

Adult intussusception: 10-year experience in two Belgian centres

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Abstract

Background: adult intussusception is a rare entity with a different clinical presentation and aetiology than in children. **Objective:** To provide a comprehensive overview of the clinical presentation, aetiology, diagnosis and management of adult intussusception

Methods: We review 43 cases with a preoperative diagnosis of symptomatic gastrointestinal adult intussusception.

Results: In 67% of the cases an underlying lead point was discovered. Most intussusceptions were of the enteric type (65%) with a predominant benign or idiopathic origin. Malignancy was present in half of the cases with a colonic lead point. CT was the preferred imaging technique (81%) with a sensitivity of 94%. Colonoscopy provided the correct diagnosis in 89% of the cases involving a colonic lead point. Surgical intervention occurred in 72% of the cases.

Conclusion: The combination of low incidence and non-specific symptoms makes intussusception in the adult difficult to diagnose. Modern imaging techniques often provide the correct preoperative diagnosis. A culprit lesion is usually identified after a careful search. Suspicion for a malignant lead point should be high in case of colonic involvement and colonoscopy can be of added value in these cases. The therapeutic strategy depends on several variables and requires for a patient-tailored approach mostly involving surgery. (*Acta gastroenterol. belg.*, 2016, 79, 301-308).

Keywords : Intussusception, adult, aetiology, diagnosis, management

Introduction

Intussusception is defined as an invagination of a proximal bowel segment (the “intussusceptum”) in an adjacent, more distal segment of the gastrointestinal tract (the “intussusciptiens”) due to an antegrade movement of a culprit lesion or lead point secondary to the bowel wall’s peristalsis, pulling on the more proximal bowel segment where the lead point is attached (1).

The condition is more common in children and here mostly no underlying lesion can be distinguished and the problem is often successfully and permanently treated by pneumatic or hydrostatic reduction (1,2,3). Adult intussusception is an even rarer entity and not only the incidence but also the clinical presentation and aetiology of intussusception is clearly different in adults, explaining why the diagnostic work-up and treatment is profoundly different between adults and children.

We report our experience with 43 cases of symptomatic adult intussusception in an attempt to provide a comprehensive overview of the clinical presentation, aetiology, diagnosis and management of adult intussusception.

Materials and methods

We retrospectively reviewed the medical records of the Ghent University Hospital (GUH) and the Maria Middelaers Hospital Ghent (MMH) between January 1st 2003 and December 31st 2013. Cases in the MMH were selected using the minimal clinical data (MCD) registration files (a compulsory registration of clinical data). In the GUH data were extracted from all radiology protocols generated between 2002 and 2014 by using the query “intussusception”. 282 cases were selected. Exclusion criteria were: age under 18 years, cases with rectal intussusception and prolapse and accidentally discovered intussusceptions in patients without abdominal complaints. In total, 43 adult patients with a preoperative diagnosis of gastrointestinal intussusception were selected (MMH 21 cases, GUH 22 cases). Data on these patients with regard to age, gender, clinical presentation, technical investigations, surgical details, management and histopathological findings were evaluated. Imaging findings regarded as diagnostic were the target or doughnut sign on transverse view, the pseudokidney sign in the longitudinal view, an oedematous bowel wall and the presence of mesentery in the lumen. Intussusceptions were classified based on the (suspected) definitive location of the lead point. An intussusception that only involved small bowel was considered enteric. An intussusception where the lead point was located in the ileum and that involved the ileum and the colon was designated as ileocolic. An intussusception with a cecal lead point that involved the ileum and the colon was called ileocecal. When the intussusception was confined to the large bowel, the intussusception was considered colocolic. Acute symptoms were defined as present during less than 4 days, subacute symptoms as present between 4-14 days and chronic symptoms lasting more than 14 days. For the literature review we searched the Pubmed database for relevant English language articles using the

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following search terms: intussusception, adult, aetiology, diagnosis, treatment. We identified additional references by crosschecking bibliographies of the retrieved full-text papers.

Results

Clinical findings

The mean age of the included patients was 47 years (18-85 years). There was a predominance of female patients: 15 patients were male and 28 were female. Symptom duration was between a few hours to more than six months. 18 patients (42%) had an acute presentation, with symptoms present for less than 5 days. 8 of those 18 patients (44%) had the clinical picture of a complete obstruction. 8 patients (19%) had a subacute presentation and 17 patients (40%) had a chronic symptomatology. Patients with a malignant lead point were somewhat older than those with a non-malignant lead point (respectively 58 vs 47 years). Most common symptoms were abdominal pain (84%), nausea and/or vomiting (42%), diarrhoea (28%), weight loss (21%) and constipation (12%). Other, less commonly reported symptoms were bloating, hematochezia, fever, borborygmus and melena (Figure 1).

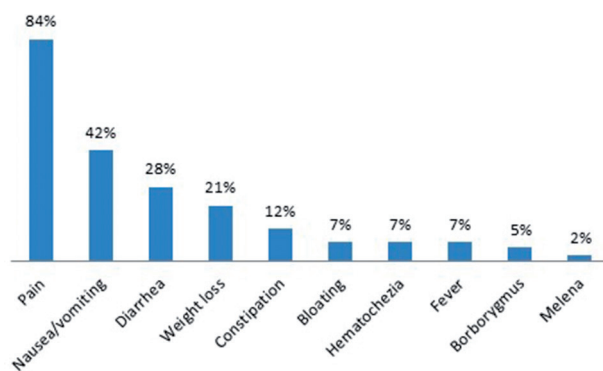


Fig. 1. — Symptoms in adult intussusception

Technical investigations

In the GUH data were extracted from radiology protocols generated by using the query “intussusception”, therefore it is not possible to assess the diagnostic sensitivity and specificity of the imaging techniques in these cases. The figures in this paragraph are based on data generated from the 21 MMH cases.

Preoperative imaging was carried out in all 21 cases. In 95% of the cases computed tomography and/or ultrasound was used and 52% of our patients got both imaging modalities. 17 of the 21 patients (81%) had a computed tomography and 13 (62%) had an abdominal ultrasound with a diagnostic sensitivity

of respectively 94% and 54% (16:17 CT-scans; 7:13 ultrasounds respectively were diagnostic for the final diagnosis of intussusception). A preoperative diagnosis of intussusception could be made in all cases, in 20 cases by use of CT and/or abdominal ultrasound and in one case by performing a barium enema.

Colonoscopy was performed in 17 cases (40%). In 75% of the patients with ileocecal or colocolic intussusception a preoperative colonoscopy was performed and the culprit lesion could be localised and diagnosed in 8 cases (89%). Colonoscopy was not performed in 3 cases with a colonic lead point because of acute obstruction. Lower GI endoscopy was performed in 6 cases with enteric intussusception and in 2 cases with ileocolic intussusception but only one was diagnostic in these types of intussusceptions.

Lab results identified 9 patients (21%) with anaemia of which 8 patients (89%) had a neoplastic lead point and only one was idiopathic. In 6 of those anaemic patients (67%) the neoplastic lead point proved malignant, with 2 lesions located in the small bowel and 4 lesions in the colon.

Type and aetiology

Most intussusceptions were of the enteric type (65%) followed by the ileocecal (19%), colocolic (9%) and ileocolic (7%) type. In 67% of the cases an underlying lead point was discovered. Neoplastic lesions were discovered in 22 cases (55%), 9 (41%) caused by benign and 13 (59%) by malignant pathology. 7 patients (16%) had a non-neoplastic lead point. In the remaining 14 cases (33%) no underlying lesion could be withheld and these cases were deemed idiopathic. The vast majority of these idiopathic intussusceptions was of the enteric or ileocolic type with a presumed lead point in the small bowel (93%). Only one (7%) of the idiopathic intussusceptions was of the colocolic type. The aetiology in this case remained unclear, even after laparoscopic evaluation and colonoscopy.

The majority of the lead points were located in the small bowel (72%) with a predominant non-malignant or idiopathic origin (81%). 12 out of the 43 patients (28%) had a colonic lead point and in half of these patients this lead point had a malignant origin. An overview of the origin and nature of the lead points is provided in Table 1.

Management

Preoperative reduction with a barium enema was attempted in 5 cases and proved (temporarily) successful in 3 patients. 31 patients (72%) underwent surgery. The type of procedure was dependent on location, length and cause (if known) of the intussusception, the experience of the attending surgeon and the viability of the bowel wall. Simple (mini)laparotomic and laparoscopic exploration without resection was performed respectively in 5 and 6 patients (16% and 19%). In 9 cases an intraoperative

Table 1. — Lead point location and characteristics

Enteric lead point	n	%	Colonic lead point	n	%	Overall lead point	n	%
Neoplastic	12	39%	Neoplastic	10	84%	Neoplastic	22	51%
<i>Benign</i>	5	42%	<i>Benign</i>	4	40%	<i>Benign</i>	9	41%
			Adenoma	3		Adenoma	3	
Inflammatory polyp	2					Inflammatory polyp	2	
Peutz-jeghers hamartoma	2					Peutz-jeghers hamartoma	2	
Leiomyoma	1					Leiomyoma	1	
			Lipoma	1		Lipoma	1	
<i>Malignant</i>	7	58%	<i>Malignant</i>	6	60%	<i>Malignant</i>	13	59%
Metastatic melanoma	4		Metastatic melanoma	1		Metastatic melanoma	5	
GIST	2					GIST	2	
			Adenocarcinoma	4		Adenocarcinoma	4	
Non-Hodgkin lymphoma	1		Non-Hodgkin lymphoma	1		Non-Hodgkin lymphoma	2	
Non-neoplastic	6	19%	Non-neoplastic	1	8%	Non-neoplastic	7	16%
Postoperative	2					Postoperative	2	
Celiac disease	2					Celiac disease	2	
			Infectious colitis	1		Infectious colitis	1	
Crohn's disease	1					Crohn's disease	1	
Bowel wall hematoma	1					Bowel wall hematoma	1	
Idiopathic	13	42%	Idiopathic	1	8%	Idiopathic	14	33%
Total	31	72%	Total	12	28%	Total	43	100%

reduction was attempted which only failed in one case. In 2 cases a cecal adenocarcinoma was involved and in 4 patients a small bowel tumour was discovered (GIST (n=2), melanoma metastasis (n=2)). In total 20 of the 31 patients (65%) underwent partial bowel resection. Most resections involved open laparotomy (85%): segmental small bowel resection (n=7), ileocecal resection (n=3), right hemicolectomy (n=5), left hemicolectomy (n=1) and rectosigmoid resection with protective ileostomy (n=1). In 3 cases a laparoscopic resection was performed (15%).

All 8 patients with complete bowel obstruction underwent surgical intervention. In 6 cases (75%) a lesion was found and a subsequent partial bowel resection performed. In 2 cases no culprit lesion could be located. One of those intussusceptions had spontaneously resolved at the time of surgical intervention and the second was reduced intraoperatively without segmental resection. There was no perioperative mortality. During the one year follow-up period, 5 of the 43 patients (14%) with a previous (enteric) intussusception (idiopathic (n=1), melanoma metastasis (n=1), Peutz-Jeghers syndrome (n=1), celiac disease (n=2) had a recurrent enteric intussusception. Both patients with underlying celiac disease and the patient with idiopathic intussusception were treated conservatively. The patients with Peutz-

Jeghers syndrome and metastatic melanoma underwent laparotomy with segmental small bowel resection (Table 2).

Discussion

Classification

Intussusceptions can be classified by clinical presentation, by aetiology or according to the part(s) of the intestinal tract involved.

First, adult intussusception can present itself as an acute, subacute, chronic or intermittent condition. The duration of the, often non-specific, symptoms can range from hours to more than one year (2). Recent reports including our own series show that an acute presentation in the adult population is common and can occur in up to more than 50% of the patients (4, 5). Frequent symptoms are (intermittent) cramping abdominal pain, nausea, vomiting, abdominal distension, weight loss, fever, change in bowel activity, hematochezia and melena (1,2,6).

Secondly, intussusceptions can be distinguished by their causative lead point. In up to 93 % of all adult intussusceptions, a well definable lesion is recognized

Table 2. — Summised data

Age	Sex	Type	Symptoms*	US ⁺	CT ⁺	Surgery	Reduction/succes [§]		Pathology
28	M	Enteric	C	N	Y	Laparoscopic exploration	N	N	/
43	M	Enteric	S	/	Y	/	N	N	Gastro-jejunal anastomosis
23	M	Enteric	S	Y	/	/	N	N	Small bowel wall hematoma
40	M	Enteric	C	/	Y	/	N	N	/
29	V	Ileocecal	S	Y	Y	Laparoscopic right hemicolectomy	Y (preop)/Y (temp)	Y/Y	Cecal diffuse large cell NHL
36	V	Enteric	C	Y	/	/	N	Y/N	Celiac disease
69	V	Ileocecal	A	Y	Y	/	N	Y/Y	Cecal valve lipoma
19	V	Enteric	A	Y	/	Laparoscopic exploration	N	Y/N	/
22	M	Ileocecal	S	Y	Y	/	N	Y/Y	Infectious colitis
22	M	Colocolic	A	Y	Y	Laparoscopic exploration	Y (intraop)/Y	Y/N	/
69	M	Colocolic	C	/	Y	Laparotomic left hemicolectomy	N	Y/Y	Colonic melanoma metastasis
23	V	Enteric	A	N	Y	/	N	N	Jejunal anastomosis
53	M	Enteric	C	/	Y	/	N	N	Small bowel Peutz Jegher hamartoma
79	V	Ileocecal	C	/	Y	Laparotomic ileocecal resection	Y (preop)/Y	Y/Y	Cecal adenoma
34	V	Enteric	A	/	Y	Laparotomic segmental small intestine resection	N	N	Small bowel Peutz Jegher hamartoma
66	M	Enteric	A	N	Y	Laparotomic segmental small intestine resection	N	N	Small bowel follicular NHL
78	V	Ileocecal	A	/	Y	Laparotomic ileocecal resection	Y (preop)/N	N	Cecal adenoma
55	V	Enteric	A	/	Y	Laparotomic segmental small intestine resection	Y (perop)/Y	N	Small bowel melanoma metastasis
35	V	Enteric	C	/	Y	/	N	Y/N	/
36	M	Enteric	A	/	Y	Laparotomic exploration	N	N	/
52	V	Enteric	S	/	Y	Laparotomic segmental small intestine resection	N	Y/N	Small bowel melanoma metastasis
53	M	Enteric	C	/	Y	Laparotomic segmental small intestine resection	N	N	Small bowel melanoma metastasis
40	M	Enteric	A	N	Y	Laparotomic exploration	N	N	/
49	M	Enteric	C	/	Y	Laparotomic exploration	N	N	/
55	V	Enteric	C	N	Y	Laparoscopic segmental small intestine resection	N	Y/N	Ulcerated small bowel leiomyoma
68	V	Enteric	A	Y	Y	Laparotomic segmental small intestine resection	Y (intraop)/Y	N	Small bowel GIST
71	V	Colocolic	C	N	Y	Laparotomic rectosigmoid resection with protective ileostoma	N	Y	Rectal adenocarcinoma
18	V	Enteric	C	/	/	Laparoscopic exploration	N	N	/
28	V	Enteric	A	N	Y	/	N	N	/
84	V	Colocolic	C	/	Y	Laparotomic right hemicolectomy	N	Y/Y	Colonic adenocarcinoma
35	V	Enteric	A	Y	Y	Laparotomic segmental small intestine resection	Y (preop-intraop)/N-Y	N	Small bowel melanoma metastasis
85	V	Ileocecal	A	N	Y	Laparotomic right hemicolectomy	N	N	Cecal adenoma

82	V	Enteric	A	/	Y	Laparotomic exploration	Y (intraop)/Y	N	/
27	V	Enteric	S	N	Y	/	N	Y/N	/
66	V	Enteric	C	/	Y	Laparoscopic segmental small intestine resection	Y (intraop)/Y	N	Small bowel inflammatory polyp
18	V	Ileocolic	A	Y	/	/	N	Y/Y	Small bowel Crohn's disease
65	V	Enteric	C	/	Y	Laparotomic exploration	N	N	/
65	M	Ileocecal	C	Y	/	Laparotomic right hemicolectomy	Y (preop-intraop)/Y(temp)-Y)	Y/Y	Cecal adenocarcinoma
33	V	Ileocolic	C	/	Y	Laparotomic ileocecal resection	Y (intraop)/N	Y/N	Small bowel inflammatory polyp
81	V	Ileocecal	S	/	Y	Laparotomic right hemicolectomy with protective ileostoma	Y (intraop)/Y	N	Cecal adenocarcinoma
26	M	Ileocolic	A	Y	Y	Laparotomic right hemicolectomy	Y (intraop)/Y	N	Small bowel GIST
35	V	Enteric	S	Y	N	Laparoscopic exploration	N	N	Celiac disease
40	V	Enteric	A	Y	/	Laparoscopic exploration	N	N	/

"A", "S", "C": Acute symptoms < 4 days, subacute symptoms between 4-14 days, chronic symptoms > 14 days

+ US/CT: "/" (not performed), "Y" (diagnostic) "N" (not diagnostic)

§ Reduction/success: N (no reduction), Y (reduction), intraop (intraoperative reduction), preop (preoperative reduction) / N (unsuccessful reduction), Y (successful reduction), temp (recurrence of intussusception after reduction)

Colonoscopy/diagnosis: Y (colonoscopy performed), N (no colonoscopy) / Y (colonoscopy diagnostic), N (no diagnosis with colonoscopy)

which often reflects lesions inherent to the intestinal site involved (1,3,6,7).

A third way to classify intussusception is by its anatomical location. In 1954, Brayton and Norris described eight different types of intussusception classified by location. The majority of all adult intussusceptions are of the enteric, ileocolic, ileocecal or colocolic type (8).

- The enteric lead point (enteric and ileocolic intussusception)

72% of all patients in our series had an enteric or ileocolic type invagination caused by a (presumed) enteric lead point with an identifiable lesion in 58% of these cases. 61% of the identifiable lesions was benign and 39% was malignant. Most of these malignant lesions are metastatic of which melanoma is by far the most common, an observation which is supported by our series (9). The remaining 42% of small bowel intussusceptions were classified as idiopathic. This reflects the relatively low prevalence of malignant small bowel tumours (2,4,10) which is fairly consistent with previous reports (1-40%) (4,6). Gastrointestinal stromal tumours (GIST) were classified as malignant in our series but often have a benign course (11). Our series also confirms the results of previous series reporting enteric intussusception as the most common type of intussusception (Table 3). In idiopathic intussusception the event can in most circumstances be attributed to motility disturbances

but it should be stressed that this can also be a sign of underlying disease (e.g. severe hyperglycaemia, Crohn's or celiac disease) (12,13,14). Our 2 cases of celiac disease associated intussusception presented with a non-obstructing proximal enteric invagination.

- The colonic lead point (ileocecal and colocolic intussusception)

28% of the patients in our series had an ileocecal or colocolic intussusception with a (presumed) colonic lead point. Ileocecal intussusception comprises about 14-38% of all adult intussusceptions and around 7-31% of all intussusceptions in adults are colocolic in location (Table 3). In contrast to the ileocolic type, the lead point in the ileocecal intussusception does not lie in the small bowel, but within the cecum (8). The general diagnostic and therapeutic principles are identical in both types of intussusception. Our study confirms that a malignant lead point is much more frequent in the colon than in the small intestine (50% vs 19% respectively). Adenocarcinoma accounts for the majority of these malignant colonic lesions. Only a minority of the colonic intussusceptions is categorised as idiopathic (1) (Table 1).

Technical investigations

First, we emphasized that a thorough anamnesis and a careful physical examination is primordial, since these

Table 3. — Intussusception type and lead point nature in 12 recent cases series, our series included [4, 5, 10, 20, 23, 28, 29, 30, 31, 32, 33]

Articles	Cases	Intussusception type				Lead point nature	
		Enteric	Ileocolic	Ileocecal	Colocolic	Idiopathic	Malignant
Wang et al, 2007	24	42%	50%		8%	0%	45%
Wang et al, 2009	41	46%	34%		18%	9%	27%
Hanan et al, 2009	16	50%		38%	31%	13%	50%
Yakan et al, 2009	20	70%	15%		15%	10%	22%
Ahn et al, 2009	42	52%	10%	14%	24%	21%	31%
Ghaderi et al, 2010	15	73%	20%		7%	13%	13%
Gupta et al, 2011	27	36%	29%		21%	11%	37%
Siow et al, 2011	14	64%	29%	14%		7%	50%
Gupta et al, 2011	38	42%	32%		26%	6%	47%
Lindor et al, 2012	148	80%	10%		7%	40%	15%
Honjo et al, 2015	44	27%	14%	36%	23%	11%	57%
de Clerck et al, 2015	43	65%	7%	19%	9%	33%	30%

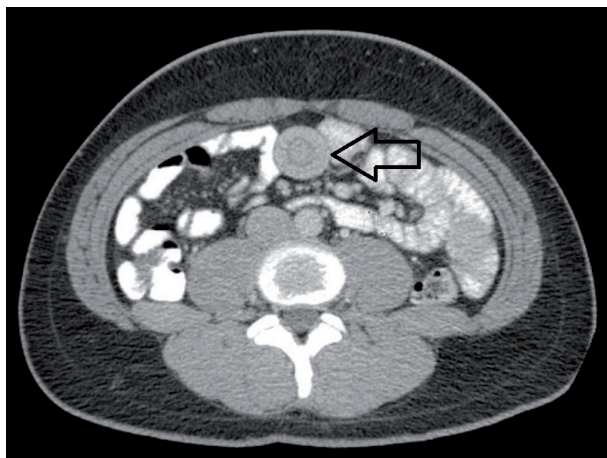


Fig. 2. — CT-image of an enteric intussusception with typical target sign (arrow).

may contain essential clues pointing in the direction of the exact nature of the underlying lead point.

In older series, the correct preoperative diagnosis of intussusception was only made in one third of the cases (15). With the arrival of new imaging techniques and the introduction of flexible endoscopy, the chance of an accurate preoperative diagnosis has been significantly enhanced (16).

Plain abdominal radiography and contrast series may provide some diagnostic clues but have mostly been replaced by modern imaging modalities (3,16,17).

Abdominal ultrasound is a rapid, easy to perform, minimally invasive and reproducible imaging technique in adult intussusception. Colour Doppler can provide additional information about the blood supply to the affected bowel segment (17,18,19). The diagnostic sensitivity in our series was only 54%. Wang and

colleagues also reported a rather low diagnostic accuracy of 60% (20). The most important limitations are obesity and the presence of air in the bowel which greatly reduce visibility (3,16).

Abdominal CT has been reported as the most useful and sensitive imaging technique, with a reported diagnostic accuracy of 90%, which is consistent with our findings (3,17,20). Just like in sonography, the characteristic images are comprised of mesentery and oedematous bowel wall (Figure 2). CT can often reveal the causative lesion and show its location, relation to surrounding tissues, extent and degree of vascular compromise (3,17).

In the non-acute setting, magnetic resonance imaging can show nearly the same features as seen on CT with a diagnostic accuracy of up to 96% (17,21,22).

Endoscopy of the lower GI tract is considered useful in ileocecal and colocolic intussusception, where its main benefits are localisation and diagnosis of the underlying lesion (3). In our opinion colonoscopy is a necessary investigation in case of colonic involvement and will influence therapeutic actions by differentiating benign from malignant disease. When performing lower endoscopy in case of acute presentation with clinical obstruction, care should be taken that the benefits outweigh the risks (e.g. risk of perforation in the presence of a malignant tumour).

Laboratory findings can provide additional information, since patients with neoplastic lesions tend to have lower haematocrit values (22). Most anaemic patients in our series had a colonic lead point but 2 patients had an enteric malignant lead point causing anaemia. Thus, the presence of anaemia should raise suspicion and is preferably followed by a careful diagnostic work-up. Serological testing for celiac disease with anti-tissue transglutaminase antibodies seems a valid and cheap

diagnostic option in case of enteric intussusception without evidence for an alternative lead point.

Management

In older series, the definitive diagnosis was only made intraoperatively in a significant percentage of the cases (1,15). In recent series, a preoperative diagnosis of invagination could be made in 94% of the cases (10) and in our series, all patients (from the MMH) had a correct preoperative diagnosis. Based on this observation, we can state that the vast majority of adult intussusceptions can be diagnosed preoperatively. Primary surgical exploration in the strict sense of the word is nowadays rather uncommon. However, operative intervention often remains necessary to resolve the mechanical and/or vascular problems caused by the intussusception and to characterize and treat the suspected underlying lead point.

There is still some controversy about the extent of the bowel resection and the recommendations about reduction of the involved segment (1,16). In some of our patients a preoperative hydrostatic reduction was attempted without any complications. The technical success rate however, was disappointing. Pneumatic or hydrostatic reduction, as is often performed in children, is not regarded as an ideal treatment option in the adult population (2,3,7).

In 1971, Weilbaecher and his colleagues established the principle of resection without reduction whenever possible (7). In the decades that followed, a more selective approach in the management of intussusception, depending on variables such as clinical presentation, location and aetiology of the intussusception and the condition of the patient, was more and more illustrated. The question whether or not to reduce is a key point in the management of adult intussusception because there is a risk of perforation with intra-abdominal seeding of tumour cells and microorganisms, venous tumour dissemination in case of malignancy and a higher risk of anastomotic complications after manipulation of an already friable bowel wall. Therefore, in general, reduction is not recommended in case of signs of ischemia or inflammation (3).

In case of small bowel pathology, some authors advocate primary resection without reduction due to the lower (but not negligible) risk of malignancy and the difficulties encountered in differentiating benign from malignant lesions pre- and intraoperatively (23). Yet, when preoperatively the diagnosis of a benign lesion has been made, reduction before resection can be attempted to avoid excessive resection (24). When the definitive preoperative diagnosis remains unclear and the segment that needs to be resected is very large, reduction before resection may be attempted to rule out a benign process that would only require limited resection (2,24). Benign enteric lesions require resection in order to prevent recurrence (16). Other

authors propose always to attempt reduction in cases of small bowel intussusception if the bowel is viable and there is no evidence of overt malignancy (1).

Enteric intussusception in Crohn's or celiac disease is mostly self-limiting and does not require any specific treatment except treatment of the underlying condition itself (12,13). In enteric intussusception after digestive surgery with involvement of the jejunum-jejunostomy, the anastomosis should be resected and reconstructed resulting in fewer recurrences (25).

In intussusceptions involving a colonic culprit lesion, primary resection without reduction using oncologic techniques is recommended due to the high likelihood of malignancy (2,8,24). It may be very difficult to determine whether the lead point of an intussusception that involves the right colon lies within the ileum, the cecum or the colon (1).

Wang and colleagues stated that in case of colonic involvement, pre- or intraoperative colonoscopy is required since it might help in distinguishing benign from malignant pathology, thereby avoiding excessive surgery (20). Snare polypectomy is not advised in case of chronic intussusception due to the higher risk of perforation (3,26).

In the present study, laparoscopic exploration was used several times as a diagnostic tool when preoperative assessment proved inconclusive. We also report the successful laparoscopic management of small, as well as large intestine intussusception by an experienced surgeon in selected cases, as has previously been reported (27).

Conclusion

Adult intussusception is a rare entity that produces a wide variety of symptoms, making it a clinically difficult to diagnose disease. In the majority of the cases a preoperative diagnosis of intussusception is made using sonography and/or CT-scan. Acquiring the final diagnosis necessitates further biochemical, endoscopic, surgical and/or histopathologic work-up. In case of symptomatic intussusception, a culprit lesion is usually identified after a careful search. We emphasise the high incidence of malignancy in adult intussusception, comprising almost one third of the cases in our series. The presence of a (pre)malignant lead point is especially high in the case of colonic involvement. Consequently, correct and early diagnosis significantly influences treatment strategy and ultimately prognosis. Celiac disease should be kept in mind in case of enteric intussusception without a clear macroscopic lead point. Therapeutic approach has changed from resection without reduction in most cases to a more nuanced, aetiology based strategy guided by lab values, imaging, endoscopy and intraoperative findings.

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References

1. BEGOS D.G., SANDOR A., MODLIN I.M. The diagnosis and management of adult intussusception. *Am. J. Surg.*, 1997 Feb, **173**(2) : 88-94.
2. FELIX E. Adult intussusception, case report of recurrent intussusception and review of the literature. *The American journal of surgery*, 1976.
3. MARINIS A., YIALLOUROU A., SAMANIDES L., DAFNIOS N., ANASTASOPOULOS G., VASSILIOU I., THEODOSOPOULOS T. Intussusception of the bowel in adults: a review. *World. J. Gastroenterol.*, 2009 Jan 28, **15**(4) : 407-11.
4. AHN J.H., CHOI S.C., LEE K.J., JUNG Y.S. A clinical overview of a retrospective study about adult intussusceptions: focusing on discrepancies among previous studies. *Dig. Dis. Sci.*, 2009 Dec, **54**(12) : 2643-9.
5. HANAN B., DINIZ T.R., DA LUZ M.M., DA CONCEIÇÃO S.A., D.A. SILVA R.G., LACERDA-FILHO A. Intussusception in adults: a retrospective study. *Colorectal Dis.* 2010 Jun, **12**(6) : 574-8.
6. AZAR T., BERGER D.L. Adult intussusception. *Ann. Surg.* 1997 August; **226**(2) : 134-138.
7. WEILBAECHER D., BOLIN J.A., HEARN D., OGDEN W 2nd. Intussusception in adults. Review of 160 cases. *Am. J. Surg.*, 1971 May, **121**(5) : 531-5.
8. BRAYTON D., NORRIS W.J., Intussusception in adults. *Am. J. Surg.*, 1954 Jul, **88**(1) : 32-43.
9. GAYER G., HERTZ M., ZISSIN R., CT findings of Intussusception in Adults. Seminars in Ultrasound, CT, and MRI, 2003.
10. HONJO H., MIKE M., KUSANAGI H., KANO N. Adult intussusception: a retrospective review. *World J. Surg.* 2015 Jan, **39**(1) : 134-8.
11. GUPTA A., GUPTA S., TANDON A., KOTRU M., KUMAR S. Gastrointestinal stromal tumor causing ileo-ileal intussusception in an adult patient a rare presentation with review of literature. *Pan. Afr. Med. J.* 2011, **8** : 29. Epub 2011 Mar 20. Review.
12. COHEN M.D., LINTOTT D.J. Transient small bowel intussusception in adult coeliac disease. *Clin. Radiol.*, 1978 Sep, **29**(5) : 529-34.
13. KNOWLES M.C., FISHMAN E.K., KUHLMAN J.E., BAYLESS T.M. Transient intussusception in Crohn disease: CT evaluation. *Radiology.* 1989 Mar, **170**(3 Pt 1) : 814.
14. MCFARLANE S.I., BYRNE K., SHIN J., WILLIAMS R. Intussusception in an adult patient with severe hyperglycaemia-a case report. *Diabet. Med.* 2002 Jul, **19**(7) : 611-4. Review.
15. CHOI S.H., HAN J.K., KIM S.H., LEE J.M., LEE K.H., KIM Y.J., AN S.K., CHOI B.I. Intussusception in adults: from stomach to rectum. *AJR. Am. J. Roentgenol.* 2004 Sep, **183**(3) : 691-8.
16. TAKEUCHI K., TSUZUKI Y., ANDO T., SEKIHARA M., HARA T., KORI T., KUWANO H. The diagnosis and treatment of adult intussusception. *J. Clin. Gastroenterol.*, 2003 Jan, **36**(1) : 1 8-21.
17. BALEATO-GONZÁLEZ S., VILANOVA J.C., GARCÍA-FIGUEIRAS R., JUEZ I.B., MARTÍNEZ DE ALEGRÍA A. Intussusception in adults: what radiologists should know. *Emerg. Radiol.*, 2012 Apr, **19**(2) : 89-101. Epub 2011 Dec 27.
18. CERRO P., MAGRINI L., PORCARI P., DE ANGELIS O. Sonographic diagnosis of intussusceptions in adults. *Abdom. Imaging.*, 2000 Jan-Feb, **25**(1) : 45-7.
19. ANDERSON D.R. The Pseudokidney Sign. *Radiology*, 1999.
20. WANG N., CUI X.Y., LIU Y., LONG J., XU Y.H., GUO R.X., GUO K.J. Adult intussusception: a retrospective review of 41 cases. *World J. Gastroenterol.*, 2009 Jul 14, **15**(26) : 3303-8.
21. FLOEMER F., BISSIG H., OERTLI D., BONGARTZ G., HAMEL CT. Multislice CT in adult colocolic intussusception: case report and review of the literature. *Emerg. Radiol.*, 2008 Sep, **15**(5) : 361-6.
22. WARSHAUER D.M., LEE J.K., Adult intussusception detected at CT or MR imaging: clinical-imaging correlation. *Radiology.*, 1999 Sep, **212**(3) : 853-60.
23. YAKAN S., CALISKAN C., MAKAY O., DENECLİ A.G., KORKUT M.A. Intussusception in adults: clinical characteristics, diagnosis and operative strategies. *World J. Gastroenterol.*, 2009 Apr 28, **15**(16) : 1985-9.
24. EISEN L.K., CUNNINGHAM J.D., AUFSES A.H. JR. Intussusception in adults: institutional review. *J. Am. Coll. Surg.*, 1999 Apr, **188**(4) : 390-5.
25. DAELLENBACH L., SUTER M. Jejunojunal intussusception after Roux-en-Y gastric bypass: a review. *Obes. Surg.*, 2011 Feb, **21**(2) : 253-63.
26. HURWITZ L.M., GERTLER S.L. Colonoscopic diagnosis of ileocolic intussusception. *Gastrointest. Endosc.* 1986 Jun, **32**(3) : 217-8.
27. MCKAY R. Ileocecal intussusception in an adult: the laparoscopic approach. *JSLs.* 2006 Apr-Jun, **10**(2) : 250-3. Review.
28. WANG L.T., WU C.C., YU J.C., HSIAO C.W., HSU C.C., JAO S.W. Clinical entity and treatment strategies for adult intussusceptions: 20 years' experience. *Dis. Colon. Rectum.* 2007 Nov, **50**(11) : 1941-9. Epub 2007 Sep 11.
29. SIOW S.L., CHEA C.H., HASHIMAH A.R., TING S.C. Adult intussusception: 5-year experience in Sarawak. *Med. J. Malaysia.*, 2011 Aug, **66**(3) : 199-201.
30. GUPTA V., DOLEY R.P., SUBRAMANYA BHARATHY K.G., YADAV T.D., JOSHI K., KALRA N., KANG M., KOCHHAR R., WIG J.D. Adult intussusception in Northern India. *Int. J. Surg.* 2011, **9**(4) : 297-301.
31. LINDOR R.A., BELLIOLO M.F., SADOSTY A.T., EARNEST F., CABRERA D. Adult intussusception: presentation, management, and outcomes of 148 patients. *J. Emerg. Med.*, 2012 Jul, **43**(1) : 1-6.
32. GHADERI H., JAFARIAN A., AMINIAN A., MIRJAFARI DARYASARI S.A. Clinical presentations, diagnosis and treatment of adult intussusception, a 20 years survey. *Int. J. Surg.*, 2010, **8**(4) : 318-20.
33. GUPTA R.K., AGRAWAL C.S., YADAV R., BAJRACHARYA A., SAH P.L. Intussusception in adults : institutional review. *Int. J. Surg.*, 2011, **9**(1) : 91-5