echocardiographic examination. None of the conventional echocardiographic parameters (LV ejection fraction, LV volumes, LV mass index, E/A ratio, deceleration time, e′, a′, LA volume index, LA volume index/a′, tricuspid annular plane systolic excursion, and grade of diastolic dysfunction) were significant predictors of PAF. However, the LAEF was significantly reduced (37 ± 17% vs. 47 ± 11%, p = 0.016) in patients subsequently diagnosed with PAF. The risk of subsequently being diagnosed with PAF increased with decreasing tertile of the LAEF (**Figure 1**), and was approximately 10× higher for patients in the first tertile (with an LAEF ≤41%) compared with patients in the third tertile (with an LAEF >50%) (hazard ratio: 9.6; 95% confidence interval: 1.2 to 77.3; p = 0.033).

Age <60 years and an LAEF >50% individually predicted the absence of PAF with 94% and 95% accuracy, respectively. Furthermore, an age ≥60 years and an LAEF ≤50% correctly identified 85% and 92% of the PAF patients, respectively.

Using joint criteria by combining both cutoff values, the diagnostic utility was improved. If the patient was <60 years of age and had an LAEF >50%, the patient had no risk of PAF, corresponding to a negative predictive value of 100%. Furthermore, when using ≥60 years of age and/or an LAEF ≤50% as warning signals for the presence of PAF, no patient subsequently diagnosed with PAF would have been misclassified, corresponding to a sensitivity of 100%. In addition, if a patient was ≥60 years of age and had an LAEF <50%, the risk of suffering from PAF was 59%, corresponding to a positive predictive value of 59%.

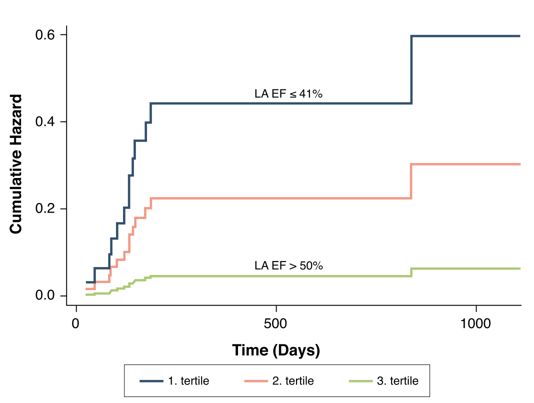


**FIGURE 1 LAEF and the Risk of PAF**

Cumulative hazard curves depicting the cumulative risk of paroxysmal atrial fibrillation (PAF) for patients stratified into tertiles of the left atrial emptying fraction (LAEF) (1. tertile ≤41%; 2. tertile >41% to ≤50%; 3. tertile >50).

This is the first study, using long-term rhythm monitoring, to demonstrate that a simple echocardiographic assessment of the left atrium function contributes significantly to risk stratification for PAF in patients with CS.

We found that a decrease in the LAEF was associated with an increased risk of PAF (**Figure 1**). Furthermore, using joint criteria by combining both cutoff values of age and LAEF, the diagnostic accuracy was increased to 100% for excluding PAF as the causal reason for the cryptogenic ischemic stroke. However, these results are from a relatively small sample size, and unless they are repeated in larger cohorts, the results cannot be extrapolated to the entire cohort of cryptogenic stroke patients.

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## The Ethics of Publishing Dual Exposure Scans Involving Ionizing Radiation When Validated Alternatives Exist

We read with great interest the Editor's concerns regarding the ethics of publishing medical imaging research that involves repeat radiation and contrast

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exposure to patients (1). The evaluation of new techniques on patients, especially if it involves ionizing radiation, remains challenging. It is essential that we take account of all the ethical issues involved when justifying exposures both for clinical and research studies. The imaging community, including medical physics experts and industry has been actively involved in the optimization of radiation doses of coronary computed tomography angiography (CTA) for many years and with significant success. Patient-specific protocols, automated tube current modulation systems, single heart beat acquisition, and most recently iterative reconstruction (IR) algorithms have all been used to achieve the lowest achievable dose while maintaining diagnostic quality. The evaluation of image quality with IR is challenging. In coronary CTA researchers have used different methods when comparing filtered back projection and IR. These include comparison of different patients randomly assigned to different protocols or the evaluation of a single population scanned twice with full-dose then reduced-dose examinations (2). Whereas the latter scenario has merit in that it allows direct intrapatient comparison, it may justifiably attract criticism given that alternative strategies are available to compare filtered back projection and IR images at no additional radiation or contrast dose. Repeat scans are possible when patients are referred for a clinical follow-up examination, as used previously for thoracic imaging (3); however, this is rarely likely to be the case for coronary artery disease assessment. The fundamental point about the study by Yin et al. (2), however, is that alternative strategies for comparing filtered back projection and IR on the same patient already exist by comparing standard-dose images and reduced-dose images reconstructed from the same acquisition. This is achievable using dual-source CT technology that acquires reduced-dose images from 1 x-ray tube (4). Dose reduction can also be simulated by adding noise within images. Validated informatics tools are able to add noise and simulate a broad range of dose levels and this has recently been applied to coronary CTA (5). Whereas the latter technique is a proxy for true reduced dose acquisition, it allows assessment of multiple combinations of noise and IR algorithms on identical datasets. The study by Yin et al. (2) may well be confounded by residual contrast, altered cardiac physiology, and response to contrast between scans, all of which may compound head-to-head analysis in the same patient. Every clinician performing medical imaging research should be aware of all the different available technical options, working in close conjunction with their medical physics experts. Only where no credible alternatives exist should research requiring multiple exposures be performed and published. In our humble opinion, this would avoid the tricky ethical considerations the *iJACC* editors allude to and form a reasonable basis from which to start the debate.

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## REPLY: The Ethics of Publishing Dual Exposure Scans Involving Ionizing Radiation When Validated Alternatives Exist

We thank Drs. Achenbach, Chandrashekhar, and Narula for initiating a refreshing debate on the ethics of publishing.

In our role as reviewers and editors of scientific contributions, it is not unusual to encounter submissions that reportedly have received sanctification by a local institutional review board, but were conducted in a fashion that places them in an ethical gray zone or renders them plainly unethical. Common examples include a purportedly "retrospective" nature of data analysis where patient management was obviously prospectively altered or the research use of ionizing radiation without approval by national agencies in countries where such a requirement