



FIGURE 9-3 Sinus node dysfunction. **A**, Sinus bradycardia in a patient receiving metoprolol. This bradycardia results from diminished normal automaticity of the sinus node. **B**, Pauses related to blocked premature atrial contractions (PACs). Blocked PACs are a common cause for apparent sinus pauses because the PAC may be early enough to be concealed by the T wave of the preceding beat (*arrows*). The pauses are not a sign of sinus node dysfunction but rather a physiologic response to an early coupled PAC. **C**, The sinus pause is an abnormal finding that suggests sinus node disease. The pause is exactly two sinus cycles and may represent sinoatrial exit block. **D**, Sinoatrial Wenckebach type exit block. As is the case with the RR interval preceding atrioventricular nodal Wenckebach, progressive shortening of the PP interval preceding a doubling in sinus cycle length likely represents Wenckebach exit block from the sinus node tissue to the atrium. **E**, Bradycardia tachycardia syndrome due to sinus node dysfunction. An episode of rapidly conducted atrial fibrillation or flutter terminates and is followed for a protracted period of sinus arrest before recovery of sinus rhythm and ultimate relapse of rapidly conducted atrial fibrillation. These pauses may result in syncope or near-syncope.

constituting His-Purkinje conduction, is short, it is the major prognostic component of AV conduction and therefore clinically important. Because the last portion of the PR interval is the time from the onset of His bundle to the time of ventricular activation, it is commonly referred to as the HV interval. Although the HV interval cannot be measured directly from the surface ECG, a block in the His-Purkinje system can be inferred from the characteristic features that can be gleaned from review of the surface ECG.

First-Degree Atrioventricular Block

First-degree AV block is defined as a PR interval exceeding 0.2 seconds (200 milliseconds) in the setting of otherwise preserved AV conduction (Fig. 9-4A). First-degree block implies a conduction delay in one of the components of AV conduction, usually at the level of the AV node or His-Purkinje system (i.e., infranodal conduction system). First-degree AV block is usually asymptomatic, but it is a sign of AV conduction system disease and may be a diagnostic clue to the mechanism of intermittently electrocardiographically undocumented symptoms in a patient with unexplained syncope.

Second-Degree Atrioventricular Block

Second-degree AV block is defined as intermittent failure of AV conduction with interspersed periods of intact AV conduction.

Second-degree AV block, like sinus bradycardia and pauses, may be seen normally during hours of sleep as well as in athletes with high parasympathetic tone. Alone, it is not an indication of AV conduction system disease.

Second-degree block may be asymptomatic, may be associated with mild symptoms such as palpitations, or if resulting in protracted pauses or persistent bradycardia, may result in hemodynamic symptoms, including lightheadedness, syncope, and fatigue. Second-degree AV block at the level of the AV node is usually indolent and gradually progressive. Because of stable junctional escape mechanisms associated with progression to complete heart block at the level of the AV node, second-degree AV block at this level tends to have a benign prognosis and, in the absence of symptoms, can be followed safely without intervention.

Second-degree block in the infranodal conduction system, which is composed of the His bundle and bundle branches, can be malignant with a tendency to progress abruptly and unpredictably to higher degrees of AV block accompanied by unstable or absent subsidiary escape mechanisms. After a patient becomes symptomatic, the infranodal block may progress to complete heart block and, in some cases, to sudden death. Despite its malignant nature, SCD is rarely attributable to complete heart block, suggesting that most patients have symptoms permitting intervention before progression to sudden death.