EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE

BROWARD HEALTH Care Warriors

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Rate-Refractory Permanent Atrial Fibrilation

A 68-year-old male, with medical history significant for permanent atrial fibrillation and hypertension, presents to the ED for the second time in a week. The first ER visit occurred for atrial fibrillation with rapid ventricular response (AF w/ RVR) after the patient ran out of his prescribed Sotalol—which had asymptomatically controlled his heart rate and rhythm for seven years. The patient left the ED, rate-controlled and with a new prescription for Sotalol, only to return four days later with left-sided chest pain, palpitations, and weakness. He denies any other symptoms, tobacco, alcohol, drug use, travel, sick contacts, and pets. Previously he underwent failed cardioversion, ablation, and combination regimen of Metoprolol and Digoxin. His only other current medications are Xarelto and Lisinopril. The patient is afebrile, normotensive, breathing normally, and his heart rate is erratic alternating between bradycardia and tachycardia. On physical exam, patient is obese, diaphoretic, and has a 2/6 intensity, harsh, systolic murmur, loudest at the left-sternal border. The rest of the physical exam is within normal limits. Chest radiograph is clear and EKG demonstrates AFib w/ RVR and atrial enlargement, but no ischemic changes.

Which of the following is the most appropriate treatment for this patient's condition?

A. DC Cardioversion

B. Sotalol 160mg q12h

C. Diltiazem 0.25 mg/kg IV bolus over 2 min; then 5-15mg/h

D. Synthroid 75 µg loading dose

E. Amiodarone 300mg IV over 1h, then 10-50 mh/h over 24h

TABLE I: DEFINITIONS OF ATRIAL FIBRILATION (AF)

Paroxysmal AF	Terminates spontaneously or with intervention within 7 d of onset.
Persistent AF	Episodes may recur with variable frequency. Continuous AF that is sustained >7 d.
Long-standing persistent AF	Continuous AF >12 mo in duration.
Permanent AF	Patient and clinician make a joint decision to stop further attempts to restore and/or maintain sinus rhythm.
Nonvalvular AF	AF in the absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve, or mitral valve repair.

January et al. 2253 Executive Summary: 2014 AHA/ACC/HRS Atrial Fibrillation Guideline

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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The correct answer is C. Diltiazem 0.25 mg/kg IV bolus over 2 min; then 5-15mg/h.[1] Cardioversion, choice A, is appropriate if the patient is hemodynamically unstable, or if new onset and less than 48h into the episode, or if following a transesophageal echocardiogram (TEE)—ruling out atrial thrombi.[1] Amiodarone (Choice D) can also be used to pharmacologically cardiovert the patient (Class IIa).[1]

Atrial fibrillation (AF) is an irregularly irregular heart rhythm, further classified by the duration of episodes (Table I).[1] Implanted loop recorders, pacemakers, and defibrillators can also be used to increase the precision of detection.[1] The condition is often progressive, leading to permanent AF.[1] The US incidence of AF is 2.2 million persons.[2] The condition affects 4% of individuals older than 60 years and 8% of persons older than 80 years.[2] Data suggests that 25% of people older than 40 years will develop AF during their lifetime.[2]

Discussion

AF occurs when structural chances and aberrant electrical activity alter the atria to propagate a dysrhythmia (Figure 1).[1] Risk factors include increasing age, hypertension, diabetes mellitus, heart attack, valve disease, obesity, sleep apnea, heart surgery, smoking, exercise, alcohol use, hyperthyroidism, and family history[1].

Treatment

AF is often progressive, leading to permanent AF; early treatment and lifestyle modification are key to halting progression.[1] Treatment recommendations for AF address thromboembolic risk and heart rate and/or rhythm control.[1] In the emergency department, symptomatic treatment goals focus on rate control to less than 80 beats per minute (Class IIa).[1]

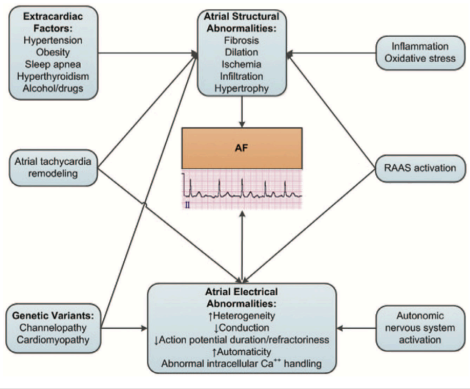

FIGURE 1 Mechanisms of AF

AF indicates atrial fibrillation; Ca^{++}, ionized calcium; and RAAS, renin-angiotensin-aldosterone system.

The mainstay of pharmacologic therapy, following the AFFIRM trial in 2002, is rate control (Table 8).[1]

Beta-blockers and non-dihydropyridine calcium channel blockers are endorsed as a first-line treatment.[1] If the patient is concurrently presenting with EKG evidence of Wolf-Parkinson-White Syndrome (WPW), avoid all Atrioventricular Nodal agents.[1] Procainamide is indicated with AF with RVR in the presence of WPW.[1] Electrical cardioversion is indicated if the patient is hemodynamically unstable.[1] If the AF episode has lasted longer than 48h, a TEE must be performed before cardioversion to exclude the risk of an atrial thrombus.[1] If the patient's rhythm is refractory to both beta-blockers and non-dihydropyridine calcium channel blockers, then transitioning to rhythm control, with amiodarone is appropriate.[1]

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TABLE 9 Common Medication Dosage for Rate Control of AF

	Intravenous Administration	Usual Oral Maintenance Dose
Beta blockers		
Metoprolol tartrate	2.5–5.0 mg IV bolus over 2 min; up to 3 doses	25–100 mg BID
Metoprolol XL (succinate)	N/A	50–400 mg QD
Atenolol	N/A	25–100 mg QD
Esmolol	500 mcg/kg IV bolus over 1 min, then 50–300 mcg/kg/min IV	N/A
Propranolol	1 mg IV over 1 min, up to 3 doses at 2-min intervals	10–40 mg TID or QID
Nadolol	N/A	10–240 mg QD
Carvedilol	N/A	3.125–25 mg BID
Bisoprolol	N/A	2.5–10 mg QD
Nondihydropyridine calcium channel antagonists		
Verapamil	0.075–0.15 mg/kg IV bolus over 2 min; may give an additional 10.0 mg after 30 min if no response, then 0.005 mg/kg/min infusion	180–480 mg QD (ER)
Diltiazem	0.25 mg/kg IV bolus over 2 min, then 5–15 mg/h	120–360 mg QD (ER)
Digitalis glycosides		
Digoxin	0.25 mg IV with repeat dosing to a maximum of 1.5 mg over 24 h	0.125–0.25 mg QD
Others		
Amiodarone*	300 mg IV over 1 h, then 10–50 mg/h over 24 h	100–200 mg QD

*Multiple dosing schemes exist for the use of amiodarone.
AF indicates atrial fibrillation; BID, twice daily; ER, extended release; IV, intravenous; N/A, not applicable; QD, once daily; QID, 4 times a day; and TID, 3 times a day.

Thromboembolic risk should also be assessed to prevent any cerebrovascular incidents. The CHA_2DS_2-VASc score is used to evaluate thromboembolic risk.[1] Warfarin is recommended for mechanical heart valves, chronic kidney disease, and valvular AF.[1] Prior stroke, TIA, or CHA_2DS_2-VASc >2, are appropriate indications for oral anticoagulants: Dabigatran, Rivaroxaban, Apixaban, or Warfarin (Class I).[1]

Take Home Points

- Atrial fibrillation (AF) is an irregularly irregular heart rhythm classified by the duration of episodes.[1]
- Risk factors include increasing age, hypertension, diabetes mellitus, heart attack, valve disease, obesity, sleep apnea, heart surgery, smoking, exercise, alcohol use, hyperthyroidism, and family history[1].
- Treatment recommendations for AF address thromboembolic risk and heart rate and/or rhythm control.[1] In the Emergency Room, treatment goals focus on rate control to less than 80 beats per minute (Class IIa).[1]
- A Beta-blockers and non-dihydropyridine calcium channel blockers are endorsed as a first-line treatment.[1]
- Electrical cardioversion is indicated if the patient is hemodynamically unstable.[1]
- If the AF episode has lasted longer than 48h, a TEE must be performed before cardioversion to exclude the risk of an atrial thrombus.[1]
- The CHA_2DS_2-VASc score is used to evaluate thromboembolic risk.[1] Warfarin is recommended for mechanical heart valves, chronic kidney disease, and valvular AF.[1]
- Prior stroke, TIA, or CHA_2DS_2-VASc >2, are appropriate indications for oral anticoagulants:

ABOUT THE AUTHOR

Adam L. Rosenblum wrote this month's case. Adam is a 4th year medical student from NSU-COM. He did his emergency medicine rotation at BHMC in February 2017. Adam plans on pursuing a career in Cardiology after graduation.

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