Abdominal Computed Tomography in the Evaluation of Patients with Asymptomatic Iron Deficiency Anemia: A Prospective Study

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Chronic gastrointestinal blood loss is the leading cause of iron deficiency anemia in patients older then 50 years (1,2). Since more than 10% of patients with iron deficiency (with or without fecal occult blood) have colorectal cancer and about 1% have gastric cancer, extensive gastrointestinal evaluation is recommended in these patients (3–6). However, iron deficiency anemia without gastrointestinal symptoms is a diagnostic challenge, since the location of the lesion causing the blood loss cannot be predicted on clinical grounds. U.S. and European guidelines recommend colonoscopy and esophagogastroduodenoscopy, with additional evaluation if necessary (4–6).

Although computed tomographic (CT) scanning is more accurate than endoscopy in the evaluation of mural and extraintestinal abnormalities of the gastrointestinal tract, and an excellent tool to detect colorectal tumor recurrence and metastases (7–11), its usefulness in the evaluation of iron deficiency anemia is debated. The aim of our study was to compare colonoscopy and esophagogastroduodenoscopy with abdominal CT scan in the evaluation of asymptomatic patients over the age of 50 years with iron deficiency anemia.

METHODS

Patients with iron deficiency anemia were recruited from the Departments of Gastroenterology and Internal Medicine at Meir Hospital between August 1999 and August 2001. Iron deficiency anemia was defined as a hemoglobin level $<$12 g/dL in men or $<$11 g/dL in women, with a serum iron level $<$50 μg/dL associated with a serum ferritin level $<$30 ng/dL or a serum transferrin level $>$360 mg/dL. Postmenopausal women and men older then 50 years were included in this study if they did not have any site-specific symptoms (e.g., melena, rectal bleeding, vomiting, constipation, abdominal pain, dyspepsia, diarrhea, vaginal bleeding, hematuria). Patients with active or chronic gastrointestinal diseases, previous gastrectomy, or bowel resection, or who were receiving anticoagulant therapy, were excluded. We also excluded patients who had site-specific findings on physical examination, a contraindication for endoscopy or CT scan, or mental or psychiatric disorders. The use of aspirin or nonsteroidal anti-inflammatory drugs was allowed. Occult blood in the stool was not an inclusion or exclusion criterion. None of the patients had an endoscopy, CT scan, or barium study within the previous 12 months.

Laboratory studies included complete blood count, and serum levels of iron, ferritin, and transferrin. Patients underwent colonoscopy, esophagogastroduodenoscopy, and abdominal CT scan with contrast agent. The tests were performed within 2 weeks in an arbitrary order.

CT scans were obtained after oral and intravenous contrast media administration on a nonhelical scanner (Elscint 2400; Elite, Haifa, Israel) or a helical scanner (Twin-Flash, Marconi, Haifa, Israel) with 8.8- to 10-mm collimation and 0.8- to 1-cm interval from the diaphragm to the symphysis pubis. Endoscopies were performed using standard video endoscopes (model EG 2940, EC 3840L; Pentax, Tokyo, Japan). Duodenal biopsies were performed during esophagogastroduodenoscopy; gastric biopsies were also performed when atrophic gastritis was suspected. The cecum was intubated successfully in all colonoscopies.

CT scan images were evaluated by a single experienced radiologist, and all endoscopies were performed by one of the senior gastroenterologists at Meir Hospital. None of these physicians was aware of the results of the other studies.

The following abnormalities of the gastrointestinal tract were considered a possible etiology of iron deficiency anemia: erosive esophagitis, hiatal hernia with erosions, erosive gastritis, atrophic gastritis, gastric and duodenal ulcers, gastric tumors, erosive duodenitis, celiac disease and other malabsorption syndromes, small intestinal tumors, inflammatory bowel diseases, colorectal tumors, angiodysplasia, and colonic polyps $>$1 cm.

All patients provided informed consent. The study was approved by the local research ethics committee.

Statistical Analysis

The chi-squared test with two-sided type I error of 0.05 was used to assess statistical significance.

RESULTS

Forty-eight patients (25 men and 23 women; mean [$\pm$ SD] age, 75 $\pm$ 16 years) met the inclusion criteria of asymptomatic iron deficiency anemia and were enrolled in the study. Most patients (n = 36 [75%]) were older

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Table 1. The Etiology of Iron Deficiency Anemia in the Study Group of 48 Patients

	Detected by Endoscopy	Detected by CT Scanning
Malignant causes		
Carcinoma of stomach	2	2
Carcinoma of colon	10	11
Tumor of small intestine	–	1
Benign causes		
Atrophic gastritis	7	0
Erosive esophagitis	2	0
Erosive gastritis	2	0
Hiatal hernia	15	15
with erosions	2	–
Duodenal ulcer	1	0
Erosive duodenitis	1	0
Colonic polyps	5*	0
Angiodysplasia	3	0

* Three were removed before CT scanning.
CT = computed tomographic.

then 70 years. The mean hemoglobin level was 8.7 g/dL (range, 5.0 to 11.8 g/dL).

Altogether, endoscopies and abdominal CT scans detected the cause of iron deficiency anemia in 34 (71%) of the patients (Table). Fourteen patients (29%) had an anemia-explaining lesion in the upper gastrointestinal tract only, 16 (33%) had a lesion in the lower gastrointestinal tract only, 3 (6%) had lesions in both the upper and lower tract, and 1 had a lesion in the small intestine. In 14 patients (29%), a malignancy was responsible for the iron deficiency anemia.

Abdominal CT scans detected all 12 cases of colonic and gastric malignancies that were diagnosed by endoscopy (10 colonic and 2 gastric carcinomas). In addition, CT scans identified 1 patient with a right-sided colonic carcinoma, which was missed during the first colonoscopy but seen during the second colonoscopy (at the location identified by CT). The colonic tumors appeared on the CT scans either as lesions protruding into the lumen (mean size, 5 ± 1 cm; range, 3 to 8 cm) or wall thickening (2 to 3 cm). CT scan also showed a small intestinal tumor in 1 patient. However, in 1 patient with cirrhosis, a lesion in the hepatic flexure of the colon that appeared malignant on the CT scan was actually a dilated mural varix. One carcinoma of the prostate was identified as an incidental finding.

CT scans did not detect any superficial mucosal lesions such as atrophic gastritis, erosive gastritis and duodenitis, esophagitis, duodenal ulcer, colonic polyps, or angiodysplasia. CT scans detected 15 large hiatal hernias, but could not distinguish between those with and without erosions (Table).

Three colonic polyps (<1 cm) were removed at the time of colonoscopy before the CT scan. The other two polyps that were missed by the CT scan were benign and smaller than 1.5 cm.

The mean hemoglobin level in patients with cancer was not significantly different from those with benign lesions (8.8 ± 0.4 g/dL vs. 8.6 ± 0.5 g/dL, $P = 0.77$).

There were no complications from either endoscopies or abdominal CT scans.

DISCUSSION

This prospective study suggests that abdominal computed tomography might be useful in selected patients who have iron deficiency anemia without gastrointestinal symptoms. It has a good concordance with endoscopy for the detection of gastrointestinal malignancies, and has the advantage of being able to detect small bowel cancers and extraintestinal lesions. However, it cannot reliably detect superficial, mucosal, or small lesions, although these are usually benign.

Two previous studies compared computed tomography with various radiological tests and endoscopies for the evaluation of a wide range of the gastrointestinal problems, without focusing on iron deficiency anemia. Lipscomb et al compared abdominal CT scanning with colonoscopy for the diagnosis of colonic disease in 55 elderly patients with gastrointestinal symptoms (12). Concordance between the colonoscopic and CT scan findings was demonstrated in 69% (38/55) of patients, including all those with colonic carcinoma. CT scan missed polyps in 3 patients and angiodysplasia in 1 patient. However, it provided additional information in 16% (n = 9) of patients, including one gastric leiomyosarcoma. Dixon et al compared CT scanning with barium enema in elderly patients who had gastrointestinal symptoms (13). Again, CT scanning detected all carcinomas and demonstrated several extracolonic lesions, but missed small polyps. Both studies concluded that CT scanning may be an alternative to colonoscopy or barium enema studies in the diagnosis of colonic disease in the elderly, especially for the diagnosis of gastrointestinal malignancies.

Almost a third of the patients in our study had an underlying cancer as the cause of their iron deficiency anemia. In previous studies of both symptomatic and asymptomatic patients with iron deficiency anemia, 7% to 51% had cancer (14–26). These differences reflect the heterogeneity of the patients in the various studies; our study focused on a homogenous group of patients older than 50 years who had asymptomatic iron deficiency anemia.

In conclusion, our findings suggest that abdominal computed tomography could be used for the diagnosis of malignant causes of iron deficiency anemia in patients older than 50 years. However, CT scanning is not as reliable for the detection of benign lesions such as small polyps, erosions, and angiodysplasias. Endoscopic examinations, of course, have advantages over CT scans, since

both biopsies and therapeutic measures such as polypectomy can be performed. Thus, CT scanning may be useful in selected asymptomatic elderly patients with iron deficiency anemia who have comorbid diseases or who refuse, or have contraindications for, endoscopy.

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