

Clinical Practice Statement

What Is the Role of Intravenous and Intraoral Contrast in CT Evaluation of Acute Appendicitis?

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Recommendations

- 1) The administration of oral contrast is not required when performing CT of the abdominal and pelvis for the evaluation of acute appendicitis (AAP) in adult patients.
- 2) CT of the abdomen and pelvis with intravenous contrast (IVCT) has slightly better test characteristics compared with non-contrast CT(NCT) for the diagnosis of acute appendicitis. Notwithstanding, both CT modalities have high accuracy. In circumstances where IV contrast is contraindicated, unavailable, or have potentially higher risk than benefit, a NCT may be appropriate.

Introduction

Patients presenting to the emergency department (ED) with abdominal pain and concern for appendicitis typically require diagnostic imaging to confirm the diagnosis. Computer tomography (CT), magnetic resonance imaging (MRI), and ultrasound (US) are the imaging modalities that can be used to diagnosis appendicitis. For non-pregnant adult appendicitis, CT of the abdomen and pelvis is commonly utilized and is supported by 2018 American Academy of Radiology appropriateness criteria for right lower quadrant pain.¹

CT of the abdomen and pelvis can be performed without contrast (NCT), with intravenous contrast (IVCT), with oral contrast (OCT), or with both IV and oral contrast (IVOCT). Each of these options have advantages and disadvantages. In the case of OCT, administration of oral contrast can take several hours, is uncomfortable to drink, may induce vomiting, delay definitive diagnosis and treatment, and can significantly increase ED length of stay. Oral or IV contrast may also induce allergic reactions which can be life threatening. Furthermore, IVCT can only be performed in those patients without significant renal impairment. Non-contrast CT can be performed without delay but the lack of oral and/or IV contrast may limit the ability to identify specific pathologies.

Executive Summary

CT technology has evolved over the past four decades and research defining CT test characteristics has been robust. The 2018 ACR guidelines endorse IVCT of the abdomen and pelvis as “usually appropriate”, whereas NCT, MRI, and US “may be appropriate.” These recommendations are primarily based on test characteristics for the radiologist. The ED is a complex, busy, dynamic work environment which must have flexibility to accommodate patient conditions and other constraints. For this reason, CT for appendicitis must be patient customized with acknowledgement of each protocol’s limitations.

CT

Numerous studies have evaluated the utility of OCT in acute appendicitis. The majority of quality studies demonstrate no significant improvement in test characteristics with the addition of oral contrast to intravenous contrast.^{2,3,4} When used oral contrast may cause complications and delay care to definitive treatment.^{5,6}

No large, prospective, randomized trials exist comparing IVCT to NCT. Earlier studies have demonstrated similar test characteristics of NCT and IVCT, with the slight advantage to IVCT. A recent metaanalysis of older prospective studies by Xiong et al. found the pooled sensitivity and specificity of NCT to be 0.90 (95% confidence interval [CI]: 0.86-0.92) and 0.94 (95% CI:0.92-0.97), respectively.⁷ Similarly, a 2010 systematic review authored by Hlibczuk et al. calculated pooled sensitivity and specificity of 92.7% (95% confidence interval 89.5% to 95.0%) and 96.1% (95% confidence interval 94.2% to 97.5%), respectively.⁸ Ege, et al. prospective studied 296 patients with equivocal history and exam and found a sensitivity of 96% and specificity of 98% for NCT.⁹ Additional retrospective studies found similar test characteristics.^{11,12}

More recent studies suggest IVCT has slightly better sensitivity than NCT for diagnosing appendicitis. The largest multicenter study to date, Drake et al involved 9047 adults in 56 medical centers with diverse demographics. Their results demonstrated an NCT concordance of 85.7% in comparison to IVCT which showed a 90.4% concordance for appendicitis surgically proven pathology.⁵ A smaller retrospective study of 100 patients demonstrated IVCT slightly outperformed NCT by approximately 7% in sensitivity, and had superior specificity, PPV, NPV for diagnosing appendicitis.¹⁰ Likewise, Tamburrini's study of 536 patients found that using iv contrast for inconclusive NCT increased sensitivity of acute appendicitis detection by 15% to 20%.¹³

Conclusion

Oral contrast is not required for CT imaging of the abdomen and pelvis when evaluating for acute appendicitis. IVCT test characteristics are slightly better than NCT; however, both are highly accurate and in the right clinical circumstances can be used for clinical decision making. The 2018 ACER recommendations continue to advocate for IVCT which may lead to fewer NCT being performed and thus less radiology comfort reading such studies.

