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Clinical spectrum and surgical approach of adult intussusceptions: a multicentric study

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Abstract *Background:* The preoperative diagnosis of adult intussusceptions (AIs) remains difficult, and the assessment of the radiological methods has been evaluated very little in the literature. The aim of this study was to evaluate the interest of the different imaging modalities for the preoperative diagnosis of AI and describe causes of AI. *Patients and methods:* Consecutive patients of 15 years and older with the postoperative diagnosis of intussusception from 1979 to 2004 were reviewed retrospectively for this multicentric study. Data concerning clinical considerations, morphological examinations, surgical procedure, histological conclusions, mortality rate and recurrence were analysed. *Results:* Forty-four patients with documented intussusception were included. The mean age was 51 years (15–93 years). The preoperative diagnosis of intussusception was made in 52% of the cases. The sensitivities of the different radiological methods were abdominal ultrasounds (35%), upper gastrointestinal barium study (33%), abdominal computed tomography (CT) (58%) and barium enema (73%). An organic lesion was identified in 95% of the cases. There was 29 enteric and 15 colonic (including appendicular) intussusceptions. Thirty-seven percent of the enteric lesions were malignant, and a bit less than 50% of them were metastatic melanomas. The benign enteric lesions were Meckel's diverticulum and Peutz–Jeghers syndrome in half of the cases. Fifty-eight percent of the pure colonic lesions (excluding appendix) were malignant, and 85% of them were primary adenocarcinomas. The benign colonic lesions were lipomas in 80% of the cases. All patients, except one, had a surgical treatment, and 13 of them had a complete reduction of the intussusception before resection. The mortality rate was 16% and recurrence occurred in three patients; two of them had a Peutz–Jeghers syndrome. *Conclusion:* Intussusception rarely occurs in adults, but nearly half of their causes are malignant. The CT scan is a helpful examination for enteric intussusceptions whether barium enema seems to be the most performing method for colonic lesions. Surgery is the recommended treatment, with or without a primary reduction of the intussusception. During the surgical procedure, this reduction can lead to a more limited bowel resection.

Keywords Adult intussusception · Management · Clinical relevant

Abbreviations AI: Adult intussusception · CT scan: computed tomography scanning

Introduction

Intussusception occurs when a proximal segment of bowel and its associated mesentery telescope into the lumen of the adjacent distal segment. It is a rare entity in adults and it accounts for only 1% of all cases of intestinal obstructions and 5% of all intussusceptions [1–4].

In contrast to its paediatric counterpart, and despite the morphological examination improvement, adult intussusception (AI) remains difficult to diagnose preoperatively.

The purposes of the present study are (1) to review and update the data of 44 patients during the last 25 years, (2) to discuss the value of radiological modalities, location and nature of the causes and surgical management and (3) to try to improve the preoperative diagnosis and eventually determine some evocating contexts and recurrence risk.

Patients and methods

The records of all patients who were 15 years of age and older with a diagnosis of intussusception at the hospitals of Nantes, Angers and La Roche-sur-Yon, France, from January 1979 to May 2004, inclusively, were reviewed retrospectively. Data of 44 patients were gathered from patients' charts, operative notes and pathology reports, and analysed on Excel (Microsoft, USA) and Statview 5.0. Abdominal ultrasounds and barium studies were performed by residents, whereas computed tomography (CT) scans were made by senior radiologists. Until December 2003, a monodetector CT scan was used. Since this date, CT scans were performed using a multidetector CT. Seven different MD radiologists analysed the pictures, and when a first imaging study had been obtained, they were informed about the presumed diagnosis. All diagnoses but one were surgically proven by laparotomy or laparoscopy. Intussusceptions were divided into two categories based on the site of the lead point that was enteric or colonic (appendix was included as being colonic). The patients were further divided into four groups based on the final pathology reports: ones with benign enteric, malignant enteric, benign colonic and malignant colonic lesions. Patients who had idiopathic intussusceptions were included in the group of benign enteric lesions.

Results

Demographics

Forty-four patients, 23 men and 21 women, were included in this study. The median age at the time of diagnosis was 51 years with a range of 15 to 93 years. Five patients had a prior known melanoma, one had an oesophagus malignancy, one had a gastric lymphoma and two patients already had a Peutz–Jeghers disease discovered on intussusceptions. Thirteen patients had a prior laparotomy.

Table 1 Symptoms of patients

Symptoms	No. of patients (*n*)
Abdominal pain	17
Obstruction	15
Constipation/diarrhoea	14
Abdominal mass	11
Hematochezia	5
Peritonitis	2

Clinical features

Pain was the most common presenting complaint, associated or not with an intestinal obstructive syndrome. The different symptoms are summed up in Table 1. Palpable abdominal mass was found out in 47% of the patients with a colonic lesion and 14% of the patients with an enteric lesion.

Fifty percent of the patients had symptoms for more than 3 weeks before presentation to the hospital. Most of the patients (73%) with colonic intussusceptions had a duration of symptoms of more than 10 days.

Diagnostic studies

Intussusception was a preoperative diagnosis in 52% of patients (Table 2). Although 41% of the enteric intussusceptions were recognized preoperatively, 73% of the colic ones were correctly diagnosed. Other preoperative diagnoses included abdominal masses in eight patients, appendicitis in two patients, three obstructions and one peritonitis. The first imaging study obtained in patients with suspected intussusception was an abdominal ultrasound 21 times, a barium enema six times and a CT scan eight times. When neither abdominal ultrasonography (14

Table 2 Preoperative examination

Procedure	No. of patients (*n*)	Accuracy (%)
Plain radiographs of the abdomen	44	0
Abdominal ultrasound	22	35
Barium enema	11	73
Upper gastrointestinal barium study	10	33
Abdominal CT scan	22	58
Colonoscopy	10	44
Laparoscopy	4	100

times) nor barium enema (3 times) was able to demonstrate intussusception, a CT scan was performed (8 times) but provided the diagnosis only three times. In five cases, the diagnosis had already been done by abdominal ultrasounds (four times) or barium enema (once), and CT scan was performed to try to precise the nature of the causative pathology. Finally, 48% of our patients underwent surgical intervention without preoperative diagnosis of intussusception. In our series, a barium contrast study of the colon diagnosed intussusception in 86% of the cases.

Etiologic factors

In our current series, a proven pathological entity was associated with 95% of the intussusceptions (Table 3). Forty-three percent of the organic lesions were malignant, and 58% of them were located on the colon. Two patients had idiopathic enteric intussusceptions. Two of the four patients with Peutz–Jeghers syndrome had a recurrent intussusception.

Treatment

All patients but one underwent surgery. Thirty-nine patients had a laparotomy (33 with a median incision) and four patients underwent a laparoscopic approach (all were changed into laparotomy: two patients underwent enteric resection and anastomosis by a right iliac fossa incision for Meckel's diverticulum, the two other patients had the same intervention, one by a Pfannenstiel incision for an enteric adenoma and the last one for metastatic melanoma by a median incision). The choice of procedure was determined by location, size, cause and viability of the bowel. One patient underwent coloscopic reduction of an ileocolic intussusception with concomitant polypectomy. In one case, a barium reduction was attempted but was not successful, and the patient was operated on a few hours later. Overall, 15 patients underwent primary resections without initial reduction. Twenty-three reductions were attempted before a concomitant resection and anastomosis. This manipulation was successful in 13 patients, and none of them underwent ileostomy or colostomy. Of these 13 patients, 5 had a malignant lesion and only 2 of them with metastatic melanoma were known to have died. The remainder of the patients had resections and anastomosis after initial reductions without any complication. A resection of the lesion by colotomy has been performed twice: once in a patient with an adenoma of the ileocecal valve and once after reduction of the intussusception in a woman with a lipoma of the ascending colon. The two patients operated for peritonitis underwent intestinal resection without reduction, and ileostomy was performed in a patient with an enteric perforation and metastasis of melanoma, and a colostomy was made in a 29-year-old patient with a colonic sarcoma. One patient only had reduction and no organic lesion was found out.

Morbidity and mortality rates

Overall, no patient suffered postoperative complications. In this study, no anastomotic leak was noticed. Of the 43 patients who underwent surgery, 7 died (mortality rate, 16%). All of them had malignant diseases: five had metastatic melanomas and died within an average of 5 months after surgery, one had an oesophageal metastatic carcinoma and the remaining patient had a sarcoma (Table 4).

Table 3 Etiologies of intussusceptions

Location	Malignant	Benign	Total (%)
Enteric	Metastatic melanoma (5)	Meckel's diverticulum (5)	*n*=29 (66%)
	Metastatic oesophagus cancer (1)	Peutz–Jeghers syndrome (4)	
	Lymphoma (1)	Adenoma (3)	
	Leiomyosarcoma (1)	Lipoma (3)	
	Carcinoid tumor (1)	Anatomic aberration (1)	
	Neuroendocrine tumor (1)	Idiopathic (2)	
	Stromal tumor (1)		
	n=11 (37%)	*n*=18 (63%)	
Appendix	Carcinoid tumor (1)	Endometriosis (1)	*n*=3 (7%)
		Mucocele (1)	
	n=1	*n*=2	
Colonic	Adenocarcinoma (6)	Lipoma (4)	*n*=12 (27%)
	Sarcoma (1)	Villous adenoma (1)	
	n=7 (58%)	*n*=5 (42%)	
Total	*n*=19 (43%)	*n*=25 (57%)	*n*=44

Table 4 Principal lesions and treatments of the 44 patients

Age (years)	Sex	Location of the lesion	Nature of the lesion	Preoperative diagnosis	Surgical treatment	Follow-up
70	M	Enteric	Metastatic melanoma	No	Resection/anastomosis	Dead at 2 days
77	M	Enteric	Lymphoma	Yes/CT	Resection/anastomosis	Alive at 5 months
52	F	Enteric	Neuroendocrine tumor	Yes/US, CT	Resection/anastomosis	Alive at 2 months
54	M	Enteric	Metastatic melanoma	Yes/CT	Resection/anastomosis	Dead at 6 months
42	M	Enteric	Leiomyosarcoma	Yes/CT	Resection/anastomosis	Alive at 22 months
37	M	Enteric	Metastatic melanoma	No	Resection/anastomosis	Dead at 6 months
49	M	Enteric	Carcinoid tumor	No	Resection/anastomosis	Alive at 1 month
65	M	Enteric	Stromal tumor	No	Resection/anastomosis	Alive at 80 months
55	M	Enteric	Metastatic melanoma	No	Resection and ileostomy	Dead at 1 months
57	M	Enteric	Metastatic oesophagus cancer	No	Resection/anastomosis	Dead at 6 months
69	M	Enteric	Metastatic melanoma	No	Resection/anastomosis	Dead at 5 months
36	M	Enteric	Peutz–Jeghers adenoma	Yes/BE, CT	Resection/anastomosis	Alive at 36 months
62	M	Enteric	Adenoma	Yes/BE, GIBS	Tumorectomy	Alive at 48 months
93	F	Enteric	Lipoma	No	Resection/anastomosis	Alive at 2 months
52	M	Enteric	Lipoma	Yes/CT	Resection/anastomosis	Alive at 24 months
57	F	Enteric	Lipoma	Yes/US, CT	Resection/anastomosis	?
42	M	Enteric	Adenoma	Yes/CT	Resection/anastomosis	?
15	M	Enteric	Meckel's diverticula	No	No surgery	Alive at 8 months
89	F	Enteric	Idiopathic	No	Resection/anastomosis	Alive at 3 months
52	F	Enteric	Anatomic aberration	No	Resection/anastomosis	Alive at 10 days
20	F	Enteric	Peutz–Jeghers adenoma	Yes/US, CT	Resection/anastomosis	Alive at 96 months
30	F	Enteric	Peutz–Jeghers adenoma	Yes/US	Resection/anastomosis	Alive at 194 months
16	F	Enteric	Meckel's diverticula	No	Resection/anastomosis	Alive at 1 month
31	F	Enteric	Adenoma	No	Resection/anastomosis	Alive at 3 months
33	F	Enteric	Idiopathic	No	No cause found	Alive at 11 months
22	M	Enteric	Meckel's diverticula	No	Resection/anastomosis	?
29	M	Enteric	Meckel's diverticula	No	Resection/anastomosis	Alive at 2 months
15	M	Enteric	Peutz–Jeghers adenoma	No	Resection/anastomosis	Alive at 10 days
56	M	Enteric	Meckel's diverticula	Yes/US, GIBS	Resection/anastomosis	Alive at 60 months
54	F	Appendix	Mucocele	Yes/US, CT	Resection/anastomosis	Alive at 2 months
25	F	Appendix	Endometriosis	Yes/US, CT	Resection/anastomosis	Alive at 6 months
38	F	Appendix	Carcinoid tumor	No	Resection/anastomosis	Alive at 6 months
45	F	Colonic	Lipoma	Yes/BE	Resection/anastomosis	Alive at 24 months
59	F	Colonic	Lipoma	Yes/US, BE	Resection/anastomosis	Alive at 4 months
62	M	Colonic	Villous adenoma	No	Resection/anastomosis	Alive at 36 months
39	F	Colonic	Lipoma	No	Tumorectomy	Alive at 2 months
44	F	Colonic	Lipoma	No	Resection/anastomosis	Alive at 5 months
68	M	Colonic	Adenocarcinoma	Yes/BE	Resection/anastomosis	?
72	F	Colonic	Adenocarcinoma	Yes/BE	Resection/anastomosis	?
89	F	Colonic	Adenocarcinoma	Yes/BE	Resection/anastomosis	?
89	F	Colonic	Adenocarcinoma	Yes/BE	Resection/anastomosis	Alive at 2 months
29	M	Colonic	Sarcoma	Yes/CT	Resection and colostomy	Dead at 10 months
89	F	Colonic	Adenocarcinoma	Yes/CT	Resection/anastomosis	?
64	F	Colonic	Adenocarcinoma	Yes/US, CT	Resection/anastomosis	Alive at 6 months

CT Computed tomography, *US* ultrasounds, *BE* barium enema, *GIBS* gastrointestinal barium study

Recurrences

The follow-up period ranged from 1 month to 16 years, with a mean of 19 months. Three recurrences have been documented: two patients with a Peutz–Jeghers syndrome and a young girl with no organic cause found in a first time and a recurrence of the intussusception 10 days later. Finally, a Meckel's diverticulum was discovered.

Discussion

This study is one of the biggest report of AI in the literature. Azar and Berger [1] and Nagorney et al. [2] published series with, respectively, 58 and 48 patients. The data have been recorded in a limited and coherent population, in the west of France (two university hospitals and one general hospital), and 44 patients have been included, over a 25-year period.

Intussusception in adult remains a surgical disease with a pathological process leading it in 85 to 95% of the cases [1–3]. Despite of the evolution of the radiological procedures, intussusception is rarely diagnosed preoperatively: 51% in our study, 32% for Azar and Berger [1], 35% for Nagorney et al. [2] and 40% for Eisen et al. [4]. Perhaps the easiest accessibility of CT scan for acute abdominal pain can explain the best accuracy in the most recent series. The radiological signs of intussusception are well known nowadays, particularly the CT scan signs that are often described in the literature [5, 6]. In our study, CT scan was used 22 times and made the preoperative diagnosis in 58% of the cases. In opposition to the literature [1, 4], abdominal CT scan is not the most accurate examination in this series. Barium enema seems to be an excellent method for the diagnosis of colonic intussusceptions (73% in this series). This examination is cheap, quite easy to carry out, but remains limited to the colonic lesions. Because of these results, it seems interesting to associate CT scan and barium enema for the research of enteric and colonic intussusceptions during the same examination. Gastrointestinal barium study had a low sensitivity (33%) in this study. Nagorney et al. [2] reported that a diagnosis was made 77% of the time with upper gastrointestinal tract barium study but did not distinguish intussusception, mass and obstruction. More recently, other studies [1, 4] reported an accuracy of 21% in the diagnosis of intussusceptions only.

Intussusceptions have been classified according to location and to malignancy. In our series, most of the lesions were enteric (66%) and most of the colonic lesions were malignant (54%). These notions are found out in other series [1–4]. Metastatic melanomas were associated with 45% of the malignant enteric lesions, whereas adenocarcinomas were the most common causes of malignant colonic lesions (83%). Meckel's diverticulum was a common cause of benign enteric intussusceptions, and lipoma was the principal cause of benign colonic ones as known in the literature [2, 3], but in distinction to other series, there were only two idiopathic intussusceptions in our study (11%), whereas there were 28 to 48% of benign enteric intussusceptions caused by postoperative adhesions recorded in the literature.

Definitive surgical resection remains the recommended treatment in nearly all cases, because of the large proportion of structural causes and the relatively high incidence of malignancy. For the same reasons, preoperative reduction with barium or air should not be recommended in adults as a definitive treatment [2, 7], and a non-surgically treated lesion can lead to a recurrence. Although all the authors do agree with the precedent notions, the optimal surgical management of intussusception remains controversial. Theoretically, a reduction at surgery before resection might permit a more limited resection but should be avoided because of the risk of potential intra-luminal seeding or venous tumor dissemination during the manipulation of a malignant lesion [2]. The main problem is to distinguish the benign and the malignant lesions preoperatively. It is exceptionally done by CT scan, but it is not a reliable method. As we have seen, most of the colonic intussusceptions are malignant, and it seems logical to recommend a primary surgical resection without prior reduction. Of course, the context of known neoplasm, the age of the patient, a gangrenous bowel or a perforation with peritonitis must be taken in consideration in the choice of the treatment. In our series, a primary reduction before resection was attempted in 59% of the patients and succeeded 56% of the time, allowing a limited resection. For the enteric intussusceptions, most of the malignant lesions are due to metastatic process, and manipulating the tumor or not should not change the catastrophic prognosis. (In our series, all the patients died in an average of 5 months after surgery). In selected patients, a polypectomy through a limited colotomy or enterotomy is feasible but is done through an oedematous bowel, with an increased theoretic risk of leak. This treatment has been done twice in our study, without complication.

In our series, three patients had a recurrent intussusception. Two of them had a Peutz–Jeghers syndrome. In this disease, because of the recurrent nature of intussusception (43%), initial reduction followed by enterotomy and polypectomy is recommended [2, 8–10]. The third patient underwent laparoscopic surgery for abdominal pain. An enteric intussusception was discovered but no cause was found. As recommended in literature [2], a simple reduction was made, but the patient had another intussusception 10 days later and underwent another surgery. This time, a Meckel's diverticulum was found and removed.

Conclusion

Intussusceptions are rare in adult population, and the variety of different presenting symptoms makes the di-

agnosis difficult. Non-invasive imaging techniques are now essential to make the diagnosis preoperatively and eventually to give indications of malignancy. CT associated or not with barium enema is maybe the most accurate modality for diagnosis of intussusceptions in adults, but we have not performed this experiment yet. Surgery is the only treatment and a cause must be systematically searched. The high proportion of malignant lesions advocates theoretically a resection without reduction, but in some cases, because of the risk of recurrence like in Peutz–Jeghers disease, the will to limit the bowel resection seems logical to us to lead to a primary reduction of the intussusception.

References

1. Azar T, Berger D (1997) Adult intussusception. Ann Surg 226(2):134–138
2. Nagorney DM, Sarr MG, McIlrath DC (1981) Surgical management of intussusception in the adult. Ann Surg 193:230–236
3. Haas EM, Etter EL, Ellis S, Taylor TV (2003) Adult intussusception. Am J Surg 186:75–76
4. Eisen LK, Cunningham JD, Aufses AH (1999) Intussusception in adults: institutional review. J Am Coll Surg 188:390–395
5. Lvoff N, Breiman RS, Coakley FV, Lu Y, Warren RS (2003) Distinguishing features of self-limiting adult small-bowel intussusception identified at CT. Radiology 227:68–72
6. Bruel JM, Gallix B, Achard C, Pierredon MA, Molina E (2003) Multidetector CT and MRI in diseases of the GI tract. J Radiol 84:499–513
7. Huang BY, Warshauer DM (2003) Adult intussusception: diagnosis and clinical relevance. Radiol Clin North Am 41:1137–1151
8. Cherki S, Adham M, Bizollon T, Gaudin JL, Baulieux J (2002) Intussusception of the small bowel due to Peutz–Jeghers syndrome: a case report and literature review. Ann Chir 127:714–717
9. Kurugoglu S, Aksoy H, Kantarcy F, Cetinkaya S, Mihmanli I, Korman U (2003) Radiological work-up in Peutz–Jeghers syndrome. Pediatr Radiol 33:766–771
10. Giardiello FM, Brensinger JD, Tersmette AC, Goodman SN, Petersen GM, Offerhauss JA et al (2000) Very high risk of cancer in familial Peutz–Jeghers syndrome. Gastroenterology 119:1447–1453