

To CT or not to CT?: Anaphylaxis secondary to IV Contrast

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Story from the Front Lines:

A 24-year-old woman presented to the emergency department (ED) with one day of diffuse abdominal and flank pain preceded by one week of nausea and constipation. Her past medical history included focal segmental glomerulosclerosis (FSGS), upper gastrointestinal bleed, and small bowel obstruction (SBO). She reported ability to pass flatus, but she had not had a bowel movement in several days. She denied hematemesis, hematochezia, melena, fevers, chills, or weight loss. She additionally denied dysuria, urinary frequency, or urgency.

On examination her vital signs were normal, and she was in no visible distress. She had diffuse abdominal distention and tenderness to palpation, without guarding or rebound tenderness. There was no costovertebral angle tenderness. Complete blood count, comprehensive metabolic panel, and lipase were all within normal limits. Urinalysis was significant for red-colored urine, presence of microscopic hematuria, pyuria, two-plus proteinuria, leukocyte esterase, and nitrites. A urine pregnancy test was negative. A three-way abdominal radiograph suggested constipation only.

The patient underwent computed tomography (CT) scan of her abdomen and pelvis with intravenous (IV) contrast, to evaluate for nephrolithiasis and/or perinephric abscess. This study revealed only a hemorrhagic corpus luteum cyst. Following contrast administration, the patient developed anaphylaxis, requiring treatment with steroids, albuterol, and epinephrine, as well as endotracheal intubation for airway protection. She was admitted to the medical intensive care unit (MICU). Her anaphylaxis was treated successfully, and she was extubated within 12 hours.

Teachable Moment:

This case highlights a very serious, though fairly uncommon, harm of IV contrast. Radiocontrast-mediated anaphylaxis is estimated to affect between 0.22%-1% of the US population and result in up to 100 deaths per year.^{1,2} In this case exposure to contrast did not lead to death but did lead to MICU admission with endotracheal intubation and mechanical ventilation.

The American College of Radiology (ACR) provides evidence-based guidelines to rate the appropriateness of an imaging study for specific clinical conditions³. A numbered scale rates various imaging modalities from "Usually Not Appropriate;" to "May be appropriate;" to "Usually appropriate." In this case, after an abdominal x-ray showed no evidence of obstruction, the differential diagnosis for the patient's pain was nephrolithiasis, pyelonephritis, and/or perinephric abscess, and a CT abdomen/pelvis with IV contrast was ordered to complete the work up. According to ACR Appropriateness Criteria, suspicion of stone disease in a nonpregnant

patient should be evaluated with CT abdomen pelvis without contrast, while administration of IV contrast is considered “inappropriate.” For acute uncomplicated pyelonephritis, all imaging studies can be avoided. If a patient is deemed complicated—such as by having diabetes or other immunocompromise, history of stones, prior renal surgery, or having not responded to initial therapy—then a CT scan with contrast is recommended.

In this case, the patient had laboratory evidence of and some symptoms suggestive of acute pyelonephritis—though no flank tenderness, dysuria, urinary frequency or urgency. She did not meet criteria for complicated pyelonephritis. She had radiographic evidence of constipation without obstruction, and she was hemodynamically stable without evidence of sepsis. Per ACR Appropriateness Criteria, a CT abdomen/pelvis with IV contrast was not indicated. If stone disease were of concern, the appropriate test would have been a CT abdomen pelvis without contrast. If an ovarian cyst were suspected, an ultrasound would be the appropriate test. Ultimately the test chosen provided the patient negligible added diagnostic value, and resulted in undue harm.

Acute abdominal pain in the ED is a frequent and alarming complaint. CT scan is shown to be accurate in diagnosing abdominal pathology, but only when combined with a history and physical examination compatible with the imaging study.^{4,5} Its use in the acute setting has increased, with recent data showing a tripling of utilization from 1996-2010.⁶ The differential for acute abdominal pain is broad, however. This is reflected by 44% of patients presenting to the ED with abdominal pain who underwent CT scans that showed no serious pathology and 43% whose management was unchanged by the result of the scan.^{5,7}

Cognitive biases, such as base rate neglect, where possibilities take precedence over probabilities may lead to well intended, though avoidable evaluations⁸. This patient presented with nonspecific abdominal pain with hematuria, pyuria and proteinuria (with known nephrotic disease). Based on initial evaluation the most likely diagnosis was constipation and nephrolithiasis; with the etiology of her abdominal pain ultimately being ovarian cyst. Though etiologies, such as perinephric abscess, were possible, these were less likely and could have been pursued if her symptoms had worsened.

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