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Commentary

From Atrial Fibrillation to Mitral Regurgitation: An Electrophysiological Perspective

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DESCRIPTION

Bautista et al., disclosed the left atrial substrate in patients with Atrial Fibrillation (AF) and moderate to severe Mitral Regurgitation (MR), investigating the causal relationship between substrate and clinical outcomes [1]. The study demonstrated that patients with MR and a Low Voltage Zone (LVZ) over the low posterior wall close to the mitral annulus are associated with poor recovery of MR and AF recurrence after catheter ablation. This investigation yields several implications and insights when considering the relationship between AF and MR. In the following reviews, we aim to discuss three main perspectives inspired by the study, along with insights from previous publications that assess this issue. Our particular focus is on the roles of both disease entities in the formation of atrial cardiomyopathy.

Mitral regurgitation in AF: An electrophysiologist's perspective

In Bautista's study, patients were diagnosed and graded based on the severity of regurgitation using echocardiograms. This measurement is universally accepted to assess common regurgitation caused by multiple factors, whether primary or secondary. Secondary MR was excluded from this study. Considering the varied outcomes of ablation concerning MR status, the formation characteristics of substrate in AF patients with mitral regurgitation should also be considered.

MR reaching a grade where the low voltage zone extensively covers the low posterior wall of the atrium might lead to an irreversible form of AF-induced MR. In such cases, the response to catheter ablation could be suboptimal, potentially resulting in higher recurrence rates. A LVZ in this region might be more arrhythmogenic compared to other areas, indicating a poorer response solely to Pulmonary Vein Isolation (PVI) strategies without additional substrate modification. This establishes a closed loop of pathophysiological interaction between AF and MR.

Based on this observation, AF patients presenting with a LVZ over the low posterior wall and moderate to severe MR might benefit from additional ablation approaches.

Mitral regurgitation and atrial remodeling: An enclosed circle

Bautista et al., also showcased the reversibility of atrial remodeling [1]. This study raises an intriguing question about whether MR should be considered a component of this remodeling process. Presently, there is no consensus on the definition of atrial remodeling, as it varies from one study to another and relies on data-acquisition methods like voltage endocardial mapping or cardiac magnetic resonance [2]. However, the purpose of delineating such atrial changes is to evaluate adverse structural abnormalities that promote atrial arrhythmias. In the study, these changes might have been initiated and exacerbated by the MR induced during the initial stages of AF. Similar to a vicious cycle, MR and AF might have mutually reinforced each other.

Furthermore, despite the limited number of patients, the study reported a higher recurrence rate of AF compared to the contemporary rate. This rate was notably higher in groups where there was no improvement in MR, indicating the persistence of ongoing remodeling due to backflow. Thus, early ablation of AF before the onset of MR might result in a lower recurrence rate. It would be valuable to analyze the disparity in AF recurrence rates between patients with no or mild MR and those with moderate to severe MR to comprehend the actual contribution of regurgitation to the initiation and sustenance of AF.

Another variable worth considering is the presence of Heart Failure (HF). A previous study by Hunter et al. demonstrated that patients with heart failure and AF were more likely to develop a LVZ at the posterior wall of the left atrium [3]. Functional MR is also prevalent among patients with HF and reduced ejection fraction. Considering all factors, the interplay between HF, AF, and MR appears to mutually advance each other's progression. Early catheter ablation, coupled with more

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extensive ablation for improved AF control, might represent the sole breakthrough solution to disrupt this vicious cycle [4].

Functional mitral regurgitation in AF: Functional or actual anatomic substrate

Considering the potential reversibility of MR and the proposed hypothesis of posterior tethering or inadequate remodeling of the mitral leaflet [5], the response of MR to AF ablation might deviate from the conventional understanding, as most changes induced by ablation predominantly target rhythm control. It is challenging to envision that such measures would structurally reverse the already tethered muscle. It's therefore more plausible that MR prior to ablation was primarily induced by both annulus dilation and irregular, abnormal atrial contractions.

CONCLUSION

The irregular contractions lead to variations in left atrial volume from beat to beat, affecting the normal coaptation of the mitral leaflet. Consequently, during AF, MR might be more pronounced, exacerbating the regurgitation beyond that seen in sinus rhythm. In summary, the study invites the electrophysiological community to delve deeper into the intricate interplay between AF and MR, fostering a more nuanced understanding that can inform tailored treatment strategies. Continued research in this area holds the promise of refining therapeutic approaches and improving outcomes for patients grappling with the complex interrelationship of AF and MR.

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