The questionable utility of oral contrast in abdominal CT’s
By Jonathan Rakofsky, M.D.  PGY III
HFH Emergency Medicine

“All patients from the DEM at LACUSC who have a CT scan of the abdomen and pelvis requested will be scanned without oral contrast. The only exception being patients in who a fistula/leak from bowel is the primary concern or is to be excluded.”

Why are we using oral contrast?

- Performing studies with oral contrast increases cost of about an average of $25000-30000 a year (usc)
- Patient's with abdominal pain tolerate oral contrast poorly (USC)
- Increases disposition time of at least 90 minutes (USC)
- Increased Risk of aspiration
- They are occupying a bed someone else needs

“Well it's a better study...right?”

There is mounting evidence that oral contrast does not increase the accuracy of CT studies and may actually degrade the study in a number of scenarios (USC)

1. Diagnostic accuracy of NONCONTRAST Computed Tomography for Appendicitis in Adults: A Systematic Review

Methods: A systematic literature review examining all relevant electronic databases and the bibliographies of pertinent studies.
Results: 1060 patients from an initial group of 1,258 patients. Sensitivity 92.7% (CI 95% 89.5%-95%) Specificity 96.1% (95% CI 94.2-97.5%). The 7.3% false-negative rate in this study was in the same range found for CT using contrast (3-17%)
Conclusion: Non-contrast CT scanning is reasonably sensitive and highly specific for the diagnosis of acute appendicitis in adult ED patients and its accuracy is similar to contrast
2.  
A Systematic Review of Whether Oral Contrast is necessary for the Computed Tomography Diagnosis of Appendicitis in Adults 

Methods: 23 studies (19 prospective, 4 retrospective) involving 3,474 patients over the age of 16 having abdominal CT scanning for suspected appendicitis.

Results: The sensitivity 93% and specificity 98% and diagnostic accuracy was 96% for no oral was used. In comparison with oral contrast, which was used either alone or with IV or rectal contrast, the sensitivity was more for without (95% vs 92%) specificity (97% vs 94%) and diagnostic accuracy was 96% vs 92%.

Conclusions: unenhanced CT scanning appears to be at least comparable to scanning protocols requiring oral contrast if not better.

3.  
Prospective Comparison of Helical CT of the Abdomen and pelvis without and with oral contrast in assessing acute abdominal pain in Adult Emergency Department Patients 

Background: The need for oral contrast enhancement with newer abdominal CT technologies is uncertain

Methods: 100 adults with acute nontraumatic abdominal pain without and then with oral contrast. Interpreted independently by different radiologists and a significant difference in interpretation was defined as one that resulted in a change in patient management.

Results: Significant disagreement in interpretation of the contrast vs noncontrast ct scans for 21 patients (an agreement level of 79%). 11/21 negative unenhanced CT and abnormality on contrast CT. 6/21 abnormal unenhanced and normal contrast CT. 4/21 were abnormal on both scans but significant abnormalities in the reported abnormalities. On unblinded review of the discordant CT’s by two radiologists, 2/21 discordant on the basis of the oral contrast protocol and the rest d/t interobserver variability.

Conclusion: While there was disagreement in the interpretation of oral contrast-enhanced and unenhanced CT scans in 21% of these ED patients with nontraumatic acute abdominal pain, this was almost always due to interobserver variability, rather than increased accuracy secondary to contrast enhancement.

In other words, it’s not the contrast that makes the difference but the radiologist!!

Methods: A retrospective review of blunt intra-abdominal injury and were admitted to a level 1 trauma center from May 1996 to September 2001. Abdominal CT scans were performed with intravenous contrast but without oral contrast. All gastrointestinal injuries were confirmed by laparotomy, autopsy, or additional imaging studies.

Results: 6,052 patients underwent abdominal CT scan and 106 patients (1.8%) had gastrointestinal injuries identified. CT result was “abnormal” in 91 of the 106 patients (86%; 95% confidence interval [CI] 78% to 92%). Findings were suggestive of gastrointestinal injury in 81 of the 106 patients (76%; 95% CI 67 to 84%). Abdominal CT scan found gastrointestinal injury in 58 of the 64 patients with major gastrointestinal injury (91%; 95% CI 81 to 96%). 238 (4%) patients had findings suspicious for gastrointestinal injuries on CT but never confirmed.

Conclusion: Helical Abdominal CT scan without oral contrast identified nearly 3/4ths of patients with blunt gastrointestinal injuries. Sensitivity improves in the subset of patient with major gastrointestinal injuries.

5. Blunt Abdominal Trauma: Performance of CT without Oral Contrast Material

Background: Most prior studies were based on protocols in which conventional or single-detector row helical CT technology was used with both intravenous and oral contrast material but at this level 1 trauma center all ct examinations are with a multidetector row CT scanner without oral constrast material in patients suspected of having abdominal injury secondary to blunt trauma. In the absence of gross bowel wall disruption, reported ct signs of bowel and mesenteric injury include bowel wall discontinuity, pneumoperitoneum, focal bowel wall thickening, mural hematoma, pneumatosis, mesenteric hematoma, triangle shaped fluid collections in the mesentery, abnormal mural enhancement, extravasation of contrast material from mesenteric vessels, the sentinel clot sign, and extravasation of oral contrast material. Of these findings, extravasation of oral contrast material was determined to be the least sensitive for bowel and mesenteric injury.

Methods: Retrospective study, reviewed CT reports for all adult patients during a 2 year period in the setting of blunt abdominal trauma and referred for CT of the abdomen and pelvis within 24 hours after injury. 1082 patients with a mean age of 39.8 years. mechanism of injury were collision of motor vehicles (n= 652) fall from height (n=179) collision of motor vehicle with pedestrian (n=101), assault (n= 79), and others (n=71). Reports were generated by nine radiologists with various levels of experience (2-20 years) in the interpretation of trauma CT scans.
Results: CT scans reported negative for abdominal injury in 932 patients. Solid organ injury with or without hemoperitoneum, without findings suspicious for bowel or mesenteric trauma was identified in 102 patients. 34 patients found to have only free fluid as an abnormal finding. 14 patients had findings suspicious for bowel or mesenteric injury with or without associated solid organ injury. The results of the study show 1066 were true negative, 9 true positive, 2 false negative, 5 false positive CT interpretations. The sensitivity for identification of bowel or mesenteric injury requiring surgical repair was 82% (9 of 11 patients; 95% CI: 52%, 95%), specificity was 99% (1066 of 1071; 95% CI 98%, 99%), positive predictive value was 64% (9 of 14; 95% CI 39%, 83%) and negative predictive value was 99% (1066 of 1068; 95% CI 98%, 99%)

Conclusion: oral contrast material has been shown useful for depicting bowel injuries of the duodenum and proximal jejunum as well as pancreatic and mesenteric injuries. The addition of oral contrast material is also helpful for depicting bowel wall thickness as well as for clearly differentiating loops of bowel from other soft tissues or free fluid. The results of this study suggests, “without oral contrast is adequate for evaluation of patients with blunt abdominal trauma”

Limitations of study include unproved findings were considered false positive which negatively affected the performance results. 2 false negatives found both cases involved injury to the distal colon, which is unlikely that oral contrast material would have been helpful for identifying these injuries, given their distal location. The improved quality provided by the multi-detector row CT and the increased awareness of other signs of visceral and mesenteric injuries has greatly improved diagnostic ability and made routine oral contrast not routinely necessary for detecting bowel or mesenteric injury in patients with blunt abdominal trauma. Given the ever increasing number of emergency CT examinations and the increasing dependence on emergency radiology departments to perform CT safely and efficiently, we believe that the acquisition of initial CT scans without oral contrast material helps us to meet both criteria of safety and efficiency without sacrificing diagnostic accuracy.

6. **Eliminating routine oral contrast use for CT in the emergency department: impact on patient throughput and diagnosis**


Methods: A retrospective analysis was performed on patients undergoing Abdominopelvic CT during 2 month periods prior to and following oral contrast protocol change in an urban tertiary care ED. Patients with inflammatory bowel disease, prior gastrointestinal tract altering surgery, or lean body habitus continued to receive oral contrast. Of 2001 patients, 1,218 remained in the study; 607 prior to protocol and 611 following. Data collected included patient demographics, acute CT findings per final radiology report, repeat CT imaging with oral contrast during patient visit following a non-oral contrast CT, 72 hour ED patient return if
discharged from ED, and repeat/additional ap imaging during patient admission. Patient ED length of stay and time from CT order to CT performed were obtained from an ED database. 

**Results:** ED LOS decreased by a mean of 97.7 min (P<0.001) and time from CT order to CT performed decreased by a mean of 66.2 min (P<0.001). No difference in percentage of acute CT findings, admission, discharge, or return to the ED. 3 had repeat with oral contrast to better visualize the appendix with all negative pre and post reads. 

**Conclusion:** Elimination of routine of oral contrast use in the ED in patients eligible for oral contrast may lead to decrease in patient time from CT ordered to CT performed as in mean ED LOS. No patient had a repeat CT with oral contrast during the initial ED or 72-hour ED return visit that resulted in a change in the CT diagnosis. Furthermore, no patient admitted to the hospital following a CT without oral contrast or acute CT findings had subsequent AP imaging during their hospital course that led to a change in diagnosis. Limitations include their determination of a “thin” patient was subjective. However, Anderson et al. in 2010 found that differences in-patient BMI did not significantly influence reader confidence in the diagnosis of appendicitis in patients with or without oral contrast.

“The proper function of man is to live, not to exist. I shall not waste my days in trying to prolong them. I shall use my time.”

— Jack London