

Quantification of Left Atrial Tissue Remodeling Using Intra-Atrial Dyssynchrony by Cardiac Magnetic Resonance Imaging

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Short Editorial related to the article: *Intra-Atrial Dyssynchrony Using Cardiac Magnetic Resonance to Quantify Tissue Remodeling in Patients with Atrial Fibrillation*

Morphological and functional characteristics of the left atrium (LA) play a key role in the pathogenesis of atrial fibrillation (AF), which represents a global health burden as the most common cardiac arrhythmia encountered in clinical practice.¹ For patients with drug-refractory AF, catheter-ablation may aid in a) prolonged restoration of sinus rhythm, b) decreased in total arrhythmic burden, symptomatic improvement, and c) better quality of life. However, catheter-ablation may not have a durable effect for a significant number of patients despite repeated procedures.² A variety of innovative procedural technologies aim to improve patient freedom from AF. Scientific progress in the identification of patient characteristics that suggest a favorable or poor likelihood of procedural success may enhance patient selection for catheter-ablation and optimize time utilization for the cardiac electrophysiologist.

Cardiac magnetic resonance (CMR) imaging with late gadolinium enhancement (LGE) has been shown to be a promising, non-invasive tool for the measurement of LA fibrosis, which predicts the recurrence of AF after catheter-ablation.^{3,4} While this tissue characterization of the LA represents a promising technology for patients with AF in whom catheter-ablation is being considered, it remains mostly these days at expert centers, has labor-intensive post-processing and necessitates the use of gadolinium contrast, which may exclude patients who have advanced kidney disease or allergic reactions to gadolinium. Functional assessment with intra-atrial dyssynchrony utilizing tissue-tracking represents

an elegant technique to characterize LA mechanics that does not require gadolinium contrast or significant post-processing and was recently shown to correlate with the recurrence of AF after catheter-ablation.⁴

In this issue, Ciuffo et al.⁵ advance the understanding of adverse LA remodeling and dysfunction in patients with AF. Using CMR to measure intra-atrial dyssynchrony in sinus rhythm, defined as the standard deviation of the time to the peak longitudinal strain [SD-TPS (%)] and pre-atrial contraction strain [SD-TPS_{preA} (%)] corrected by the cycle length. LA fibrosis was quantified using LGE images, which, interestingly, did not differ significantly between paroxysmal and persistent AF types. Notably, SD-TPS was significantly higher in patients with persistent AF than those with paroxysmal AF, although this association did not hold true for SD-TPS_{preA} between the AF types. On multivariable adjustment for age, sex, BMI, AF type, history of heart failure, OSA, hypertension, minimal LA volume and maximum LA longitudinal strain, both SD-TPS and SD-TPS_{preA} remained significantly associated with LA LGE, although the signal was much stronger for SD-TPS. Inter- and intra-reader reproducibility was excellent for both indices, and the data were post-processed in a short amount of time.

These findings highlight the potential for intra-atrial dyssynchrony by CMR to represent a fast and accurate surrogate of LA fibrosis, especially in the prediction of AF recurrence after catheter-ablation.^{3,4} The authors have appropriately acknowledged the potential for selection bias in their non-randomized, retrospective cohort, and this technique requires patients to be in sinus rhythm at the time of CMR imaging. Still, Ciuffo et al.⁵ have added valuable insights into the understanding of LA remodeling in AF and must be praised for their work, which studied a real-world population and considered the important concern of work-flow for CMR post-processing. Their findings should stimulate more research into the use of intra-atrial dyssynchrony as non-invasive risk stratification for patients with AF, which does not require gadolinium contrast to enhance patient selection for invasive therapies such as catheter-ablation.

Keywords

Atrial Fibrillation; Remodeling Atrial; Atrial Dyssynchrony Diagnostic Imaging; Magnetic Resonance Imaging.

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