Colonic Pseudoobstruction: CT Findings

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OBJECTIVE. The purpose of this review was to define the imaging features of colonic pseudoobstruction and to describe the pathologic findings.

CONCLUSION. Colonic pseudoobstruction can be diagnosed on the basis of CT findings that show extensive colonic dilatation without an obstructive lesion at the intermediate transitional zone or adjacent to the splenic flexure. Pathologic examination reveals that intramural ganglion damage has a high tendency to occur in cases of chronic colonic pseudoobstruction.

Keywords: colonic pseudoobstruction, CT, ganglion cell, transitional zone

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Colonic pseudoobstruction is a syndrome in which the clinical features resemble those of mechanical obstruction, that is, failure of motility associated with pain and abdominal distention, but there is no mechanical obstructing lesion. Uncertainty about the pathogenesis of colonic dilatation without obstruction has led to a variety of terms for the disease, including pseudoobstruction, Ogilvie's syndrome, false colonic obstruction, pseudomegacolon, adult megacolon, adynamic ileus, functional obstruction, and idiopathic large-bowel obstruction [1]. We favor the term pseudoobstruction because it is descriptive but not overly specific.

Despite the absence of an obstructing lesion, particularly acute colonic distention can be rapidly progressive and lead to necrosis and perforation of the large bowel. Furthermore, an incorrect diagnosis of mechanical obstruction can lead to unnecessary surgery. Pseudoobstruction of the colon is often mistaken, both clinically and radiologically, for other abnormal conditions, such as mechanical obstruction and paralytic ileus. This error may occur because colonic pseudoobstruction is a relatively unknown entity that has received scarce attention in the radiologic literature. Our purpose was to describe the imaging features of colonic pseudoobstruction and to discuss the pathologic findings.

Materials and Methods

Patients

A computerized search of electronic medical records at our university hospital over the 5-year period 2002–2006 revealed the cases of eight patients who underwent CT examinations and had a final diagnosis of colonic pseudoobstruction or a similar entity. The medical records were reviewed for demographic features, clinical symptoms, imaging study performed (colonoscopy, CT), and follow-up results. This retrospective study was approved by our institutional review board, and informed consent was waived.

CT and Image Evaluation

All patients underwent contrast-enhanced CT. The scans were obtained with a 4-MDCT (Lightspeed Plus, GE Healthcare) or a 64-MDCT (Sensation 64, Siemens Medical Solutions) scanner. Contrast medium with an iodine concentration of 370 mg/mL (iopromide, Ultravist 370, Bayer HealthCare) was administered with a power injector at a rate of 4 mL/s. Images were acquired in a craniocaudal direction from the diaphragmatic dome to the level of the symphysis pubis with 2.5 × 4 or 0.6 × 64 beam collimation and 60- to 70-second scan delay (portal venous phase). A reconstruction section thickness of 3.0 mm or 5.0 mm and an interval of 3.0 mm or 5.0 mm were used to interpret axial and coronal images.

The CT images were jointly evaluated by two gastrointestinal radiologists (9 and 4 years of experience). For patients who underwent multiple CT examinations ($n = 4$) during follow-up, the first CT examinations showing colonic dilatation were used. The presence or absence of a transitional zone between dilated and collapsed colon was determined. Location and character of the transitional zone also were analyzed. In the transitional zone, the presence or absence of a structural obstructive lesion was determined. The characteristics of transition were classified as smooth, intermediate, or

abrupt. A smooth transition was defined as a slight discrepancy (less than 50%) between the caliber of the proximal and distal colonic loops. An intermediate transition was defined as a discrepancy of 50% or more between the proximal and the distal colonic caliber with residual gas or fecal material in the distal colon. An abrupt transition was defined as a discrepancy of 50% or greater between the proximal and distal colonic luminal caliber and complete collapse of the distal colon. The diameters of the maximally dilated segment and cecum were measured with electronic calipers as the longest diameter on axial or coronal images. The location of the maximally dilated segment was classified as one of five segments: cecum, ascending colon, transverse colon, descending colon, and rectosigmoid. In the cases of two patients who underwent follow-up CT examinations immediately before surgery, the diameters of the maximally dilated colon and cecum were repeatedly measured.

Pathologic Review

Six of the eight patients underwent surgical resection of the dilated colonic segments. Sections from various areas of the specimen were stained routinely with H and E. Our pathologist retrospectively reviewed paraffin-block specimens of the colonic loops with an emphasis on the change in ganglion cells.

Results

Clinical Findings

Our study group was composed of two men and six women with an average age of 52.7 years (range, 31–71 years). All patients presented with abdominal pain and distention at first admission. The mean duration of the initial symptoms was 22 days (range, 3–90 days). All patients had a history of chronic constipation. Two patients also had a history of hypertension; one patient, a history of diabetes mellitus; and one, a history of epilepsy. Two patients had had nonspecific colitis 2 and 6 months before colonic pseudoobstruction. The absence of obstructive lesions was confirmed with colonoscopy in all cases.

CT Findings

In all cases, CT scans at first hospitalization for colonic obstruction showed prominent colonic dilatation without distal obstructing lesions (Figs. 1–3). Six patients had marked dilatation from the cecum to the transverse colon with transitional zones in the splenic flexure (Table 1). In the other two patients, transitional zones were found in the midportion of the transverse and descending colon. All eight patients had an intermediate transition. Maximally dilated segments were found in the transverse colon in five patients and the cecum in three patients. At initial CT examinations, the average diameters of the maximally dilated colonic segment and cecum were 9.6 cm (range, 8.2–13.7 cm) and 7.4 cm (range, 4.0–10.0 cm). In the six patients treated surgically, the average diameters of the maximally dilated colonic segments and cecum were 10.1 cm and 7.2 cm, respectively, at CT examinations immediately before surgery. Only one of the eight patients had diffuse small-bowel dilatation.

Two of the patients in our study group had a medical history of nonspecific colitis. On the CT images of these two patients when colitis was present, the involved segments were mainly located in the transverse colon. The CT findings showed long segmental wall thickening, increased vascularity of marginal vessels, and mucosal fold thickening (Fig. 3). None of the etiologic factors was defined at the time. Both of these patients were admitted because of colonic pseudoobstruction 2 and 6

TABLE 1: CT and Pathologic Findings Among Patients with Colonic Pseudoobstruction

		CT Finding								
			Transition			Diameter (cm)				
Sex	Age (y)	Obstructive Lesion	Location	Character	Segment	Maximal Dilatation (cm)[a]	Cecal Diameter (cm)[a]	Small-Bowel Dilatation	Surgery	Pathologic Finding
M	62	None	Splenic flexure	Intermediate	Transverse colon	8.4	8.1	None	None	
M	61	None	Mid transverse colon	Intermediate	Cecum	9.0	9.0	Present	None	
F	31	None	Splenic flexure	Intermediate	Transverse colon	9.5	4.2	None	Subtotal colectomy	Reduction and degeneration of ganglion cells
F	46	None	Splenic flexure	Intermediate	Cecum	10.0	10.0	None	Subtotal colectomy	Reduction and degeneration of ganglion cells
F	61	None	Splenic flexure	Intermediate	Transverse colon	13.7	8.9	None	Subtotal colectomy	Reduction and degeneration of ganglion cells
F	48	None	Mid descending colon	Intermediate	Cecum (transverse colon)	8.8 (11.0)	8.8 (9.2)	None	Subtotal colectomy	Reduction and degeneration of ganglion cells
F	42	None	Splenic flexure	Intermediate	Transverse colon	9.4	4.0	None	Subtotal colectomy	Normal ganglion cells
F	71	None	Splenic flexure	Intermediate	Transverse colon (transverse colon)	8.2 (10.1)	6.5 (6.6)	None	Total colectomy	Normal ganglion cells

Note—Segments and diameters in parentheses indicate findings on CT immediately before surgery in patients who underwent multiple CT examinations.
[a]On initial CT scans.

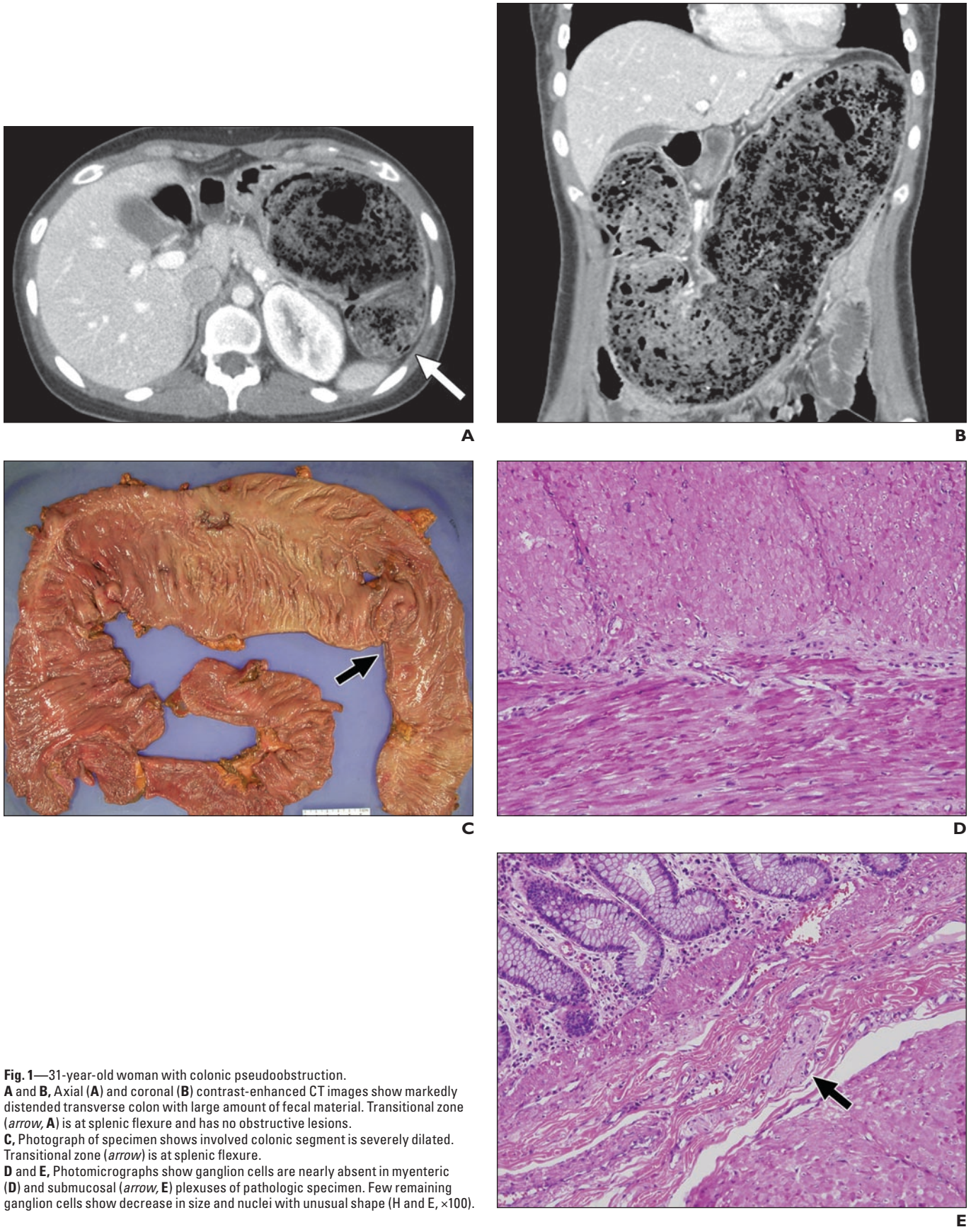

Fig. 1—31-year-old woman with colonic pseudoobstruction.
A and **B,** Axial (**A**) and coronal (**B**) contrast-enhanced CT images show markedly distended transverse colon with large amount of fecal material. Transitional zone (*arrow,* **A**) is at splenic flexure and has no obstructive lesions.
C, Photograph of specimen shows involved colonic segment is severely dilated. Transitional zone (*arrow*) is at splenic flexure.
D and **E,** Photomicrographs show ganglion cells are nearly absent in myenteric (**D**) and submucosal (*arrow,* **E**) plexuses of pathologic specimen. Few remaining ganglion cells show decrease in size and nuclei with unusual shape (H and E, ×100).

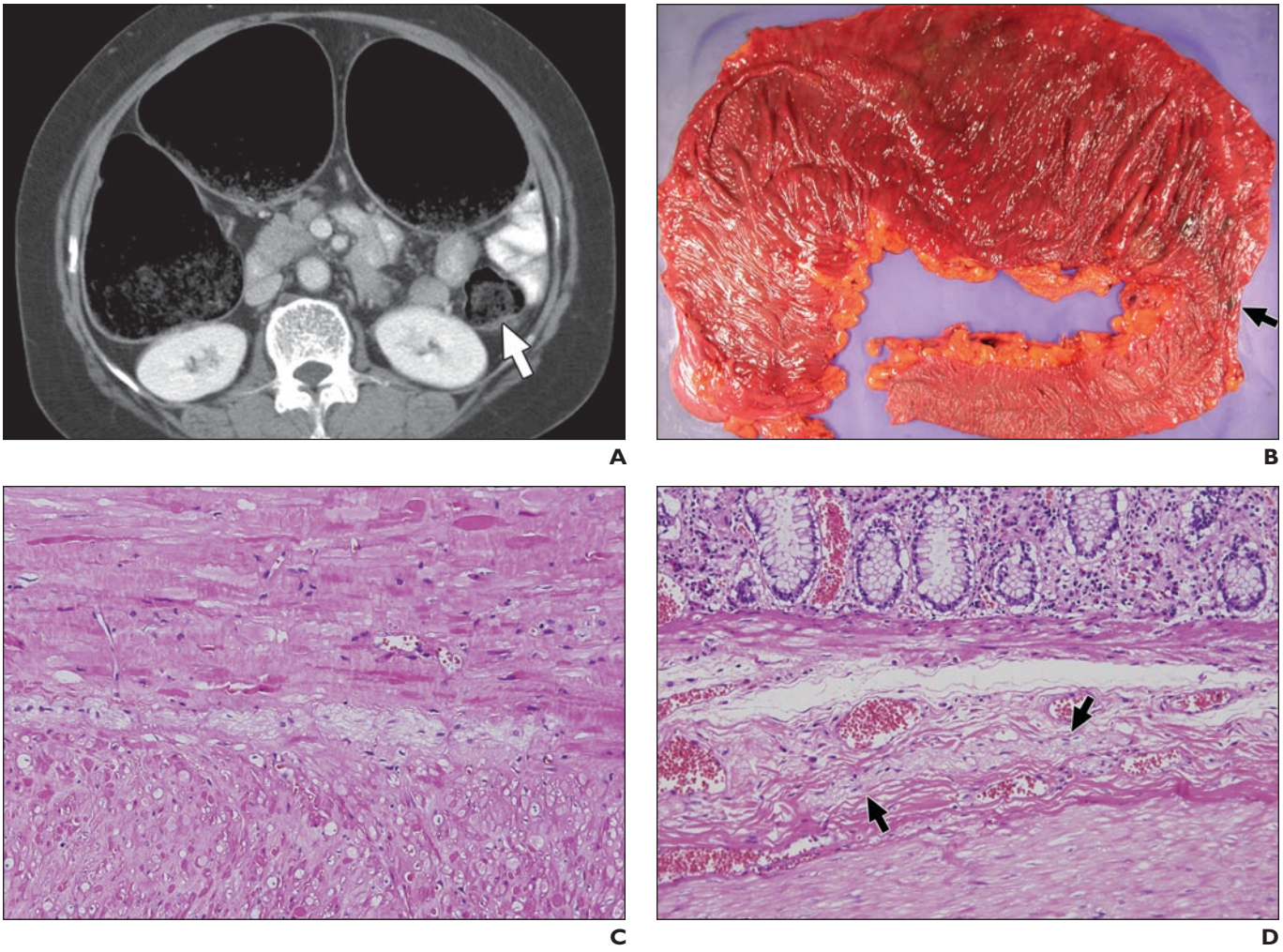

Fig. 2—61-year-old woman with colonic pseudoobstruction.
A, Axial CT image shows severely distended transverse colon without obstructive lesion. Diameter of maximally dilated colonic segment was 13.7 cm. Transitional zone (*arrow*) is in splenic flexure.
B, Photograph of gross specimen shows marked dilatation of ascending and transverse colon. Transitional zone (*arrow*) is in splenic flexure.
C, Photomicrograph of myenteric plexus of dilated colonic segment shows loss of ganglion cells. (H and E, ×100)
D, Photomicrograph of submucosal plexus of specimen shows reduction in number of ganglion cells. Few remaining cells (*arrows*) are flattened with abnormal shape. (H and E, ×100)

months after undergoing conservative therapy for colitis.

Follow-Up Results

At the first hospitalization, all patients were initially treated conservatively with nasogastric tube placement, fluid resuscitation, or colonoscopic decompression. The condition of four patients improved after conservative treatment. The four patients whose condition did not improve underwent surgery. The four patients treated conservatively had recurrence of symptoms 6–24 months after therapy. Two of the four had two episodes of recurrence, and two had one episode. At the time of each recurrence, CT examinations were performed. The condition of two of these four patients improved with continued conservative treatment. The other two patients were treated surgically. One patient underwent surgery at the first recurrence and the other at the second recurrence. One of the six patients treated surgically underwent total colectomy; the other five underwent subtotal colectomy. Two patients whose condition improved with conservative treatment had decreased colonic distention on follow-up radiography after the last recurrence.

Pathologic Findings

The surgical specimens of six patients exhibited severe dilatation of the involved colonic segments without obstructive lesions or mucosal defects. In the dilated colonic segments of four patients, the myenteric and submucosal plexuses had microscopic evidence of a loss of or reduction in number of ganglion cells (Figs. 1 and 2). The specimens of two patients with a history of colitis had only flattened mucosa without reduction in the number of ganglion cells (Fig. 3).

Discussion

Early recognition of colonic pseudoobstruction is important for prompt treatment. Conservative treatment with nasogastric suction, enemas, and neostigmine is highly effective in the management of colonic pseudoobstruction. If the cecum is markedly dilated, the risk of perforation is high, and direct intervention, such as colonoscopic decompression, must be prompt. Before these treatments are

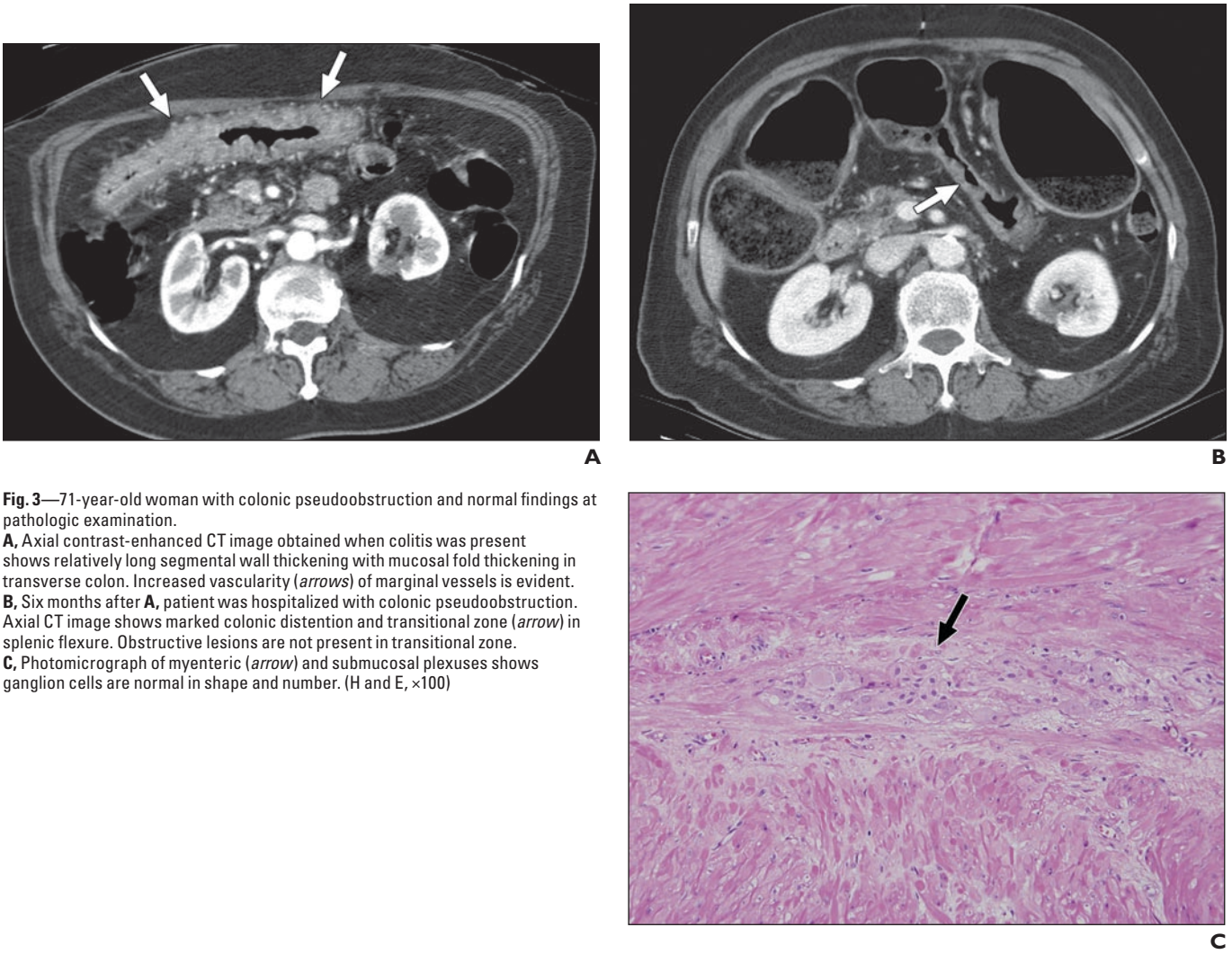

Fig. 3—71-year-old woman with colonic pseudoobstruction and normal findings at pathologic examination.
A, Axial contrast-enhanced CT image obtained when colitis was present shows relatively long segmental wall thickening with mucosal fold thickening in transverse colon. Increased vascularity (*arrows*) of marginal vessels is evident.
B, Six months after **A,** patient was hospitalized with colonic pseudoobstruction. Axial CT image shows marked colonic distention and transitional zone (*arrow*) in splenic flexure. Obstructive lesions are not present in transitional zone.
C, Photomicrograph of myenteric (*arrow*) and submucosal plexuses shows ganglion cells are normal in shape and number. (H and E, ×100)

begun, it is imperative that mechanical obstruction be excluded. Abdominal radiographs show only nonspecific findings of gaseous distention of the colon. Although findings at barium enema can confirm dilatation of the colon without mechanical obstruction, this examination should be avoided in cases in which complicated cecal perforation is suspected on clinical grounds [1]. CT is the single most useful study because it can yield information about the location and cause of bowel obstruction [2]. To our knowledge there have been no studies on the CT findings of colonic pseudoobstruction. The CT findings in all of our patients were proximal colonic dilatation with an intermediate transitional zone at or adjacent to the splenic flexure. Structural obstructing lesions were not visualized.

The presence of transitional zones in all cases can be used to differentiate colonic pseudoobstruction from paralytic ileus. This finding also is very similar to the features of adhesional obstruction. Adhesive bands, however, seldom obstruct the colon [3]. Furthermore, whereas the transition of adhesive obstruction has an abrupt pattern, that of pseudoobstruction in our cases was intermediate. The location of the transitional zone can be somewhat characteristic. In all cases, the transition zones were at the splenic flexure or adjacent to it. Bachulis and Smith [4] reported that the transitional region in pseudoobstruction tends to be at the splenic flexure or within a short distance to one side or the other. At this point the parasympathetic innervation of the colon undergoes transition from the vagal nerve for the proximal portion to the sacral nerve for the distal portion. This finding may indirectly implicate an autonomic neuronal imbalance as a causative factor in colonic pseudoobstruction [5, 6].

The decision to pursue colonic decompression is partly based on cecal diameter as determined on abdominal radiographs. When the cecal diameter exceeds 12 cm, colonic decompression is indicated [7]. We believe that CT may be more helpful than abdominal radiography for accurate measurement of cecal diameter because fluid or fecal material can obscure the margin of the cecum on radiographs.

All of the cecal diameters in our cases were less than 12 cm. However, six patients underwent surgical resection of the colon because conservative treatment failed or obstructive symptoms recurred repeatedly. In 1948, Ogilvie [8] described two cases of isolated colonic pseudoobstruction. The term Ogilvie's syndrome, however, has been used loosely for acute and chronic forms of colonic pseudoobstruction. Anuras and Baker [1] suggested that isolated colonic pseudoobstruction can occur in two forms: acute and chronic. The acute form is a transient reversible illness that occurs

in conjunction with severe medical illness and major surgical procedures [9–11]. The chronic form usually recurs or persists [1, 10]. Several characteristics in our patients, including chronic constipation, no major surgical procedures or illnesses, and repeated obstructive symptoms, suggest that our patients probably had the chronic form. In contrast to the acute form, the chronic form rarely is accompanied by perforation. In addition, there is no effective medical therapy for chronic pseudoobstruction, whereas a parasympathomimetic agent is the choice of management of the acute form [1]. It has been suggested [12, 13] that subtotal colectomy gives symptomatic relief to most patients with the chronic form of colonic pseudoobstruction.

Small-bowel dilatation was found in only one of our patients. Ileocecal valve incompetence may be a causative factor in the finding, as it is in mechanical obstruction of the large bowel. At pathologic examination, four of six patients who underwent surgery were found to have atrophic changes and decreased numbers of intramural ganglions. Intramural plexus damage in chronic pseudoobstruction has been reported [14–16] as a remote phenomenon in carcinoma, neuronal disease, and viral infection. These pathologic findings indicate irreversible changes, in contrast to the reversible changes of the acute form. These results may be indirect evidence that the acute and chronic forms are different disease entities, as suggested by Anuras and Baker [1]. In the two patients with pseudoobstruction after colitis, no changes in intramural ganglions were detected. The relation between infection and pseudoobstruction has been documented [1, 14], but most reports have shown that the pseudoobstruction developed during the active phase of infection. We cannot explain the cause of delayed development of pseudoobstruction 2 and 6 months after colitis. Further pathophysiologic evaluation should be done to investigate the delayed development of pseudoobstruction after infection.

There might have been selection bias in our study because we selected patients who underwent CT. Acute and reversible colonic pseudoobstruction would be diagnosed only with radiographs. CT examination would be performed on patients with the chronic form. This factor might have been responsible for the high incidence of surgical treatment in our cases.

For early diagnosis of colonic pseudoobstruction, thorough knowledge of the condition is required by both radiologists and clinicians, because the clinical symptoms can mimic those of mechanical obstruction and paralytic ileus. Colonic pseudoobstruction can be diagnosed on the basis of the CT finding of extensive colonic dilatation without obstructive lesions at the intermediate transitional zone at or adjacent to the splenic flexure. The pathogenesis of colonic pseudoobstruction is not clear, but intramural ganglion damage has a high tendency to occur in at least chronic colonic pseudoobstruction.

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