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REPLY: A Commentary on the SPARC Study

We appreciate the interest of Drs. Lundbye and Heller in our paper (1). They are concerned about the selection of patients for computed tomography angiography, positron emission tomography, and single-photon emission computed tomography, because there were many differences in the baseline characteristics of these groups. The baseline characteristics listed in Table 1 of our paper are for the entire study population, not the propensity score–matched patients used to compare the outcomes. The characteristics of the matched patients (Table 3 in our paper) are quite similar. Although propensity score matching may not fully adjust for patient selection, it largely corrects for the imbalances in baseline characteristics.

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Coronary CT Angiography Again Results in Better Patient Outcomes

The SPARC (Study of Myocardial Perfusion and Coronary Anatomy Imaging Roles in Coronary Artery Disease) Study by Hlatky et al. (1) is the latest of multiple studies showing improved outcomes with use of computed tomography angiography (CTA). Although this may not be surprising, because neither single-photon emission computed tomography (SPECT) nor positron emission tomography can detect subclinical atherosclerosis, it is understated in the current paper. The 2-year event rate for nonfatal myocardial infarction (MI) and death, a standard hard endpoint for many studies, was 1% (6 of 590) for CTA, 2.8% (16 of 565) for SPECT, and 6.6% (36 of 548) for positron emission tomography ($p < 0.001$), favoring CTA. This was meaningful in absolute terms as well, representing a number needed to scan of only 55 for CTA over SPECT and 18 for CTA over positron emission tomography to prevent one MI or death. The cost-effectiveness per life year saved was also quite low at $10,700 per life year added. Furthermore, the median (interquartile range) cost of care for CTA and SPECT was virtually identical at $2,820 ($1,777 to $4,585) for CTA and $2,810 ($1,692 to $4,436) for SPECT.

The results of SPARC are highly concurrent with a much larger observation by Shreibati et al. (2). They demonstrated that compared with stress myocardial perfusion imaging, coronary CTA was associated with a 40% reduction (odds ratio: 0.60; 95% confidence interval [CI]: 0.37 to 0.98; $p = 0.04$) in acute MI after multivariable adjustment. The study, which was limited to 180 days of follow-up, included 8,820 patients undergoing CTA and 132,343 patients undergoing myocardial perfusion imaging. Despite the short follow-up period, an 18% (nonsignificant) reduction in all-cause mortality (1.05% for CTA vs. 1.28% for myocardial perfusion imaging; $p = 0.32$) was also shown.

This benefit of CTA as compared with functional testing was evaluated in a meta-analysis of CTA and functional testing for diagnosis and outcomes (3). The combined results of 11 studies including 1,575 patients showed a higher diagnostic sensitivity for CTA versus exercise electrocardiography and SPECT (98% [95% CI: 93% to 99%] vs. 67% [95% CI: 54% to 78%] [$p < 0.001$] and 99% [95% CI: 96% to 100%] vs. 73% [95% CI: 59% to 83%] [$p = 0.001$], respectively). The specificity of CTA was 82% (95% CI: 63% to 93%) versus 46% (95% CI: 30% to 64%) ($p < 0.001$) for exercise

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electrocardiography and 71% (95% CI: 60% to 80%) versus 48% (95% CI: 31% to 64%) ($p = 0.14$) for SPECT. Seven nonrandomized studies including 216,603 patients with a mean follow-up period of 20 months assessed post-test outcomes, and the OR of CTA versus exercise electrocardiography/SPECT testing for acute MI was 0.53 (95% CI: 0.39 to 0.72; $p < 0.001$).

SPARC is the latest piece of the puzzle demonstrating improved outcomes with CTA. Whether these results are related to the higher accuracy of the test leading to increased appropriate use of revascularization, increased use of statins with CTA over SPECT (observed in SPARC), or yet undefined mechanisms requiring further evaluation, the advantage of CTA over functional testing continues to be demonstrated in every study that compares both tests.

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