

Soft-tissue case 43. Diagnosis

Cecal volvulus: differentiating distended viscus from pneumoperitoneum

The abdominal films (Figs. 1-3) were interpreted by the emergency physician, surgical staff and radiologist as being suspicious for pneumoperitoneum. The patient underwent an emergent laparotomy. On opening the abdomen, no free air was apparent. The cecum was located in the right upper quadrant between the diaphragm and the liver and had rotated clockwise around the pedicle of the ileocolic artery. It was freely mobile with no mesenteric attachments to the posterior abdominal wall. It was ischemic but had not yet perforated. A right hemicolectomy with primary ileocolic anastomosis was done. The patient's recov-

ery was smooth and she was discharged from hospital 6 days postoperatively, tolerating a full diet.

This case demonstrates the potential difficulty in differentiating free air from distended viscus that lies directly beneath the diaphragm on plain films. Although computed tomography is extremely sensitive for detecting pneumoperitoneum and is superior to plain radiography, the method may not always be available, and the patient may not be stable enough to allow its use.^{1,2} Therefore, it is important for the general surgeon to be familiar with the key features for identifying pneumoperitoneum using plain films of the chest and abdomen.

Upright chest and left lateral decubitus views have long been considered the standard for diagnosing

pneumoperitoneum, with the ability to detect as little as 1 to 2 mL of free air.¹ Free air accumulates superiorly under the dome of the diaphragm or along the right lateral abdominal wall.¹ Visualization of in-

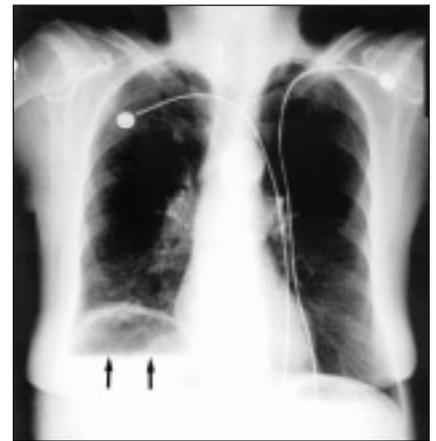


FIG. 1.

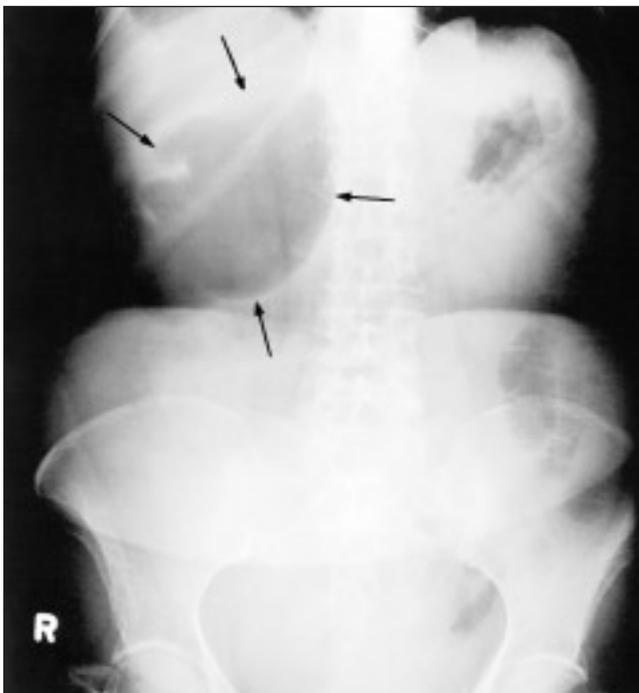


FIG. 2.

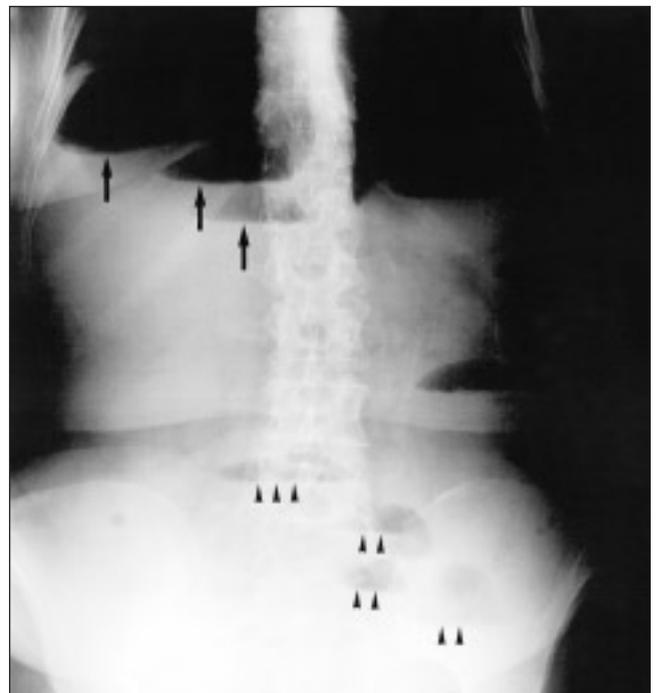


FIG. 3.

traperitoneal gas requires proper technique (having the patient in the left lateral decubitus or upright position for 15 minutes before radiography).^{2,3} In reality, this is rarely achieved in a busy emergency department.

In critically ill patients a supine view may be the only one available for interpretation and has been reported to detect pneumoperitoneum with a sensitivity of 59%.² Recent reports state that, with careful observation, the supine film reveals free air in more than 90% of patients.^{1,3} If a lucency cannot be explained by its location in the stomach, small bowel, colon or appendix, free air must be ruled out.^{1,3} The 2 following signs have the greatest yield.^{1,2}

- Right upper quadrant signs: the most frequent signs of pneumoperitoneum, present in 41% to 49% of cases.² Free air may appear as a triangle of gas confined within the posterior subhepatic space, as a vertical strip in the region of the porta hepatis or as an ill-defined lucency in the right upper quadrant.³
- Rigler's sign: present in 32% of cases of pneumoperitoneum. Free air surrounding air-filled bowel causes the wall to appear as a linear stripe with lucencies on either side. This sign is insensitive, as at least 750 mL of free air

must be present to outline the bowel wall, and nonspecific because it can be simulated by the apposition of 2 adjacent gas-filled bowel loops and by intraperitoneal fat adjacent to the bowel wall.

Other signs of pneumoperitoneum are found in less than 3% of cases and are seen in conjunction with one of the above signs.²

There are several instances in which a plain film may simulate free air under the diaphragm. Interposition of bowel between the liver and diaphragm (Chilaiditi syndrome), distended viscus, subphrenic abscess or pulmonary collapse parallel to and just above the diaphragm may all mimic free air under the diaphragm.⁴

On reviewing our case, we noted 4 points against simple pneumoperitoneum:

- There are no signs of free air on the supine film (Fig. 2) — the air lucency in the right upper quadrant (arrows) is well defined and suggests a distended viscus.
- The air lucency under the right hemidiaphragm is associated with air-fluid levels on the chest and upright abdominal films (Figs. 1 and 3, arrows).
- The cecum cannot be identified in the right lower quadrant on either the upright or supine films of the abdomen.

- Dilated loops of small bowel are present along with air-fluid levels, consistent with a small-bowel obstruction (Fig. 3, arrowheads).

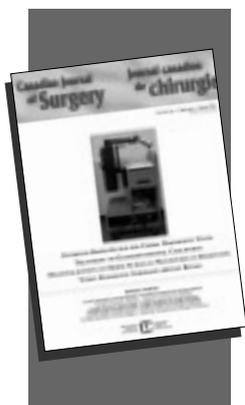
A subphrenic abscess should be considered when an air-fluid level is seen under the diaphragm. In this case the shape and location of the air collection on the supine film (Fig. 2) suggests it is within a distended viscus rather than an abscess cavity.

In summary, an air lucency under the diaphragm does not always indicate the presence of free air. Confirmatory evidence on the supine film should be sought. The presence of an air-fluid level excludes a simple pneumoperitoneum, and other diagnoses should be considered when reviewing the radiographs.

References

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