

hemiblock), or inferior myocardial infarction. Right axis deviation also may occur as a normal variant (particularly in children and young adults), as a spurious finding due to reversal of the left and right arm electrodes, or in conditions such as right ventricular overload (acute or chronic), lateral infarction, dextrocardia, left pneumothorax, and left posterior fascicular block.

### ■ T WAVE AND U WAVE

Normally, the mean T-wave vector is oriented roughly concordant with the mean QRS vector (within about  $45^\circ$  in the frontal plane). Since depolarization and repolarization are electrically opposite processes, this normal QRS–T-wave vector concordance indicates that repolarization normally must proceed in the reverse direction from depolarization (i.e., from ventricular epicardium to endocardium). The normal U wave is a small, rounded deflection ( $\leq 1$  mm) that follows the T wave and usually has the same polarity as the T wave. An abnormal increase in U-wave amplitude is most commonly due to drugs (e.g., dofetilide, amiodarone, sotalol, quinidine) or to hypokalemia. Very prominent U waves are a marker of increased susceptibility to *torsades de pointes* ([Chap. 246](#)).

## MAJOR ECG ABNORMALITIES

### ■ CARDIAC ENLARGEMENT AND HYPERTROPHY

Right atrial overload (acute or chronic) may lead to an increase in P-wave amplitude ( $\geq 2.5$  mm) ([Fig. 240-8](#)), previously referred to as “P-pulmonale.” Left atrial overload typically produces a biphasic P wave in  $V_1$  with a broad negative component or a broad ( $\geq 120$  ms), often notched P wave in one or more limb leads ([Fig. 240-8](#)). This pattern, historically referred to as “P-mitrale,” may also occur with left atrial conduction delays in the absence of actual atrial enlargement, leading to the more general designation of *left atrial abnormality*.