Atrial Fibrillation and Stroke
A Neurologic Perspective

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KEYWORDS

• Atrial fibrillation • Dementia • Stroke • Ablation • Monitoring

KEY POINTS

- Atrial fibrillation is associated with long-term cognitive decline and stroke.
- Recognition of occult atrial fibrillation in patients with stroke, and appropriate use of risk stratification schemes for prevention of stroke and bleeding with anticoagulant therapy, are essential for optimal patient outcomes.
- Catheter-based ablation procedures are associated with silent cerebral events, and their role in long-term cognitive decline has to be carefully evaluated.

Atrial fibrillation (AF) is the most common supraventricular arrhythmia associated with reduced quality of life and increased risk of cerebrovascular disease. The prevalence of AF increases with age[1,2] and the presence of structural heart disease. There were 2.7 million Americans with AF in 2010, and there is a 25% chance of men and women more than 40 years of age developing AF in their lifetimes.[3] The prevalence of AF in the developed world is about 1% to 2% of the population. AF is associated with loss of effective atrial contractility, loss of atrioventricular synchrony, and stasis of blood with associated thrombus formation. Transient ischemic attacks and stroke caused by thromboembolism are the most severe complications from AF.

To provide a neurologic perspective, this article describes the pathogenesis of thrombus formation, associated risk factors for stroke with AF, various stroke risk stratification schemes, bleeding risk with anticoagulation therapy, and the current bleeding risk stratification schemes. Cognitive decline[4] is increasingly recognized as a long-term sequela of AF. It may be secondary to recurrent thromboembolism, microbleeds on anticoagulant therapy, or progression of vascular risk factors (hypertension, diabetes, atherosclerotic disease) associated with AF. The role of prolonged monitoring in detection of occult atrial fibrillation, and measures to reduce stroke in patients undergoing ablation procedures for AF are briefly explored.

EPIDEMIOLOGY OF AF

AF is uncommon in infants and children and occurs mostly in association with congenital heart disease. The risk of AF in young healthy adults is low, as shown in a screening study of Air Force personnel.[5] Several cross-sectional studies show the prevalence characteristics among subgroups of the US population. AF is more prevalent in elderly men and women (0.1% among patients less than 55 years of age and 9% among patients

Disclosures: Department of Internal Medicine, Mayo Clinic Career Development Grant to S.K. Mulpuru.
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Card Electrophysiol Clin 6 (2014) 31–41
http://dx.doi.org/10.1016/j.ccep.2013.11.001
1877-9182/14/$ – see front matter

more than 80 years of age). AF is more common among men than among women across all subgroups and more common in white people than in black people.[1,6] As the population ages, the projected prevalence of AF for 2050 is about 7.56 million,[7] which will place a huge strain on the health care system.

The incidence of AF also increases with age (0.5 per 1000 person-years before age 50 years of age to 9.7 per 1000 patient years after age 70 years)[8] and the presence of other cardiovascular risk factors. The lifetime risk of developing AF from the Framingham Heart Study cohort was 26% for men and 23% for women.[9] Various risk factors associated with AF from population bases studies are listed in **Box 1**.

- AF is the most common supraventricular arrhythmia in the United States.
- The incidence and prevalence of AF increase with age.
- The lifetime risk of developing AF (from the Framingham Heart Study cohort) is 26% for men and 23% for women.

Box 1
Risk factors associated with AF

1. Hypertension
2. Coronary artery disease
3. Structural heart disease
   a. Valvular heart disease
   b. Heart failure and various cardiomyopathies
   c. Hypertrophic cardiomyopathy
   d. Congenital heart disease
   e. Myocarditis
4. Cardiopulmonary conditions
   a. Pulmonary embolism
   b. Chronic obstructive pulmonary disease
   c. Pericarditis
   d. Obstructive sleep apnea
5. Obesity
6. Diabetes
7. Metabolic syndrome
8. Hyperthyroidism
9. Chronic kidney disease
10. Cardiac and noncardiac surgery
11. Family history
12. Occurrence of other supraventricular arrhythmias.

CEREBROVASCULAR EVENTS AND AF

Strokes related to AF can involve any vascular territory and typically involve the cortex. However, cortical involvement is not necessary to suspect cardiac embolism. Some patients can have cardioembolic occlusion of a major intracranial vessel like the proximal middle cerebral artery causing infarction of subcortical structures but maintain adequate perfusion to the cortex through collateral flow. Although uncommon, the pattern of multiple acute brain infarctions in different vascular territories (anterior and posterior circulation or both hemispheres) indicates a proximal source of embolism. In these cases, the possibility of AF should be strongly considered. Patients with cardiac embolism from AF can present with severe deficits followed by rapid and complete or nearly complete spontaneous resolution (so-called spectacularly vanishing deficits). Recognition of this clinical presentation should prompt detailed evaluation of heart rhythm.

Patients with suspected cardiac embolism should be evaluated with electrocardiography, echocardiography (preferably transesophageal), and heart rhythm monitoring. Presence of AF, either persistent or paroxysmal, on electrocardiogram, cardiac telemetry, or Holter monitoring usually defines the stroke as cardioembolic and, in the absence of contraindications, is an indication to start long-term oral anticoagulation. However, even in patients with documented AF it is important to check the status of the blood vessels and exclude alternative mechanisms of stroke. A patient with a stroke in the right middle cerebral artery territory who has AF but also advanced stenosis of the right internal carotid artery with an ulcerated plaque needs carotid revascularization, not just anticoagulation. A patient with a small subcortical stroke or a pontine infarction with advanced basilar artery atherosclerosis may also have AF, but the stroke is less likely to be related to the arrhythmia, and the secondary stroke prevention treatment should address all possible causes of recurrent ischemia.

Strokes related to AF are associated with worse functional outcomes,[10] even after thrombolysis,[11] and are associated with higher rate of stroke recurrence in the absence of adequate anticoagulation.[12] Worse outcomes in strokes related to AF are probably caused by greater volumes of ischemic brain and greater risk of hemorrhagic conversion.[13] Thus, timely recognition of AF and initiation of anticoagulation in safe candidates are essential to avert the potentially serious consequences of ischemic cerebrovascular disease.

In addition, AF can cause early complications after a stroke. Patients with previously documented