



## Catheter Ablation for Atrial Fibrillation Targeting Incremental Left Ventricular Ejection Fraction — Reply —

We appreciate the letter from Chapman and Imamura concerning the post-procedural systolic function and clinical outcomes following atrial fibrillation (AF) ablation. As they remarked, determining any other risk factors for persistently impaired systolic function following AF ablation is valuable, but we could not show the relationship between heart failure (HF) duration and an increase in left ventricular ejection fraction (LVEF) or prognosis due to a lack of detailed data.

An ischemic etiology in HF patients is a well-known factor for a condition refractory to therapeutic challenges, including medical treatment and cardiac resynchronization therapy.<sup>1,2</sup> Regarding the improvement in LVEF after AF ablation, a recent meta-analysis revealed an inverse relationship between the proportion of ischemic heart disease and improvement in LVEF.<sup>3</sup> We previously investigated the predictors of an improvement in LVEF (defined as an improvement to an LVEF >50% or an absolute increase of 20%) after AF ablation in patients with an impaired systolic function.<sup>4</sup> Only 6 patients had ischemic heart disease, and 4 of these patients experienced an improvement in LVEF ( $P=1.00$ ); this study had too small a sample size to assure statistical confidence. Having said that, we speculated that an ischemic etiology would principally have a negative effect on the improvement in LVEF, but that this would depend on the myocardial scar volume, as mentioned by Chapman and Imamura. It remains uncertain whether AF ablation could improve patients' prognosis regardless of an improvement in LVEF. An etiological difference in the prognosis following AF ablation is worth investigating in the future.

Atrial tachyarrhythmia (ATA) recurrence is one of the strong factors preventing improvements in the LVEF, as described previously.<sup>5</sup> In a previous study, we also elucidated that ATA recurrence has a significant effect on improvements in LVEF.<sup>4</sup> In our more recent study,<sup>6</sup> sinus rhythm was maintained after multiple procedures in 73% of all patients off anti-arrhythmic drugs 1 year after the index procedure. This strongly affected the absolute increase in LVEF (mean [ $\pm$ s.d.]  $9.6\pm 6.8\%$  vs.  $5.8\pm 10.0\%$  in the no recurrence and recurrence groups, respectively;  $P=0.007$ ), suggesting the importance of the maintenance of sinus rhythm by performing multiple procedures. In addition, ATA recurrences significantly predicted a poor prognosis in the univariate analysis (hazard ratio 3.62; 95% confidence interval 1.36–11.29;  $P=0.01$ ).<sup>4</sup> In addition, a previous study showed a significant reduction in the AF

burden after AF ablation even if AF recurred.<sup>7</sup> We demonstrated that 27% of the subjects with an improvement in LVEF after AF ablation had an ATA recurrence during the follow-up period, suggesting that the decrease in the AF burden possibly contributed to the improvement in LVEF.

We also reported that the pre-early diastolic mitral annular velocity ( $e'$ ) and pre-left ventricular end-systolic volume index (LVESVI) have substantial relationships with the improvement in LVEF.<sup>4</sup> Among the echocardiographic parameters,  $e'$  and LVESVI had a moderate predictive value for an improvement in LVEF (area under the curve 0.753 and 0.788, respectively). Furthermore, a high  $e'$  and low LVESVI could independently predict an improvement in LVEF after adjustment for relevant covariates, including the presence of structural heart disease, left atrial volume index, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker use, and ATA recurrence. We considered that these parameters could reflect the potential viability of the myocardium in AF patients with an impaired LVEF.

In our more recent study,<sup>6</sup> we investigated the association between pre- and post-procedural LVEF and prognosis, which finally revealed that post-procedural LVEF had a stronger association with prognosis than pre-procedural LVEF. A very important finding was that a post-procedural mid-range LVEF and preserved LVEF had a comparable prognosis, whereas a reduced LVEF had the worst prognosis; that is, post-procedural LVEF normalization is not mandatory to avoid a poor prognosis. Given these results, we estimate that left ventricular systolic function alone cannot predict the prognosis, but is one factor among many associated with the prognosis. This is a theme that should be investigated in detail to stratify appropriate candidates for AF ablation among patients with reduced LVEF.

### Disclosures

N.H. is a member of *Circulation Reports*' Editorial Team.

### IRB Information

This study was approved by the Institutional Review Board of Tokyo Women's Medical University (ID 4190-R).

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