Management of Device-detected Atrial High-rate Episodes

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KEYWORDS

• Atrial fibrillation • Atrial high-rate episodes • Cardiac monitoring
• Cardiac implantable electronic devices • Pacemaker • Implantable cardioverter-defibrillator

KEY POINTS

- Atrial tachyarrhythmias are common in patients with cardiac implantable electronic devices (CIEDs), such as pacemakers or implantable cardioverter-defibrillators with atrial leads, and they are detected as atrial high-rate episodes (AHREs) by the CIED.
- AHREs may be brief, infrequent, and asymptomatic, and they may be detected before any clinical arrhythmia is apparent.
- Studies have shown that these subclinical device-detected AHREs are associated with an increased stroke risk.
- Several areas of uncertainty regarding AHREs remain, including whether treatment with anticoagulation for subclinical device-detected AHREs reduces stroke risk as it does for clinical atrial fibrillation and whether anticoagulation can be targeted around the time of an AHRE to reduce the risk of stroke in some patients.

Case History

A 76-year-old woman with a history of systemic hypertension has a DDD (dual pacing, dual-chamber activity sensing, and dual response) pacemaker for pauses and syncope. During a routine device evaluation, the stored electrograms reveal 2 episodes of atrial fibrillation (AF), being 7 hours and then 9.5 hours in duration, occurring over an 11-month period. The patient had no awareness of the AF. How to manage this patient?

THE CLINICAL PROBLEM

AF is the most common arrhythmia in clinical practice. The lifetime risk of AF is high, with a quarter of 40-year-old patients expected to develop AF over the course of their lifetimes.[1] More than 5 million people in the United States and more than 8 million people in the European Union were estimated to have AF in 2010.[2–4] In the United States, the prevalence is expected to increase to more than 12 million AF cases by

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2030[4]; whereas in the European Union there will be an estimated 17.9 million cases by 2060.[3] The prevalence of AF also increases sharply with age, such that at least 6% to 8% of patients more than the age of 65 years have AF.[5,6] These estimates do not account for silent or undiagnosed AF, such as AF detected by cardiac implantable electronic devices (CIEDs).

AF is a major cause of stroke, and stroke is one of the most serious complications of AF, associated with increased stroke severity and stroke-associated mortality.[7–9] Clinical AF detected by routine methods increases the overall risk of stroke by 500%.[10] This risk can be further stratified by various stroke risk scores, the most commonly used of which are the $CHADS_2$ (congestive heart failure, hypertension, age greater than or equal to 75 years, diabetes mellitus, and prior stroke or transient ischemic attack [2 points]) and the CHA_2DS_2-VASc score (congestive heart failure/left ventricular dysfunction, hypertension, age greater than or equal to 75 years [2 points]; diabetes mellitus, prior stroke, or transient ischemic attack [2 points]; vascular disease, age 65–75 years, and female sex).[11,12] This risk of stroke has been traditionally thought to be increased similarly for both paroxysmal AF and persistent AF,[13] although some more recent data suggest that the pattern of AF (paroxysmal, persistent, or permanent) may be related to stroke risk even when controlling for baseline risk factors, with the greatest risk present in patients with permanent AF.[14] In addition, AF detected by CIEDs is also associated with an increased risk of stroke, regardless of the presence or absence of symptoms (discussed later).[15–19]

Oral anticoagulation (OAC) with either warfarin or one of the novel oral anticoagulants (NOACs) can reduce the risk of stroke in patients with AF by at least two-thirds.[20–23] Current US guidelines recommend initiating anticoagulation for stroke prevention in patients with a CHA_2DS_2-VASc score of 2 or higher, with the option of OAC, aspirin, or nothing for a CHA_2DS_2-VASc score of 1.[24] European guidelines recommend OAC for CHA_2DS_2-VASc scores of 1 or greater.[25] However, all prior studies showing the efficacy of OAC in stroke are based on patients with AF burdens high enough or symptoms significant enough to be detected through routine care. However, AF can be completely asymptomatic in at least one-third of patients,[26,27] and those who do have symptoms are only aware of a minority of episodes.[26,28,29] Regardless, patients with silent AF have increased rates of stroke that are similar to those of patients with symptomatic AF, and stroke may be the presenting sign of AF in approximately 25% of cases.[30] Thus, the risk of stroke associated with short episodes of device-detected subclinical AF and its responsiveness to OAC has been largely unexplored.

CIEDs with the ability to detect atrial arrhythmias, such as pacemakers with atrial leads, implantable cardioverter-defibrillators (ICDs) with atrial leads, or leadless insertable cardiac monitors (ICMs) with AF detection algorithms, provide a unique opportunity to identify and manage patients with asymptomatic AF who may benefit from stroke prevention interventions. Several studies have shown that a substantial proportion of patients with these devices have a high burden of AF, even if they have no clinical history of the arrhythmia before implant. Between 10% and more than 50% of patients with pacemakers or ICDs and no known history of AF before device implantation have device-detected asymptomatic AF.[16–19,31–33] The ability of CIEDs to continuously monitor the heart rhythm over a time horizon measured in years not only provides the unique ability to detect infrequent and asymptomatic AF but also raises questions about the clinical significance and management of these arrhythmias that may not otherwise have been detected. With more than 3 million CIEDs already implanted and more than 400,000 additional new CIEDs implanted each year in the United States alone,[34] defining the clinical significance and management of CIED-detected subclinical AF is critical.

DEVICE-DETECTED ATRIAL HIGH-RATE EPISODES CORRELATE WITH TRUE ATRIAL TACHYARRHYTHMIAS

Pacemakers and ICDs with atrial leads can detect local atrial depolarizations at the site where the atrial lead is attached to the myocardium. Atrial rates that exceed a certain cutoff (typically 170–220 beats per minute [bpm]) can be categorized as atrial high-rate episodes (AHREs). These AHREs can be triggered by any of the atrial tachyarrhythmias, including AF, atrial flutter, or atrial tachycardia, with AF and atrial flutter representing the most common arrhythmias.[35,36] However, not all AHREs are true atrial tachyarrhythmias. False-positive AHREs may result from far-field R-wave oversensing by the atrial lead, runs of premature atrial complexes, electrical interference, myopotentials, or repetitive nonreentrant ventriculoatrial synchrony, among other things. False-negatives may result from brief episodes that last for a shorter period of time than that programmed for the detection of AHREs. In addition, different atrial rate cutoffs (>250 bpm) and different detection