Critical Review Form

Meta-analysis

Detection of non-ST-elevation myocardial infarction and unstable angina in the acute setting: meta-analysis of diagnostic performance of multi-detector computed tomographic angiography, *BMC Cardiovasc Disord* 2007; 7: 39

Objective: **"The purpose of our study was to review the literature and perform a meta-analysis on the diagnostic performance of multi-detector computed tomography angiography for the exclusion of ACS in the emergency department. More specifically, we focused on the early non-invasive diagnosis of non ST elevation myocardial infarction (NSTEMI) with initially negative biomarkers and unstable angina pectoris (UAP). "**

Methods: **Authors searched CRISP, DARE, INAHTA and Cochrane Database of Systematic Reviews databases for reviews on MDCTA. Next they searched PUBMED using a previously described search strategy. In addition they hand-searched several core journals in several languages including English, Italian, Dutch, and French. Studies were chosen on the basis of whether the criteria for a positive clinical outcome was explicitly defined and reported. In addition studies had to report the absolute numbers of true-positive, false-negative, false-positives, and true-negatives cases. Quality was assessed using QUADAS with a minimum score of 12.**

The authors then extracted data per STARD standards, and calculated the FN, FP, TP, TN or requested the information from authors. If absolute numbers were not available they were calculated per Bayes Theorem. The results from two authors were compared using Cohen's Kappa, heterogeneity was expressed the with I^2 statistic, publication bias assessed with a funnel plot.

Guide	Question	Comments
I	***Are the results valid?***	
1.	Did the review explicitly address a sensible question?	Yes. MDCTA for ruling out ACS in the ED with – biomarkers.
2.	Was the search for relevant studies details and exhaustive?	CRISP, DARE, INAHTA – no studies. Cochrane, PubMed search focused on ED studies. 9-year hand search in specific journals.
3.	Were the primary studies of high methodological quality?	1. At least four slice MDCT 2. All had either follow-up cath or clinical info. 3. Sens/Spec listed or derived 4. MDCTA was positive in 50% or more 5. Only 1 RCT! 6. Not all explicitly state low-risk chest pain

4.	Were the assessments of the included studies reproducible?	1. STARD, QUADAS 2. Cohen's Kappa 3. I^2 statistic, Cochrane's Q: inconsistency or heterogeneity 4. Funnel Plot to evaluate Pub bias.
II.	***What are the results?***	
1.	What are the overall results of the study?	- Total 566 patients. - No heterogeneity for NLR but present for SE, SP, PLR - Pooled LR^- = 0.12 (95% CI; 0.06-0.21) - Pooled LR^+ = 8.6 (95% CI; 5.03-14.7) - Sensitivity = 0.95 (95% CI; 0.90-0.98) - Specificity = 0.90 (95% CI 0.87 - 0.93) - AUC = 0.97 (this means the technology is 97% likely to make the right diagnosis)
2.	How precise are the results?	The confidence intervals are narrow and precise. The question to ask is whether the lower margin of the CI's would alter your use of this test. Of note, the proportion of non-assessable patients was 3% (95% CI 1%=7%).
3.	Were the results similar from study to study?	There are three studies that differ from the rest and likely represent the heterogeneity in the overall results. Figures 4 through 8 illustrate this heterogeneity. The confidence intervals for several studies are also large. It's surprising that overall there was little heterogeneity
III.	***Will the results help me in caring for my patients?***	
1.	How can I best interpret the results to apply them to the care of my patients?	MDCTA in patients with chest pain in acute setting has a high negative-LR & can exclude CAD while including concurrently identifying other diagnoses. However, costs, operator variability, & role of radiation remain unexplored.
2.	Were all patient important outcomes considered?	Yes, for cardiac conditions. No in terms of exploring the effects of radiation dose and the number of additional tests. Only 3% of all tests were non-assessable in stark contrast to the 24% cited in the PGY I RCT.

3.	Are the benefits worth the costs and potential risks?	Yes if the point is to make sure that a CT can accurately identify significant coronary artery calcification that suggests CAD is the underlying cause of the patient's chest pain. Unclear if excess testing and radiation lead to saving money. Also there are several other diagnoses (e.g. lung nodules) that may impose additional burden on patients they would not otherwise carry. Conversely, there may be other diagnoses such as PE or dissection that the physician may not otherwise have suspected. The impact on these scenarios is not the subject of this paper and remains unexplored.

Limitations

1) **Small pooled sample (566 total patients) suggests caution in the interpretation**
2) **Heterogeneity in some studies due to small samples (though this was adjusted for statistically in the analysis)**
3) **Only 3% were non diagnostic which compares to 21% in a reviewed RCT.**
4) **Lack of standardized pre-test probability scoring in all included studies of the meta-analysis**

Bottom Line **If the ultimate goal is to rule out the degree of coronary calcification as a proxy for suspected ACS in a low risk population of patients, then MDCTA performed very accurately (pooled sensitivity of 95%, specificity 90%, negative-LR= 0 .10). Given that the AUC in the adjusted summary Receiver Operating Curve was 0.97, MDCTA on low risk patients can be 97% likely to make the right diagnosis. However, issues such as additional unnecessary testing and risk of radiation dose were not addressed in this paper. Furthermore, specific equipment, training specific Radiologists expertise, and chemical control of heart rate are all necessary to make MDCTA successful. BMI and other confounding variables lead to technically poor studies and could result in a significant increase in additional testing. Future studies using less radiation and institution specific capabilities should be considered when moving to a MDCTA strategy. Future studies comparing the radiation doses of MDCTA to nuclear medicine stress testing are also necessary.**