The computed tomographic scans of 200 consecutive patients with Crohn disease were studied to determine the frequency and patterns of perirectal and perianal involvement. In 163 patients (82%) abnormalities in the perirectal-perianal region were demonstrated; findings included inflammation of fat planes (73%), bowel wall thickening (30%), fistulas or sinus tracts (22%), and abscesses (14%). Fistulas or sinus tracts occurred with equal frequency above or below the level of the anterior symphysis pubis. Abscesses, rectal thickening, and inflammatory infiltration of fat occurred more than twice as often above the symphysis pubis. However, 37% of patients had manifestations of Crohn disease below the symphysis pubis, emphasizing the importance of extending scanning sequences to the perineum.

PATIENTS AND METHODS

The CT scans of 200 consecutive patients with documented Crohn disease with scanning sequences extending below the symphysis pubis were retrospectively reviewed by two of the authors (D.M.Y. and E.K.F.) with special attention to the perirectal and perianal regions. Four easily reproducible and recognizable anatomic levels were identified to determine the frequency of findings in Crohn disease: (a) the mid-acetabulum at the femoral head articulation (acetabulum), (b) the anterior symphysis pubis at the level of the fibrocartilage, (c) the inferior pubic rami, and (d) the perineum at the level of the external anal sphincter (Fig. 1). Each CT scan was analyzed at these levels to determine the presence of inflammatory streaking of fat planes, rectal wall thickening, fistulas or sinus tracts, or abscesses. Disease elsewhere in the abdomen was also noted.

Scans were obtained on a Somatom DR-3 scanner (Siemens, Iselin, N.J.) at 1-1.5-cm intervals from the diaphragm through the lower perineum. Scanning techniques were either 5 seconds, 450 mAs, 125 kVp, and 4-mm collimation or 3 seconds, 230 mAs, 125 kVp, and 8-mm collimation. Oral contrast material consisting of 1,000 mL of flavored diatrizoate sodium (3% Hypaque; Winthrop-Breon, New York) 2-3 hours prior to scanning and 250 mL at the time of examination was routinely administered. When pelvic disease was suspected, 200 mL of rectal contrast material (2% Hypaque; Winthrop-Breon) was slowly injected manually while the patient was on the CT table. This was followed by 100 mL of air through a small-bore enema tube. An intravenous infusion of 100 mL of Hypaque 60 (Winthrop-Breon) was administered routinely.

RESULTS

One hundred sixty-three of the 200 patients (82%) had abnormalities in the perirectal or perianal region; these data are tabulated according to the designated levels in Table 1. The most common abnormality seen at all levels and occurring in 146 of the 200 (73%) patients was inflammatory streaking of fat in the perirectal region and ischiorectal fossa; this finding was present in 90% of the 163 patients with positive CT scans (Fig. 2). Inflammatory streaking was most often seen as linear, single-thickness areas of soft-tissue attenuation not necessarily connecting to the bowel lumen and often causing an associated increase in the attenuation of neighboring fat. Near the rectum this streaking was often associated with thickening (greater than 1 mm) of the perirectal fascia. It was most frequent at the acetabular level (53%). In positive CT scans, inflammatory fat
Figures 2, 3. (2a) CT scan at the acetabular level demonstrates inflammatory streaking of the perirectal fat with thickening of the perirectal fascia (arrows). Air (a) in uterine cervix is from prior instrumentation. (2b) Asymmetric stranding and inflammatory streaking of fat in the perianal region and perineum (arrows) on CT scan below inferior pubic rami. (3) Rectal wall thickening (arrow), perirectal fascial thickening, and minimal inflammatory fat streaking seen at acetabular level in this 30-year-old man.

streaking was more prevalent at the upper two levels (88% and 89% at the levels of the acetabulum and symphysis pubis, respectively) than at the lower two (59% and 60% at the inferior pubic rami and perineum, respectively).

Rectal wall thickening greater than 3 mm was the next most typical finding, occurring in 60 of the 200 patients (30%) and seen most frequently at the level of the acetabulum (Fig. 3). Small bowel thickening was the most common finding in the 115 patients with evidence of Crohn disease remote from the perirectal-perianal regions (66 patients; 57%).

Fistulas or sinus tracts occurred with equal frequency at all four levels, and in half of the patients who had fistulas or sinus tracts that extended from one level to the next. Fistulas or sinus tracts were diagnosed when either a linear soft-tissue, an air-containing, or a contrast material-containing tract was identified extending from the bowel to an extraluminal location (Fig. 4). Sometimes the distinction among inflammatory streaking, sinus tracts, and fistulas was difficult to make, and, in truth, they may be a continuum of abnormalities. As the connection to the skin of an enterocutaneous fistula closes it becomes a blind-ending sinus tract, progressing to inflammatory streaking as its connection to bowel heals over. When air or contrast material is not present in a sinus tract, one may distinguish it from mere inflammatory streaking by its double-wall thickness (Fig. 4a), its origin from inflamed bowel wall, and its nonlinear quality. Forty-four of the 200 patients (22%) had perirectal-perianal fistulas or sinus tracts.

An abscess was found in 28 of the 200 patients (14%); the abscesses occurred most frequently at the acetabular level and either were associated with the adjacent rectosigmoid colon or were in the perirectal fat (Fig. 5).

DISCUSSION

CT findings in patients with Crohn disease include bowel wall thickening, luminal narrowing, fistulas, sinus tracts, abscesses, inflammatory streaking of fat planes, and mesenteric changes, including fibrofatty infiltration, mesenteric thickening, and interloop abscesses (1-11). A detailed CT study dedicated to the perirectal-perianal regions has not, to our knowledge, been previously performed, although mention of disease in these areas has appeared in several earlier reports of CT findings in Crohn disease (1, 2, 6-8). However, the diagnosis of perirectal or perianal disease is important, since Crohn disease has a predilection for this region, and the presence of perianal involvement may help in distinguishing Crohn disease from ulcerative colitis or diverticulitis.

Perianal fistulas were seen in 37% of 418 patients with Crohn disease with colonic involvement in the series of Farmer et al. (12) and occurred in 10% of 80 patients previously reported from this institution (2). Thirty-six percent of 569 patients in the National Cooperative Crohn's Disease Study (NCCDS) demonstrated perirectal-perianal disease; it was seen more frequently in those patients with colitis or ileocolitis than in those with disease otherwise restricted to the small bowel (9). Perianal findings in the NCCDS series included anal fissures (14%), anal fistulas (11%), anorectal strictures (4%), and perianal abscesses (3%) (9).

While perianal disease is common in patients with Crohn disease, the region is often inadequately examined with a barium enema study, either due to a high insertion of the enema tip or exquisite tenderness in the area, which prohibits an adequate retrograde examination. Finally, as

| Table 1 CT Findings in 200 Patients with Crohn Disease at Designated Levels |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Level           | Evidence of Disease | Inflammation of PR-PA Fat | Bowel Wall Thickening | Fistulas or Sinus Tracts | Abscesses |
| Acetabulum      | 120 (60)          | 106 (53)         | 43 (22)          | 23 (12)               | 22 (11)           |
| Symphysis pubis | 64 (32)           | 57 (29)          | 27 (14)          | 22 (11)               | 5 (3)             |
| Inferior pubic |                 |                 |                 |                     |                  |
| ramus           | 63 (32)           | 37 (19)          | 9 (5)            | 22 (11)               | 3 (2)             |
| Perineum        | 60 (30)           | 36 (18)          | NA              | 20 (10)               | 3 (2)             |

Note.—Numbers in parentheses are percentages. PR-PA = perirectal-perianal, NA = not applicable.
demonstrated in this study, the most typical manifestation of Crohn disease in this region is extraluminal, that is, inflammatory streaking of the fat planes. This cannot be seen on a barium enema study. For these reasons, we believe that CT is the study of choice to demonstrate the perirectal-perianal complications of Crohn disease.

A most important technical note in detecting perirectal-perianal disease is the caudal level of scanning; scans must be continued to the level of the external anal sphincter (13-15). The lower frequency of perirectal-perianal findings in previous CT studies may stem from premature termination of scanning at too high an anatomic level or a lack of recognition that any increase in CT attenuation or the presence of linear streaks in nearby fat may be the only sign of regional Crohn disease (16). The importance of extending the scanning to the perineum is emphasized by our finding that fistulas or sinus tracts are as frequent at the inferior pubic ramus and perineum levels as they are at the two levels above. Thus the standard CT routine of scanning from “the diaphragm to the symphysis pubis” would not have allowed us to detect 42 fistulas or sinus tracts, six abscesses, and 73 instances of inflammatory fat streaking; 74 of the 200 patients (37%) had evidence of inflammation at levels below the symphysis pubis.

Several pitfalls were identified during analysis of the scans. Partial volume averaging of the ischiocavernosa muscles and anal sphincters with fat can simulate inflammatory streaking (14, 15). Gluteal and pudendal vessels may simulate nodular infiltration of fat. Rectal wall thickening may be difficult to assess if the lumen is collapsed (17). It was difficult to distinguish between fistulas to the skin and sinus tracts with adjacent cutaneous inflammation. Often the cutaneous orifice of an inflammatory tract may not be obvious or may be partial volume averaged. When air or contrast material do not enter a fistula, the fistula may be falsely labeled as mere inflammatory streaking.

The relatively high rate of perirectal-perianal involvement in this study population (82%) probably reflects the condition of the patients referred for CT study in our institution. Often these patients are suspected of having complications, such as abscesses or fistulas, because of persistent fevers, a lack of response to standard treatment protocols, or suggestive findings from other imaging studies. Thus, the 82% occurrence rate of perirectal-perianal disease may not reflect the frequency in the entire population with Crohn disease. A different diagnosis of inflammatory perirectal-perianal findings in another clinical setting may include seminal vesiculitis, pelvic inflammatory disease, diverticulitis, infectious proctitides, and postoperative or postradiation changes (18, 19).

The potential effect of CT on the clinical management of Crohn disease has been recently reported by Fishman et al., who found that CT provided information that altered medical or surgical management in 28% of 80 patients (2). In the perirectal-perianal region, the diagnosis and the percutaneous drainage and follow-up of abscesses can be easily achieved noninvasively with CT. CT has been shown to assist in distinguishing supralevator abscesses (which have increased morbidity and mortality and require general or spinal anesthesia for surgical drainage) from infralevator abscesses, which may be approached percutaneously (20). Supralevator abscesses occur medial to the levator ani muscles, above the coccygeus muscles, and invade the perirectal fat enclosed by the perirectal fascia; infralevator abscesses occur lateral to the levator ani muscles.
muscles and infiltrate the ischiorectal fossa fat (20).

CT often will delineate the extent of perirectal and perianal fistulas and sinus tracts and can demonstrate connections to adjacent viscera when adequate oral or rectal contrast material has been administered. CT is also helpful in the detection of residual inflammation after treatment or the development of inflammatory collections deep to the skin after the cutaneous drainage opening has healed. Detection of such complications may guide antibiotic management or lead to consideration of drainage procedures by means of surgery or aspiration.

In summary, CT is a sensitive means of examining the perirectal and perianal regions in patients with Crohn disease. The major abnormalities include inflammatory streaking of perirectal and ischiorectal fossa fat, thickening of the rectal wall, abscesses, fistulas, and sinus tracts. In this series, all of these manifestations except fistulas and sinus tracts were more common at levels above the symphysis pubis. Fistulas and sinus tracts occurred as frequently in the perineum as at the acetabular level, and disease below the symphysis pubis was found in more than one-third of patients. Therefore, the most important factor in adequately evaluating the perirectal and perianal areas in the patient with Crohn disease is the extension of the scanning sequence caudal to the external anal sphincter level to enable detection of all manifestations of the disease.

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References