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Enteroclysis CT and PEG-CT in patients with previous small-bowel surgical resection for Crohn's disease: CT findings and correlation with endoscopy

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Abstract The aim of this study was to evaluate the accuracy of multidetector CT in patients with Crohn's disease (CD) relapse after ileocolic resection compared with endoscopy. Thirty-four patients were studied by endoscopy and multidetector CT, after oral administration of polyethylene glycol solution (n=21) or after administration of methylcellulose via nasojejunal tube (n=13). In CT examinations we evaluated the presence of mural thickening, target sign, perienteric stranding, comb sign, fibrofatty proliferation and complications. Endoscopic results were classified in accordance with Rutgeerts score (from 0 to 4). The statistical evaluations were carried out by using Fisher's exact text and χ^2 testing ($p<0.05$, statistically significant difference). Sensitivity, specificity and accuracy of the CT were 96.9%, 100% and 97%, respectively. We found a statistically significant correlation between an endoscopic score of 4 and the CT signs of target sign, perienteric stranding, comb sign and fibrofatty proliferation, and between scores 1 and 2 and mucosal hyperdensity without or with mural thickening, respectively ($p<$ 0.05). Moreover, only CT identified the presence of jejunal and proximal ileum disease in two and three patients, respectively, and fistulas in three patients. CT is a reliable method in the diagnosis of CD relapse and shows agreement with the approved endoscopic Rutgeerts score.

Keywords Small-bowel multidetector CT · Crohn's disease · Rutgeerts score · Ileocolic relapse

Introduction

Crohn's disease (CD) is an intestinal chronic inflammatory disease that can involve any segment of the gastrointestinal system. About 70% of patients with CD undergo at least one surgical resection in their lifetime. After surgery it is possible to find a relapse in the ileocolic anastomosis with the presence of lesions in the neoterminal ileum in 73–93% of patients within 1 year of the surgical resection [1].

Rutgeerts et al. [1, 2] described the endoscopic features of the relapse in the ileocolic anastomosis. They described five grades of endoscopic severity ranging from 0 to 4 (Table 1) and found that a high endoscopic score was predictive of a symptomatic and surgical relapse.

In spite of the frequency of relapse in patients with Crohn's disease, few studies in the literature have evaluated the role of the imaging in patients undergoing surgery with relapse of disease [3–7].

We did not find any studies on the accuracy of small-bowel CT and on its correlation with the endoscopic score.

The first and main objective of our study was to evaluate the diagnostic accuracy of multidetector CT, performed after small-bowel distension with polyethylene glycol solution (PEG) via the oral route (PEG-CT) or with methylcellulose through a nasojejunal tube (enteroclysis CT) versus retrograde ileocolonoscopy in patients who had undergone previous intestinal resection.

In addition, we attempted to establish if there was a correlation between CT findings and endoscopic Rutgeerts

Table 1 Rutgeerts score

Score	Definition
0	No lesion
1	Fewer than five aphthous lesions
2	More than five aphthous lesions with normal mucosa between the lesions or skip areas of larger lesions or lesions confined to ileocolonic anastomosis
3	Diffuse aphthous ileitis with diffusely inflamed mucosa
4	Diffuse inflammation with large ulcers, nodules and/or narrowing

score to obtain a new severity-based CT score, based on CT findings, in order to differentiate between low and high grade lesions.

Materials and methods

We prospectively evaluated 34 consecutive patients (20 men and 14 women; age range 25–75 years, mean 43 years) who had been operated on for intestinal resection with ileocolic anastomosis and who currently showed a clinical and/or symptomatic relapse of Crohn's disease. A time interval between the operation and examinations for recurrent Crohn's disease of 3–10 years was allowed. Exclusion criteria included pregnancy, renal insufficiency, documented reaction to iodinated contrast material, previous intestinal resection, failure of the endoscopy due to a stenosis that was not surmountable by endoscope. All patients gave oral informed consent to the procedure.

Before examination, all patients underwent an intestinal preparation according to the following plan: 2 days before, a light diet free of fruit and vegetables; the day before, 150 mg of a mixture in equal parts of sennosides A and B with a cup of sugared tea at 8.00 a.m.; at 1.00 p.m. a semiliquid diet; at 5.00 p.m., 15 g of magnesium sulphate in three-quarters of a glass of lukewarm water followed by the consumption of 3 L of water during the following 4–5 h; at 9.00 p.m., a cup of hot soup; fasting from 9.00 p.m.

Small-bowel distension was achieved in 21 patients by oral administration of 1.5–2.0 L of iso-osmotic polyethylene glycol (PEG) solution administered in equal doses of 100 mL starting 45 min before CT (PEG-CT).

Thirteen patients underwent fluoroscopic placement of a 12- to 16-F nasojejunal tube (enteroclysis CT or E-CT), after which they were brought into the CT room. Contrast material (1,500–2,500 mL of 0.5% methylcellulose) was hand-infused, using 60-mL syringes.

An anticholinergic compound (*N*-butyljoscine bromide) was administered intravenously (i.v.) in all patients to avoid spasms, to obtain homogeneous small-bowel distension and to reduce patients' abdominal discomfort. We administered 10 mg when the patient complained of abdominal discomfort and 10 mg just before a CT.

At the end of the infusion the patients underwent multidetector 16-row CT (LightSpeed Pro16, GE Medical System, Milwaukee, USA). The operator was unaware of the patients' symptoms and of the results of other examinations performed, but was informed about the type of anastomosis the patients had previously had.

We used the following imaging parameters: collimation 1.25 mm, table speed 13.75 mm/rotation, reconstructed interval 1.25 mm, pitch 1.375, rotation time 0.6 s, 120 kVp, 500 mA s. Unenhanced and contrast-enhanced CT were performed with the patient in the supine position from the diaphragm to the perineum during a single breath-hold. A further 200–250 mL of methylcellulose or PEG was given after the unenhanced images in the case of inadequate small-bowel distension. Contrast-enhanced CT images were acquired 40 s after the i.v. injection of 130–150 mL of contrast agent at a rate of 3 mL/s (Ultravist 370, Schering AG, Berlin, Germany). Image 2D processing was performed with a computer workstation (Advantage Windows, GE Medical Systems, Milwaukee, USA). We also performed maximum intensity projection (MIP) reconstructions.

Two gastrointestinal radiologists reviewed all images in consensus and reported all data on a file card.

First of all, we looked for small-bowel distension. The distension of each small-bowel segment was classified according to a four-point scale (0=absent, 1=incomplete, 2=partial, 3=complete).

A well-distended loop was defined as a diseased loop if its thickness was more than 3 mm [8, 9]. We analysed the density (HU), grade (mm) and symmetry of the parietal thickening and the presence of associated extraluminal signs. We also considered: the diameter of the small-bowel lumen; the presence of stenosis; the presence, site and number of abnormal altered bowel segments; the degree of mural thickening; mural enhancement; the presence of a target sign (alternating rings of high and low density); the presence of a comb sign (hypervascularity of the mesentery involved); the presence of perienteric stranding (loss of the normal sharp interface between the bowel wall and mesentery); the presence of fibrofatty proliferation (increasing the attenuation value of mesenteric fat to 20–60 HU); the presence of fistulas; lymphadenopathy (diameter>1 cm); the presence of abscesses; and other signs [8, 9].

Ileocolonoscopy was performed as a standardised routine procedure in all patients not later than 2 weeks before or after the CT examinations. Endoscopic recurrence was defined as the presence of typical CD lesions in the anastomosis with or without involvement of the neoterminal ileum, according to the criteria proposed by Rutgeerts et al. (Table 1) [1, 2].

The comparable statistical evaluations were carried out by using χ^2 testing (Yates corrected) and Fisher's exact

Table 2 Degree of small-bowel loop distension in PEG-CT and E-CT, and statistical analysis of the distension

	0 Absent		1 Incomplete		2 Partial		3 Complete		*p* value
	E-CT	PEG-CT	E-CT	PEG-CT	E-CT	PEG-CT	E-CT	PEG-CT	
PJ	0 (0%)	5 (23.8%)	1 (7.7%)	9 (42.8%)	3 (23%)	3 (23%)	9 (69.2%)	3 (14.3%)	0.0039*
DJ	0 (0%)	1 (4.7%)	0 (0%)	5 (23.8%)	4 (30.7%)	4 (30.7%)	9 (69.2%)	4 (19.04%)	0.0104*
PI	0 (0%)	0 (0%)	0 (0%)	1 (4.7%)	2 (15.3%)	2 (15.3%)	11(84.6%)	10 (47.6%)	0.1391
TI/A	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (7.7%)	1 (7.7%)	12 (92.3%)	17 (80.9%)	0.6816

Results are presented as number of patients, with corresponding percentage of total patient number [PEG-CT (n = 21), E-CT (n = 13)] in parentheses
PJ proximal jejunum, *DJ* distal jejunum, *PI* proximal ileum, *TI/A* neoterminal ileum/Ileocolic anastomosis
*$p<0.05$, statistically significant difference (according to the χ^2 test, Yates corrected)

test. A value of p less than 0.05 was considered statistically significant.

Results

The different degrees of distension of the loops are summarised in Table 2. Distension of the proximal and distal jejunum was found to be significantly better in patients studied with E-CT than those studied with PEG-CT, as confirmed by the χ^2 test with Yates correction ($p<0.05$, statistically significant difference). No significant difference (Table 2) was present for other sites ($p>0.05$).

After acquisition of the unenhanced images, a further 200–250 mL of methylcellulose or PEG was administered to achieve adequate small-bowel distension in 5/34 patients (15%; 1 studied by E-CT and 4 studied by PEG-CT).

Concerning the use of *N*-butyljoscine bromide, none of the patients had any contraindications to the drug (glaucoma, prostatic hypertrophy, tachyarrhythmia) and no side effects were observed. The first dose was usually administered i.v. before 1–1.5 L of methylcellulose or PEG.

CT showed relapse of disease in the ileocolic anastomosis in 20 patients studied with PEG-CT and in 11 patients studied with enteroclysis CT. Other pathological sites were: the neoterminal ileum in 23 patients (8 studied by E-CT and 15 studied by PEG-CT), the distal jejunum in 2 patients (1 studied by E-CT and 1 studied by PEG-CT), and the proximal ileum in 3 patients (2 studied by E-CT and 1 studied by PEG-CT). All patients with involvement of the neoterminal ileum or with involvement of the proximal ileum also had a relapse of the ileocolic anastomosis. The patients with involvement of the distal jejunum did not

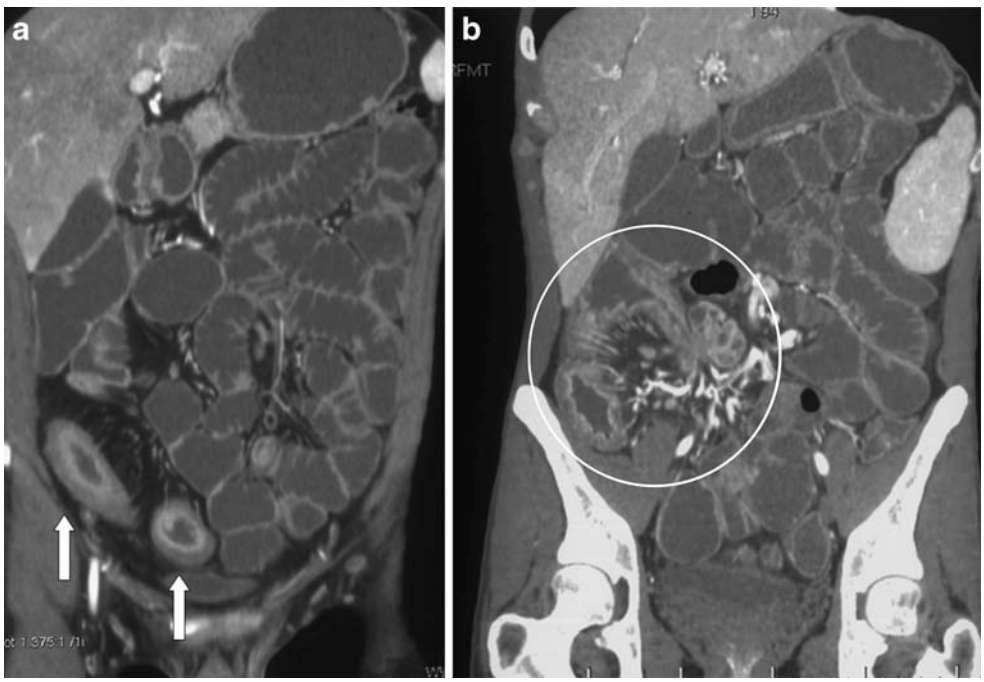

Fig. 1 Enteroclysis CT (**a**) shows mural thickening of the neoterminal ileum (*arrows*) with a target sign, perienteric strand-ing and a comb sign. In another patient PEG-CT (**b**) shows mural thickening of the ileocolic anastomosis and proximal ileal loop with a target sign, comb sign and lymph nodes (*inside* the *circle*)

Table 3 CT findings

CT findings	E-CT	PEG-CT	Total
Mucosal hyperdensity without wall thickening	3	4	7
Mucosal hyperdensity with wall thickening	1	2	3
Target sign	8	13	21
Perienteric stranding	7	13	20
Comb sign	4	6	10
Fibrofatty proliferation	3	10	13
Stenosis	2	6	8
Fistulas	1	6	7
Abscess	0	0	0
Lymph nodes	9	14	23

Results are presented as number of patients

show relapse of the ileocolic anastomosis. Diseased loops showed wall thickening ranging between 3 and 12 mm (mean 7.5 mm), loop diameter ranging between 10 and 34 mm (mean 17 mm), and luminal diameter between 4 and 20 mm (mean 12 mm). Unenhanced CT depicted density values of the segments involved ranging between 28 and 54 HU and the degree of their contrast enhancement ranged between 34 and 164 HU. A target sign was observed in 21 patients, mucosal hyperdensity with or without mural thickening in 10 patients, perienteric stranding in 20 patients, the comb sign in 10 patients, lymph nodes (diameter 4–20 mm) in 23 patients (Fig. 1). Other signs were fibrofatty proliferation in 13 patients, stenosis in 8 patients and fistulas in 7 (Table 3).

All patients underwent retrograde endoscopy, which confirmed a relapse of the disease in the ileocolic anastomosis in 31 patients.

One patient did not show any alterations in the anastomosis on CT, but endoscopy showed a relapse in the ileocolic anastomosis (score 2), so it is a false-negative CT case (Fig. 2).

We did not find any false-positive cases. Nevertheless, CT and endoscopy did not show a relapse in disease in the ileocolic anastomosis in two patients, but CT alone could show the presence of disease in some jejunal loops (Fig. 3). CT alone showed involvement of the proximal ileum in three patients, which also showed a relapse of the ileocolic anastomosis.

Finally, CT alone showed the presence of fistulas in three patients with a relapse in the ileocolic anastomosis (one patient with score 1, one with score 3 and one with score 4), modifying the management of the patients (Fig. 4).

In total, values of sensitivity, specificity and diagnostic accuracy of CT in the evaluation of the ileocolic anastomosis were 96.9%, 100% and 97%, respectively (Table 4).

Table 5 shows CT signs and their correlation with endoscopic scores. Seventeen patients had an endoscopic score of 4, four patients had a score of 3, three patients had a score of 2 and seven patient had a score of 1.

Fig. 2 PEG-CT does not show any alterations in the ileocolic anastomosis (*arrow*). Endoscopy images (not shown) reveal alteration of the ileal mucosa with small erosions and some aphthous ulcers

All patients with score 4 showed mural thickening at CT (Fig. 5); this was associated with a target sign in 16 patients, perienteric stranding in 14 patients, fibrofatty proliferation in 12, a comb sign in 9, and fistulas in 4.

All patients with score 3 showed mural thickening with a target sign (Fig. 6). Three patients had score 2 (Fig. 7). Two patients showed mucosal hyperdensity with mural thickening. A target sign was present in only one patient.

All patients with score 1 showed mucosal hyperdensity without mural thickening (Fig. 8). We found positive correlations between score 4 and the following CT signs:

Fig. 3 PEG-CT shows mural thickening of some jejunal loops (*arrows*) with a target sign and a comb sign. Both CT and endoscopy did not show relapse of the ileocolic anastomosis (endoscopic score 0)

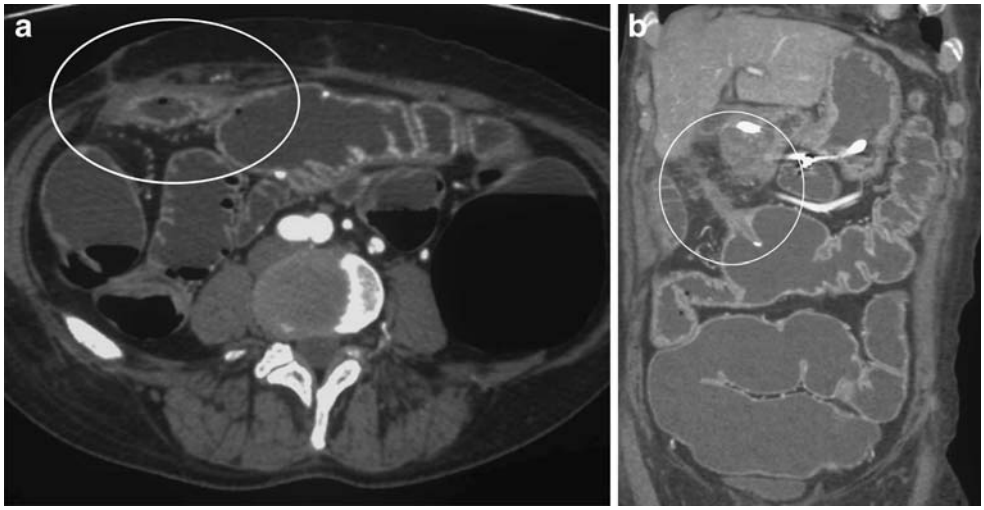

Fig. 4 Enteroclysis CT in a patient with relapse of the ileocolic anastomosis. Ileoscopy confirms relapse of disease (endoscopic score 1). CT also shows two fistulas (*inside* the *circles*) not shown by endoscopy

target sign, perienteric stranding, comb sign and fibrofatty proliferation (Table 6), as confirmed by Fisher's exact test. Moreover, positive correlation was present between score 1 and mucosal hyperdensity without wall thickening and between score 2 and mucosal hyperdensity with wall thickening (Table 6). We did not find a positive correlation for the other CT signs (Table 6).

In addition, to improve the statistical comparison of CT findings with the endoscopic score, a CT score system was established and the CT score was adapted; thus, Rutgeerts scores 3 and 4 were merged into a CT high grade score, score 2 was merged into a CT intermediate grade score and Rutgeerts score 1 was merged into a CT low grade score. Accordingly, we defined a CT score system from CT 0 to CT 3: (a) CT 0, i.e. no lesions; (b) CT 1 (low grade), i.e. minor mucosal irregularities with mucosal hyperdensity without wall thickening, no stenosis or stenosis without prestenotic dilatation; (c) CT 2 (intermediate grade), i.e. mucosal hyperdensity with bowel wall thickening, no stenosis or stenosis without prestenotic dilatation; (d) CT 3 (high grade), i.e. major mucosal abnormalities, distinct bowel wall thickening with a target sign and extravisceral signs such as perienteric stranding, a comb sign, fibrofatty proliferation, high grade stenosis with prestenotic dilatation, and the presence of complications.

When correlating Rutgeerts scores with this CT score system (Table 7) we found a positive statistical correlation among a high grade score, a target sign and CT signs of extravisceral involvement ($p<0.05$). Moreover, positive correlation was present between a low grade score and mucosal hyperdensity without wall thickening, and between an intermediate grade and mucosal hyperdensity with wall thickening.

Discussion

Ileocolonoscopy is still the gold standard used to evaluate recurrence of disease in patients who have undergone ileocolic resection. Nevertheless, endoscopy is an invasive method that frequently needs sedatives or anaesthesia, can be incomplete in the presence of stenosis that is not surmoun-

Table 4 Sensitivity, specificity and diagnostic accuracy of CT in the evaluation of the ileocolic anastomosis

	CT
Positive-true cases (PT)	31
Negative-true cases (NT)	2*
False-negative cases (NF)	1
False-positive cases (PF)	0
Specificity (NT/NT + PF)	100%
Sensitivity PT/PT + NF)	96.9%
Diagnostic accuracy (PT + NT/tot)	97%

*No ileocolic relapse, but jejunal disease was present in these patients

Table 5 Correlation between CT signs and endoscopic score

CT findings	Score 1	Score 2	Score 3	Score 4
Target sign with wall thickening	0	1	4	16
Mucosal hyperdensity without wall thickening	7	0	0	0
Mucosal hyperdensity with wall thickening	0	2	0	1
Perienteric stranding	1	2	3	14
Comb sign	0	0	1	9
Fibrofatty proliferation	0	0	1	12
Stenosis	0	1	1	6
Fistulas	1	0	2	4

Results are presented as number of patients

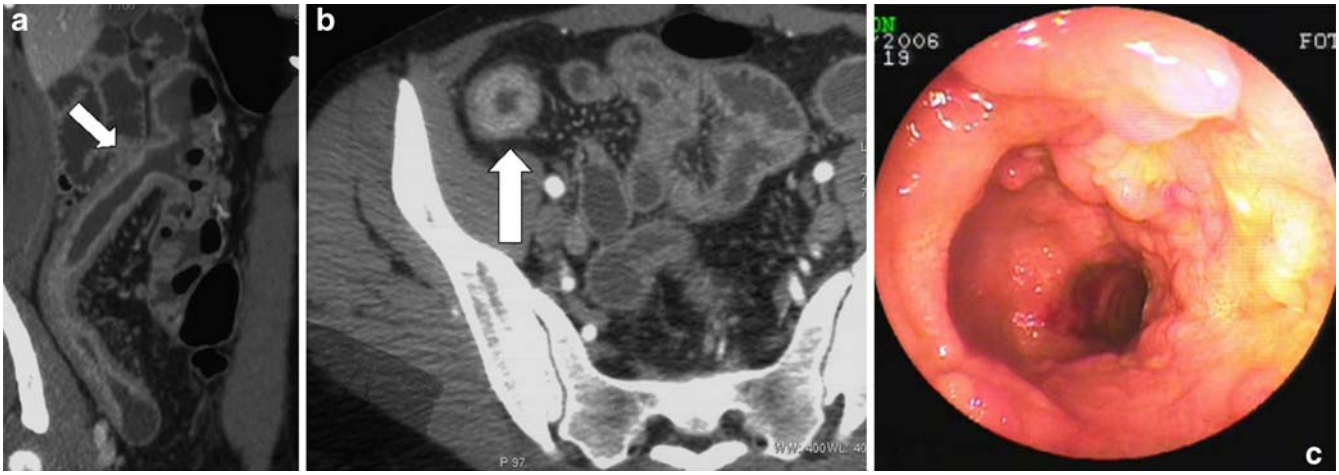

Fig. 5 Relapse of ileocolic anastomosis and ileal relapse with an endoscopic score of 4. PEG-CT (**a**, **b**) shows mural thickening with a target sign and a comb sign (*arrows*). Endoscopy picture (**c**) of the neoterminal ileum shows ileal substenosis with a cobblestone pattern

table by endoscope and permits the vision of only ileocolic anastomosis with or without neoterminal ileum [3, 5].

In the literature few studies have been published in which the authors evaluate an alternative method to endoscopy in patients who have undergone surgery with relapse of disease.

In 1996, Bourreille et al. [5] compared ileocolonoscopy with capsule endoscopy in 32 patients. Sensitivity and specificity of capsule endoscopy were 62–76% and 90–100%, respectively, while sensitivity and specificity of ileocolonoscopy were 90% and 100%. The authors concluded that capsule endoscopy cannot systematically replace ileocolonoscopy in the management of patients.

In 1998, Andreoli et al. [4] published a study in which they compared ultrasound and ileocolonoscopy in 41 patients. Sensitivity, specificity and diagnostic accuracy of ultrasound were 81%, 86% and 83%, respectively. The positive predictive value was 96%, but the negative predictive value was only 57%. The authors concluded that ultrasound should be the first examination for patients with a clinically suspected relapse.

In 2005, Zalev et al. [6] retrospectively reviewed the small-bowel studies (small-bowel series and small-bowel enemas) of 105 consecutive patients with a proven diagnosis of Crohn's disease: a control group of 47 patients with no previous surgery and a postoperative group of 58 patients who had undergone resection. Fifty-six out of 58 (97%) postoperative patients had anastomotic recurrence. There were lower frequencies of mucosal thickening, ulceration/ulceronodular mucosa, sacculation, loop separation, sinuses and masses, and a higher frequency of strictures in recurrent disease than in de novo disease.

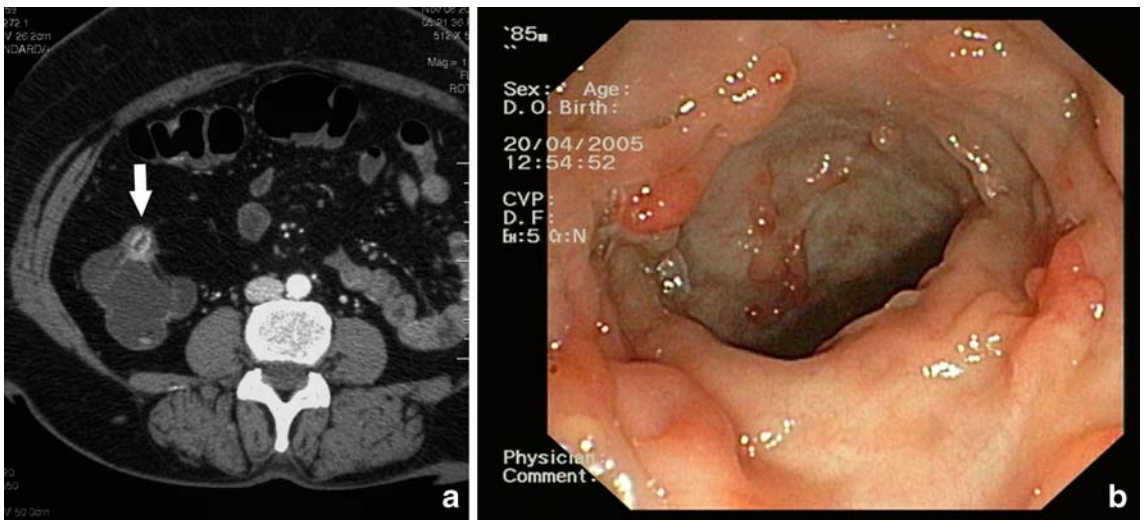

Fig. 6 Relapse of ileocolic anastomosis with an endoscopic score of 3. PEG-CT (**a**) shows moderate mural thickening of the ileocolic anastomosis with a target sign (*arrow*). Endoscopy picture (**b**) shows mucosal oedema and erythema, with some pseudopolyps

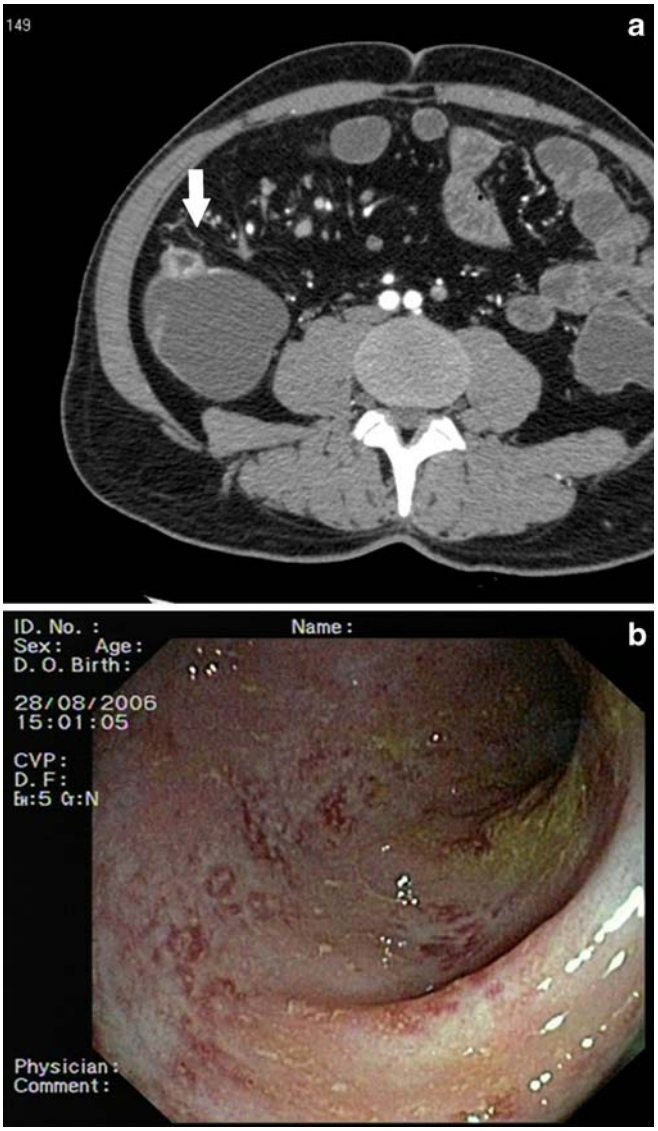

Fig. 7 Relapse with endoscopic score 2. PEG-CT (**a**) shows mucosal hyperdensity with moderate mural thickening of the ileocolic anastomosis (*arrow*). Endoscopic picture (**b**) shows some small erosions and aphthous ulcers

In 2008, Sailer et al. [7] performed MR enteroclysis and endoscopy in 30 patients with suspected Crohn's disease recurrence after ileocolic resection and used an MR score based on image quality, contrast enhancement, and mural and extramural bowel wall changes from MR0 to MR3. Comparing the MR and Rutgeerts scores, the mean observer agreement for the total score rating was 77.8%. When comparing only scores below or above MR2—the threshold indicative of the necessity of medical treatment—there was a total agreement of 95.1% (kappa 0.84). The authors concluded that the MR score was reproducible and showed high agreement with the approved endoscopic Rutgeerts score.

As far as we know, no studies have been reported about the accuracy of the multidetector CT in patients with Crohn's disease after ileocolic resection in correlation with endoscopic results.

We performed multidetector CT with a dedicated protocol characterised by small-bowel distension with a contrast medium. Low-density agents are preferred because they allow better depiction of wall enhancement between the hypodensity of the intraluminal fluid and the hypodensity of the extraluminal fat. Proposed low-density contrast agents are water, air, oil emulsion, 0.1% barium sulphate or PEG for oral use and methylcellulose or water via nasojejunal tube [8–15]. We chose methylcellulose for

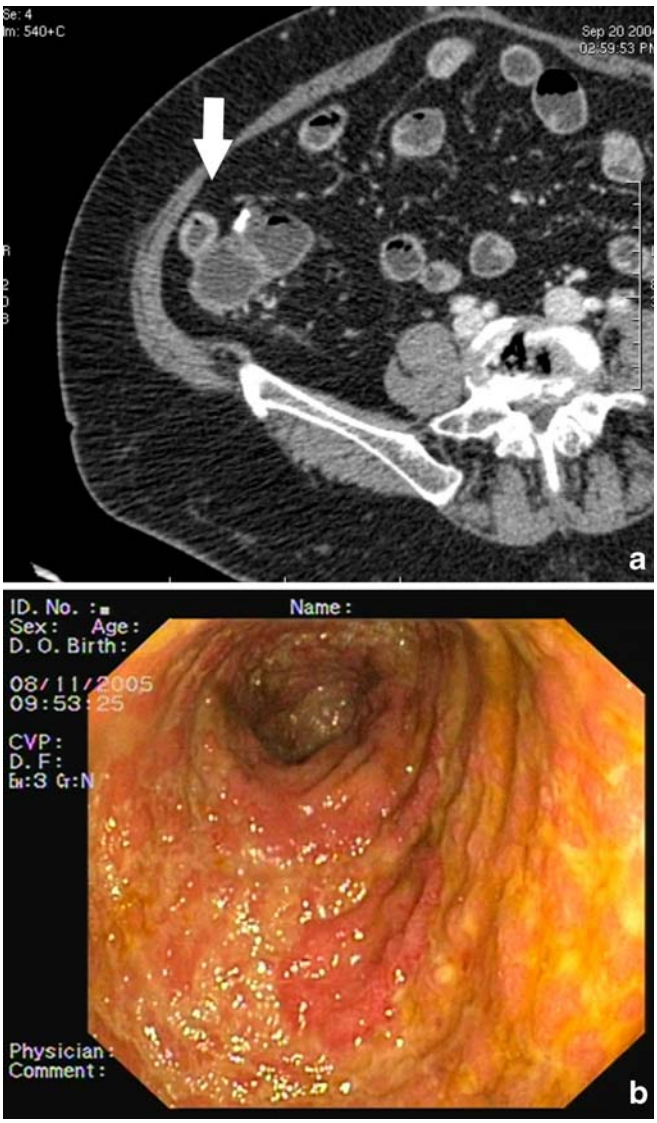

Fig. 8 Relapse with an endoscopic score of 1: PEG-CT (**a**) shows mucosal hyperdensity of the ileocolic anastomosis without mural thickening (*arrow*). In the ileoscopy (**b**) ileal mucosa shows erythema. Erosions and ulcers are also present

Table 6 CT signs and statistical correlation with endoscopic scores (Fisher's exact test)

CT signs	Score 1	Score 2	Score 3	Score 4
Target sign with wall thickening	0.00004°	0.105	0.277	0.001*
Mucosal hyperdensity without wall thickening	3.803×10^{-7}**	0.570	0.287	0.287
Mucosal hyperdensity with wall thickening	0.570	0.019***	1	0.576
Perienteric stranding	0.003°	0.718	1	0.032*
Comb sign	0.066	0.532	1	0.009*
Fibrofatty proliferation	0.024°	0.245	0.613	0.0007*
Stenosis	0.245	1	1	0.239
Fistulas	0.660	0.570	0.212	1

*$p<0.05$, statistically significant difference. Presence of these signs is indicative of score 4
°$p<0.05$, statistically significant difference. Absence of these signs is indicative of score 1
**$p<0.05$, statistically significant difference. Presence of these signs is indicative of score 1
***$p<0.05$, statistically significant difference. Presence of these signs is indicative of score 2

enteroclysis CT and PEG for enterography CT; methylcellulose is already widely employed both in small-bowel enema and in CT [10–15]; PEG is mainly used in MRI [16, 17] and more rarely in CT [14, 18]. The choice of PEG was based on the fact it is a well-known solution in widespread use for the preparation of endoscopic studies. Its main characteristics are an agreeable flavour and lack of toxicity; moreover it has the same density as water but it is not adsorbed in the intestine.

In our study CT showed high values of sensitivity, specificity and accuracy in the evaluation of the relapse of the ileocolic anastomosis (96.9%, 100% and 97%, respectively). CT also had the added value of enabling the examination of the entire small bowel as well as extraluminal involvement, two well-known limitations of endoscopy.

The important task in CT imaging is to define the stage of diffuse aphthoid ileitis, and to detect extramural complications that would require further surgical treatment. For this reason we attempted to establish if there was a correlation between CT findings and endoscopic Rutgeerts score to obtain a new severity-based CT score, based on CT findings. The results we obtained did not enable us to establish a score system closely linked point by point with the endoscopic score. With our CT score we can differentiate between low and intermediate grade lesions that need only medical therapy, and high grade lesions that might also need surgery. In other words, if CT shows mucosal hyperdensity without wall thickening or mucosal hyperdensity with wall thickening, we obtain a low grade and an intermediate grade, respectively. If CT shows wall thickening with a target sign and extravisceral involvement, we obtain a high score.

Further prospective studies with a larger patient sample are necessary for implementation of an established Crohn's disease activity scoring system, based on endoscopic, CT and clinical findings

Table 7 CT system score and statistical correlation with endoscopic scores (Fisher's exact test)

CT signs	*p* value (endoscopic low score vs. endoscopic high score)	*p* value (endoscopic moderate score vs. endoscopic high score)
Target sign with wall thickening	0.000007*	0.032*
Mucosal hyperdensity without wall thickening	8.446×10^{-7}**	1.0
Mucosal hyperdensity with wall thickening	1.0	0.011***
Perienteric stranding	0.003*	1.0
Comb sign	0.063	0.239
Fibrofatty proliferation	0.007*	0.081
Stenosis	0.633	1.0
Fistulas	0.639	0.546

*$p<0.05$, statistically significant difference. Presence of these signs is indicative of high grade score
**$p<0.05$, statistically significant difference. Presence of these signs is indicative of low grade score
***$p<0.05$, statistically significant difference. Presence of these signs is indicative of moderate grade score

Our study has some limitations. A first limitation might be the fact that we use two different techniques to study the patients: enteroclysis CT and PEG-CT. Even if administration of contrast agents via nasojejunal tube permits a better distension of small-bowel loops than by oral administration [10], in our study we did not find a statistically significant difference between enteroclysis CT and PEG-CT with regard to the distension of the ileocolic anastomosis and neoterminal ileum, the main sites of relapse and the subject of our study; in fact, the distension of these sites was good in 92.3% of patients studied by E-CT and in 80.9% of patients studied by PEG-CT ($p>0.05$, no statistically significant difference). Therefore the different distension between the CT techniques has no bearing on our results.

There are other limitations of the Rutgeerts score. Endoscopy cannot diagnose the extramural complications of Crohn's disease, nor does it provide any information on transmural oedema or perienteric inflammation. In our study, all patients rated with an endoscopic score of 4 presented extravisceral CT signs.

Conclusion

Our study CT shows high values of sensitivity and specificity in the evaluation of Crohn's disease relapse to such a degree that, in the case of suspected clinical relapse, this could be used as the first examination as long as it is carried out with extreme care.

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