

Editorial



Postoperative Outcome in the Patients With Atrial Functional Atrioventricular Valve Insufficiency: Atrial Fibrillation Troubles, Always

Euijae Lee , MD

Division of Cardiology, Bucheon Sejong Hospital, Bucheon, Korea



► See the article “Functional Insufficiency of Mitral and Tricuspid Valves Associated With Atrial Fibrillation: Impact of Postoperative Atrial Fibrillation Recurrence on Surgical Outcomes” in volume 53 on page 550.

Received: Jul 16, 2023
Accepted: Jul 18, 2023
Published online: Aug 1, 2023

Correspondence to

Euijae Lee, MD

Division of Cardiology, Bucheon Sejong Hospital, 28, Hohyeon-ro 489beon-gil, Bucheon 14754, Korea.

Email: euijae14@sejongh.co.kr
euijae14@hotmail.com

Copyright © 2023. The Korean Society of Cardiology

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted noncommercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ORCID iDs

Euijae Lee 
<https://orcid.org/0000-0002-8735-5474>

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The author has no financial conflicts of interest.

Functional atrioventricular valve insufficiency (AVI) pertains to the retrograde flow during ventricular systole resulting from geometric alterations in the valvular apparatus in the absence of structural valvular abnormalities. This phenomenon arises due to a combination of annulus dilation and tethering of the valve leaflets, leading to an imbalance between increased tethering forces and decreased closing forces, particularly observed in cases of ischemic or dilated cardiomyopathy.¹⁾ Furthermore, recent research has demonstrated that long-standing persistent atrial fibrillation (AF) and/or heart failure (HF) of preserved ejection fraction (HFpEF) can contribute to the development of functional AVI in patients with structurally normal valves and ventricles. This condition known as “atrial functional insufficiency” represents a distinct pathologic entity. The concept of “AF begets HF” can explain the possible mechanisms of atrial functional AVI that persistent rapid depolarization of atrial muscles during AF can lead to myocardial inflammation and fibrosis, leading to inhomogeneity of impulse propagation, atrial interstitial fibrosis.²⁾ These electrical and structural remodeling results in perpetuation of AF and enlargement of both atria and aortic valve (AV) annulus and AV regurgitation.

Atrial functional AVI is not a benign condition. In a retrospective study, atrial functional mitral regurgitation (MR) had worse survival and more heart failure hospitalizations compared with primary MR.³⁾ A recent single center study reported that insignificant atrial functional tricuspid regurgitation (TR) progressed to significant TR predominantly in patients with AF and showed poor prognosis.⁴⁾ Atrial functional AVI may require a different treatment strategy than primary or ventricular functional AVI. However, current guidelines have yet to distinguish between atrial functional AVI and nonatrial functional AVI. The optimal medical therapy for heart failure to reduce the atrial volume and pressure is mandatory. And rhythm control for AF reduces the severity of regurgitation and shows a survival benefit.⁵⁾

In this issue of the *Korean Circulation Journal*, Kim et al.⁶⁾ investigated the impact of AF following surgery for functional AVI associated with AF. The authors evaluated 100 patients

Data Sharing Statement

The data required to reproduce these findings cannot be shared due to article type as it is an editorial.

The contents of the report are the author's own views and do not necessarily reflect the views of the *Korean Circulation Journal*.

who underwent valve repair and AF surgery during 20 years in a single tertiary center. In this study, surgical AV repair and AF surgical ablation showed excellent early safety but the postoperative AF recurrence rate was high (48.1% at 1 year, 60.2% at 6 years). Recurrence of AF is significantly associated with major adverse clinical outcomes, including all-cause mortality, valve reoperation, HF admission, and stroke (hazard ratio, 3.33; 95% confidence interval, 1.50–7.40). Recurrence of severe functional AVI was common (18.9±12.1% and 32.4±20.7% at 5 and 10 years) irrespective of rhythm status and preoperative left atrial volume index (LAVI) was the only risk factor for recurrence of severe AVI.

To improve the patients' outcome, the maintenance of sinus rhythm (SR) after valve repair and AF surgery in patients with atrial functional AVI is crucial. AF itself is a risk for cardiovascular events, and AF recurrence signifies the reactivation of cardiac remodeling processes that were initially halted or reversed by SR restoration. In this study, primary composite cardiovascular outcome was lower in SR group than AF recurrence group. A single center retrospective study also reported that the maintenance rate of SR was higher in the group that underwent valve repair and concomitant AF surgery than in the group that underwent valve repair only, and that the effect of cardiac remodeling was greater when SR was maintained.⁷⁾

Meanwhile, the effect of AF surgery in this study was not as favorable as anticipated. The authors did not perform full-set Cox-Maze surgery in all patients and often preserved the left atrial appendage (LAA) based on their experiences.⁸⁾ This may give the impression to us that modified Cox-Maze with LAA preservation was insufficient to control AF. However, these poor rhythm control results may be indicative of the unique nature of atrial functional AVI. In a previous study, which reported the result of valve repair and full Cox-Maze IV plus LAA excision in atrial functional MR showed that only 65% patients remained SR.⁷⁾ These results imply the possibility of unidentified pathophysiologic mechanisms between atrial functional AVI and AF progression, and further research is needed on this topic.

Interestingly, this study showed that LAVI and not recurrence of AF was associated with the recurrence of severe functional AVI. Another study also found that surgical valve repair and rhythm control can reduce the recurrence of functional AVI only in patients whose left atrial (LA) diameter did not exceed 60 millimeters.⁷⁾ LA size (diameter or volume) is a well-known predictor of AF recurrence and can be a surrogate marker for severity of atrial remodeling. These results emphasize the need for early intervention before atrial structural remodeling becomes too severe.

Finally, as a cardiac electrophysiologist, I feel sorry that catheter ablation (CA) was not included in the postoperative rhythm care in this study. Antiarrhythmic drugs (AADs) or direct current cardioversion are often used in cases of AF/atrial tachycardia (AT) recurrence. However, AADs are usually ineffective in terminating AF/AT. Direct current cardioversion was effective in converting SR but had a high risk of recurrence during follow-up. CA has the advantage of electroanatomical mapping, which can accurately identify the triggers or circuits of recurred atrial tachyarrhythmias and reliably ablate these culprits.⁹⁾ Although the CA could not cure the recurred atrial tachyarrhythmias, the reported results were acceptable.¹⁰⁾ Considering the effect of rhythm control on the patients' outcome, I think the CA could be a valuable approach for rhythm control after cardiac surgery.

In conclusion, atrial functional AVI warrants attention and early intervention to prevent significant atrial damage. Collaboration between thoracic surgeons and cardiac electrophysiologists can aid in developing effective strategies to manage this condition. It is essential to recognize the impact of AF, initiate interventions before irreversible atrial remodeling occurs, and explore the potential benefits of CA in rhythm control post-cardiac surgery. By doing so, we can improve the outcomes for patients with atrial functional AVI.

REFERENCES

1. Sun BJ, Park JH. Current unmet needs and clues to the solution in the management of tricuspid regurgitation. *Korean Circ J* 2022;52:414-28.
[PUBMED](#) | [CROSSREF](#)
2. Santhanakrishnan R, Wang N, Larson MG, et al. Atrial fibrillation begets heart failure and vice versa: temporal associations and differences in preserved versus reduced ejection fraction. *Circulation* 2016;133:484-92.
[PUBMED](#) | [CROSSREF](#)
3. Mesi O, Gad MM, Crane AD, et al. Severe atrial functional mitral regurgitation: clinical and echocardiographic characteristics, management and outcomes. *JACC Cardiovasc Imaging* 2021;14:797-808.
[PUBMED](#) | [CROSSREF](#)
4. Kwak S, Lim J, Yang S, et al. Atrial functional tricuspid regurgitation: importance of atrial fibrillation and right atrial remodeling and prognostic significance. *JACC Cardiovasc Imaging* 2023;16:575-87.
[PUBMED](#) | [CROSSREF](#)
5. Ukita K, Egami Y, Nohara H, et al. Predictors and outcomes of tricuspid regurgitation improvement after radiofrequency catheter ablation for persistent atrial fibrillation. *J Cardiovasc Electrophysiol* 2023;34:1360-6.
[PUBMED](#) | [CROSSREF](#)
6. Kim K, Kim HJ, Jung SH, Lee J, Kim JB. Functional insufficiency of mitral and tricuspid valves associated with atrial fibrillation: impact of postoperative atrial fibrillation recurrence on surgical outcomes. *Korean Circ J* 2023;53:550-62.
[CROSSREF](#)
7. Chen J, Wang Y, Lv M, et al. Mitral valve repair and surgical ablation for atrial functional mitral regurgitation. *Ann Transl Med* 2020;8:1420.
[PUBMED](#) | [CROSSREF](#)
8. Lee CH, Kim JB, Jung SH, Choo SJ, Chung CH, Lee JW. Left atrial appendage resection versus preservation during the surgical ablation of atrial fibrillation. *Ann Thorac Surg* 2014;97:124-32.
[PUBMED](#) | [CROSSREF](#)
9. Kim D, Yang PS, Joung B. Optimal rhythm control strategy in patients with atrial fibrillation. *Korean Circ J* 2022;52:496-512.
[PUBMED](#) | [CROSSREF](#)
10. Enriquez A, Santangeli P, Zado ES, et al. Postoperative atrial tachycardias after mitral valve surgery: mechanisms and outcomes of catheter ablation. *Heart Rhythm* 2017;14:520-6.
[PUBMED](#) | [CROSSREF](#)