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Block 8 CAT
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Wild Card Option: Annals of Emergency Medicine

Citation:
Hinson JS, Ehmann MR, Fine DM, et al. Risk of Acute Kidney Injury after Intravenous Contrast Media Administration. Ann Emerg Med. 2017 Jan 19.

Clinical Question:
Is it reasonable to stop worrying about contrast-induced nephropathy when ordering contrast-enhanced CT scans in the Emergency Department, such as a CT scan to rule out pulmonary embolism?

Bottom Line Up Front:
For patients in the ED with mildly or moderately elevated creatinine (<4 mg/dL) without history of dialysis or renal transplant who urgently need a contrast-enhanced CT scan, such as to rule out a pulmonary embolism, it is reasonable to place the order and reassure the patient that the risk of contrast-induced nephropathy in this case is likely minimal. This change in practice may require conversations with the radiologist and may depend on local policies until a randomized trial can confirm the findings of this study.

Introduction:
Intravenous iodinated contrast is routinely used to enhance the diagnostic accuracy of CT scans ordered in the ED. Use of contrast is often limited by concerns about contrast-induced nephropathy. However, the causal relationship between use of contrast and the development of acute kidney injury is being challenged given the absence of control populations in the majority of studies looking at this relationship. Additionally, one of the potential confounders of current understanding is the development of low- and iso-osmolar contrast media that have been widely adopted and the questionable accuracy of extrapolating findings from the original studies that showed contrast-induced nephropathy from arterial angiographic studies.

Study Design:
This study was a retrospective cohort analysis in a single-center urban academic ED over 5 years involving 17,934 adult patients. Logistic regression modeling and propensity score matching were used to test for an independent association between contrast administration and kidney injury, with a power sufficient to detect a difference in incidence between populations as low as 1.5%. Three assigned groups were those undergoing contrast-enhanced CT, unenhanced CT, and a matched control group of similar ED patients not undergoing any CT imaging. Exclusion criteria included those with missing or undesired creatinine levels (<0.4 mg/dL, ≥4.0 mg/dL), those with a history of dialysis or renal transplant, those with a previous ED visit or CT scan within the preceding 6 months, and those with a contrast CT performed within 72 hours of ED departure. Primary outcome was acute kidney injury (AKI), defined as creatinine at 48-72 hours showing absolute increase of ≥0.5 mg/dL or ≥25% from baseline on arrival.

Results:
Rate of (AKI) was about 10-11% and similar between the three groups. This rate of AKI may overestimate the true incidence of AKI since a large percentage of patients in this study were admitted and thus possibly more ill than the general ED population at other locations. Secondary more patient-centered outcomes in this study included progression to chronic kidney disease, dialysis or renal transplant within 6 months. There was no significant difference in primary or secondary outcome. Clinicians were more likely to prescribe intravenous fluids when contrast was used, which was associated with a lower probability of developing AKI. Although not part of the primary analysis, supplemental data

analysis for the 493 patients with initial creatinine level above 4.0 mg/dL similarly showed no increased risk of AKI in these patients after contrast.

Limitations:

This study addresses an important question as the largest controlled study to date of acute kidney injury after contrast administration in the ED. Use of control groups with propensity matching is a particularly useful aspect of this study. However, conclusions are limited by this study's retrospective and single center design. The study design leaves room for possible bias masking the true rate of AKI as a result of the nephroprotective treatment patterns observed, such as the increased use of IV fluids in those with a higher baseline creatinine. Another fault with the study is that the group receiving unenhanced CT scan was older by about 7 years with a lower baseline GFR and a higher prevalence of diseases such as DM, CHF, and CKD.

Conclusion:

Despite its limitations, this study highlights the lack of convincing causal relationship between use of modern contrast-enhanced CT scans in the ED and development of kidney injury for patients with mild to moderate elevation of creatinine. Validation of this study's conclusions in a randomized trial is warranted. Design of such a randomized trial is much more ethically feasible thanks to the data in this study. In the meantime, it is worth considering the potential morbidity and mortality from failure to diagnose possibly life-threatening conditions, which likely outweigh any potential risk of contrast-induced nephropathy. It is reasonable to reassure the patient that the risk of contrast-induced nephropathy is likely minimal. This change in practice may require conversations with the radiologist and may depend on local policies until a randomized trial can confirm the findings of this study.