

Brief description of patient problem/setting (summarize the case very briefly)

28F, w/ no significant PMH, presents to the ED of RLQ pain x 1 day. Patient states the pain originally was very diffuse but then localized to the RLQ. Physical exam revealed tenderness to palpation in the RLQ and a + psoas sign. You suspect appendicitis as your top differential and order a CT w/ IV contrast.

Search Question: In adults with suspected diagnosis of appendicitis, compared to IV contrast alone, is IV contrast + Oral contrast associated with better diagnostic probability?

Question Type: What kind of question is this? (boxes now checkable in Word)

- Prevalence Screening Diagnosis
- Prognosis Treatment Harms

Assuming that the highest level of evidence to answer your question will be meta-analysis or systematic review, what other types of study might you include if these are not available (or if there is a much more current study of another type)?

Please explain your choices.

Along with meta-analyses and systemic reviews, I would consider studies that involved Randomized Controlled Trials [RCT]. RCTs are prospective studies that test treatment or diagnostic options. This suits my question considering the fact I want to know whether one diagnostic method has greater accuracy in diagnosing appendicitis.

PICO search terms:

P	I	C	O
Adults	IV contrast	IV contrast + Oral contrast	Improved diagnosis of appendicitis
Appendicitis			

Search tools and strategy used:

Database	Terms	Filter	# of Articles
PubMed	IV vs oral contrast diagnosis appendicitis adult	Medline, last 5 years	100
ScienceDirect	IV vs oral contrast diagnosis appendicitis adult	Research articles, last 10 years	60

Results found:

Article 1

Citation

Wadhvani, A., Guo, L., Saude, E., Els, H., Lang, E., McRae, A., & Bhayana, D. (2016). *Intravenous and Oral Contrast vs Intravenous Contrast Alone Computed Tomography for the Visualization of Appendix and Diagnosis of Appendicitis in Adult Emergency Department Patients*. *Canadian Association of Radiologists Journal*, 67(3), 234–241. doi:10.1016/j.carj.2015.09.013

<https://sci-hub.se/10.1016/j.carj.2015.09.013>

Article Type

Randomized Control Trial

Abstract

Purpose: The study sought to compare radiologist's ability to 1) visualize the appendix; 2) diagnose acute appendicitis; and 3) diagnose alternative pathologies responsible for acute abdominal pain among adult patients undergoing computed tomography (CT) scan with 3 different protocols: 1) intravenous (IV) contrast only; 2) IV and oral contrast with 1-hour transit time; and 3) IV and oral contrast with 3-hour transit time.

Methods: We collected data of 225 patients; 75 consecutive patients with a clinical suspicion of appendicitis received oral contrast for 3 hours and IV contrast, 75 received oral contrast for 1 hour and IV contrast, and 75 trauma patients received IV contrast only. Three independent reviewers, blinded to final pathology, retrospectively analysed the cases and documented visualization of the appendix, periappendiceal structures, and their confidence in diagnosing appendicitis. Clinical diagnoses were derived from a combination of clinical, surgical, pathologic, or radiologic follow-up.

Results: Frequency of visualizing the appendix within IV group alone was 87.3%, IV with oral for 1 hour was 94.1%, and IV with oral for 3 hours was 93.8%. Both oral contrast groups had 100% sensitivity and negative predictive value in diagnosis of acute appendicitis.

Specificity for the 1- and 3-hour oral contrast groups was 94.1% and 96.1%, respectively and positive predictive value for both groups was 92%.

Conclusions: Our findings suggest that reader confidence in visualizing the appendix improved with addition of oral contrast as compared to IV contrast alone. One- and 3-hour oral regimens have a similar diagnostic performance in diagnosing appendicitis.

Key Points

- RCT was performed
- Measured IV contrast vs IV + Oral @ 1 hr time vs IV + Oral @ 3 hr time
- Improvement in visualizing the appendix with addition of oral contrast compared to IV contrast alone
- 1 and 3 hr time transits were similar in diagnostic performance

Reason for choosing:

- RCT are high levels of evidence. I really liked that this article was published in 2016 which is not too long ago. The article directly answers my PICO question.

Article 2

Citation

Kepner, A. M., Bacasnot, J. V., & Stahlman, B. A. (2012). *Intravenous contrast alone vs intravenous and oral contrast computed tomography for the diagnosis of appendicitis in adult ED patients*. *The American Journal of Emergency Medicine*, 30(9), 1765–1773. doi:10.1016/j.ajem.2012.02.011

<https://sci-hub.se/10.1016/j.ajem.2012.02.011>

Article Type

Randomized Control Study

Abstract

Objective: When the diagnosis of appendicitis is uncertain, computerized tomography (CT) scans are frequently ordered. Oral contrast is often used but is time consuming and of questionable benefit. This study compared CT with intravenous contrast alone (IV) to CT with IV and oral contrast (IVO) in adult patients with suspected appendicitis.

Methods: This is a prospective, randomized study conducted in a community teaching emergency department (ED). Patients with suspected appendicitis were randomized to IV or IVO CT. Scans were read independently by 2 designated study radiologists blinded to the clinical outcome. Surgical pathology was used to confirm appendicitis in patients who went to the operating room (OR). Discharged patients were followed up via telephone. The primary

outcome measure was the diagnosis of appendicitis. Secondary measures included time from triage to ED disposition and triage to OR.

Results: Both IV (n = 114) and IVO (n = 113) scans had 100% sensitivity (95% confidence interval [CI], 89.3-100 and 87.4-100, respectively) and negative predictive value (95% CI, 93.7-100 and 93.9- 100, respectively) for appendicitis. Specificity of IV and IVO scans was 98.6 and 94.9 (95% CI, 91.6- 99.9 and 86.9-98.4, respectively), respectively, with positive predictive values of 97.6 and 89.5 (95% CI, 85.9-99.9 and 74.2-96.6). Median times to ED disposition and OR were 1 hour and 31 minutes (P b .0001) and 1 hour and 10 minutes (P = .089) faster for the IV group, respectively. Patients with negative IV scans were discharged nearly 2 hours faster (P = .001).

Conclusions: Computerized tomography scans with intravenous contrast alone have comparable diagnostic performance to IVO scans for appendicitis in adults. Patients receiving IV scans are discharged from the ED faster than those receiving IVO scans.

Key Points

- Randomized study – pts suspected of having appendicitis were blindly placed in either IV contrast alone group or IV + Oral contrast group
- CTs with IV contrast alone demonstrated comparable diagnostic performance compared to CTs with both IV and Oral contrast
- Patients who received IV contrast alone were D/C from the hospital faster than those who received both IV + Oral contrast

Reason for choosing:

Article was published within the last 10 years. It used a RCT method which is of very good quality. A decent population size was used with 100+ patients in each group. It answered my PICO directly.

Article 3

Citation

Drake, F. T., Alfonso, R., Bhargava, P., Cuevas, C., Dighe, M. K., Florence, M. G., ... Flum, D. R. (2014). Enteral Contrast in the Computed Tomography Diagnosis of Appendicitis. *Annals of Surgery*, 260(2), 311–316. doi:10.1097/sla.0000000000000272

<https://sci-hub.se/https://dx.doi.org/10.1097%2FSLA.0000000000000272>

Article Type

Prospective Cohort Study

Abstract

Objective: Our goal was to perform a comparative effectiveness study of intravenous (IV)-only versus IV + enteral contrast in computed tomographic (CT) scans performed for patients undergoing appendectomy across a diverse group of hospitals.

Background: Small randomized trials from tertiary centers suggest that enteral contrast does not improve diagnostic performance of CT for suspected appendicitis, but generalizability has not been demonstrated. Eliminating enteral contrast may improve efficiency, patient comfort, and safety.

Methods: We analyzed data for adult patients who underwent nonelective appendectomy at 56 hospitals over a 2-year period. Data were obtained directly from patient charts by trained abstractors. Multivariate logistic regression was utilized to adjust for potential confounding. The main outcome measure was concordance between final radiology interpretation and final pathology report.

Results: A total of 9047 adults underwent appendectomy and 8089 (89.4%) underwent CT, 54.1% of these with IV contrast only and 28.5% with IV + enteral contrast. Pathology findings correlated with radiographic findings in 90.0% of patients who received IV + enteral contrast and 90.4% of patients scanned with IV contrast alone. Hospitals were categorized as rural or urban and by their teaching status. Regardless of hospital type, there was no difference in concordance between IV-only and IV + enteral contrast. After adjusting for age, sex, comorbid conditions, weight, hospital type, and perforation, odds ratio of concordance for IV + enteral contrast versus IV contrast alone was 0.95 (95% CI: 0.72–1.25).

Conclusions: Enteral contrast does not improve CT evaluation of appendicitis in patients undergoing appendectomy. These broadly generalizable results from a diverse group of hospitals suggest that enteral contrast can be eliminated in CT scans for suspected appendicitis.

Key Points

- 9000+ pts were in the study and 90% of them underwent CT scanning with either IV contrast alone or IV + Oral contrast
- Analyzed adult patients over 2 year period
- Enteral contrast did not improve CT evaluation of appendicitis in patients underdoing appendectomy

Reason for choosing:

Article was published within the last 6 years which is still recent. Even though it is not a RCT or systematic review/meta-analysis, cohort studies are still prospective studies that follow patients and observe how they are doing and this one analyzed data over a 2 year period. The population size was 9000+ which was very good. My PICO question was answered directly with this article as well.

What is the clinical “bottom line” derived from these articles in answer to your question?

2/3 of the article chosen concluded that oral contrast did not improve the diagnostic probability of appendicitis in adult patients. Wadwani et al., concluded that the addition of oral contrast was helpful in diagnosing appendicitis, however, due to the smaller sample size, this should be taken with a grain of salt. Kepner et al. study concluded that patients who only received IV contrast were able to be discharged faster! That is another thing to consider you may have patients resist ingesting the oral contrast and this can take even longer adding more time to their length of stay.

Since the addition of oral contrast does not extremely improve the diagnostic probability of appendicitis, I would stray away from it. I would not have to worry about patients trying to drink the contrast plus they would most likely be discharged quicker according to Kepner et al.

I must add, during my current clinical rotation at SIUH, there is a hospital policy that patients who are less than 30 years of age must receive oral contrast when CT scans are ordered. So hospital policy is another factor to consider depending on where a clinician is working. Essentially, the clinical bottom line here is that addition of oral contrast does not drastically improve the diagnosing probability of appendicitis in adult patients.