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Editorial

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Cryoballoon Ablation for Atrial Fibrillation in Hypertrophic Cardiomyopathy: A Step Forward or a Frozen Compromise?

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▸ See the article "Cryoballoon Ablation of Atrial Fibrillation in Patients With Hypertrophic Cardiomyopathy: From the Korean Cryoballoon Ablation Registry" in volume 55 on page 511.

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Cryoballoon ablation (CBA) has emerged as an effective alternative for rhythm control in atrial fibrillation (AF), offering procedural simplicity and reproducibility.[1] While radiofrequency catheter ablation (RFCA) has been the cornerstone of AF ablation, particularly in patients with structurally abnormal atria, data on using CBA in hypertrophic cardiomyopathy (HCM) remain limited. In this context, the study by Kim et al.[2] from the Korean Cryoballoon Ablation Registry provides valuable insights into the efficacy and safety of CBA in patients with AF and HCM. Their findings suggest that CBA may be a viable treatment option, with an atrial tachyarrhythmia (AT)-free survival rate of approximately 50% at 2 years, comparable to previous RFCA studies.[3] Importantly, procedural safety was not significantly different between HCM and non-HCM patients, reinforcing the feasibility of CBA in this population. However, the study also highlights a significantly higher recurrence rate in HCM patients, underscoring the unique challenges of managing AF in this cohort.

One of the key takeaways from this study is that HCM itself was not an independent predictor of AT recurrence. Instead, left atrial size and persistent AF were the strongest predictors of recurrence, consistent with prior studies showing that atrial remodeling plays a crucial role in AF progression.[3][4] This finding has important clinical implications, suggesting that early intervention before significant atrial enlargement may be critical in optimizing outcomes.[5] Notably, in the subgroup of patients with persistent AF, recurrence rates were similar between HCM and non-HCM patients, reinforcing that atrial substrate, rather than the underlying cardiomyopathy, is the primary determinant of ablation success. Given that HCM patients often present with larger atria and advanced atrial myopathy, it is possible that a more aggressive approach—incorporating additional lesion sets beyond pulmonary vein isolation (PVI)—may be necessary to achieve durable rhythm control.[3]

While the study provides compelling evidence supporting the use of CBA in HCM, it also raises important questions about the optimal ablation strategy in this high-risk population. Unlike RFCA, which allows for targeted lesion placement beyond PVI, CBA is inherently limited in its ability to address non-pulmonary vein triggers.[6] Previous studies have shown that HCM patients often exhibit complex atrial substrates, with extensive fibrosis and atrial remodeling contributing to arrhythmogenicity.[3] In this context, the high recurrence rate

Data Sharing Statement
The data generated in this study is available from the corresponding author upon reasonable request.

observed in the study may reflect the limitations of a PVI-only strategy in HCM. Future studies should explore whether adjunctive ablation strategies, such as posterior wall isolation, linear ablation, or substrate modification, can improve long-term outcomes.[4]

Despite these challenges, the safety profile of CBA in HCM patients remains reassuring. The study reports a low rate of procedural complications, comparable to that in non-HCM patients, suggesting that CBA can be performed safely even in structurally complex hearts. The widespread use of intracardiac echocardiography in this cohort may have contributed to procedural safety by facilitating transseptal access and reducing the risk of pericardial effusion.[6] Additionally, the consistency of outcomes across different centers highlights the reproducibility of CBA, which is a key advantage over RFCA, where operator experience can significantly influence procedural success. Given these findings, CBA may serve as a reasonable first-line ablation strategy in selected HCM patients, particularly those with paroxysmal AF and minimal atrial remodeling.

The study by Kim et al.[2] provides important real-world evidence supporting the use of CBA in HCM, but it also highlights the ongoing challenges in achieving durable rhythm control. While CBA is a feasible and safe option, its efficacy appears limited in patients with extensive atrial disease, suggesting that a personalized approach incorporating patient-specific substrate characteristics is essential. Moving forward, pulsed-field ablation (PFA) has emerged as a promising alternative, offering non-thermal, tissue-selective ablation that minimizes collateral damage to surrounding structures.[7] Unlike CBA or RFCA, PFA has demonstrated greater procedural efficiency and superior safety profiles, particularly in cases with complex atrial substrates.[4] Given that HCM patients often present with significant atrial fibrosis, PFA's ability to selectively target fibrotic regions while preserving adjacent healthy myocardium may enhance ablation outcomes in this population. While early studies on PFA have shown promising results in non-HCM AF cohorts, further research is needed to determine its efficacy and long-term outcomes in HCM patients. Future research should focus on conducting randomized controlled trials comparing CBA with RFCA or PFA specifically in HCM patients to determine the most effective ablation strategy for this cohort. Additionally, studies evaluating patient selection criteria, optimal lesion sets, and long-term arrhythmia outcomes will be essential to refining ablation approaches in this high-risk population. Until then, the decision to pursue CBA in HCM should be carefully weighed against the patient's underlying atrial pathology, emphasizing early intervention and close post-procedural monitoring.

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