UAMS EM Journal Club
November 2020 Summary
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Does Coronary CT Angiography Affect Patient Outcomes?

Clinical Bottom Line:
While multiple studies show that coronary CT angiography (CCTA) had no effect on adverse cardiac events despite increased number of interventions, the SCOT-HEART 5-year study suggests that it may reduce death from cardiovascular disease and nonfatal MI and may increase the initiation of preventative therapies. There is some evidence that CCTA may reduce hospital length of stay.

PICO Question:
"In patients for whom we have a low to moderate suspicion of ACS, does use of CCTA lower their risk of MACE?"

Background:
Heart disease is the leading cause of death in the United States. Coronary artery disease is the most common type of heart disease to cause death. Acute coronary syndrome, a type of coronary artery disease, includes non-ST-elevation myocardial infarction (NSTEMI), ST-elevation MI (STEMI) and unstable angina. Many researchers have evaluated different diagnostic tools and scoring systems to accurately diagnose patients with acute coronary syndrome, so interventions can be made to decrease the risk of death and adverse outcomes. Two papers, "Coronary CT Angiography and 5-year Risk of Myocardial Infarction" and "Acute chest pain evaluation using coronary computed tomography angiography compared with standard care: a meta-analysis of randomized clinical trials" evaluated clinical outcomes of patients with low to moderate risk chest pain who were evaluated with the diagnostic tool, Coronary CT Angiography (Coronary CTA).

https://www.cdc.gov/heartdisease/facts.htm#:~:text=Heart%20disease%20is%20the%20leading,1%20in%20every%204%20deaths.

https://www.uptodate.com/contents/acute-coronary-syndrome-terminology-and-classification

Trial 1
SCOT-HEART. Coronary CT Angiography and 5-Year Risk of Myocardial Infarction. *New England Journal of Medicine*. 2018;379(10):924-933. doi:10.1056/nejmoa1805971

https://pubmed.ncbi.nlm.nih.gov/30145934/

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Validity
Some risk of bias due to lack of blinding and use of testing to determine categorization of patient. For instance, CCTA results likely influenced whether the patients were diagnosed with myocardial infarction or not.

The Basics:
Investigators designed an open-label, multi-center, parallel group trial to find out whether use of CCTA influenced morbidity and mortality. Patients who had been referred to cardiology clinic for stable chest pain were assigned to standard care or standard care plus CCTA arms. Providers had access to all data on the patient. Treatments, interventions and health outcomes were followed for up to 7 years after group assignment for 4,146 patients.

Inclusion Criteria:
Patients were included who were 18-75 years old and had been referred to a cardiologist for what was believed to be stable chest pain.

Exclusion Criteria:
Patients were excluded who were unable or unwilling to undergo CT scanning, had GFR<30mL/min, who had a major iodinated contrast allergy, were unable to give consent, were known to be pregnant or who had known acute coronary syndrome within the last 3 months.

Primary Outcome:
Composite outcome of death from cardiovascular causes and nonfatal MI.

Other Endpoints:
Rate of noncardiovascular death, death from any cause, myocardial infarction and stroke.

Results:
Rate of death from cardiovascular disease plus nonfatal MI was lower in the CTA group than in the standard-care group (2.3% in the CTA group vs. 3.9% in the standard-care group with a hazard ratio of 0.59; 95% CI, 0.41 to 0.84; P = 0.004). This was mainly due to different rates of nonfatal MI. The rate of invasive intervention was higher in the CTA group over the first month but was not significantly different over the time of study.

Limitations/Bias:
1. A composite endpoint weakens the conclusion, especially with disparate endpoints such as, in this case, “dead” and “not dead.” Severity of nonfatal MI was not specified.
2. Open-label trial introduces risk of bias.
3. Population of Scotland does not match our patient population very well.

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Trial 2:
Gongora CA, Bavishi C, Uretsky S, Argulian E. Acute chest pain evaluation using coronary computed tomography angiography compared with standard of care: a meta-analysis of randomised clinical trials. Heart. 2018 Feb;104(3):215-221. doi: 10.1136/heartjnl-2017-311647. Epub 2017 Aug 30. PMID: 28855273.

https://pubmed.ncbi.nlm.nih.gov/28855273/

Validity
Yes, the results of this systematic review are valid because the question was not too specific or too broad since they were looking at patients with low to moderate risk patients with acute chest pain. They also used many electronic data bases including PubMed, EMBASE, SCOPUS, and ClinicalTrials.gov and had no language restrictions. The studies included in the systematic review were all randomized control clinical trials that were found to have no evidence of high risk bias through the use of the Cochran Collaboration Tool. Also, this systematic review outlined how they assessed the randomized control trials so someone else could reproduce their results. The one minor flaw was in the definition of MI and MACE because these were defined by the individual studies.

The Basics:
Investigators performed a systematic review and meta-analysis of ten randomized control trials to find out if the use of CCTA compared to standard of care in patients with low to moderate risk patients with acute chest pain was associated with a difference in all cause mortality, major adverse cardiac events (MACE), myocardial infarction (MI), invasive coronary angiography (ICA) and revascularization. They searched electronic databases to identify randomized controlled trials. Then, two investigators analyzed the studies. The studies had a follow up period of 1 to 19 months.

Inclusion Criteria:
This meta-analysis only included randomized trials that looked at low to moderate risk patients presenting with acute chest pain either in the emergency department or inpatient. The trials had to report their clinical outcomes, including all cause mortality, myocardial infarction, major adverse cardiac events, invasive coronary angiography and revascularization. Studies required a non-ischemic EKG and negative cardiac biomarkers.

Exclusion Criteria:
The exclusion criteria included pregnancy, renal failure, allergy to iodine contrast and inability to obtain informed consent.

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Primary Outcome:
The primary clinical outcomes were all cause mortality, myocardial infarction, major adverse cardiac events, invasive coronary angiography and revascularization (percutaneous coronary intervention and coronary artery bypass graft.

Other Endpoints:
Other endpoints in the studies included in this meta-analysis looked at repeat ED visits and repeat hospitalizations after the index evaluation for chest pain. Another end point was length of stay and cost of acute care.

Results:
There was no significant differences in all-cause mortality, MI, or MACE between the groups. There was significantly higher rates of ICA and revascularization in the CCTA arm.

Limitations/Bias:
The results only looked at short-term clinical outcomes. It is not known if finding an anatomic lesion on CCTA leads to more aggressive medical management of lipid lowering therapy and lifestyle modification which could ultimately affect mortality. This meta-analysis only evaluated 10 randomized trials so publication bias could still be a limitation of this study. This study did not look at the radiation exposure in patients assigned to different testing strategies. This meta-analysis showed there was no difference in MACE; however, there was a significantly higher rate of ICA and revascularization. Regarding this finding, it is important to note that procedures are not without risks and it is not known what risks/adverse events occurred due to patients undergoing more procedures in the CCTA group.