

Block 5 Journal Club Summery
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Is a non-Contrast CT of the abdomen and pelvis enough to rule out life-threatening intra-abdominal problems in patients presenting the ER with non-traumatic abdominal pain?

Scenario/Introduction:

60 y/o F with PMH of HTN presents to the ER with poorly localized abdominal pain, nausea, and vomiting. She has an elevated lactate and borderline hypotension in the ER but a normal non-contrast CT of the abdomen. The remainder of her labs and studies (cardiac, infectious etc) are unremarkable. She is given IVF, started on lifesaving Vancomycin and Zosyn and admitted to the ICU with a surgery consult. She is requiring low dose pressors but is mentating well, appears relatively comfortable and is otherwise well appearing.

12 hours later she is weaned off pressors. Pain is improved. She is taking clear liquids and is transferred out of the ICU.

24 hours after that she comes back to the ICU on Bipap with perceived “difficulty breathing” by her floor RN, but with profound metabolic acidosis. Over the next hour she is successfully coded once, but then her family opts for DNR-CC and she dies. Family refuses an Autopsy.

What did we miss? And could an IV contrast study have changed anything in her course?

Background Articles

1. Imaging findings of acute intravascular thrombus on non-enhanced computed tomography. Whitesell RT, Steenburg SD. *Emerg Radiol.* 2014 Jun;21(3):271-7. doi: 10.1007/s10140-014-1210-8. Epub 2014 Mar 21. Review. PubMed PMID: 24652034.
2. Negative predictive value of intravenous contrast-enhanced CT of the abdomen for patients presenting to the emergency department with undifferentiated upper abdominal pain. Ham H, McInnes MD, Woo M, Lemonde S. *Emerg Radiol.* 2012 Jan;19(1):19-26. doi: 10.1007/s10140-011-0996-x. Epub 2011 Nov 10. PubMed PMID: 22072086.

Discussion Articles

1. Is unenhanced CT sufficient for evaluation of acute abdominal pain? Basak S, Nazarian LN, Wechsler RJ, Parker L, Williams BD, Lev-Toaff AS, Kurtz AB. *Clin Imaging.* 2002 Nov-Dec;26(6):405-7. PubMed PMID: 12427436.
2. Efficacy of Non-contrast computed Tomography of the Abdomen and Pelvis for Evaluating Non-traumatic Acute Abdominal Pain in the Emergency Department. Payor A, Jois P, Wilson J, Kedar R, Nallamshetty L, Grubb S, Sullivan C, Fowler T J *Emerg Med.* 2015 Aug 22. pii: S0736-4679(15)00684-8. doi: 10.1016/j.jemermed.2015.06.062. [Epub ahead of print] PubMed PMID: 26306680

3. CT Scan for suspected acute abdominal process: Impact of combinations of IV, oral, and rectal contrast Hill BC, Johnson SC, Owens EK, Gerber JL, Senagore AJ. World J Surg. 2010 Apr;34(4):699-703. doi: 10.1007/s00268-009-0379-6. PubMed PMID: 20054539.

Reference Articles

1. Users' guides to the medical literature. III. How to use an article about a diagnostic test. Are the results of the study valid? R. Jaeschke, G.H. Guyatt, and D.L. Sackett, JAMA, 271:389-391 (1994).
2. Users' guides to the medical literature. III. How to use an article about a diagnostic test. B. What are the results and will they help me in caring for my patients? R. Jaeschke, G.H. Guyatt, and D.L. Sackett, JAMA, 271:702-707(1994).

CT's are rapid non-invasive tests that are almost universally available in the ER. While many lab tests and physical exam findings are questioned, the "donut of truth" is used to help us diagnose and pursue appropriate treatment for a variety of medical problems and abdominal pain is no different. While there is always the risk of radiation, this is generally considered small in the adult population. The use of IV contrast adds additional risk including allergy to the contrast and contrast induced nephropathy with IV contrast material being the 3rd leading cause of acute kidney injury in the hospitalized patient. These studies looked at if and when IV contrast may be helpful.

Background article Summary points:

1. The Whitesell article discusses findings that may be seen on a Non-contrast CT in acute intravascular thrombus. Some of these findings include the "hyperdense sign" which is the finding that can be seen as a result of clots which have increased Hounsfield units compared to the surrounding blood. This is seen better when narrower windows are used. Expansion of the clot vessel and adjacent edema may be also seen. Some of these findings may have prognostic significance as well because clots that are denser are more amenable to TPA.
2. The Ham article was a small study that looked at the negative predictive value of CT of the abdomen for undifferentiated upper abdominal pain. While many patients were excluded, it showed a 36% miss rate for abdominal CT in general.

Discussion article Summary points:

1. The Basak article, while an older study published in 2002, was a prospective study of patients presenting with less than 48 hours of non-traumatic abdominal pain. Patients had a non-enhanced scan and if a cause for their pain was not found on the initial scan they had another scan with IV contrast. The 2 scans were then read immediately and at a later date by another radiologist. In only 1 of 93 patients was a diagnosis reached with IV contrast that was not seen on the

non-contrast study and the two radiologists' opinions differed on this as well. Based on the results of this study the use of IV contrast does not add significantly to obtaining a diagnosis. One of the major limitations, other than small size, was the fact that none of the patients enrolled in the study had ischemic or embolic disease.

2. The Payor study followed patients who underwent a non-contrast abdominal CT for non-traumatic abdominal pain in the ER for 7 days to see if any required abdominal surgery or died as a result of pathology not seen on their initial non-contrasted abdominal CT. While also small (after all exclusion criteria met, only 74 patients were enrolled), this study also found that no serious pathology by the definition above was missed with the non-contrast CT. One of the major limitations of this study was the fact that the doctor had discretion in terms of the study he or she chose to order and if mesenteric ischemia or aortic pathology was suspected the practitioner ordered contrast and the patient was excluded from the study. These are two of the rarer but most life threatening diagnosis we would be most concerned about missing in the ER.
3. The Hill article was a retrospective study of inpatients who underwent CT of the abdomen with a combination of IV, oral, or rectal contrast or unenhanced CT study. They found that regardless of the combination of contrast used, the correct diagnosis was made 93% of the time. While this study too would suggest contrast of any kind is not that beneficial, the fact that the physician chose what study to order is again a significant limitation that may just show that doctors are pretty good at using history and physical to determine the most likely etiology of their patient's symptoms and choosing the best study to confirm their suspicions.

Take Home Points:

- Based on these articles, for many if not most causes of non-traumatic abdominal pain in the ER, a non-contrast CT can provide as much information as a IV contrast enhanced study without the risk that comes with contrast.
- Some of the variation we see in the use of IV contrast from hospital to hospital depends on radiologists' comfort level in reading non-contrasted studies and in looking for some of the more subtle findings such as inflammatory response as well as the number of cuts used in scanning.
- You can't treat what you don't diagnose. While this may seem obvious, it is really the very essence of what we do in the ER in determining a diagnosis and rapidly getting the critical patient to appropriate treatment. So know what you're radiologist prefers and if you have a high index of suspicion and don't yet have a diagnosis to explain a patient's symptoms, consider additional imaging/testing because while an ICU bed and Levophed is a disposition, it may not be the best one for your patient