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Case Report

Inversion of excreted intravenous contrast-fluid levels in the urinary bladder on computed tomography

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ABSTRACT

Fluid–fluid levels occur on computed tomography due to differences in density between the 2 fluids. For example, intravenous (IV) contrast excreted into the urinary bladder layers posterior with gravity in the supine patient with normal, unopacified urine layering anterior, due to their differing densities. The rare presence of inverted fluid-contrast levels in the bladder calls attention to the existence of pathology such as microscopic hematuria, infectious debris, glycosuria, and purulent fluid. In such instances, the hypodense, non-opacified urine is the abnormality and is often only recognized due to the excreted IV contrast "floating" on top of it within the bladder. Here, we describe a case in which the development of inverted fluid-contrast levels in the urinary bladder on computed tomography during a patient's hospital stay heralded further investigation with urinalysis and urinary culture, with the known, worrisome causes able to be excluded.

Case report

A 22-year-old man with a history of Crohn's colitis complicated by sigmoid stricture necessitating a descending diverting loop colostomy 3 months prior presented to the emergency department with the sudden onset of abdominal pain, low-grade fever, and decreased stoma output over the course of one day. At the time of presentation, he was on postoperative day 7 from colostomy reversal and anterior resection of the rectum with diverting loop ileostomy.

His vital signs on arrival included a temperature of 36.6°C, heart rate of 131 beats per minute, blood pressure of 91/51, and normal oxygen saturation. Physical examination was unremarkable, including a left lower quadrant loop ileostomy that was pink and patent with gas and succus in the ostomy bag. Initial laboratory data revealed a mildly elevated white cell count of 13 with an otherwise normal complete blood count and basic metabolic panel, including normal creatinine. Urinalysis was normal. Computed tomography (CT) of the abdomen and pelvis was performed after intravenous (IV) injection of 100 mL of Omnipaque 350 (iohexol, GE Healthcare, Princeton, NJ) at a 70-second delay postcontrast administration, which demonstrated a large amount of ascites, pneumoperitoneum greater than expected for postoperative day 7 with no clear etiology, and a normal appearance of the urinary bladder (Fig. 1).

The patient was admitted to the hospital, hydrated, and started on empiric antibiotics for a presumed bowel perforation or leak. A repeat CT was performed approximately

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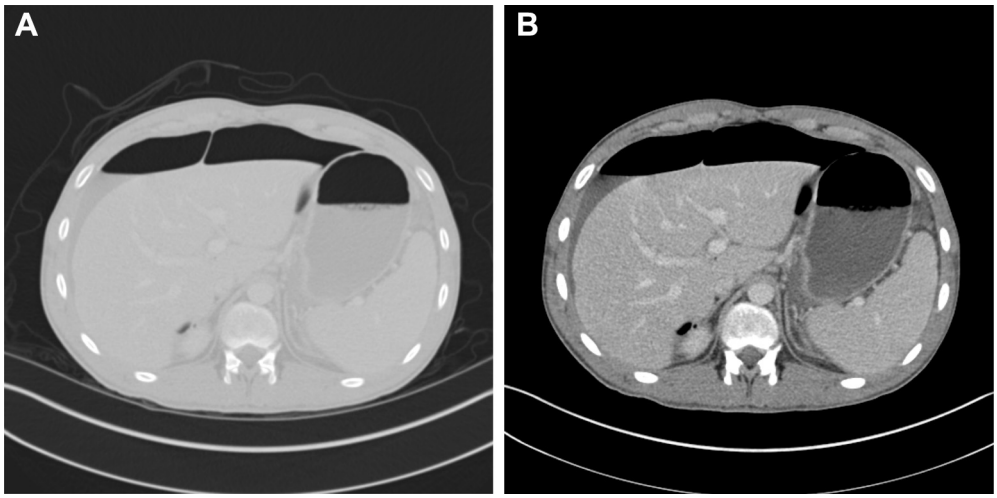

Fig. 1 – (A, B) Pneumoperitoneum and ascites. Axial IV-contrast-enhanced computed tomography demonstrates pneumoperitoneum (A) anterior to the liver and ascites (B) of uncertain etiology at the time of imaging.

10.5 hours later with oral contrast only to better evaluate for a site of leak. This CT showed unchanged ascites and pneumoperitoneum but no evidence of oral contrast leak from the bowel. At this time, the urinary bladder was completely opacified with contrast excreted from the recent IV contrast-enhanced CT (Fig. 2). Given the persistent ascites seen on CT and his leukocytosis, an ultrasound-guided paracentesis was performed. Along with the 80 mL of slightly blood-tinged peritoneal fluid that was aspirated, the ultrasound showed that the ascites was loculated (Fig. 3). The resulting cultures returned positive for *Streptococcus viridans* group, characteristic of *Streptococcus anginosus*.

The following day, approximately 33 hours after the initial IV-contrast-enhanced CT, a repeat IV contrast-enhanced CT with 100 mL of IV Omnipaque-350 with imaging again performed at a 70-second delay postcontrast administration was performed to specifically evaluate for underlying venous thrombosis as an etiology for the ascites. The CT revealed persistent ascites, pneumoperitoneum, and enhancement of the peritoneal lining. There was also marked interval diffuse thickening of the urinary bladder wall that contained persistent, residual excreted intraluminal contrast from the initial CT scan. However, instead of layering dependently within the bladder, the residual excreted contrast was seen floating on top of the hypodense urine (Fig. 4). Given the new, abnormal bladder findings of both wall thickening and inversion of expected contrast-urine layers, a repeat urinalysis was recommended, which was now positive for ketones (>80 mg/dL), protein (15 mg/dL), and red blood cells (5-9/high powered field), all of which were previously normal.

Due to the significant increase in ketonuria and concern for malnutrition, an albumin level was ordered and returned low at 2.8 g/dL. The patient was started on a full liquid diet. He continued to receive antibiotics and his clinical status, including fever and leukocytosis, began to improve. His abdominal distension resolved and at the time of discharge, the patient was stable and tolerating a low residue diet. During

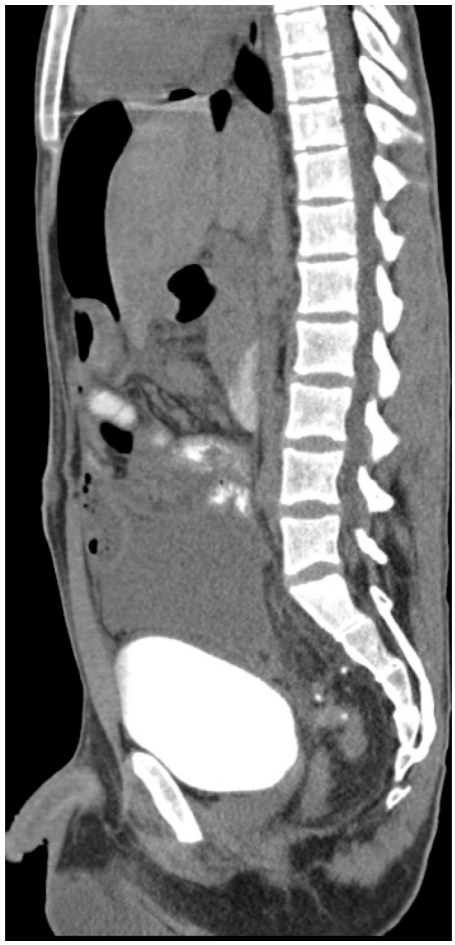

Fig. 2 – Opacified urinary bladder with excreted contrast. Oral contrast-enhanced computed tomography performed over 10 hours after the initial IV contrast-enhanced computed tomography, which demonstrates persistent upper abdominal pneumoperitoneum, ascites, and excreted IV contrast opacifying the urinary bladder.