

## Imaging of a patient with intestinal obstruction

One should obtain a chest x-ray in all patients with bowel obstruction to exclude a pneumonic process and to look for sub-diaphragmatic air. In most cases, supine, upright, or lateral decubitus films of the abdomen can distinguish the type of obstruction present (mechanical or nonmechanical, partial or complete) and establish the location of the obstruction (stomach, small bowel, or colon). A useful technique for evaluating abdominal radiographs is to look systematically for intestinal gas along the normal route of the GI tract, beginning at the stomach, continuing through the small bowel, and, finally, following the course of the colon to the rectum.

The following questions should be kept in mind as this is done.

- Are there abnormally dilated loops of bowel, signs of small bowel dilatation, or air-fluid levels?
- Are air-fluid levels and bowel loops in the same place on supine and upright films?
- Is there gas throughout the entire length of the colon (suggestive of ileus or partial mechanical obstruction)?
- Is there a paucity of distal colonic gas or an abrupt cutoff of colonic gas with proximal colonic distention and air-fluid levels (suggestive of complete or near-complete colonic obstruction)?
- Is there evidence of strangulation (e.g., thickened small bowel loops, mucosal thumb printing, pneumatosis cystoides intestinalis, or free peritoneal air)?
- Is there massive distention of the colon, especially of the cecum or sigmoid (suggestive of either volvulus or pseudo-obstruction)?
- Are there any biliary or renal calculi, and is there any air in the biliary tree (suggestive of gallstone ileus<sup>6</sup> or a renal stone that could be causing ileus)?

It is important to be able to distinguish between small and large bowel gas. Gas in a distended small bowel outlines the valvulae conniventes, which traverse the entire diameter of the bowel lumen [see *Figure 1*]. Gas in a distended colon, on the other hand, outlines the colonic haustral markings, which cross only part of the bowel lumen and typically interdigitate [see *Figures 2 and 3*]. Distended small bowel loops usually occupy the central abdomen [see *Figure 1*], whereas distended large bowel loops are typically seen around the periphery [see *Figure 2*]. In patients with ileus, distention usually extends uniformly throughout the stomach, the small bowel, and the colon [see *Figure 3*], and air-fluid levels may be found in the colon and the small intestine.

Patients with gastric outlet obstruction or gastric atony typically have a giant gastric bubble if no nasogastric tube has been placed, with little or no air in the small bowel or the colon.

Patients with mechanical small bowel obstruction usually have multiple air-fluid levels, with distended bowel loops of varying sizes arranged in an inverted U configuration [see *Figure 4*]. A dilated loop of small bowel appearing in the same location on supine and upright films suggests obstruction of a fixed segment of bowel by an adhesion or an internal hernia [see *Figures 1 and*

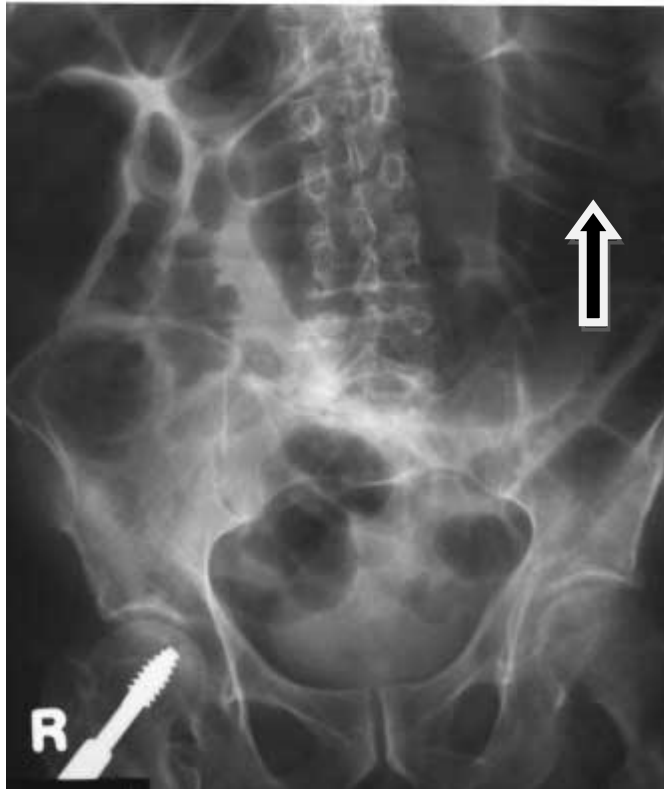
*4*]. Small bowel obstruction is often accompanied by a paucity of gas in the colon. The complete absence of colonic gas is strongly suggestive of complete small bowel obstruction; however, the presence of colonic gas does

not exclude complete small bowel obstruction, in that there may have been unevacuated gas distal to a point of complete obstruction before the radiograph was taken. On the other hand, if repeat radiographs demonstrate decreased or absent colonic or rectal gas in a patient with small bowel obstruction who previously had more colonic or rectal gas, it is probable that partial obstruction has become complete, and immediate operation is almost always indicated. High-grade obstruction of the colon with an incompetent ileocecal valve may manifest itself as distended small bowel loops with air-fluid levels, thereby mimicking small bowel obstruction. Hence, it is sometimes necessary to perform a barium enema to exclude colonic obstruction.

Massive gaseous distention of the colon is usually secondary to distal colonic or rectal obstruction, volvulus, or pseudo-obstruction [see *Figures 2, 5, 6, and 7*]. There are well-defined radiographic criteria that are highly sensitive and specific for sigmoid volvulus.<sup>6</sup> If there is any uncertainty regarding the presence, type, or level of colonic obstruction, immediate sigmoidoscopy followed by barium enema is diagnostic.



**Figure 1** Supine radiograph from a patient with complete small bowel obstruction shows distended small bowel loops in the central abdomen with prominent valvulae conniventes (small white arrow). Bowel wall between the loops is thickened and edematous (large white arrow). No air is seen in the colon or the rectum. Note the presence of an isolated small bowel loop in the right lower quadrant (black arrow), which is seen fixed in the same location on upright films, as shown in Figure 4.



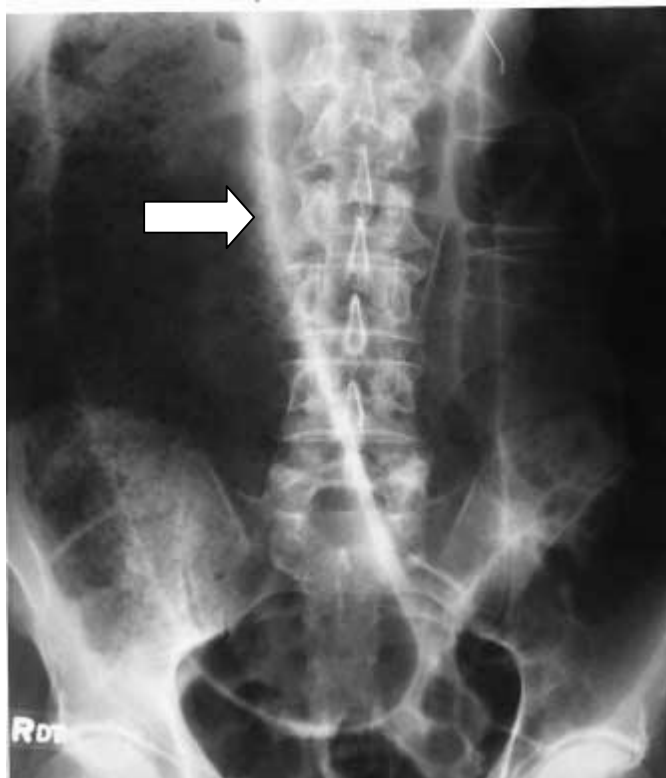
**Figure 2** Radiograph from a patient with acute colonic pseudoobstruction shows a dilated colon with haustral markings (white arrow) and edematous small bowel loops (black arrow). Air extends down to the distal sigmoid. This picture is also consistent with rectal obstruction, which could have been excluded by rigid sigmoidoscopy.



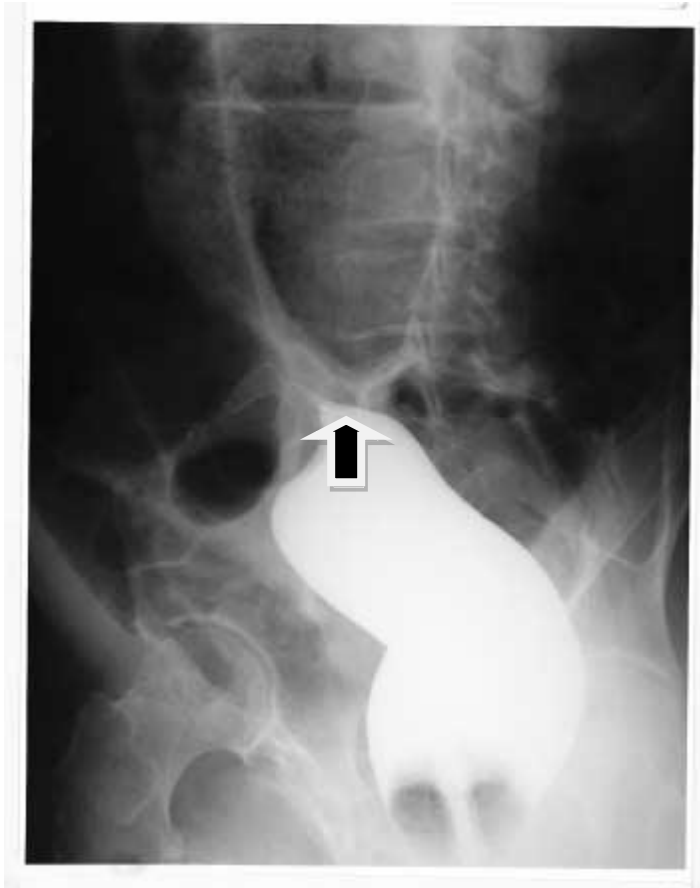
**Figure 3** Radiograph from a patient with postoperative ileus shows massive gastric distention (A), distended small bowel loops (B), air throughout the colon, mild dilatation of the sigmoid colon (C) with air mixed with stool, and a haustral fold in the apex of the sigmoid colon (D).



**Figure 4** Upright radiograph from the same patient as the supine radiograph in Figure 1 shows multiple air-fluid levels of varying size arranged in inverted Us. In the right lower pelvis, a loop of small bowel is seen in exactly the same location as on the supine abdominal film (black arrow), a finding suggestive of adhesive obstruction.



(A)

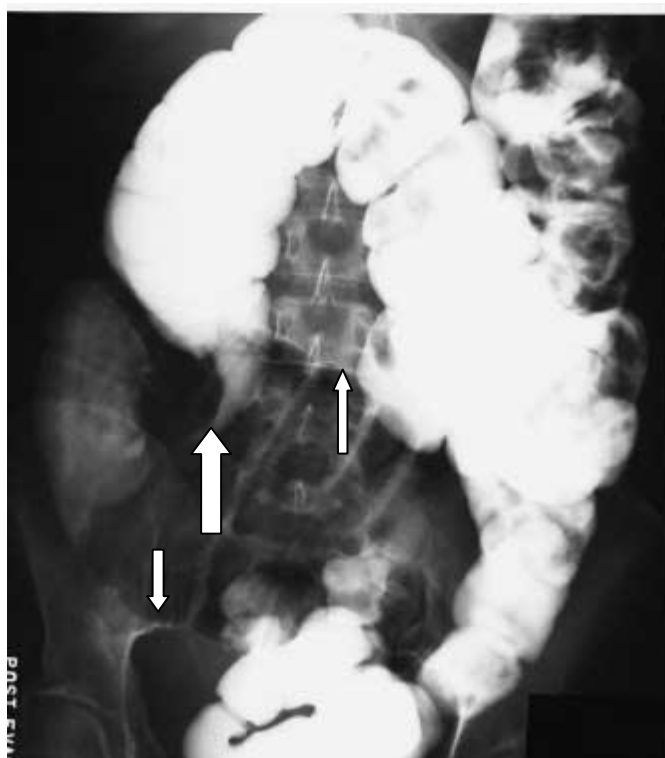


(B)

**Figure 5 (a)** Radiograph from a patient with massive sigmoid volvulus shows a distended ahaustral sigmoid loop (white arrow), inferior convergence of the walls of the sigmoid loop to the left of the midline, and approximation of the medial walls of the sigmoid loop as a summation line (black arrow). **(b)** Barium enema of the colon shows a tapered obstruction at the rectosigmoid junction with a typical bird's-beak deformity (black arrow).



(A)



(B)



**Figure 6 (a)** Radiograph from a patient with cecal volvulus shows a dilated cecum with no air distally in the colorectum. Convergence of the medial walls of the loop (black arrow) points to the right, a typical finding in cecal volvulus. **(b)** Barium examination demonstrates a bird's-beak deformity tapering at the point of volvulus (large white arrow). Note walls of dilated cecum (small white arrows).