

## Common Tachyarrhythmias: Review Questions

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### QUESTIONS

Choose the single best answer for each question.

#### Questions 1 to 3 refer to the following case.

A 52-year-old man presents to his primary care physician after experiencing occasional palpitations for 1 week. He otherwise reports feeling well and denies chest discomfort, shortness of breath, lightheadedness, or anxiety. He has had regular check-ups and has been relatively healthy except for an elevated cholesterol level and undergoing arthroscopic knee surgery 2 years ago. The patient currently takes no medications other than as-needed anti-inflammatory medications. He denies alcohol or drug use. His blood pressure (BP) is 132/78 mm Hg. Physical examination is remarkable for an irregular rhythm on cardiac auscultation. A 12-lead electrocardiogram (ECG) is performed in the clinic (Figure 1).

#### 1. Which of the following is the next best course of action?

- (A) Administer an aspirin and  $\beta$ -blocker in the office followed by repeat ECG
- (B) Admit the patient for administration of adenosine
- (C) Admit the patient for immediate electrical cardioversion
- (D) Admit the patient to rule out myocardial infarction (MI)
- (E) No immediate intervention is necessary; proceed with further evaluation as an outpatient

#### 2. Which studies should be ordered as part of the standard work-up of this patient's arrhythmia?

- (A) Cardiac biomarkers and thyroid function studies
- (B) Cardiac biomarkers and transesophageal echocardiogram (TEE)
- (C) Cardiac biomarkers and transthoracic echocardiogram (TTE)
- (D) TEE and thyroid function studies
- (E) Thyroid function studies and TTE

#### 3. Studies performed as part of the standard work-up are normal. Three months later, the patient reports that the palpitations are not as frequent. An ECG shows no change in the rhythm from the prior visit. The patient's heart rate is 68 bpm. Which of the following should be prescribed at this time?

- (A) Clopidogrel
- (B) Digoxin
- (C) Diltiazem
- (D) Enteric-coated aspirin
- (E) Warfarin

#### Questions 4 and 5 refer to the following case.

A 68-year-old woman presents to the emergency department after experiencing sudden-onset nausea and palpitations 1 hour earlier while working in her garden. She has a history of insulin-dependent diabetes and hypertension for which she takes lisinopril 20 mg daily. She denies prior similar episodes or chest discomfort. The patient's heart rate is 170 bpm, and BP is 158/92 mm Hg. Physical examination reveals a frail, anxious-appearing woman. She is mildly diaphoretic and tachypneic. Lung sounds are clear. Cardiac examination is notable for a rapid heart rate with a regular rhythm. Abdominal examination is normal. Peripheral examination reveals no clubbing, cyanosis, or edema. 12-Lead ECG is performed (Figure 2).

#### 4. The rhythm demonstrated in Figure 2 can be best characterized by which of the following?

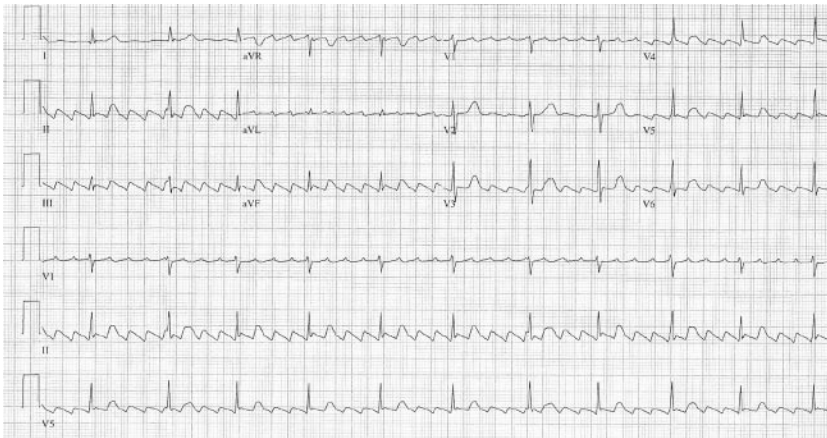
- (A) Atrial flutter

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**Figure 1.** 12-Lead electrocardiogram performed in the case patient described in questions 1 through 3.

- (B) Atrioventricular (AV) nodal reentrant tachycardia (AVNRT)
- (C) Sinus tachycardia
- (D) Ventricular tachycardia (VT)
- (E) Wolf-Parkinson-White reentrant tachycardia

**5. Which of the following measures is most appropriate at this time?**

- (A) Defibrillation
- (B) A glycoprotein IIb/IIIa inhibitor and activation of the cardiac catheterization laboratory
- (C) Initiation of a heparin drip
- (D) Intravenous (IV) adenosine
- (E) IV amiodarone

**Questions 6 and 7 refer to the following case.**

A 62-year-old man is recovering from a recent anterior wall MI and stenting of his left anterior descending coronary artery 24 hours earlier. The nurse notices a wide-complex tachycardia on telemetry monitoring, which began 1 minute ago. An ECG from earlier in the day shows sinus rhythm with Q waves across the precordial leads and no evidence of a bundle branch block. The patient appears slightly short of breath but is otherwise in no apparent distress. His BP is 118/62 mm Hg and does not vary significantly with inspiration. A 12-lead ECG demonstrates monomorphic VT.

**6. Which of the following is the next best step in the management of this patient?**

- (A) Administer IV adenosine
- (B) Administer IV amiodarone and initiate an amiodarone drip
- (C) Administer IV metoprolol
- (D) Continued monitoring and reassessment of rhythm and BP in 5 minutes
- (E) Immediate defibrillation

**7. Four days later, the patient is ready for discharge. He has had no additional arrhythmic events. TTE performed the previous day shows severe anterior and apical hypokinesia with an ejection fraction of 25%. The patient's discharge medications include aspirin, clopidogrel, metoprolol, lisinopril, and a statin. Which of the following measures is also recommended by the American College of Cardiology/American Heart Association guidelines at this time?**

- (A) Defibrillator placement without electrophysiology study
- (B) Electrophysiology study
- (C) Holter monitoring
- (D) Signal average ECG
- (E) None of the above

#### ANSWERS AND EXPLANATIONS

**1. (E) No immediate intervention is necessary; proceed with further evaluation as an outpatient.** Figure 1 demonstrates atrial flutter with variable AV block. The work-up for an otherwise asymptomatic individual with rate-controlled atrial flutter is the same as that for atrial fibrillation (AF) and should be done in the outpatient setting. Indications for admission include significant symptoms (eg, angina, heart failure, onset of a thromboembolic process), hemodynamic instability, or evidence of ischemic changes on the ECG. Administering aspirin or a  $\beta$ -blocker would not be appropriate in the absence of ischemic symptoms or ECG changes. Adenosine may prolong the AV block and make the flutter waves easier to see, but it will not convert flutter to sinus rhythm and is not needed to make the diagnosis in this case. Electrical cardioversion should not be performed at this time because the duration of the flutter is unclear; it could be done safely after TEE demonstrates the absence of atrial thrombus.



**Figure 2.** 12-Lead electrocardiogram performed in the case patient described in questions 4 and 5.

In the absence of symptoms or a difficult-to-control heart rate, immediate cardioversion would not provide any significant benefit. AF and atrial flutter can be caused by ischemia, but without symptoms or ECG changes an ischemic evaluation is not indicated.<sup>1</sup>

2. **(E) Thyroid function studies and TTE.** A TTE would provide information about the patient's left ventricular systolic function (which would help decide whether to anticoagulate) and atrial size (which may help predict the likelihood of remaining in sinus rhythm following cardioversion). Thyroid function studies are also appropriate because a hyperthyroid state may cause an intermittent rapid heart rate and explain this patient's palpitations. Cardiac biomarkers are not indicated in the absence of ischemic symptoms or ECG changes. A TEE would only be indicated if immediate cardioversion was planned.<sup>1</sup>
3. **(D) Enteric-coated aspirin.** Anticoagulation for AF/flutter is based on the patient's CHADS2 score. This is calculated by assigning a numeric value to the patient's risk factors for a thromboembolic event: 1 point is assigned for congestive heart failure, hypertension, age 75 years or older, and diabetes; and 2 points are assigned for a prior stroke or transient ischemic attack. The total score determines the patient's annual risk of a thromboembolic event and should be weighed against the risk for bleeding with warfarin. This patient has atrial flutter with a CHADS2 score of 0. Therefore, this patient can be managed with aspirin alone rather than warfarin. Digoxin is not appropriate in an active individual with rate-controlled flutter and normal left ventricular function. The addition of  $\beta$ -blockers or calcium channel blockers is unnecessary in a patient who is already rate-controlled. Clopidogrel has not been shown to be beneficial in preventing thromboembolic events in the setting of AF/flutter.
4. **(B) AVNRT.** The rhythm demonstrated in Figure 2 is AVNRT as evidenced by narrow QRS complexes, regular rhythm, and retrograde P waves (terminal positive deflection in  $V_1$  and negative deflection in aVF) within 60 ms of the QRS complex. A heart rate of 170 bpm is unusually fast for sinus tachycardia, especially in a resting individual. Furthermore, the P waves do not precede the QRS complexes to suggest a sinus rhythm. VT is characterized by wide QRS complexes and AV dissociation, which are not present in this patient's ECG. Wolf-Parkinson-White syndrome classically demonstrates a short PR interval with a characteristic delta wave. There are no flutter waves to suggest atrial flutter.<sup>2</sup>
5. **(D) IV adenosine.** IV adenosine is the most appropriate choice for a patient with stable supraventricular tachycardia (SVT). Given the ST depressions on ECG, which suggest ischemia, an IV  $\beta$ -blocker would be a reasonable alternative. Electrical cardioversion is a consideration for rapid termination of SVT in a patient who exhibits hemodynamic instability but must be synchronized to prevent ventricular fibrillation (VF). Amiodarone is not a first-line treatment for SVT. IV heparin or glycoprotein IIb/IIIa inhibitors are reasonable considerations for patients in whom cardiac ischemia from acute coronary syndrome is suspected. At this time, it is more likely that this patient's cardiac ischemia is caused by supply demand mismatch from the rapid heart rate.<sup>2,3</sup>
6. **(B) Administer IV amiodarone and initiate an amiodarone drip.** The patient has stable VT. The term "stable" refers only to the notion that the patient has a palpable pulse and a BP that allows for

peripheral organ perfusion. The rhythm has lasted for more than 30 seconds, which classifies it as sustained VT, an inherently unstable rhythm that can degenerate into VF. Hence, continued monitoring would not be appropriate. Defibrillation would be appropriate for unstable VT or VF, but is not yet necessary in this setting. Adenosine is only effective for certain idiopathic VTs and is usually ineffective for those associated with structural heart disease, as in this case. The appropriate management is either synchronized electrical cardioversion, which is not optimal in a conscious patient, or initiation of IV antiarrhythmic therapy (eg, procainamide, amiodarone, lidocaine).<sup>4</sup>

7. **(E) None of the above.** Studies have not demonstrated that the development of ventricular tachyarrhythmias during the first 24 to 48 hours after MI is predictive of an increased risk of future sudden cardiac death. In contrast, ventricular arrhythmias experienced more than 48 hours after MI portend a worse prognosis. Because the patient had no additional arrhythmic episodes, no additional studies are warranted at this time. Defibrillator placement would be indicated if the patient's ejection fraction continues to be less than 30% or if symptoms of congestive heart failure exist 4 weeks after his MI.<sup>4,5</sup>

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