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Editorial

Looking for Coronary Disease in Patients With Atrial Fibrillation

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See article by Tsigkas et al., pages 920-924 of this issue.

“Politics is the art of looking for trouble, finding it everywhere, diagnosing it incorrectly and applying the wrong remedies.”

—Groucho Marx

Atrial fibrillation (AF) is common in older individuals with risk factors. Coronary artery disease (CAD) is common in older individuals with risk factors too, and several risk factors for AF and CAD overlap, such as hypertension, diabetes, and obstructive sleep apnea. It should therefore surprise no one that CAD is present in many patients with AF.

What should we do about it? Specifically, how aggressively should we look for CAD in patients with AF? And when CAD is silent, what should we do about it when we find it? We should be careful to avoid Groucho’s definition of politics: looking for trouble, finding it everywhere, diagnosing it incorrectly, and applying the wrong remedies.

Prevalence of Coronary Disease in AF Patients

The prevalence of CAD reported in patients with AF varies according to how patients are selected and how CAD is diagnosed. Results from several representative studies are listed in Table 1.¹⁻⁸ The prevalence ranges from 22% to 49%, with the lowest prevalence observed in the study of Tsigkas et al., published in this issue of the *Canadian Journal of Cardiology*.⁸

The clinical factors predictive of CAD in patients with AF tend to be the same as in patients without AF, with older age, male sex, and smoking predominating.^{3-5,7}

Myocardial Ischemia in AF Patients

If approximately a third of patients with AF have underlying CAD, it should be quite straightforward to detect them with noninvasive modalities such as stress testing. In fact, the rapid ventricular rate that is often seen in patients with AF has been termed a stress test equivalent, and ST depression occurring at these rates has been attributed to subendocardial

myocardial ischemia. In the study of Tsigkas et al., ST depression was seen in 44 of 115 patients with rapid AF, defined as rates >80% of maximum predicted heart rate, and half of them had CAD at angiography.⁸ Perhaps the most clinically useful finding in their study is that only 3 of the 71 patients without ST depression during rapid AF had positive noninvasive tests for myocardial ischemia and CAD at angiography. Clearly, performing coronary angiography or even noninvasive stress testing in all of these patients would be an overreaction.

In contrast, 22 of the 44 patients with ST depression during rapid AF had CAD at angiography. This finding is not of great clinical use because the pretest probability of CAD based on previous studies was 1 in 3 and the posttest probability based on this study is 1 in 2. In another study, only 11 of 35 patients with ST depression during rapid AF had obstructive CAD at angiography.⁴ Therefore, electrocardiographic stress testing might have a limited role in diagnosing CAD in AF patients.

More sophisticated ways to detect myocardial ischemia such as stress nuclear imaging are also plagued by a high rate of false positives in patients with AF, perhaps because of problems with gating for patients in AF at the time of the study, or because of problems with coronary flow regulation. For example, in 1 study, single-photon emission computed tomography detected myocardial ischemia in 13 AF patients, only 2 of whom had coronary disease at angiography.⁹ In another study, thallium scintigraphy was falsely positive in 23 of 56 AF patients without CAD (and truly positive in 23 of 27 AF patients with CAD).⁵ In that study, myocardial contrast stress echocardiography was the only test with an acceptably high specificity.

However this test is not without problems in AF patients. Dobutamine stress echocardiography might trigger a rapid ventricular rate, complicating the hemodynamic loading conditions and the interpretation of wall motion abnormalities. In 1 large study, a history of AF increased the odds of developing AF during dobutamine stress echocardiography by 18.4-fold.¹⁰

As discussed by Tsigkas et al., AF might induce coronary vasoconstriction or a failure of appropriate coronary flow regulation, such that myocardial ischemia occurs in the

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See page 862 for disclosure information.

Table 1. Prevalence of coronary disease in patients with AF

Study	AF patients, n	CAD patients, n (%)	CAD detection method	Patient population
AFFIRM ¹	4060	1543 (38)	Self-report	Dependent on trial inclusion criteria
ATHENA ²	4628	1405 (30.4)	Self-report	Dependent on trial inclusion criteria
Kralev et al. ³	261	89 (34)	Coronary angiography	Consecutive series of hospitalized AF patients
Pradhan et al. ⁴	127	31 (24)	Coronary angiography	Hospitalized AF patients with heart rate \geq 120 beats per minute
Androulakis et al. ⁵	83	27 (32.5)	Coronary angiography	Patients with ST depression during AF
Weijns et al. ⁶	115	56 (49)	MCT	Preablation testing
Nucifora et al. ⁷	150	61 (41)	MCT	Patients referred for MCT testing
Tsigkas et al. ⁸	115	25 (22)	Coronary angiography or stress testing	Coronary angiography only if ST depression present

AF, atrial fibrillation; AFFIRM, Atrial Fibrillation Follow-up Investigation of Rhythm Management; ATHENA, A Trial With Dronedronone to Prevent Hospitalization or Death in Patients With Atrial Fibrillation; CAD, coronary artery disease; MCT, multislice computed tomography.

absence of coronary disease.⁸ In fact, in 1 study, troponin release occurred in 15% of a series of 354 AF patients with symptoms of myocardial ischemia, usually in the absence of CAD at angiography.¹¹

Perhaps a more advanced technique that can quantitate coronary flow reserve, such as positron emission tomography stress testing, will prove to be useful in the detection of CAD in AF patients. For now we are left with noninvasive tools that have important limitations in detecting CAD in AF patients.

Advantages of Detecting Coronary Disease in AF Patients

In patients with symptoms of CAD who coincidentally have AF, the presence of the arrhythmia should not change the indications for coronary angiography. In contrast, in asymptomatic patients with AF, coronary angiography is indicated only if the results of the test will lead to improvements in outcome. In such patients, aspirin, a statin, and perhaps a β -blocker and an angiotensin-converting enzyme inhibitor might be indicated for prevention of an atherosclerotic event if coronary angiography revealed CAD. Statins and angiotensin-converting enzyme inhibitors provide the additional advantage of reducing the risk of a recurrence in patients with paroxysmal AF.^{12,13}

Coronary Revascularization in AF Patients

AF makes revascularization a less attractive option than it otherwise might be for several reasons. First, AF is a strong, independent predictor of mortality¹⁴⁻¹⁶ independent of the severity of CAD, and this effect is unlikely to be mitigated by

revascularization. In a recent retrospective study of patients with AF taking oral anticoagulants who underwent coronary revascularization, coronary artery bypass grafting (CABG) was the revascularization option selected for 121 patients and percutaneous coronary intervention (PCI) for 301 patients.¹⁷ The clinical features of the 2 groups were quite different. Freedom from major cardiovascular events at 3 years occurred in only 57.4% of the PCI patients and 78.9% of the CABG patients, and overall survival was only 72% and 86.4%, respectively. These statistics are cited not to suggest that 1 revascularization technique is superior to the other, but to emphasize the relatively poor prognosis of both groups.

In a slightly older series of 426 patients with AF undergoing PCI, after a median follow-up of < 2 years, all-cause mortality was 22.6%, the rate of major bleeding was 12.3%, and major adverse cardiac events had occurred in 32.3%.¹⁸ The absence of anticoagulation was an independent predictor of mortality and major adverse cardiac events.

Although not invariably so, patients with AF are often old and frail, making CABG an unattractive option. Finally, insertion of a bare metal stent carries with it the risk of a month of dual antiplatelet therapy in a patient taking a vitamin K antagonist. None of these factors are contraindications to revascularization, but they should be taken into consideration when the indications are not compelling.

Summary and Conclusions

Table 2 summarizes the important points that should be considered when screening AF patients for CAD. Despite these generalizations, it is important to keep in mind that the population affected by AF is large and heterogeneous, so that exceptions to any rules are likely to be frequent. Astute clinical judgement is required to decide who to investigate and who to revascularize. In general, the long-term benefit is likely to be less than that in a patient without AF.

Disclosures

The authors have no conflicts of interest to disclose.

References

1. AFFIRM Investigators. Baseline characteristics of patients with atrial fibrillation: the AFFIRM study. *Am Heart J* 2002;143:991-1001.
2. Hohnloser SH, Crijns HJ, van Eickels M, et al. Effect of dronedarone on cardiovascular events in atrial fibrillation. *N Engl J Med* 2009;360:668-78.

Table 2. Facts about CAD in AF patients

1. Approximately a third of patients with AF have CAD¹⁻⁸
2. At least half of patients with ST depression during rapid AF do not have CAD^{4,8}
3. CAD is very rare in patients without ST depression during rapid AF⁸
4. Reversible perfusion defects using thallium scintigraphy in patients with AF do not indicate underlying CAD in about half of cases^{5,9}
5. A history of AF increases the risk of AF complicating DSE by a factor of 18.4¹⁰
6. Among patients with AF, symptoms suggestive of myocardial ischemia and troponin release, most do not have CAD at angiography¹¹
7. AF is a strong predictor of all-cause mortality, independent of the presence and severity of CAD¹⁴⁻¹⁶
8. AF is a marker of a poor long-term prognosis after coronary revascularization^{17,18}

AF, atrial fibrillation; CAD, coronary artery disease; DSE, dobutamine stress echocardiography.

3. Kralev S, Schneider K, Lang S, Süselbeck T, Borggrefe M. Incidence and severity of coronary artery disease in patients with atrial fibrillation undergoing first-time coronary angiography. *PLoS One* 2011;6:e24964.
4. Pradhan R, Chaudhary A, Donato AA. Predictive accuracy of ST depression during rapid atrial fibrillation on the presence of obstructive coronary artery disease. *Am J Emerg Med* 2012;30:1042-7.
5. Androulakis A, Aznaouridis KA, Aggeli CJ, et al. Transient ST-segment depression during paroxysms of atrial fibrillation in otherwise normal individuals: relation with underlying coronary artery disease. *J Am Coll Cardiol* 2007;50:1909-11.
6. Weijns B, Pisters R, Haest RJ, et al. Patients originally diagnosed with idiopathic atrial fibrillation more often suffer from insidious coronary artery disease compared to healthy sinus rhythm controls. *Heart Rhythm* 2012;9:1923-9.
7. Nucifora G, Schuijf JD, Tops LF, et al. Prevalence of coronary artery disease assessed by multislice computed tomography coronary angiography in patients with paroxysmal or persistent atrial fibrillation. *Circ Cardiovasc Imaging* 2009;2:100-6.
8. Tsigkas G, Kopsida G, Xanthopoulou I, et al. Diagnostic accuracy of electrocardiographic ST-segment depression in patients with rapid atrial fibrillation for the prediction of coronary artery disease. *Can J Cardiol* 2014;30:920-4.
9. Smit MD, Tio RA, Slart RH, Zijlstra F, Van Gelder IC. Myocardial perfusion imaging does not adequately assess the risk of coronary artery disease in patients with atrial fibrillation. *Europace* 2010;12:643-8.
10. Sheldon SH, Askew JW 3rd, Klarich KW, et al. Occurrence of atrial fibrillation during dobutamine stress echocardiography: incidence, risk factors, and outcomes. *J Am Soc Echocardiogr* 2011;24:86-90.
11. Parwani AS, Boldt LH, Huemer M, et al. Atrial fibrillation induced cardiac troponin I release. *Int J Cardiol* 2013;168:2734-7.
12. Fauchier L, Pierre B, de Labriolle A, et al. Antiarrhythmic effect of statin therapy and atrial fibrillation: a meta-analysis of randomized controlled trials. *J Am Coll Cardiol* 2008;51:828-35.
13. Schneider MP, Hua TA, Bohm M, et al. Prevention of atrial fibrillation by renin-angiotensin system inhibition: a meta-analysis. *J Am Coll Cardiol* 2010;55:2299-307.
14. Marte T, Saely CH, Schmid F, Koch L, Drexel H. Effectiveness of atrial fibrillation as an independent predictor of death and coronary events in patients having coronary angiography. *Am J Cardiol* 2009;103:36-40.
15. Bouzas-Mosquera A, Peteiro J, Broullón FJ, et al. Effect of atrial fibrillation on outcome in patients with known or suspected coronary artery disease referred for exercise stress testing. *Am J Cardiol* 2010;105:1207-11.
16. Ruiz Ortiz M, Ogayar C, Romo E, et al. Long-term survival in elderly patients with stable coronary disease. *Eur J Clin Invest* 2013;43:774-82.
17. Gunn J, Kuttala K, Kiviniemi T, et al. Outcome after coronary artery bypass surgery and percutaneous coronary intervention in patients with atrial fibrillation and oral anticoagulation. *Ann Med*, in press.
18. Ruiz-Nodar JM, Marin F, Hurtado JA, et al. Anticoagulant and antiplatelet therapy use in 426 patients with atrial fibrillation undergoing percutaneous coronary intervention and stent implantation: implications for bleeding risk and prognosis. *J Am Coll Cardiol* 2008;51:818-25.