Evaluation of Acute Abdominal Pain with Computed Tomography

5

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Pearls and Pitfalls

- Contrast reactions occur infrequently, and serious, life-threatening reactions are extremely rare.
- Evidence has challenged the clinical relevance of contrast-induced nephropathy.
- The risks and benefits of contrast should be considered when choosing whether to utilize a contrast-enhanced CT.
- Oral contrast should not routinely be used in abdominal computed tomography.

In 2014, approximately 6% of all patients presenting to United States emergency departments had computed tomography (CT) of their abdomen and pelvis. Abdominal pain was the most common presenting complaint, making up nearly 8% of all visits [1]. History, physical, and laboratory evaluation are often not enough to rule out or diagnose a dangerous etiology of abdominal pain. Therefore, patients presenting with focal abdominal pain or concern for a surgical cause of pain must be considered for imaging.

General Considerations

CT is the imaging test of choice for most acute abdominal pain (with exception of abdominal aortic aneurysm, acute cholecystitis, or gonadal pathology, in which ultrasound is first line). It has a high sensitivity and specificity for many serious causes of abdominal pain including appendicitis, obstruction, perforation, diverticulitis, and bowel ischemia. However, the use of CT must be weighed against risk of radiation exposure especially in younger patients [2, 3]. Clinicians must also weigh benefits and drawbacks of contrast-enhanced CT.

Intravenous (IV) contrast is beneficial for its opacification of vascular structures and solid abdominal and pelvic organs. IV contrast in abdominal imaging is recommended for nearly all indications, with the notable exception of renal colic evaluation [4–7]. There are two primary barriers to patients receiving IV contrast in the emergency department: concern for an allergic-type contrast reaction and contrast-induced nephropathy. The decision to utilize IV contrast requires a risk-benefit analysis by the ordering physician, which requires a reasonable understanding of the risks of each of these entities.

Allergic-Type Contrast Reactions

Contrast reactions are not IgE mediated and therefore not true allergic reactions. The significance is that a patient may have a contrast reaction on their first exposure to iodinated contrast, as no sensitization is required. Likewise, a patient who has had a previous contract reaction may not have subsequent reactions. While it is recognized that a previous contrast reaction is a risk factor for future reactions, this rate of recurrence may be lower than expected. One study found in patients with a reported history of contrast reaction, only 7.4% had another adverse reaction when given IV contrast. Very few (0.02%) of these reactions were anaphylactoid and none were fatal [8].

Physicians may overestimate the incidence of contrast reactions. Historical studies which were performed using high-osmolar contrast agents, as compared to the low- and iso-osmolar agents used in current practice, may overinflate the suspected risk of reactions. Studies using these modern contrast agents have shown overall reaction rates

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of 0.6–1.5%, with very few (0.03–0.05%) of these being anaphylactoid or life-threatening [8–11]. Another study of the incidence of allergic-like contrast reactions specifically in the emergency department found an overall adverse reaction rate of 0.2% with no serious reactions [11].

Shellfish and "Iodine" Allergies

It is worth addressing a long-standing myth that someone with a reported shellfish allergy is unable to receive IV contrast. Allergies to shellfish do not increase the risk of contrast reaction over any other allergy. There is also the concern of patients reporting an "iodine allergy." Iodine is not an allergen, as it is found intrinsically in the human body as well as in table salt [7, 12].

Contrast-Induced Nephropathy

Contrast-induced nephropathy is typically defined as signs of acute kidney injury (AKI) within 48 h of contrast administration and has been called the third most common cause of in-hospital AKI [13, 14]. More recent evidence has shown a lack of association between contrast use and AKI [15–19]. While not definitive, the discrepancy between previous and current evidence may be that in instances where contrast was attributed causation for AKI, other coexisting factors, such as underlying illness, nephrotoxic drugs, and hypovolemia, may have contributed. Recent studies have likely been more regimented about controlling for these cofounders.

American College of Radiology (ACR) guidelines state that assessment of renal function prior to contrast use may be warranted in patients who are of age greater than 60, have history of renal disease, have history of hypertension requiring treatment, have history of diabetes mellitus, or are currently using metformin. For all other patients, a baseline serum creatinine measurement is not required prior to contrast administration. For patients who do have an assessment of renal function, the ACR recommends a threshold of eGFR <30 for risk of nephropathy [7].

Value of Oral Contrast

Oral contrast has not been shown to significantly improve the accuracy of CT in diagnosing the vast majority of acute abdominopelvic abnormalities in the emergency department [20]. Studies of emergency departments after the elimination of the routine use of oral contrast showed decrease in wait times, an average of 97 min in one study, without an increase in bouncebacks or missed findings [21, 22]. With the exception of inflammatory bowel disease and patients post-gastric bypass, the ACR does not strongly recommend the use of oral contrast in any of the indications for acute abdominal imaging [5, 6, 20]. There have been many studies that do not show a benefit in the use of oral contrast in the evaluation of appendicitis [23–26], and the ACR recommends against the use of oral contrast when evaluating for bowel obstruction [6, 7]. Oral contrast should not routinely be used in the CT evaluation of abdominal pain in the emergency department.

Suggested Resource

- ACR Manual on Contrast Media. https://www.acr.org/~/media/ACR/Documents/PDF/QualitySafety/Resources/Contrast-Manual/Contrast_Media.pdf.

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