

UAMS Journal Club Summary  
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John Kierstead MD, Brach Williams MD  
Faculty Advisors: Carly Eastin MD

## **IV Contrast Only vs IV and PO Contrast in the Evaluation of Acute Appendicitis with CT Scanning**

### **Clinical Bottom Line**

CT scanning with oral contrast administration along with IV contrast administration appears to have similar sensitivity for appendicitis compared to IV contrast only. However the data presented here are limited and focus only on acute appendicitis, therefore cannot be applied to patients with concern for other intra-abdominal pathologies. Eliminating the need for PO contrast does appear to reduce ED LOS, however implementation of this must take into account local radiology preferences and feasibility.

### **PICO Question**

P- Adult patients presenting to the ED with undifferentiated abdominal pain with clinical suspicion for acute appendicitis  
I- CT scan with IV contrast only  
C- CT scan with IV and PO contrast  
O- Diagnostic accuracy of CT scan for acute appendicitis

### **Background**

Acute abdominal pain is one of the top reasons for presenting to the Emergency Department. Acute appendicitis is a classic intraabdominal emergency with significant morbidity and mortality if prompt diagnosis and treatment are delayed. The standard method of diagnosis is by CT scan of the abdomen and pelvis with IV contrast, and depending on institution, possibly PO contrast. The administration of PO contrast significantly increases ED LOS (>2 hours in many studies) due to protocols usually requiring 1-2 hours waiting periods after ingestion. Patients also commonly experience nausea and vomiting secondary to contrast intake. Withholding PO contrast has the potential to significantly decrease ED LOS and patient side effects if this is found to be clinically appropriate.

## Trial 1

Kepner AM, et al. Intravenous contrast alone vs intravenous and oral contrast computed tomography for the diagnosis of appendicitis in adult ED patients. AJEM. 2012;1765-1773.

**Pubmed link:** <https://pubmed.ncbi.nlm.nih.gov/22633722>

**Validity Rating:** Moderate quality RCT that does have some issues with design as discussed below

### **The Basics:**

This is a RCT of a sample of adult patients (n=227) presenting to a community teaching ED with abdominal pain concerning for appendicitis. Enrolled patients were randomized to CT with IV vs IV and oral contrast (IVO). CT scans were read contemporaneously by an attending radiologist. Two blinded, designated study radiologists read all studies independently. Study radiologists indicated presence of appendicitis by "yes" or "no." In event of discrepancy, contemporaneous read was used. Results were reviewed against surgical pathology or attending diagnosis. For negative CTs, patients were followed up by phone.

### **Inclusion Criteria:**

Patients 18 years or older with signs and symptoms suggestive of appendicitis

### **Exclusion Criteria:**

Patients younger than 18 years, confirmed pregnancy, allergy to IV or oral contrast, Cr>1.5, current incarceration, inability to consent, and patients in whom appendicitis was not primary concern

### **Primary Outcomes:**

The diagnosis of appendicitis confirmed with surgical pathology/admitting attending's discharge diagnosis

### **Secondary Outcomes:**

Time from triage to ED disposition, time from triage to OR, whether oral contrast reached cecum, and BMI

### **Results:**

35.2% of patients had CT positive for appendicitis. There was no significant difference in sensitivity and specificity between IV and IVO groups. There were 7 subjects who did not go to the OR (4 false positives, 3 true positives). Time from triage to discharge with patients with negative CT scan was significantly lower in the IV group, and there was no change between time from triage to OR between IV and IVO subjects with positive CT scan.

### **Limitations/Bias:**

- The radiologists were specifically asked to evaluate only for appendicitis, this primes them to the area of concern and introduces bias
- The study radiologists were found to be better than average at diagnosing appendicitis without oral contrast, which may be variable in other locations
- Off-site radiologists were used at night, which limited the inclusion of contemporaneous reviews unless tie breaker was needed
- 7 participants had positive CT scan but did not go to the OR, and thus appendicitis was confirmed/excluded with less than gold-standard
- Power analysis was not calculated
- Time data was pulled from EMR, and is not always accurate
- 16-slice scanner with 3-mm slice thickness was used. Higher resolution scanners (32 and 64 slice) are widely available and might affect the diagnostic performance of IV, IVO, and unenhanced scans.

### **Trial 2**

Anderson SW, et al. Abdominal 64-MDCT for suspected appendicitis: the use of oral and IV contrast material versus IV contrast material only. *AJR Am J Roentgenol.* 2009;193:1282–1288.

**Pubmed link:** <https://www.ncbi.nlm.nih.gov/pubmed/19843742>

**Validity Rating:** Moderate quality RCT that does have some issues with design as discussed below

#### **The Basics:**

This is an RCT of a convenience sample of adult patients (n=303) presenting to an urban academic emergency department with non-traumatic abdominal pain with a clinical suspicion for appendicitis, diverticulitis, or small bowel obstruction. Patients were randomized to Oral and IV vs IV contrast alone. CT was performed and independently reviewed by two expert radiologists. The reads were ranked on a 1-5 scale of confidence in diagnosis of acute appendicitis (1=definitely not present, 3=unsure, 5=definitely present). If both results agreed (both above or below the middle ground (3)) then the CT was officially read as positive or negative. In cases of discrepancy, a third radiologist was used as the tie breaker. Results were compared against the gold standard (surgery and pathology in positive CTs) and for negative CTs the patients were followed up via EMR searches and telephone interviews.

#### **Inclusion Criteria:**

Adults 21 or older presenting to the ED with non-traumatic abdominal pain with differential diagnosis of acute appendicitis, diverticulitis, and small bowel obstruction.

#### **Exclusion Criteria:**

Patients <21, IV contrast allergy, pregnant patients, traumatic abdominal pain, patients without a telephone number, and patients unable to provide written consent.

**Primary Outcomes:**

Clinical outcome of diagnosed acute appendicitis by the gold standard (pathology), sensitivity, specificity, PPV, and NPV of each testing modality

**Secondary Outcomes:**

None

**Results:**

9% of the total patient population were diagnosed with acute appendicitis. There were 14 true positives, four false positives, and 0 false negative interpretations. No significant difference in sensitivity or specificity was found between the two groups although the authors indicate that due to their low sample size the study is underpowered to detect a difference in sensitivity. The study is adequately powered to detect a difference in specificity.

**Limitations/Bias:**

- Poor follow up in the negative CT group (only 40% successfully followed up by phone at 24 hours, 51% at 6 weeks)
- The radiologists were specifically asked to evaluate only for appendicitis, this primes them to the area of concern and introduces bias
- Convenience sample used instead of consecutive enrollment, this could affect generalizability
- The study was powered assuming prevalence of 40% for any of the following: acute appendicitis, diverticulitis, and small bowel obstruction, despite this the radiologist were specifically asked only to evaluate for appendicitis
- CI are very wide due to low sample size
- A definitive conclusion regarding a difference in sensitivity cannot be made due to the study being underpowered, although the study can make the claim that there is no difference in specificity