relationship of the P wave to the preceding QRS complex, it is possible to classify PSVT as a *short RP tachycardia* or a *long RP tachycardia*. Short RP tachycardias demonstrate a short RP pattern with P waves embedded within or occurring closely after the preceding QRS complex. Short RP tachycardias occur with reentrant SVT when the retrograde VA conduction time is shorter than the antegrade AV conduction time. This pattern is observed in the two most common forms of PSVT: typical AV nodal reentry tachycardia and reciprocating AV tachycardia related to an accessory pathway.

Long RP tachycardias are characterized by an RP interval that is longer than the next PR interval during tachycardia. This pattern occurs when the retrograde VA conduction time in reentrant arrhythmias is long due to a slowly conducting retrograde pathway during tachycardia. Atypical AV node reentry, in which retrograde conduction occurs over the slow AV nodal pathway, is the most common example of a long RP reentrant tachycardia.

Atrioventricular Nodal Reentry Tachycardia

AVNRT is the most common form of PSVT. The arrhythmic mechanism depends on two distinct pathways in the AV node: a slowly conducting pathway with a short effective refractory period (i.e., slow pathway) and a rapidly conducting pathway with a longer refractory period (i.e., fast pathway). The atrial insertion sites of the two pathways are different. The fast pathway inserts anteriorly near the bundle of His, and the slow pathway inserts posteriorly near the coronary sinus ostium. Although the dual pathways are a normal feature of the AV node, patients with clinical tachycardia have more robust slow pathway conduction.

Tachycardia is most commonly triggered by a premature atrial contraction that blocks the fast pathway due to its prolonged refractory period and conducts slowly antegrade down the slow pathway, producing a long PR interval on the ECG. On reaching the distal common pathway where the fast and slow AV nodal inputs meet, if the fast pathway is no longer refractory, the impulse may penetrate the fast pathway in a retrograde direction and rapidly activate the atrium, producing a short RP interval and reinitiating reentry down the slow pathway and up the fast pathway. In typical slow-fast AVNRT, the RP interval is so short that the P wave is often buried in the preceding QRS complex (Fig. 9-5A).

Atypical fast-slow AVNRT may occur with antegrade conduction over the fast pathway and retrograde conduction over the slow pathway. This form of AVNRT is uncommon and produces a long RP pattern on the ECG with characteristically deeply inverted retrograde P waves in leads II, III, and aVF.

Vagal maneuvers cause temporary AV nodal blockade and may terminate sustained AVNRT. Alternatively, intravenous adenosine is a highly effective acute therapy. The need for chronic or definitive therapy is determined by symptoms, arrhythmia frequency, and patient preference. Catheter ablation of the slow pathway at the posterior AV node is highly successful, eliminating AVNRT with a greater than 90% success rate and a low risk of complications. Drug therapy with β-blockers and calcium-channel blockers directed at the AV node may be helpful for chronic suppression. Occasionally, class IC and III antiarrhythmics may be required. AVNRT should be easily distinguished from automatic junctional tachycardia, with a narrow complex and rapid, irregular rhythm typically demonstrating AV dissociation (see Fig. 9-5B).

Reciprocating Atrioventricular Tachycardia and Preexcitation Syndromes

Congenital anomalous extranodal AV muscle fibers or accessory pathways may arise as a consequence of incomplete development of the AV annulus. These pathways are usually observed in patients with otherwise anatomically normal hearts, although right-sided accessory pathways are associated with Ebstein's anomaly and left-sided accessory pathways with hypertrophic cardiomyopathy.

Accessory pathways, or bypass tracts, may conduct antegradely, retrogradely, or bidirectionally. They typically fail to demonstrate decremental conduction or the slowed conduction with increasingly frequent stimulation that characterizes the AV node. Accessory pathways capable of antegrade conduction produce early activation of the ventricle in sinus rhythm because conduction over the accessory pathway surpasses conduction over the AV node. The relatively rapid AV conduction produces a shortened PR interval, and eccentric ventricular activation over the pathway slurs the QRS onset, resulting in a delta wave (see Fig. 9-5C). If the accessory pathway is capable only of retrograde conduction, the baseline ECG in sinus rhythm does not show evidence of an accessory pathway, and the extranodal AV connection is called *concealed*.

Short PR intervals are also observed in patients with Lown-Ganong-Levine syndrome. These patients have a normal-appearing QRS complex without a delta wave because ventricular activation occurs through the His-Purkinje system (see Fig. 9-5D).

Whether accessory pathways are concealed or manifest, the most common associated arrhythmia is *orthodromic AV reentrant tachycardia* (AVRT). Tachycardia is mediated by antegrade conduction down the AV node to the ventricle and subsequent retrograde conduction up the accessory pathway to activate the atrium and then move back down the AV node. Because the ventricles are activated during tachycardia exclusively over the AV node, the resulting tachycardia is typically a narrow complex unless aberrancy occurs (see Fig. 9-5E). A short RP pattern is observed on the ECG, although the RP is slightly longer than commonly observed in a typical AVNRT. Because the atria and ventricles constitute portions of the reentrant circuit, tachycardia depends on 1 : 1 AV conduction.

Less frequently, *antidromic AV reentrant tachycardia* is seen in patients with accessory pathways capable of antegrade conduction. The accessory pathway provides the antegrade limb of the reentrant circuit, and the AV node serves as the retrograde pathway, resulting in a wide QRS tachycardia due to complete preexcitation of the ventricles.

Special Considerations for Patients with Supraventricular Tachycardia and Delta Waves in Sinus Rhythm

Asymptomatic patients may have delta waves on the ECG, which is called a *WPW pattern*. Prevalence of the WPW pattern in the general population is approximately 1 case per 1000 people. Accessory pathways may be poorly conducting and less likely to