

ELECTROPHYSIOLOGY

CASE REPORT: CLINICAL CASE SERIES

Atrial Fibrillation

One Size Fits All?



Fred Kusumoto, MD, Mohammad Alomari, MD, Sadhana Jonna, MD, Robert E. Safford, MD, PhD

ABSTRACT

Patients with atrial fibrillation not associated with other cardiac conditions require different individualized treatment strategies. However, in all patients it is critical to address modifiable risk factors, assess stroke risk, minimize atrial fibrillation burden, and identify the patient's individual goals of care. (J Am Coll Cardiol Case Rep 2024;29:102175)
© 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Atrial fibrillation (AF) is the most common arrhythmia in the world, with an estimated prevalence of 46.3 million individuals.¹ As emphasized by the newly published 2023 American College of Cardiology/American Heart Association (ACC/AHA) AF guideline, individual management can be very different, both acutely and over time.² Previously, AF was defined by clinical presentation, but the 2023 ACC/AHA AF guideline has proposed a classification system that uses stages to emphasize that, if untreated, AF is a progressive disease that will require individualized strategies that may be dynamic over a patient's lifetime. We present 3 cases

that illustrate the range of different management options and considerations for the long-term treatment of patients with documented AF (stage 3).

The study was reviewed by the Mayo Clinic Institutional Review Board, and in accordance with the Code of Federal Regulations, 45 CFR 46.102, it was noted that the research requires neither Institutional Review Board review nor patient consent.

CASE 1

A 60-year-old man with a 6-year history of AF came to the hospital with 2.5 days of AF. Previously, he had always converted spontaneously after 2 to 4 hours. In the emergency department, he was treated with atenolol and 600 mg propafenone and converted to sinus rhythm. His first episode was related to the use of theophylline, and subsequent episodes occurred when he had increased alcohol intake. Daily antiarrhythmic medications were considered, but the patient began an aggressive strategy of risk factor modification, including initiating effective treatment of his sleep apnea and reduced alcohol intake.

FOLLOW-UP. After 18 years of follow-up, the patient, now 78 years of age, has had minimal episodes of AF (once every several years) that he treats with

LEARNING OBJECTIVES

- To understand the importance of risk factor modification for all patients with AF.
- To understand that assessing stroke risk is critical and may be dynamic over time and that many strategies can be used to assess risk.
- To understand and appreciate the different strategies for reducing AF burden and the importance of identifying potential underlying mechanisms.

From the Department of Cardiovascular Disease, Mayo Clinic, Jacksonville, Florida, USA.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

Manuscript received December 1, 2023; accepted December 6, 2023.

**ABBREVIATIONS
AND ACRONYMS****ACC** = American College of
Cardiology**AF** = atrial fibrillation**AHA** = American Heart
Association

propafenone and a beta-blocker and has had no episode last >6 hours. He remains on anticoagulation.

CASE 2

A 58-year-old woman with a 6-year history of paroxysmal AF underwent catheter ablation 2 years ago. She developed persistent AF, and after discussion about next steps, she decided to pursue a second catheter ablation. Her pulmonary veins were isolated and she had normal voltages throughout her entire left atrium. However, she had salvos of AF (Figure 1) with triggers that localized to the posterior wall. After catheter ablation of 2 sites, the patient lost all atrial ectopy despite the use of isoproterenol.

FOLLOW-UP. Now 69 years of age, the patient has had no recurrent AF, but recent ambulatory electrocardiography monitoring revealed short episodes (3-6 beats) of atrial tachycardia. She remains on anticoagulation.

CASE 3

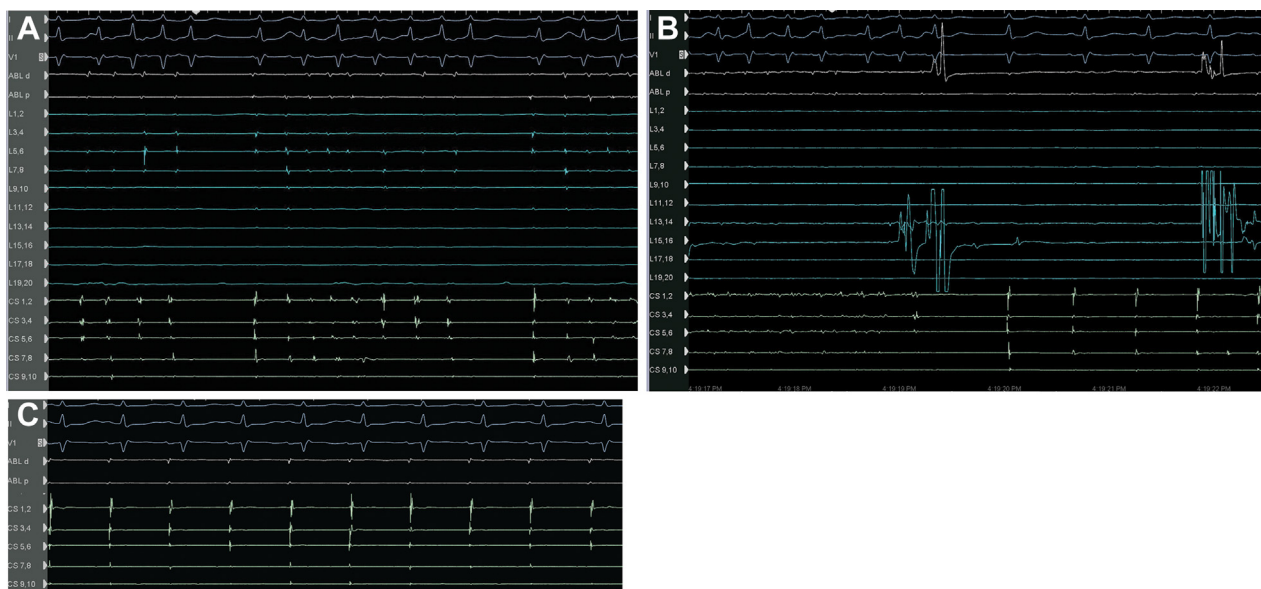
A 67-year-old man noted that he has had irregular heartbeats since his 30s (likely stage 2 in the new classification scheme) and had his first episode of

documented AF 4 years ago. Since then, he has undergone 2 prior catheter ablation procedures. The patient was started on dofetilide 1 year ago but has now developed symptomatic persistent AF. After discussion about the options (changing antiarrhythmic medications, repeat AF ablation with either a purely endocardial approach or with a hybrid procedure, and atrioventricular node ablation with permanent pacing), he opted for a repeat AF ablation using an endocardial approach. His pulmonary veins were isolated and after cardioversion was noted to have frequent premature atrial contractions. The premature atrial contractions mapped to the base of the right atrium (Figure 2), and after ablation complete cessation of atrial ectopy was observed.

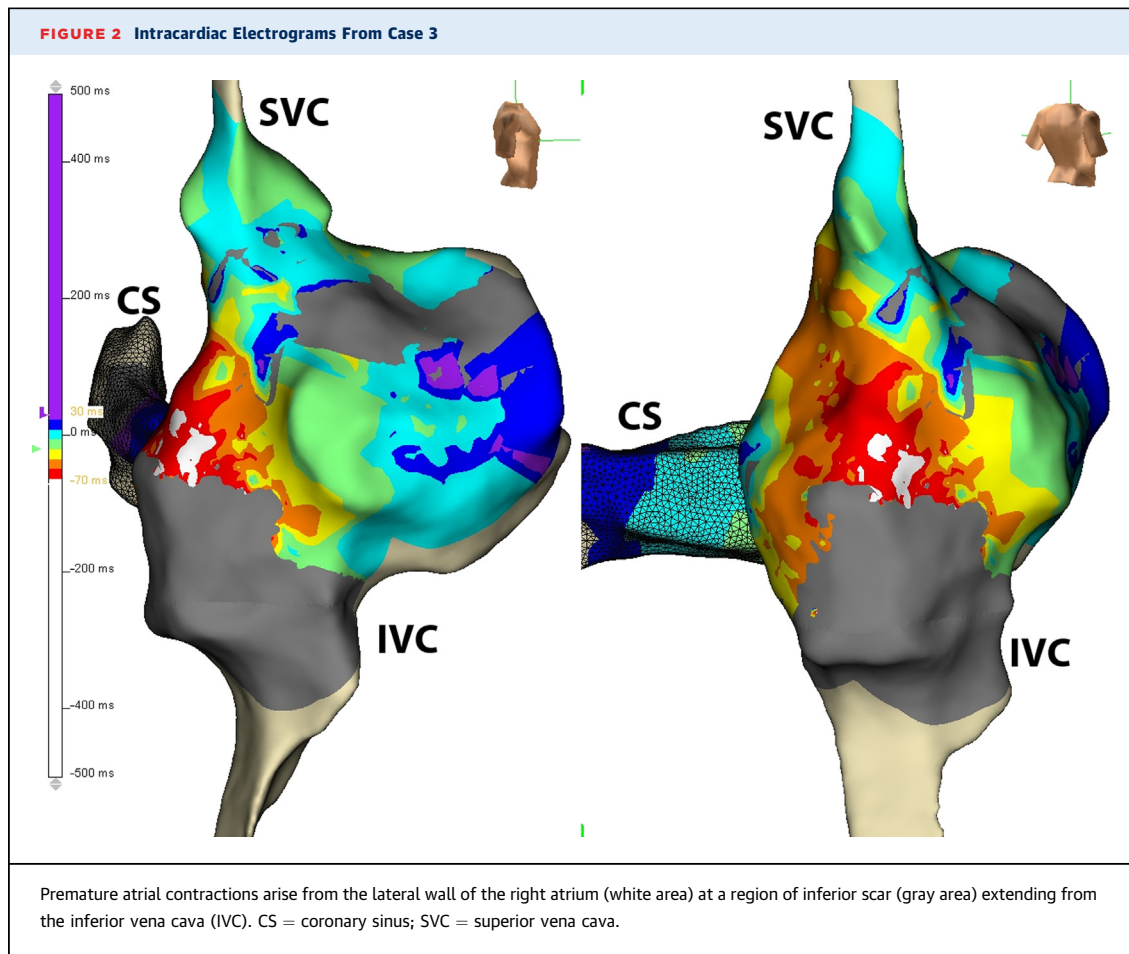
FOLLOW-UP. After 5 years of follow-up, the patient remains free of AF off dofetilide, documented by repeat monitoring. He is on anticoagulation and is receiving continued treatment for his hypertension and diabetes.

DISCUSSION

The cases presented demonstrate the importance of having a comprehensive and individualized plan that accounts for lifetime management of the patient with AF. The foundation of care requires treatment of risk

FIGURE 1 Intracardiac Electrograms From Case 2

(A) After cardioversion, the patient had salvos of atrial tachycardia and atrial fibrillation. (B) During focal ablation at the posterior wall at the earliest site of activation, atrial fibrillation completely resolved. (C) After ablation, the patient had no atrial ectopy despite the use of isoproterenol. Abl = ablation catheter; CS = coronary sinus; d = distal pair electrodes; L = 20-electrode circular catheter placed at the posterior wall; p = proximal pair electrodes.

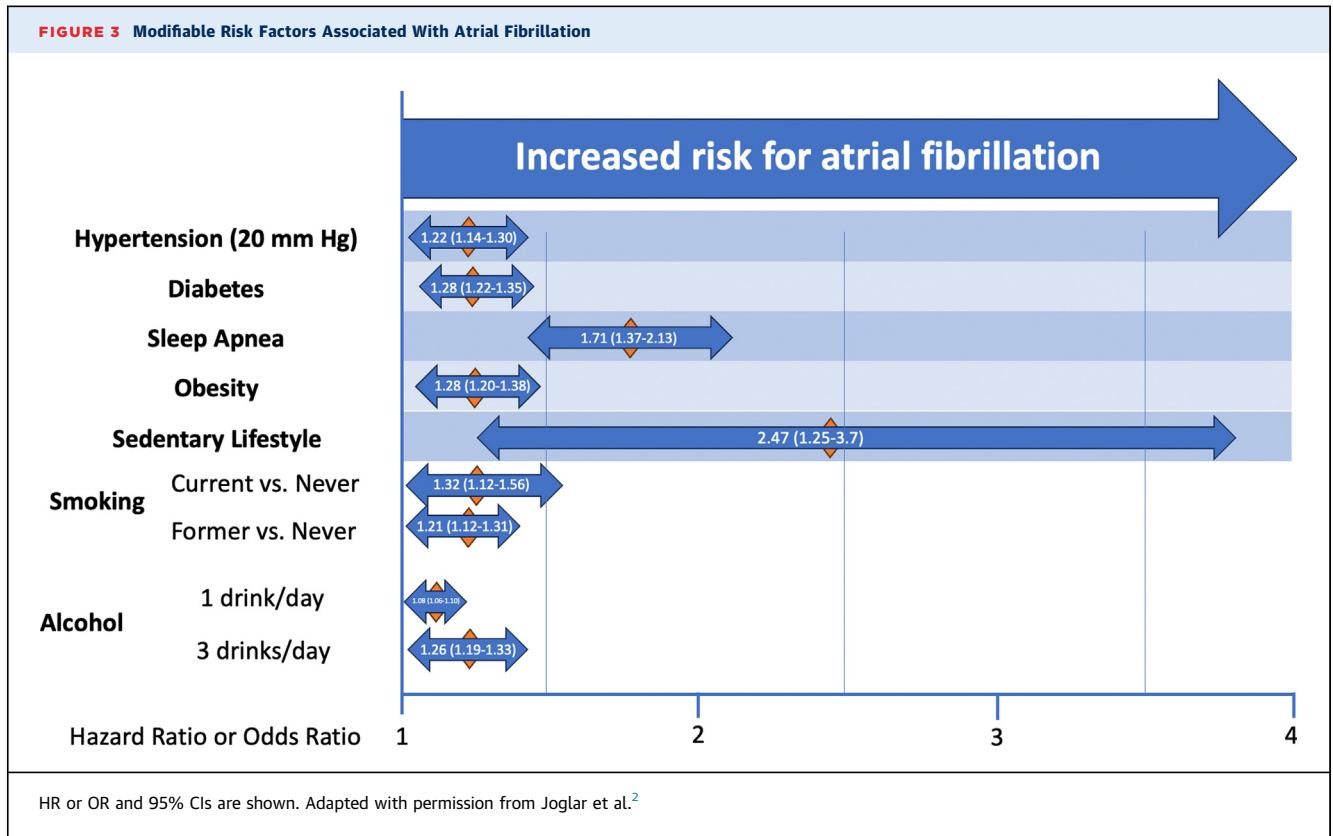


factors and enacting behavioral changes.² In case 1, treatment of sleep apnea and minimizing alcohol was associated with a significant decrease in symptomatic AF. In cases 2 and 3, although catheter ablation was performed, continued management of modifiable risk factors was critical (Figure 3). In all 3 patients, over long-term follow-up there were dynamic changes in atrial arrhythmia burden, with initial progression over time until interrupted by risk factor modification or medical treatment.

Management of AF has historically been divided into rate and rhythm control strategies. Data from the EAST AFNet 4 (Early Treatment of Atrial Fibrillation for Stroke Prevention 4) trial suggest that the distinction is more nuanced.³ Rhythm control was associated with a significant reduction in the combined primary endpoint. Inspection of the rhythm control arm shows that while 95% of patients were on

antiarrhythmic medications or underwent ablation as initial therapy, at 2-year follow-up 35% patients had neither undergone ablation nor were being treated with antiarrhythmic drugs.³ In the 3 presented cases, all were managed with a rhythm control strategy, but in case 1 neither regular antiarrhythmic medication nor catheter ablation has been pursued because the patient has infrequent symptoms. Rather, the patient uses intermittent antiarrhythmic medication (“pill in the pocket” strategy) when a prolonged episode develops.²

The last 2 patients in the case series underwent catheter ablation for persistent AF. The 2023 ACC/AHA AF guideline makes no separate recommendations for paroxysmal and persistent AF based on recent evidence. As one example, in the CABANA (Catheter Ablation vs. Antiarrhythmic Drug Therapy for Atrial Fibrillation) trial ablation was associated



with similar outcomes for both persistent and paroxysmal AF.⁴ As a final point, case 3 emphasizes that catheter ablation and antiarrhythmic medications are complementary therapies, and often both are used to reduce AF burden.

The best strategy for catheter ablation of persistent AF is not known. Randomized controlled trials evaluating additional ablation targets beyond pulmonary vein isolation have generally not been associated with improved outcomes.² The CONVERGE (Convergence of Epicardial and Endocardial Ablation for the Treatment of Symptomatic Persistent AF) trial randomized patients with persistent AF to a combined endocardial and epicardial approach or a purely endocardial approach to posterior wall ablation and found that the combined epicardial/endocardial approach was more successful than an endocardial-only approach, but the recurrence rate at 12 months was 32%, and the study design did not include a treatment arm of pulmonary vein isolation only.⁵ The lack of success with standardized approaches for unselected groups of patients with AF is not surprising, given the varied mechanisms of AF in individual

patients, as illustrated by the 2 patients in this case series who underwent catheter ablation. In case 2, targeting 2 individual foci at the posterior wall was associated with a successful long-term clinical result. However, if the patient develops recurrent AF and a continued rhythm control strategy is desired, an epicardial approach might be preferred to a repeat endocardial procedure. For case 3, based on follow-up, a right atrial source appears to be the putative mechanism for his AF. In this case, posterior wall ablation or other approaches not guided by electrophysiologic data such as empiric left atrial appendage isolation may not have led to long-term success. The 2 cases illustrate the heterogeneity of potential mechanisms for AF in the setting of isolated pulmonary veins. As an extension, this may be a partial explanation for the generally negative results found in randomized controlled trials that evaluate the efficacy of additional targets other than pulmonary vein isolation. The 2023 ACC/AHA AF guideline notes that the value of additional anatomic ablation targets beyond pulmonary vein isolation is uncertain (Class IIb recommendation).²

In all patients with AF, stroke risk must be evaluated, and a detailed discussion is beyond the scope of this discussion.² However, it is important to keep in mind that stroke risk can have many parameters and that an individualized approach using shared decision making is necessary. In case 2, although no AF was identified, after an apparent successful ablation, recommendations for anticoagulation remained unchanged, and the patient has a Class IIa recommendation for anticoagulation based on age.² Per the 2023 ACC/AHA AF guideline, while noting that the CHA₂DS₂-VASc score has been traditionally used as the preferred method for assessing risk of stroke, other strategies may be used to estimate annual risk of stroke for the individual patient in addition to or in lieu of the CHA₂DS₂-VASc score particularly as new evidence develops.² Anticoagulation should generally be recommended in most patients with an annual risk of stroke $\geq 2\%$ (Class I) and is reasonable if the risk is 1% to 2% (Class IIa).

CONCLUSIONS

AF is commonly observed but has significant heterogeneity that requires careful individualized

evaluation of potential mechanisms, etiologies, and risks. However, all patients should be evaluated for their current stage in the AF continuum and have modifiable risk factors continuously addressed. The stroke risk for all patients should be assessed. Other than those patients with permanent AF, in which there is a mutual decision between the patient and health care provider to not pursue future attempts to maintain sinus rhythm, the focus should be on reducing AF burden by whatever strategy is determined to be best after a shared decision-making process. In those patients who undergo AF ablation (whether endocardial or epicardial), assessment of the potential mechanism and ablation strategy should be evaluated on an individual basis.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

ADDRESS FOR CORRESPONDENCE: Dr Fred M. Kusumoto, Department of Cardiovascular Disease, Mayo Clinic, 4500 San Pablo Avenue, Jacksonville, Florida 32224, USA. E-mail: kusumoto.fred@mayo.edu.

REFERENCES

1. Benjamin EJ, Muntner P, Alonso A, et al. Heart Disease and Stroke Statistics-2019 update: a report from the American Heart Association. *Circulation*. 2019;139:e56–e528.
2. Joglar JA, Chung M, Armbruster A, et al. 2023 ACC/AHA/ACCP/HRS guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2024;83(1):109–279.
3. Kirchhof P, Camm AJ, Goette A, et al. EAST-AFNET 4 Trial Investigators. Early rhythm-control therapy in patients with atrial fibrillation. *N Engl J Med*. 2020;383(14):1305–1316.
4. Packer DL, Mark DB, Robb RA, et al. Effect of catheter ablation vs antiarrhythmic drug therapy on mortality, stroke, bleeding, and cardiac arrest among patients with atrial fibrillation: the CABANA randomized clinical trial. *JAMA*. 2019;321(13):1261–1274.
5. DeLurgio DB, Crossen KJ, Gill J, et al. Hybrid convergent procedure for the treatment of persistent and long-standing persistent atrial fibrillation: results of CONVERGE clinical trial. *Circ Arrhythm Electrophysiol*. 2020;13(12):e009288.

KEY WORDS atrial fibrillation, catheter ablation, rhythm control