque 350; Nycomed Amersham).

Results

During the study period, 17 cases of adult intussusception (7 males and 10 females; mean age of 35.9 years; age range 16-78 years) were managed at our hospitals. The clinic-pathological characteristics of the patients and CT scan findings are summarized in Table 1. Ultrasound was performed for 10 patients and it suggested the diagnosis in 7 of them. The ultrasonic findings were "doughnut" sign and "pseudokidney" sign depending on the angle of scanning (Fig. 1). The diagnosis was possible in all patients by CT scan. The CT scan findings revealed unequivocal signs of intussusception in all patients, which are summarized in table 1 and shown in figures 2-5. Intraluminal soft tissue mass in the intestine with an intussusception was seen in 7 patients.

The sites of the intussusception were as follows: Jejunojejunal (n=9), ileo-ileal (n=4), colocolic (n=3), and ileocolic (n=1). The etiologies of the intussusception are summarized in table 1. Ten patients had operations, and the diagnosis of intussusception was confirmed in all of them. Pathologic examinations of the resected intestine showed that the underlying etiologies of intussusception were colon cancer (n=2), lymphoma (n=2), small bowel adenomatous polyps (n=2), jejunal lipoma (n=1), metastatic melanoma (n=1), and Meckel's diverticulum (MD) (n=1). In the remaining 8 patients, the intussusception was idiopathic (n=1) or transitory form (n=7), which showed resolution of intussusception on delayed scans (Fig. 5) with no demonstrable underlying cause. These cases were treated conservatively with no recurrence or significant sequela on a 2-60 months follow-up period. No postoperative morbidity or mortality occurred in any patient.

Discussion

Intussusception is considered a rare condition in adults, representing about 5-10% of all intussusceptions and about 1% of all adult intestinal obstructions (3-6) and has a demonstrable underlying etiology in more than 90% of the cases (8). According to its etiology, Agha classified intussusception as tumor related, postoperative, miscellaneous, and idiopathic (9). While large bowel intussusception is secondary to malignant tumors in about 65-70% of cases, small bowel intussusception is associated with malignancy in only 30-35% of cases (10-12). In our series, 5 patients had malignant tumors, 2 had polypoidal lesions, and 1 patient had a jejunal lipoma.

Thirteen of our patients had small bowel (enteroenteric) intussusception. Although it has been reported that the most common causes of intestinal intussusception in

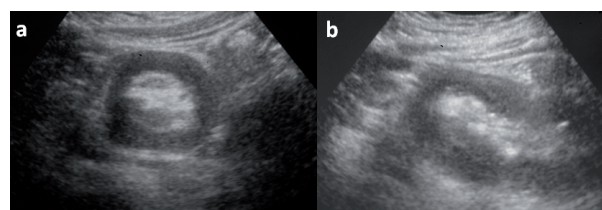


Fig. 1. — Abdominal ultrasound showing an abnormal loop of bowel in the right iliac fossa with (A) a "doughnut" sign on transverse section and (B) a "pseudokidney" on longitudinal scan. Appearances are characteristic of intussusception

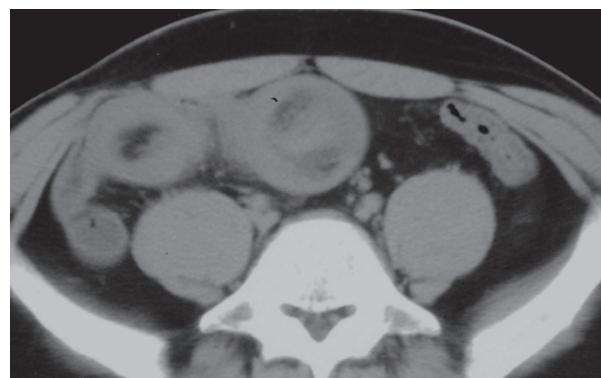


Fig. 2 — Abdominal CT scan showing the characteristic "target lesion" in the right lower abdomen indicating intussusception, which proved operatively to be due to Meckel's diverticulum (Case no. 5).

adults are tumors of the small bowel (13,14), only 5 of our patients had small bowel tumors (two polyps, one lymphoma, one metastatic melanoma, and one lipoma). The intra-luminal lesion may affect the normal intestinal peristalsis and predispose to the displacement of the proximal intestine into the interior of a fixed distal intestinal segment.

Bowel tumors including intestinal lipoma and adenomyoma are the most common causes of intussusception in adults. However, other predisposing conditions had been reported and these included postoperative adhesions, protracted diarrhea associated with immunodeficiency syndrome, bowel hematoma from coagulopathy, Kaposi's sarcoma in patients with HIV-1 infection, non-Hodgkin's lymphoma, ileal leiomyosarcoma, acute appendicitis, appendiceal adenoma or mucocoeles, perforated diverticulitis, ileo-cecal tuberculosis, splenosis, blunt abdominal trauma, metastatic tumor deposits into the bowel and MD (11,15). Occasionally, intussusception in adults can be idiopathic (16), a result of the abdominal surgery itself, or due to an inverted MD (17). Figure 2 shows one rare case where the intussusception was secondary to MD.

None of our patients had documented celiac disease. Intussusception is not uncommon in celiac disease, but it is easily missed due to its transient nature (18). The intussusception in celiac disease is related to the loss of normal tone in the small bowel brought on by the toxic effect of gluten. The flaccid and dilated bowel loops are more prone to non-obstructing intussusception. It is probable that one or more of our 7 patients, who sustained transient intussusception, had celiac disease. However, upper gastrointestinal endoscopy was not

performed for these patients to confirm or rule out this possibility.

Seven of our patients (40%) had transitory intestinal intussusceptions with no demonstrable underlying cause. Due to increase awareness about this condition, transitory intestinal intussusceptions are being reported more frequently nowadays (19). In our patients with transitory intussusceptions, the CT scan findings characteristically showed that the intussusception was localized to the proximal intestine and all of them had a short segment of intussusception (6 patients with less than 3 cm and only one patient with 4 cm length of the intussusception). This is consistent with the report by Lvoff *et al.* (20). These patients were treated by non-operative techniques and no recurrence occurred after a follow-up of 2-60 months. However, a follow-up abdominal CT revealed complete resolution of the previously detected intussusceptions. Although this form of intussusception was reported to be very rare in adults, we believe that it is more common than it had been reported. It constituted more than 40% of all our patients, and most of these patients were diagnosed in the last 2 years of this study. We believe that increasing the awareness of the radiologists about this entity will enable the diagnosis of more cases of this transient forms. In one study, approximately more than 20% of the patients had no demonstrable cause (7). Severe hyperglycemia and/or the effects of the accompanying hyperkalemia or acidosis on gastrointestinal motility have been reported to cause intussusception in adults (21). Correction of the hyperglycemia has been reported to resolve the intussusception without surgical intervention (22). Saenz De Ormijana *et al.* (23) reported on similar four patients with this form of intussusception, which was discovered during the course of barium meal and small bowel follow-through radiological studies carried out for nonspecific abdominal pain. Similar to our results, their patients had non-obstructive intestinal intussusception and some of the intussusceptions were resolved by applying pressure to separate the pathologic intestinal loop without subsequent complications. The absence of bowel obstruction may account for the chronicity of the condition (24).

One of our patients with transient intussusception had a long feeding jejunostomy tube in the course of treatment of her corrosive esophageal stricture (case number 17, Table 1). She developed later on abdominal pain and a CT scan of the abdomen revealed a short segment of bowel intussusception. Intussusception secondary to the use of a long intestinal tube has been reported before (25).

The preoperative diagnosis of intestinal intussusception in adults is often difficult. The basis for the diagnosis is a high index of clinical suspicion and noninvasive techniques. Plain and contrast media radiography, abdominal US, CT scan, and magnetic resonance imaging (MRI) are imaging techniques suitable for the diagnosis of intussusception. The underlying cause of intussusception

can be best identified on small bowel barium enema, CT, and MRI images (26). Contrast examination was found useful in bowel intussusceptions in patients with colo-colic or ileo-colic suspected intussusception and is characterized by the classical "meniscus sign" (3,27,28).

US proved to be a fast, non-invasive, easy to perform and reproducible imaging technique to use in the diagnosis of intussusception especially in children, in which intussusception is idiopathic (29). The US typical appearances of intussusception on transverse sections include a so-called "doughnut" or "bull's eye" sign. On longitudinal sections, a "pseudokidney" or "hayfork" sign is typically seen (Fig. 1) (30). The accuracy of US diagnosis was found high, which, in turn, aided in increasing the diagnostic confidence in patients with suspected intussusceptions (31). However, thickened bowel wall in other gastrointestinal conditions might mimic US features of intussusceptions and, therefore, a high index of suspicion is recommended and contrast enema becomes important (31).

Abdominal CT has several advantages, which make it the imaging modality of choice for the detection and assessment of adult bowel intussusception (3,12,32). It provides information on the presence of the intussusception disease, its site, the involvement of intestinal segments and their extent (12,33). Furthermore, abdominal CT is very useful in differentiating between intussusceptions with a lead point from those without (12,34). Abdominal CT has the ability to show the complications associated with intussusceptions such as bowel wall ischemia and perforation, which helps differentiating the incidental and transient (cold intussusception) from the acute and irreversible form (warm intussusception) (12). On CT images, three different appearances for intussusception were described by Merine *et al.* in 1987 (35) including target-like pattern, reniform pattern, and sausage-shaped pattern, which reflect the severity and duration of the disease process. Thus, CT helps on deciding the most appropriate treatment and avoiding surgery when unnecessary (12).

Takeuchi *et al.* (36) were able to establish a preoperative diagnosis using CT scan and/or US in 4 out of 7 patients. In our patients, the use of abdominal CT scan allowed us to establish the diagnosis of intussusception in all patients. The CT appearance of intussusception is characteristic and depends on the imaging plane and where along the bowel images are obtained (32). The majority of CT features in our series were similar to those previously described (Table 2). The lead point can be diagnosed with certainty only in cases of lipoma. In the case of malignant lesions, CT provided an excellent preoperative evaluation, including possible extension and/or dissemination of a malignant tumor (37). In our series, CT provided confident identification of intussusception in all cases but the exact etiology could not be determined with certainty except in the case of lipoma (Fig. 3), which appeared as a well-margined, round homogeneous intraluminal masses with a fat

Table 2. — The characteristics of CT scan findings in adult intussusception

No.	CT scan sign	Explanation
1	Apparent complex soft tissue mass with “bowel within bowel” appearance	Thickened bowel segment (the intussusceptum telescoping into the intussusciptens)
2	A crescent-like, eccentric low attenuation fatty mass with thin soft tissue strands within the fat represent mesenteric blood vessels within the invaginated mesenteric fat.	Entrapped mesenteric fat
3	A target or sausage-shaped mass. A round mass lesion consisting of thickened bowel walls with eccentric low density mesenteric fat within it.	The combination of signs 1 and 2 A thickened segment of bowel with an eccentrically placed crescent-like fatty area, representing the intussusception and the intussuscepted mesentery. This appeared either as a round target mass or as an oblong sausage-shaped mass or both configurations depending on the angle of CT beam Vs. the intussusception
4	Rim of contrast material	Rim of oral contrast material coating of the opposing bowel walls of the intussusceptum and intussusciptens
5	Air bubbles peripheral to the upper part of the intussusception, which just like contrast material may enter between the opposing bowel walls.	The location of these bubbles should not be confused with intramural air, which reflects vascular compromised bowel. Intraluminal air tends to accumulate uppermost when the patient is examined in the supine position, whereas intramural air can appear anywhere in the periphery of a mass lesion
6	Dilatation of the bowel proximal to the intussusception	Intussusception rarely presents in adult as intestinal obstruction
7	A leading mass of fat density that does not contain blood vessels	Lipoma



Fig. 3 — Enhanced CT scan of the lower abdomen showing a central homogenous fat density mass within the small bowel. Jejunojejunal intussusception, which was caused by lipoma and confirmed at operation (Case no. 9).

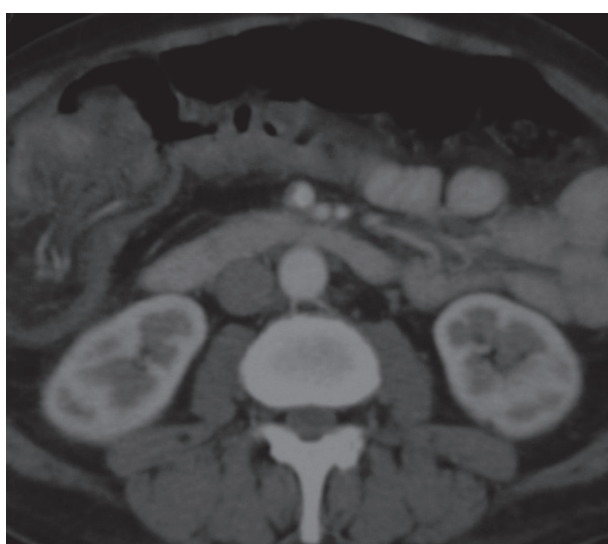


Fig. 4. — Enhanced CT scan through mid-abdomen (parallel to the axis of the intussusception) showing elongated mass in the right abdomen with central low density mesenteric fat containing enhanced mesenteric vessels. Colocolic intussusception, which was due to colon cancer and confirmed at surgery (Case no. 13).



Fig. 5. — Enhanced CT scan of the upper abdomen showing small bowel intussusception anterior to the left kidney. This had spontaneously resolved on follow up abdominal CT scan (Case no. 8)..

content density, unlike the mesenteric, peripherally placed fat seen in entrapped mesenteric fat. Benign and malignant causes of intussusception could not be distinguished on CT images, neither in this series nor in other series.

The optimal treatment of intestinal intussusception in adults is not universally agreed upon. Previous reports have recommended surgical resection without reduction because of the high possibility of malignancy, and the inability to distinguish malignant from benign lesions preoperatively or intraoperatively. Furthermore, reduction prior to resection of the bowel increases the risk of bowel perforation, intraluminal seeding, and venous embolization of the malignant cells during manipulation (38,39). However, small bowel lesions should be reduced in patients in whom a benign diagnosis has been strongly suggested preoperatively or in patients in whom resection may result in short gut syndrome (36).

A major limitation of this retrospective study is that the interpretation approach of the CT images by

two radiologists could have been influenced by the data of the patients' clinical files. Furthermore, as there is no gold standard, and despite a high index of suspicion, some patients might have been missed in this retrospective study.

In conclusions, the important role of the CT in the preoperative diagnosis of intussusception and in characterizing its causes cannot be overemphasized. All cases of transient intussusception have a characteristic short segment of intussusception (2-4 cm) and can be managed conservatively without surgery and with no subsequent sequel. All other forms of adult intussusceptions require surgical treatment, an approach, which is different from that recommended in the pediatric population. Awareness and continuous investigation of this medical condition may allow the surgeon and the radiologist to make a correct diagnosis preoperatively.

Ethical approval

"All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards."

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Conflicts of interest

The authors have declared that no competing interest exists.

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