CHAPTER e28

Atlas of Electrocardiography

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The electrocardiograms (ECGs) in this Atlas supplement those illustrated in Chap. 228. The interpretations emphasize findings of specific teaching value.

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The abbreviations used in this chapter are as follows:

AF—atrial fibrillation
HCM—hypertrophic cardiomyopathy
LVH—left ventricular hypertrophy
MI—myocardial infarction
NSR—normal sinus rhythm
RBBB—right bundle branch block
RV—right ventricular
RVH—right ventricular hypertrophy

MYOCARDIAL ISCHEMIA AND INFARCTION

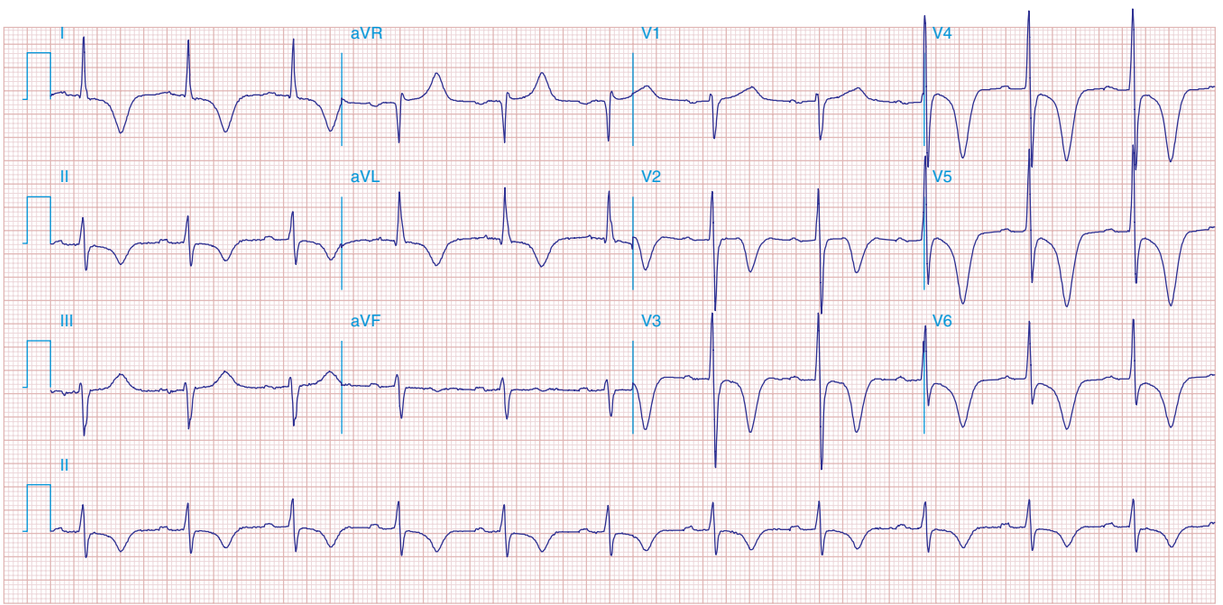

Figure e28-1 **Anterior wall ischemia** (deep T-wave inversions and ST-segment depressions in I, aVL, V_3–V_6) in a patient with **LVH** (increased voltage in V_2–V_5).

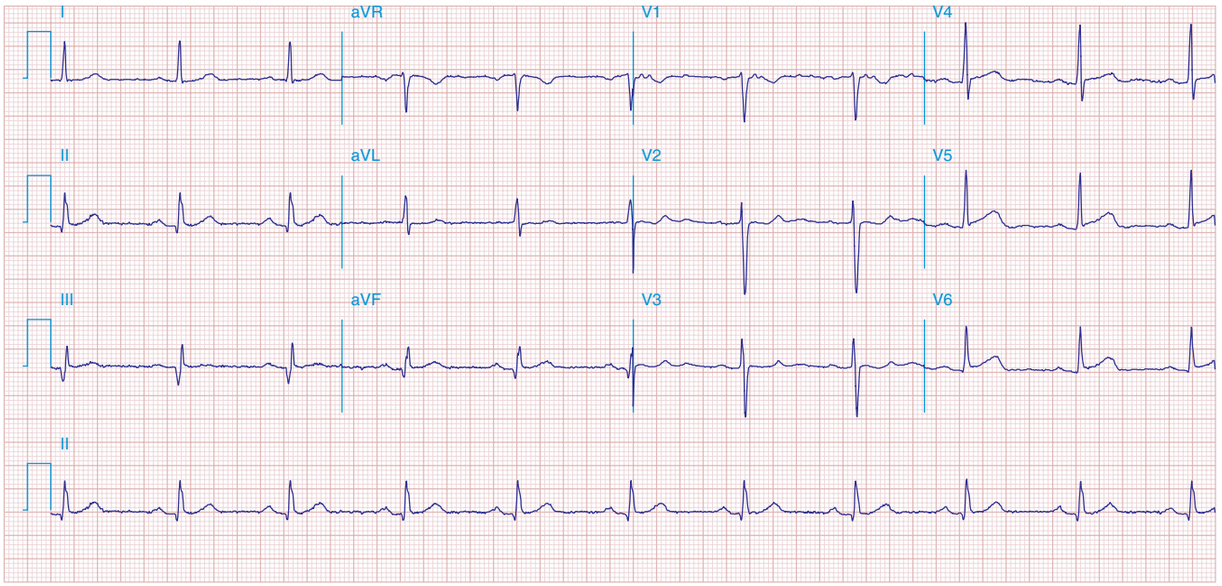

Figure e28-2 **Acute anterolateral wall ischemia** with ST elevations in V_4–V_6. Probable prior inferior MI with Q waves in leads II, III, and aVF.

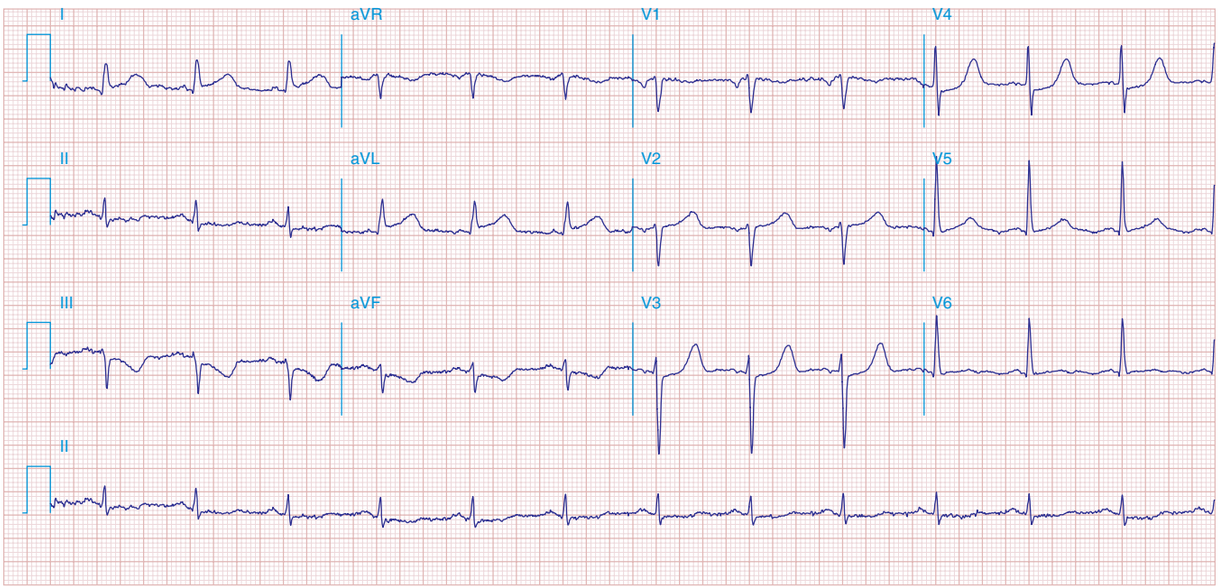

Figure e28-3 **Acute lateral ischemia** with ST elevations in I and aVL with probable reciprocal ST depressions inferiorly (II, III, and aVF). Ischemic ST depressions also in V_3 and V_4. **Left atrial abnormality**.

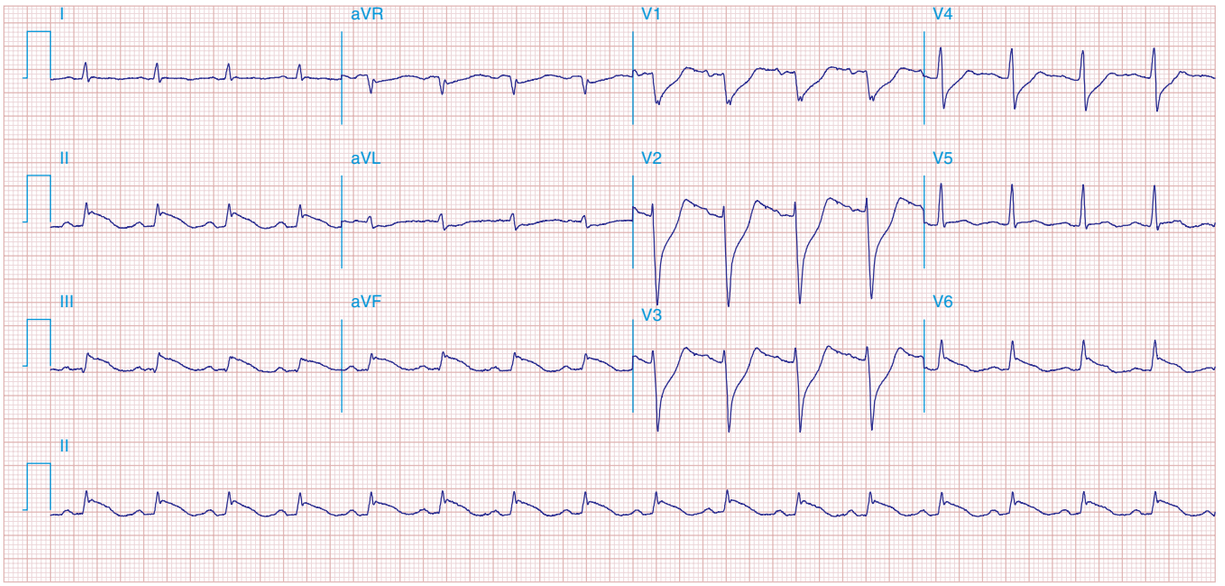

Figure e28-4 **Sinus tachycardia.** Marked ischemic ST-segment elevations in inferior limb leads (II, III, aVF) and laterally (V_6) suggestive of **acute inferolateral MI,** and prominent ST-segment depressions with upright T waves in V_1–V_4 are consistent with associated **acute posterior MI**.

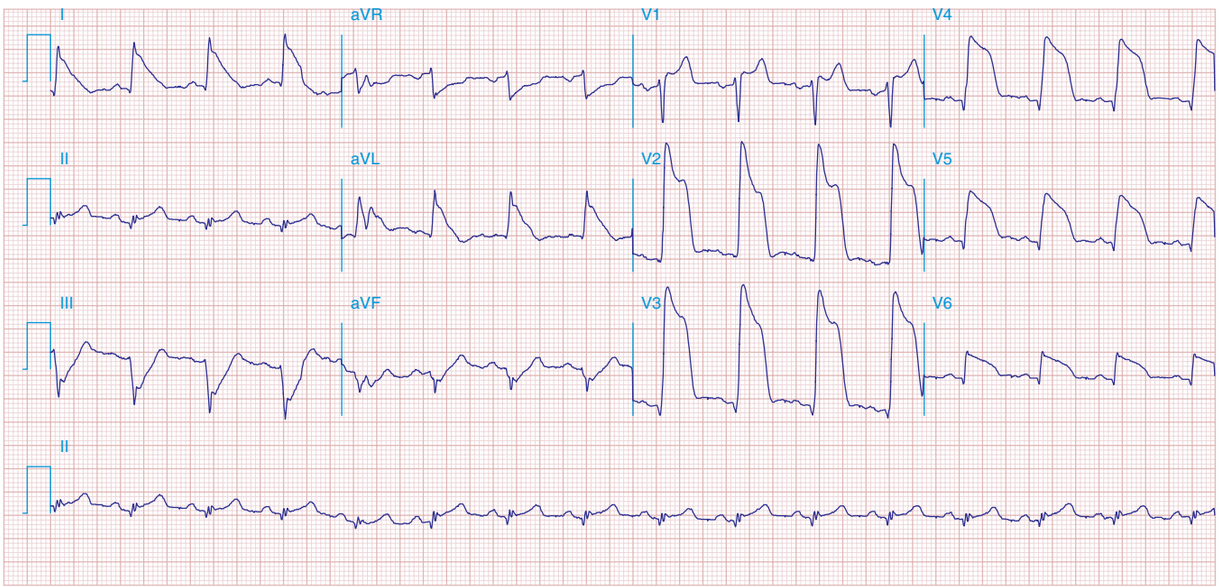

Figure e28-5 **Acute, extensive anterior MI** with marked ST elevations in I, aVL, V_1–V_6 and small pathologic Q waves in V_3–V_6. Marked reciprocal ST-segment depressions in III and aVF.

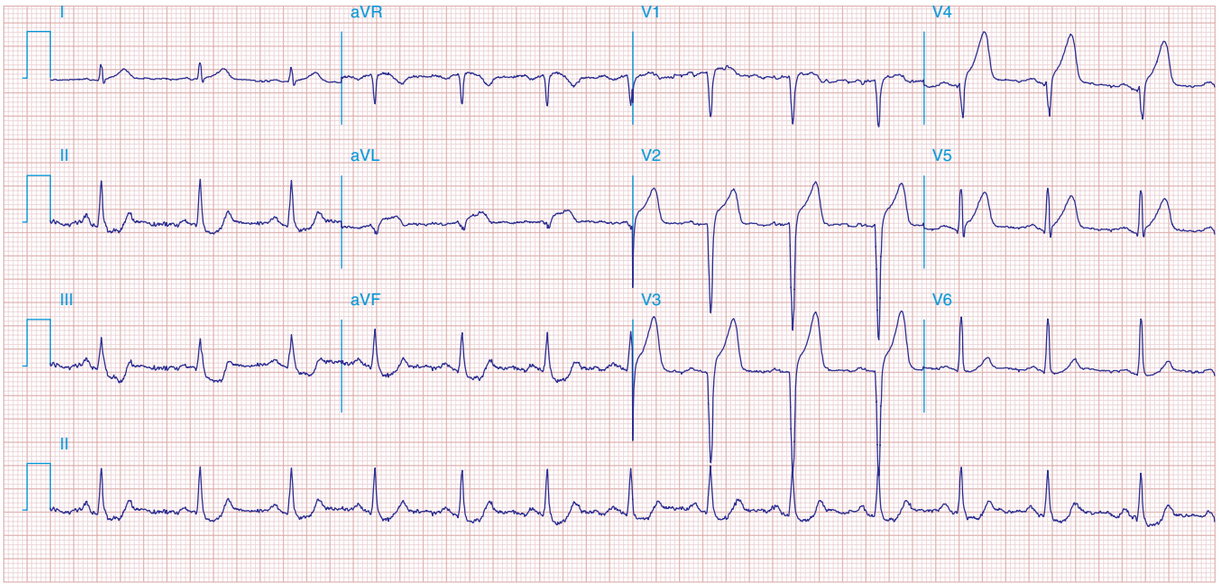

Figure e28-6 **Acute anterior wall MI** with ST elevations and Q waves in V_1–V_4 and aVL and reciprocal inferior ST depressions.

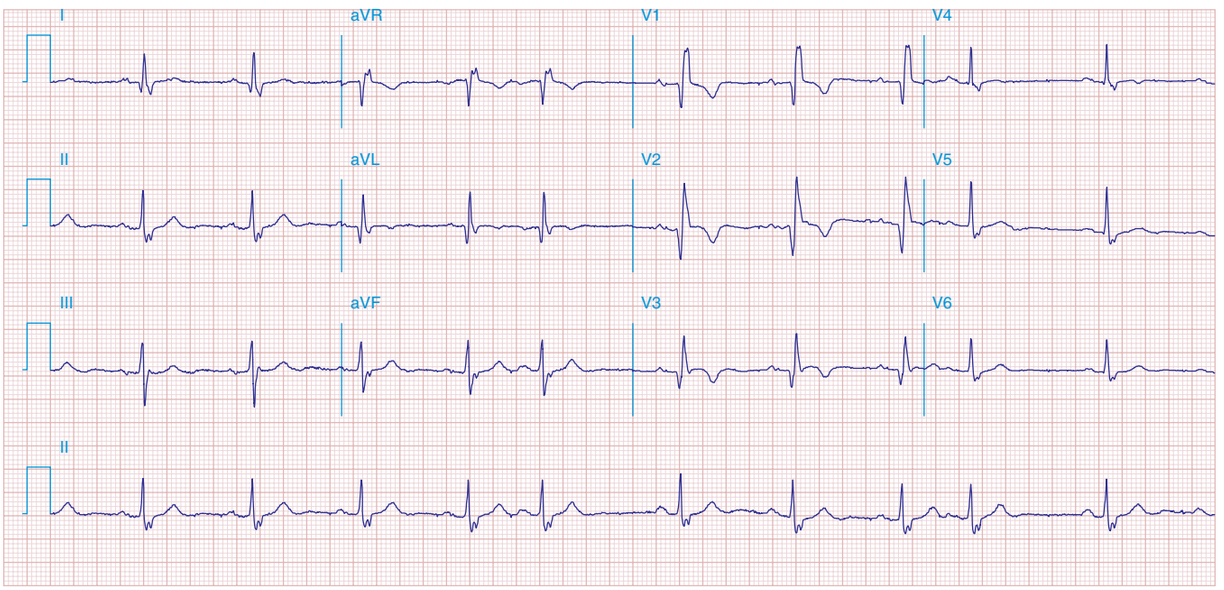

Figure e28-7 NSR with premature atrial complexes. **RBBB;** pathologic Q waves and ST elevation due to **acute anterior/septal MI** in V_1–V_3.

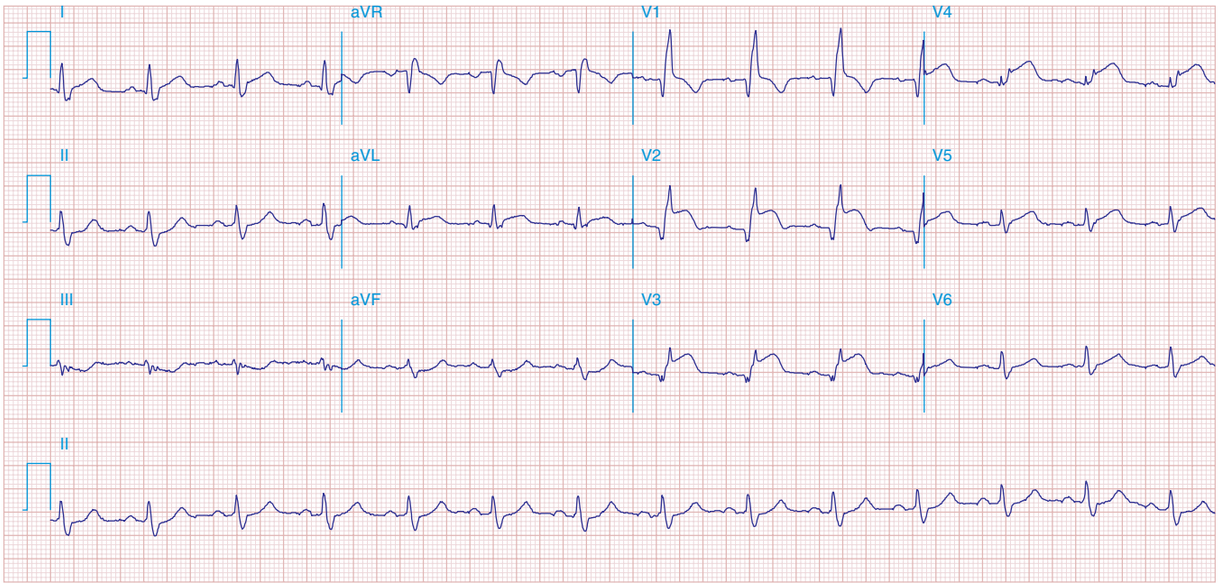

Figure e28-8 **Acute anteroseptal MI** (Q waves and ST elevations in V_1–V_4) with **RBBB** (note terminal R waves in V_1).

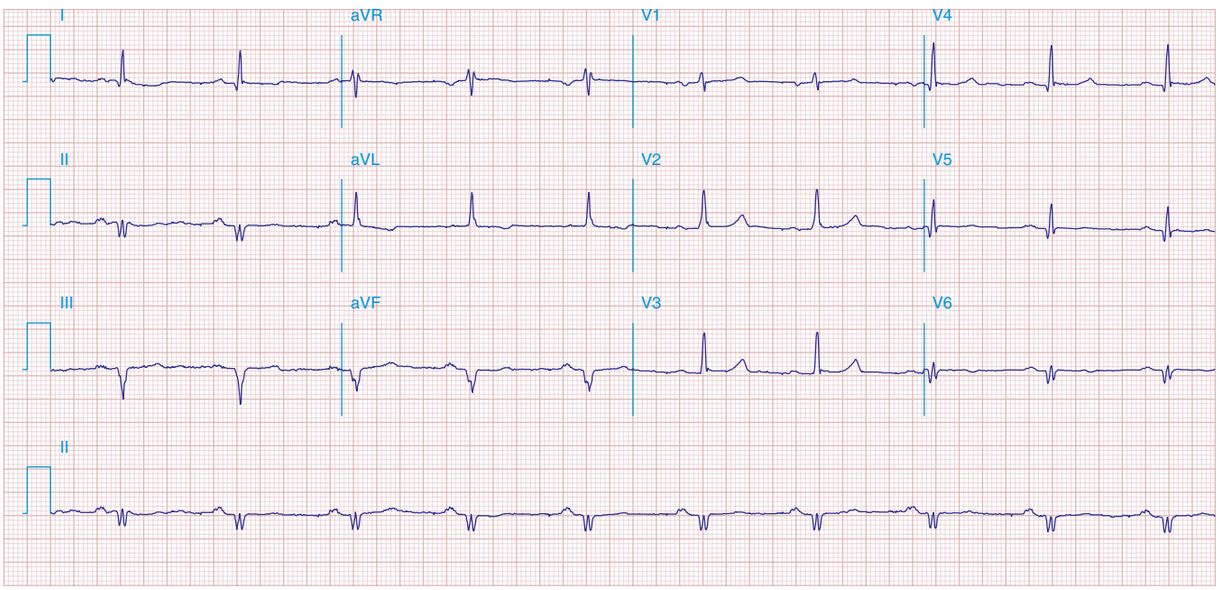

Figure e28-9 **Extensive prior MI involving inferior-posterior-lateral wall** (Q waves in leads II, III, aVF, tall R waves in V_1, V_2, and Q waves in V_5, V_6). T-wave abnormalities in leads I and aVL, V_5, and V_6.

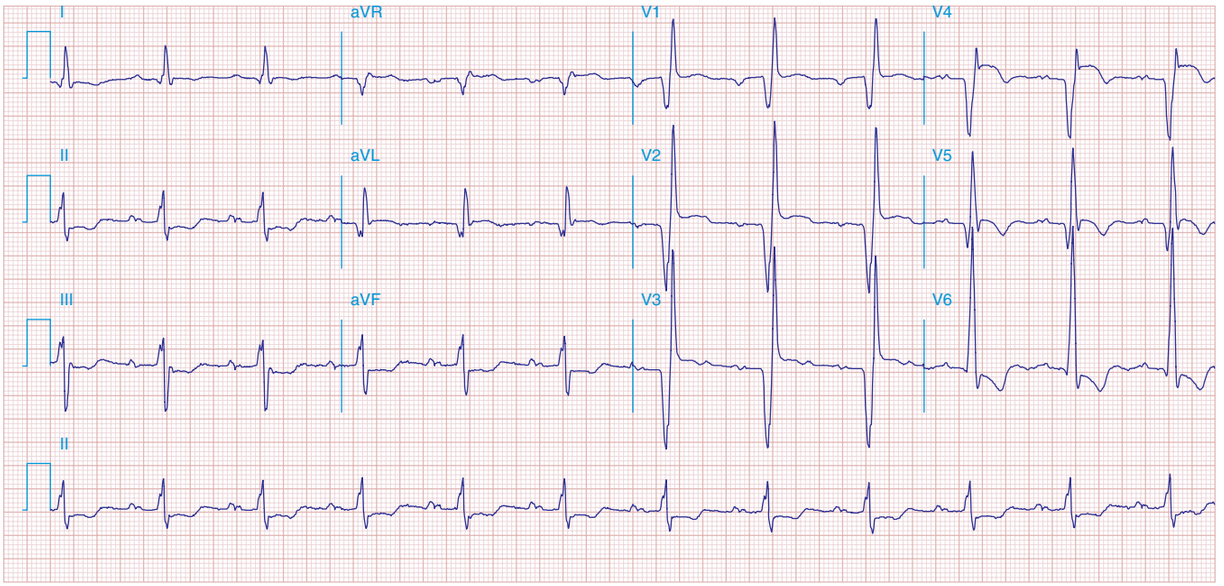

Figure e28-10 **NSR with PR prolongation** ("1st degree AV block"), left atrial abnormality, LVH, and RBBB. Pathologic Q waves in V_1–V_5 and aVL with ST elevations (a chronic finding in this patient). Findings compatible with **prior anterolateral MI and LV aneurysm**.

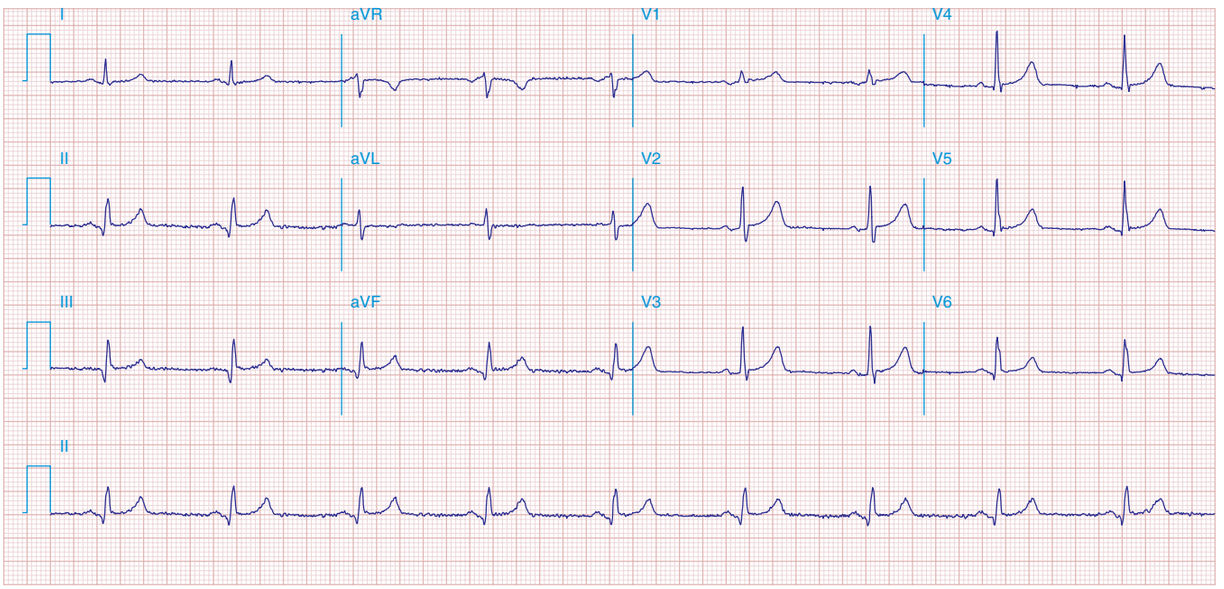

Figure e28-11 **Prior inferior-posterior MI.** Wide (0.04 s) Q waves in the inferior leads (II, III, aVF); broad R wave in V_1 (a Q wave "equivalent" here). Absence of right-axis deviation and the presence of upright T waves in V_1–V_2 are also against RVH.

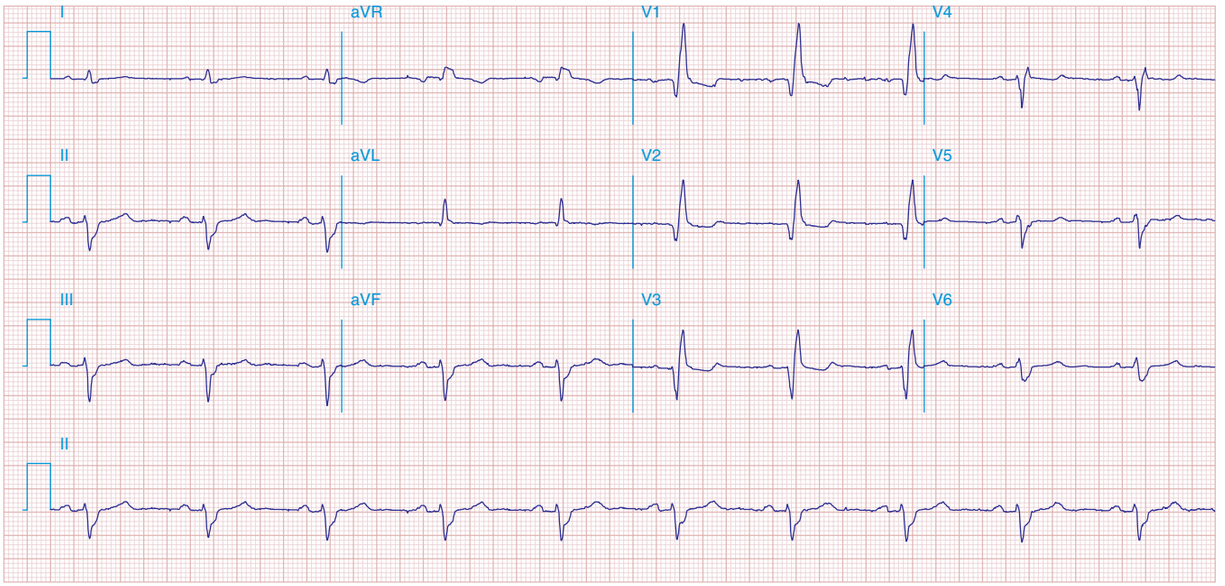

Figure e28-12 NSR with RBBB (broad terminal R wave in V_1) and left anterior fascicular block (hemiblock) and pathologic anterior Q waves in V_1–V_3. Patient had **severe multivessel coronary artery disease,** with echocardiogram showing septal dyskinesis and apical akinesis.

PERICARDITIS

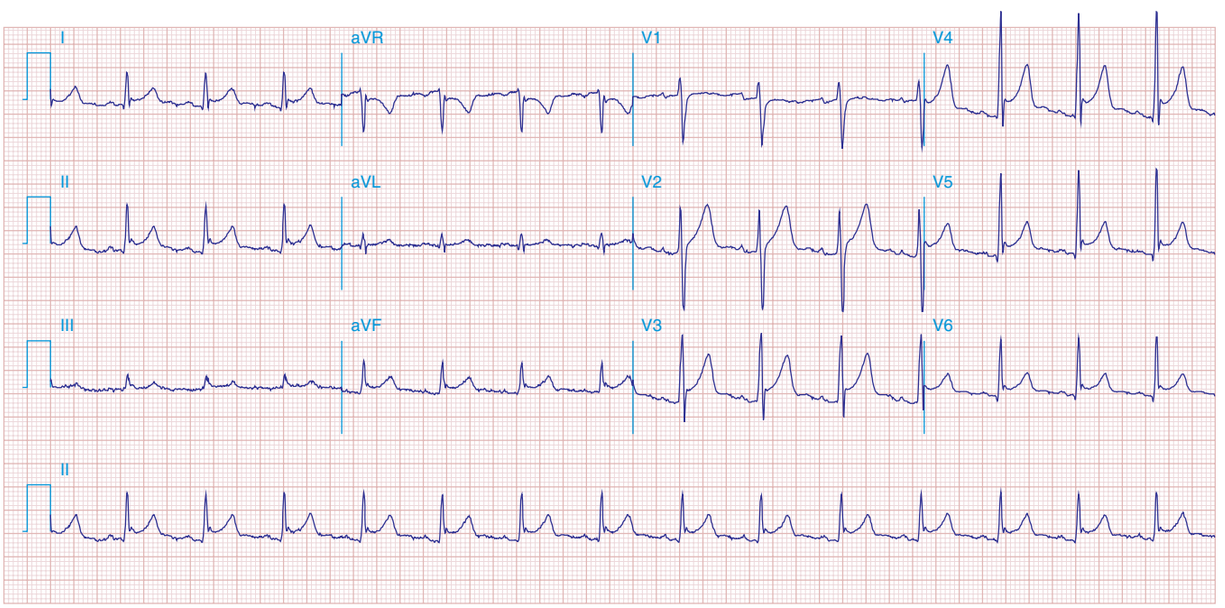

Figure e28-13 **Acute pericarditis** with diffuse ST elevations in I, II, III, aVF, V_3–V_6, without T-wave inversions. Also note concomitant PR-segment elevation in aVR and PR depression in the inferolateral leads.

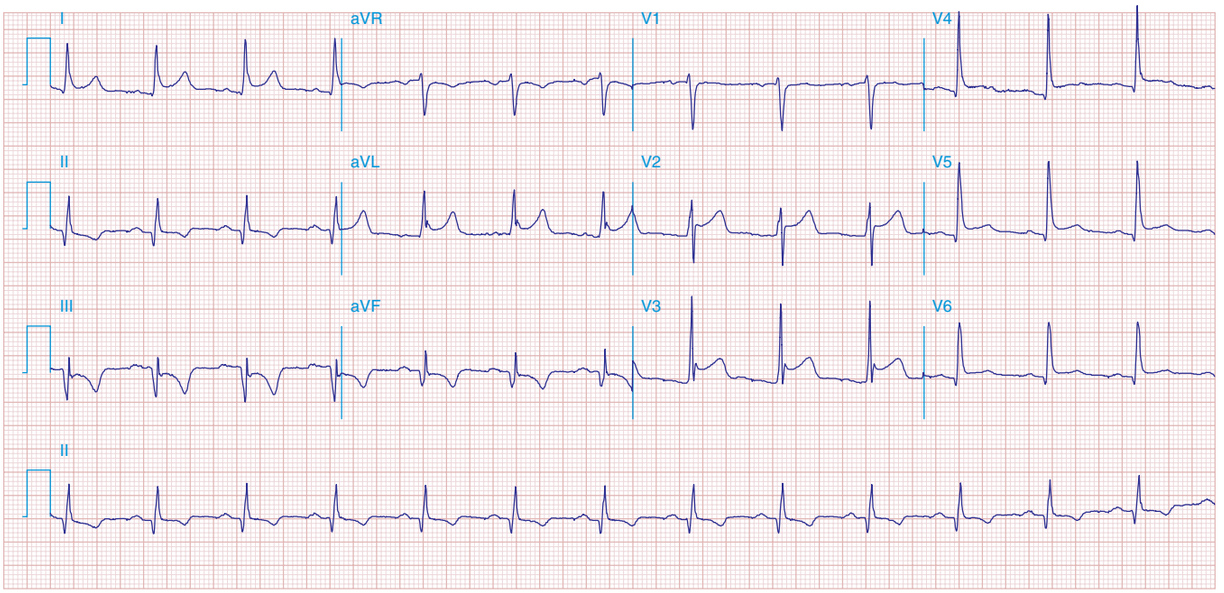

Figure e28-14 Sinus rhythm; diffuse ST elevations (I, II, aVL, aVF, V_2–V_6) with associated PR deviations (elevated PR in aVR; depressed in V_4–V_6); borderline low voltage. Q-wave and T-wave inversions in II, III, and aVF. Diagnosis: **acute pericarditis with inferior Q-wave MI**.

VALVULAR HEART DISEASE AND HYPERTROPHIC CARDIOMYOPATHY

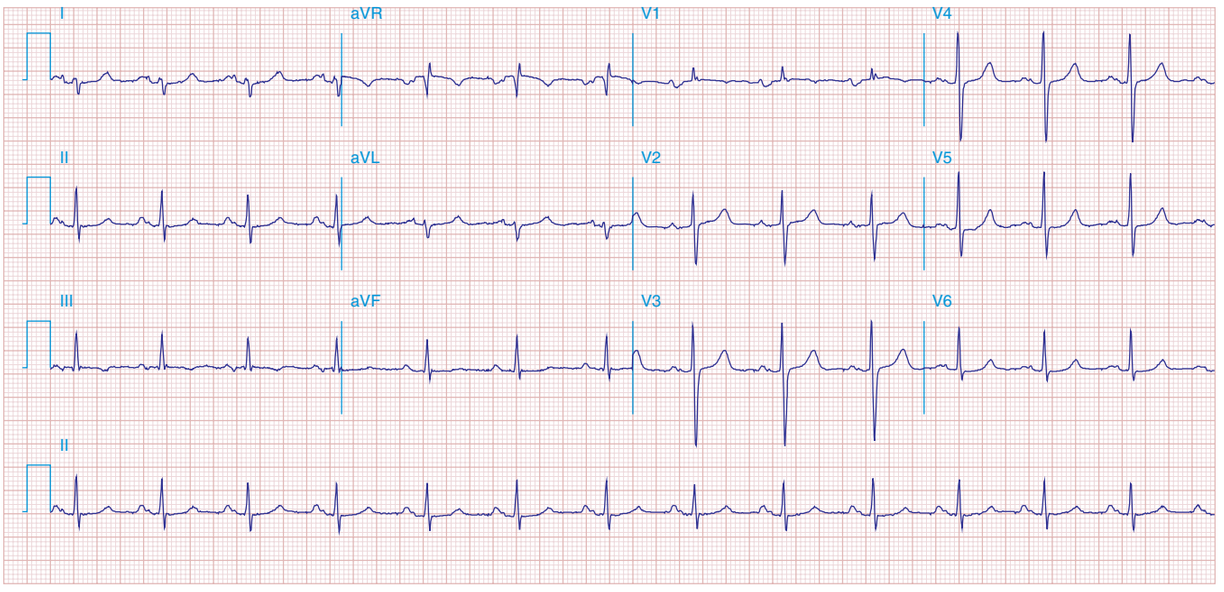

Figure e28-15 NSR, prominent left atrial abnormality (see I, II, V_1), right-axis deviation and **RVH** (tall, relatively narrow R wave in V_1) in a patient with **mitral stenosis**.

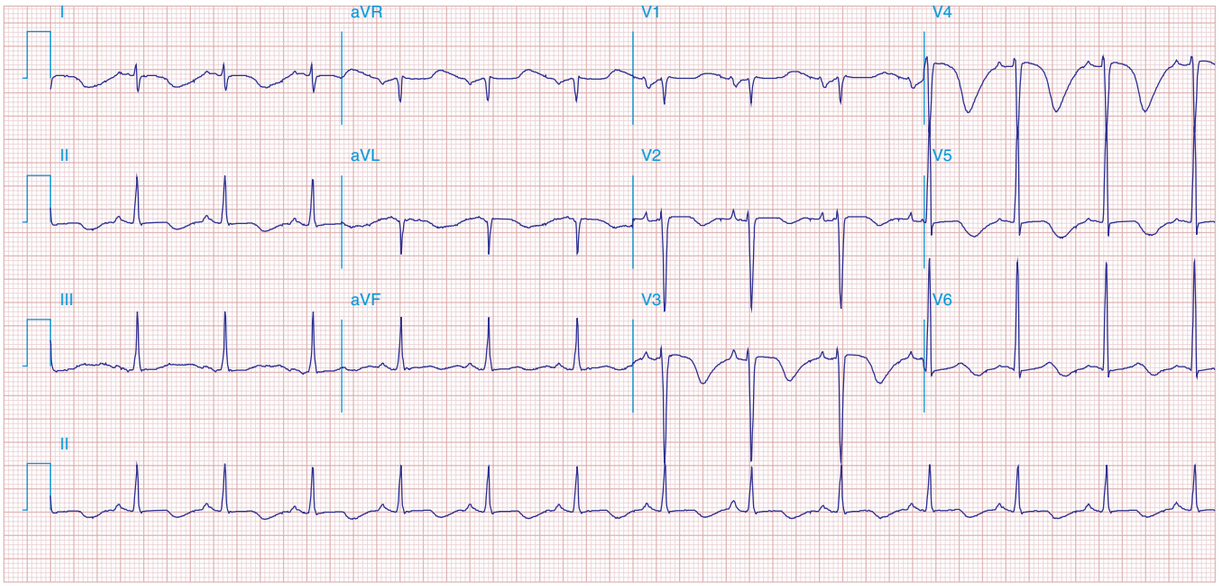

Figure e28-16 NSR, left atrial abnormality, and LVH by voltage criteria with borderline right-axis deviation in a patient with **mixed mitral stenosis** (left atrial abnormality and right-axis deviation) and **mitral regurgitation** (LVH). Prominent precordial T-wave inversions and QT prolongation also present.

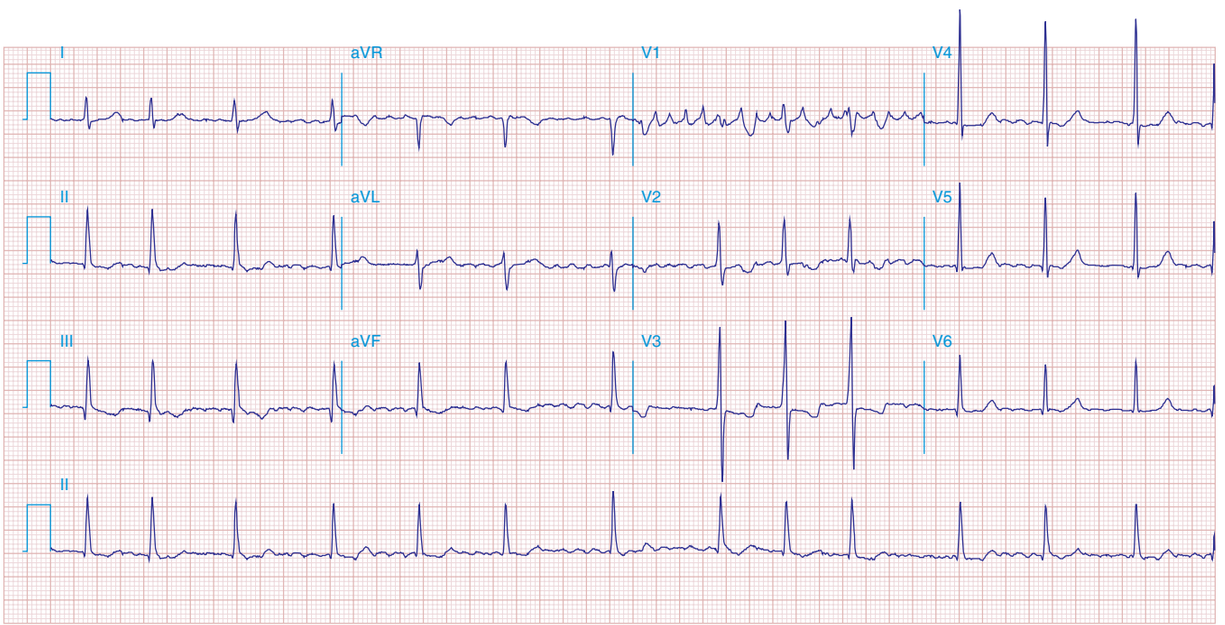

Figure e28-17 Coarse AF, tall R in V_2 with vertical QRS axis (positive R in aVF) indicating RVH. Tall R in V_4 may be due to concomitant LVH. Patient had **severe mitral stenosis with moderate mitral regurgitation**.

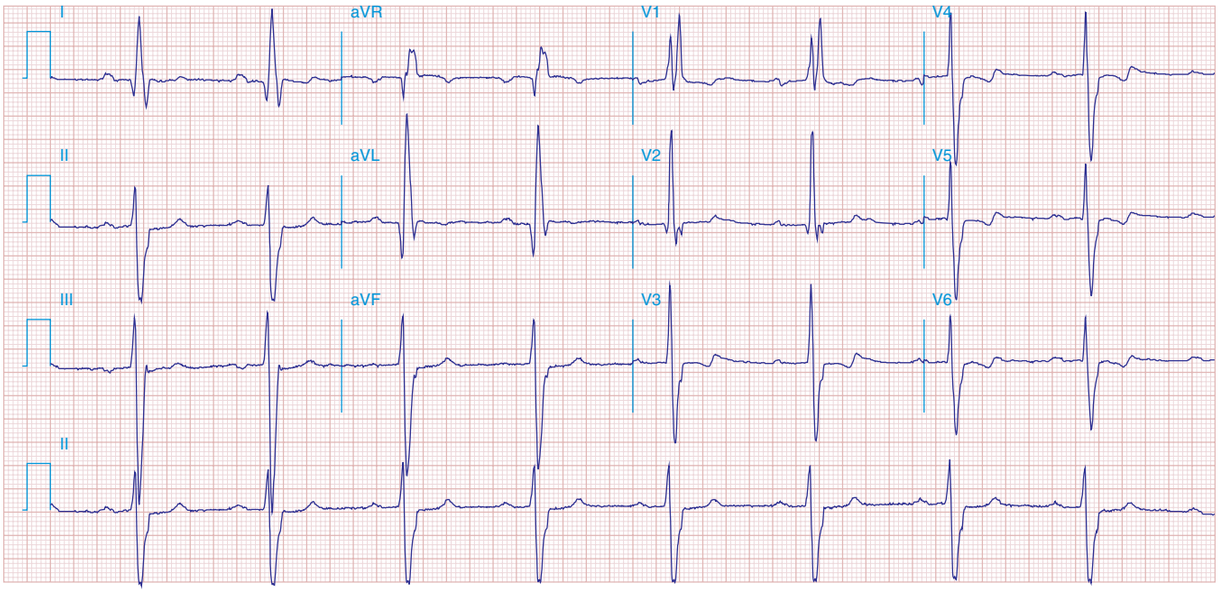

Figure e28-18 NSR; first-degree A-V "block" (P-R prolongation); LVH (tall R in aVL); RBBB (wide multiphasic R wave in V1) and left anterior fascicular block in a patient with **HCM.** Deep Q waves in I and aVL are consistent with **septal hypertrophy**.

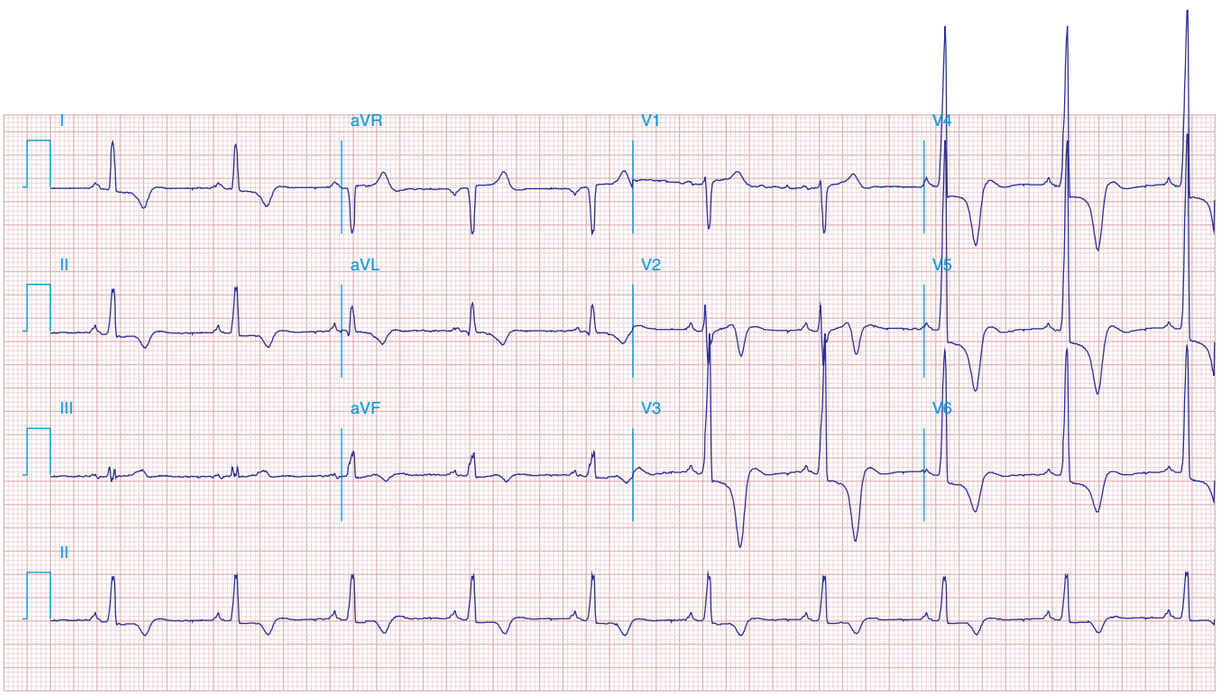

Figure e28-19 LVH with deep T-wave inversions in limb leads and precordial leads. Striking T-wave inversions in mid-precordial leads suggest **apical HCM** (Yamaguchi's syndrome).

PULMONARY EMBOLISM AND CHRONIC PULMONARY HYPERTENSION

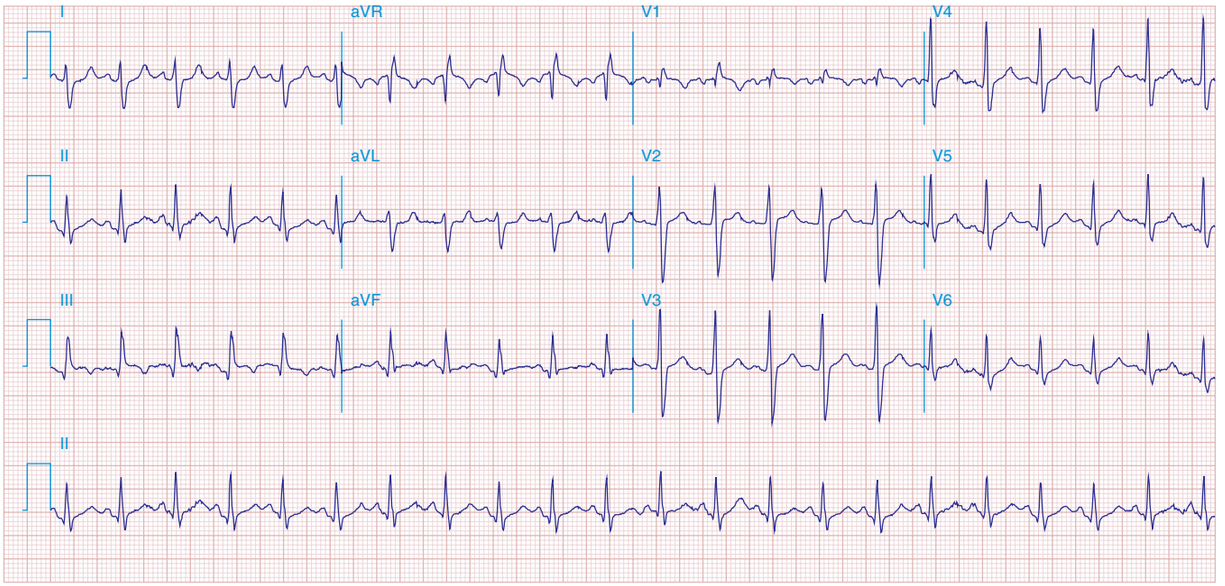

Figure e28-20 Sinus tachycardia with S1Q3T3 pattern (T-wave inversion in III), incomplete RBBB, and right precordial T-wave inversions consistent with acute RV overload in a patient with **pulmonary emboli**.

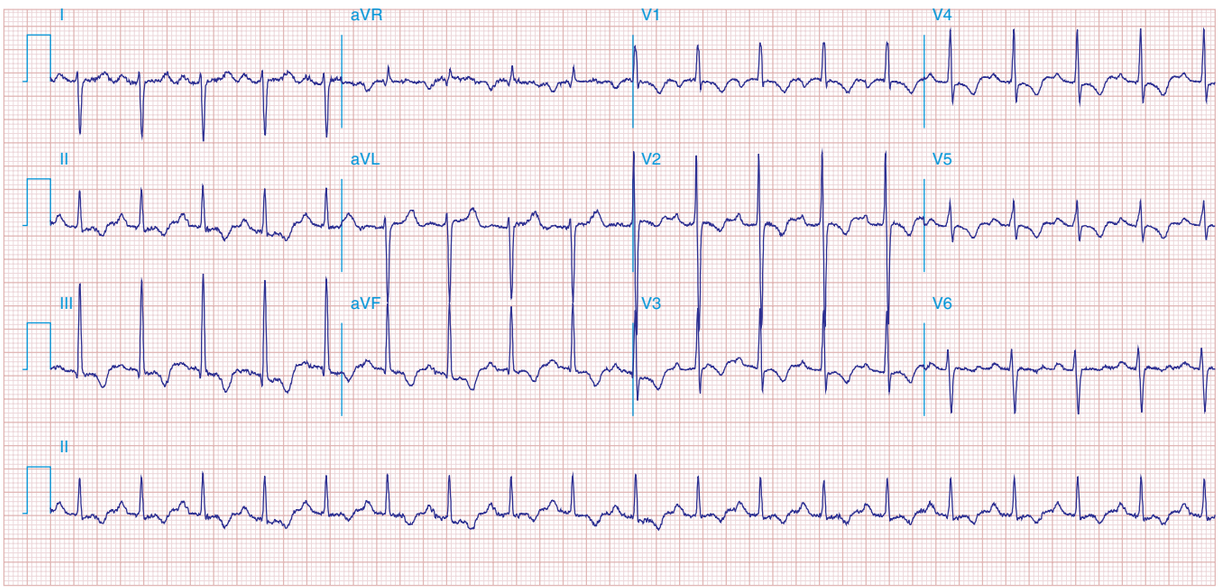

Figure e28-21 Sinus tachycardia, right-axis deviation, RVH with tall R in V_1 and deep S in V_6 and inverted T waves in II, III, aVF, and V_1–V_5 in a patient with **atrial septal defect and severe pulmonary hypertension**.

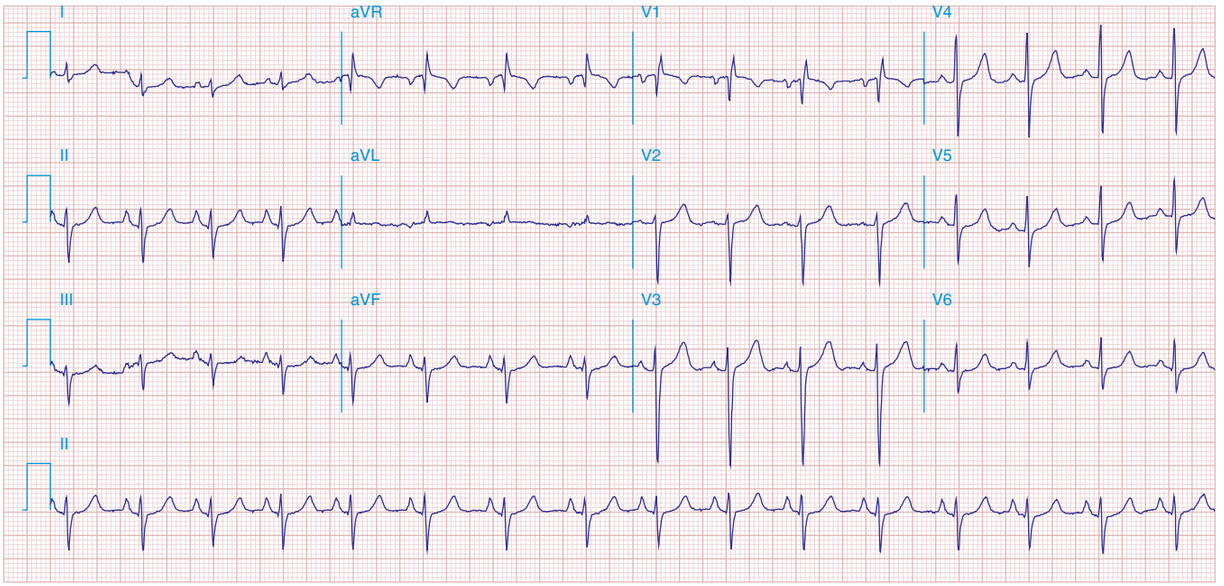

Figure e28-22 Signs of right atrial/RV overload in a patient with **chronic obstructive lung disease:** (1) peaked P waves in II; (2) QR in V_1 with narrow QRS; (3) delayed precordial transition, with terminal S waves in V_5/V_6; (4) superior axis deviation with an S_1-S_2-S_3 pattern.

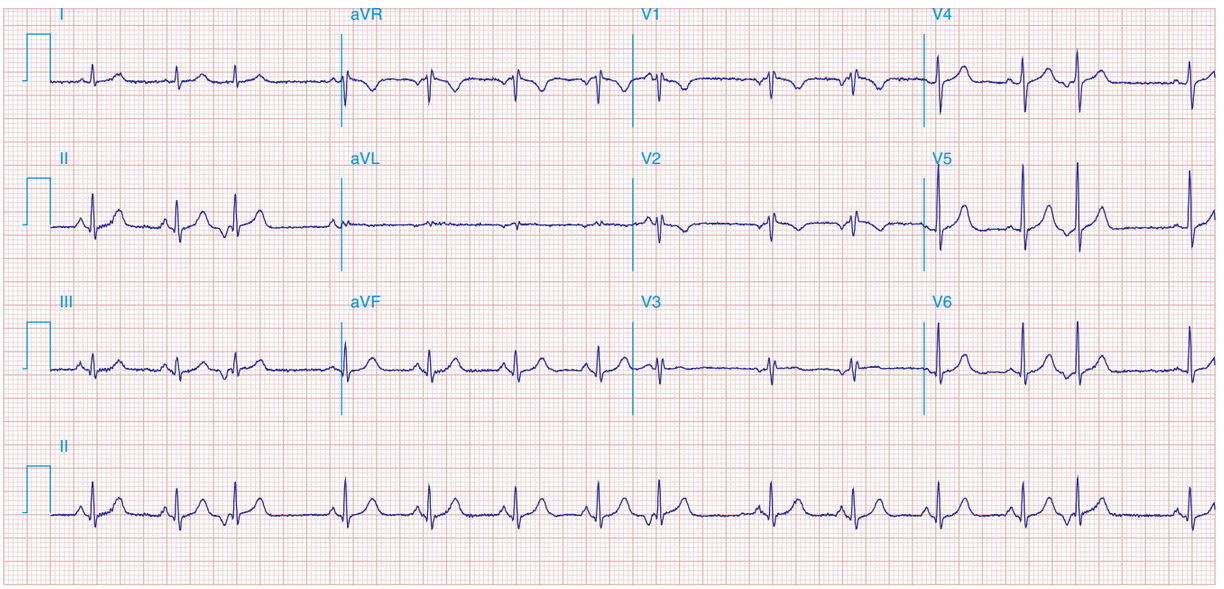

Figure e28-23 (1) Low voltage; (2) incomplete RBBB (rsr' in V_1–V_3); (3) borderline peaked P waves in lead II with vertical P-wave axis (probable right atrial overload); (4) slow R-wave progression in V_1–V_3; (5) prominent S waves in V_6; and (6) atrial premature beats. This combination is seen typically in **severe chronic obstructive lung disease**.

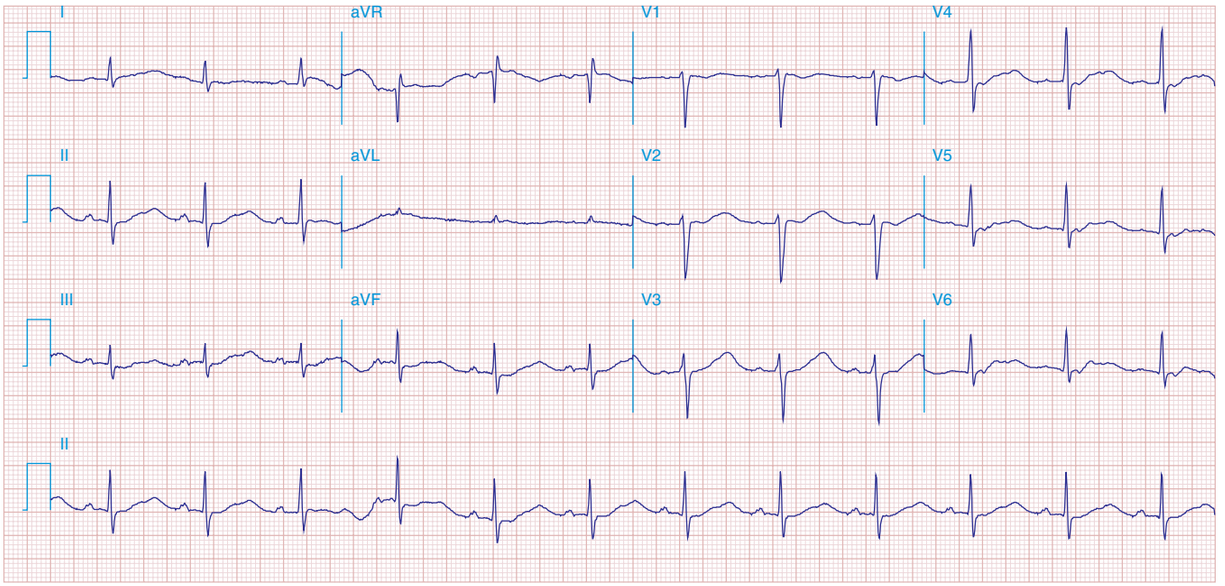

Figure e28-24 Prominent U waves (II, III, and V_4–V_6) with ventricular repolarization prolongation in a patient with **severe hypokalemia**.

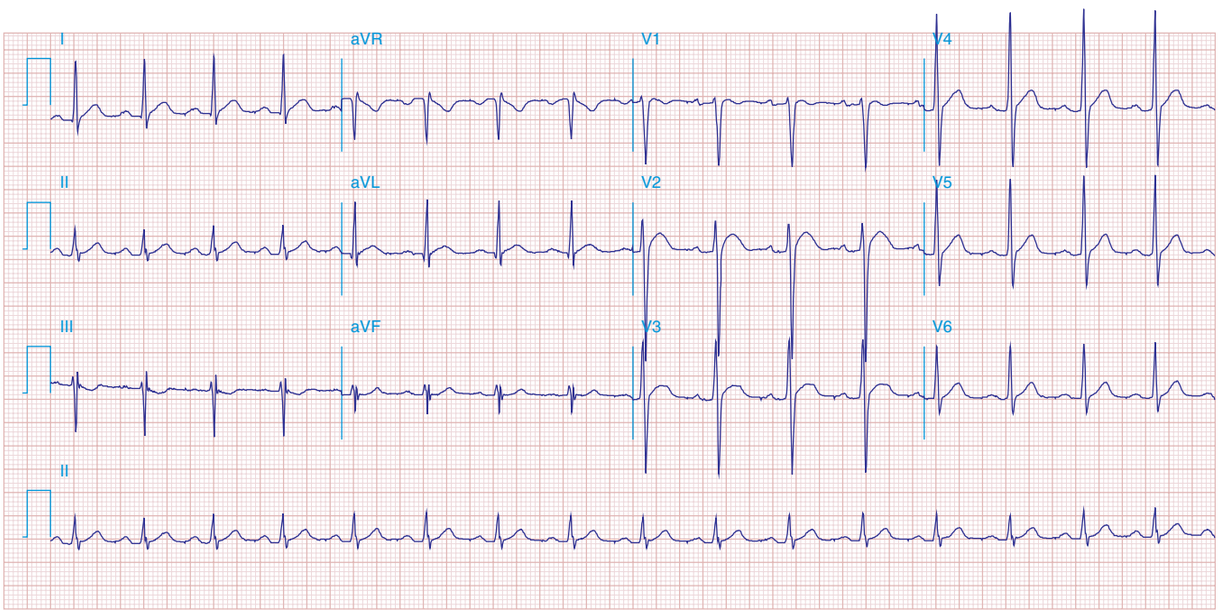

Figure e28-25 Abbreviated ST segment such that the T wave looks like it takes off directly from QRS in some leads (I, V_4, aVL, and V_5) in a patient with severe **hypercalcemia**. Note also high takeoff of ST segment in V_2/V_3 simulating acute ischemia.

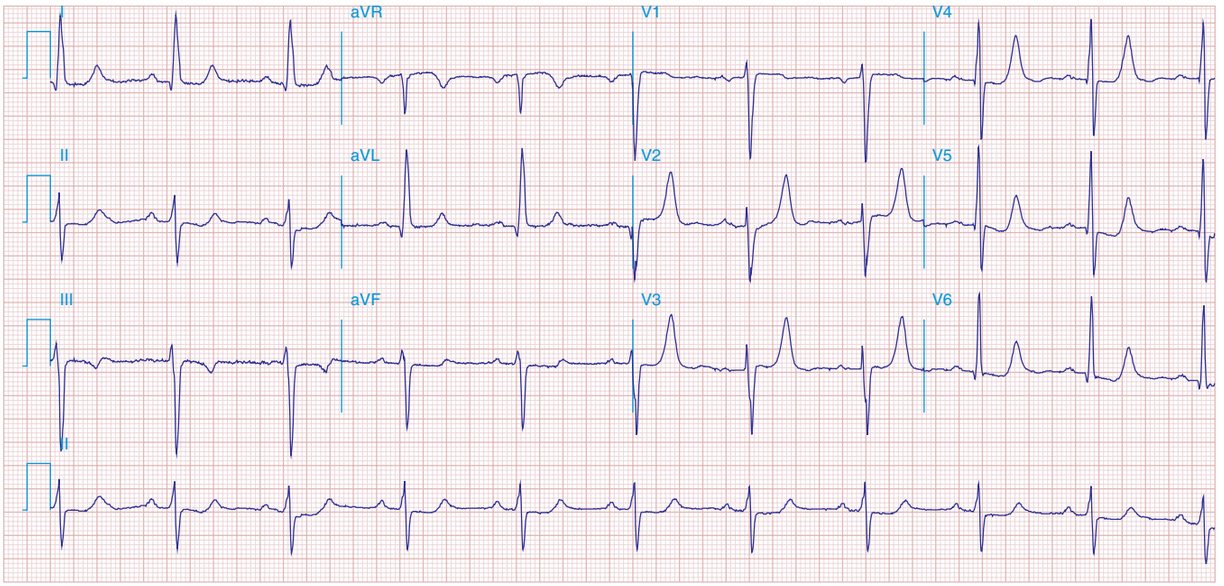

Figure e28-26 NSR with LVH, left atrial abnormality, and tall peaked T waves in the precordial leads with inferolateral ST depressions (II, III, aVF, and V_6); left anterior fascicular block and borderline prolonged QT interval in a patient with **renal failure, hypertension, and hyperkalemia;** prolonged QT is secondary to **associated hypocalcemia**.

MISCELLANEOUS

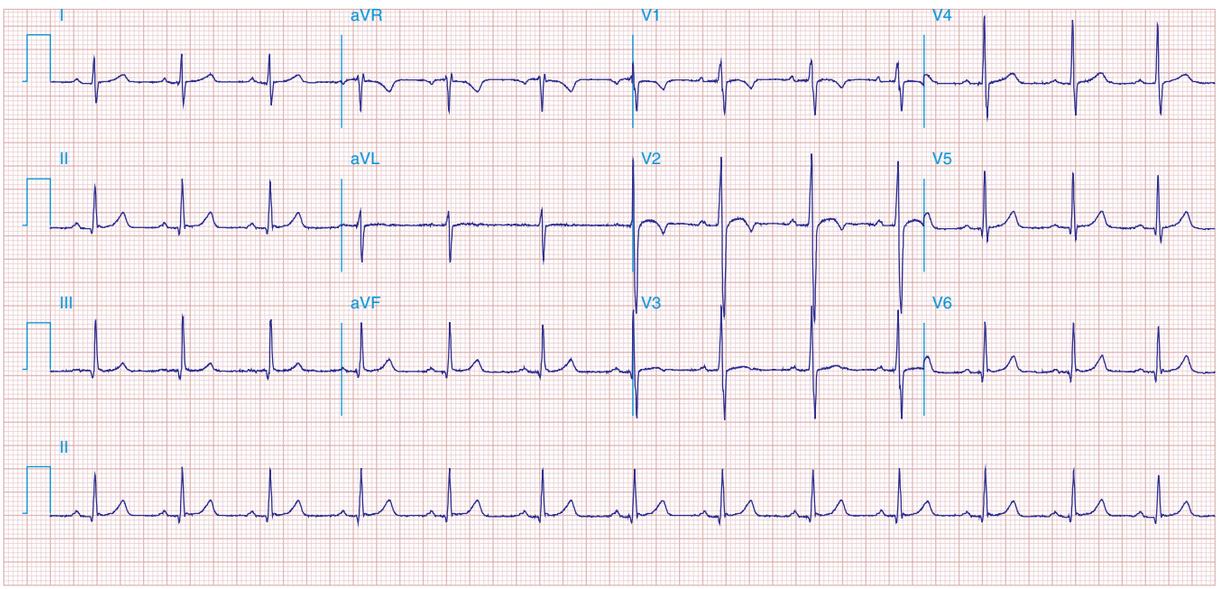

Figure e28-27 Normal ECG in an 11-year-old male. T-wave inversions in V_1–V_2. Vertical QRS axis (+90°) and early precordial transition between V_2 and V_3 are **normal findings in children**.

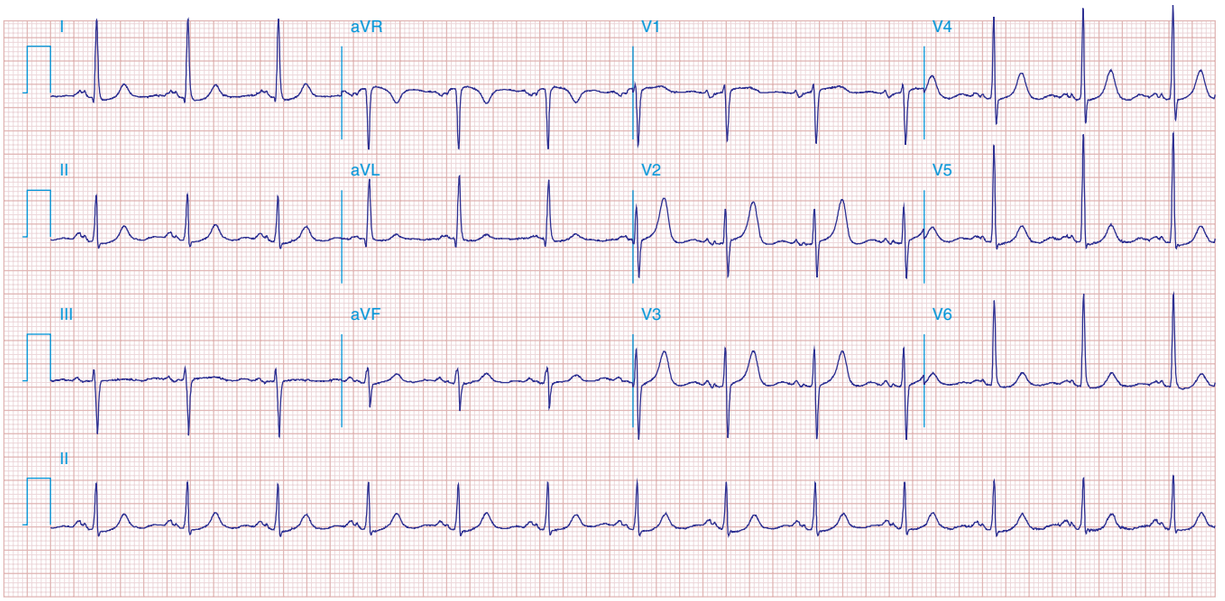

Figure e28-28 Left atrial abnormality and **LVH** in a patient with **long-standing hypertension**.

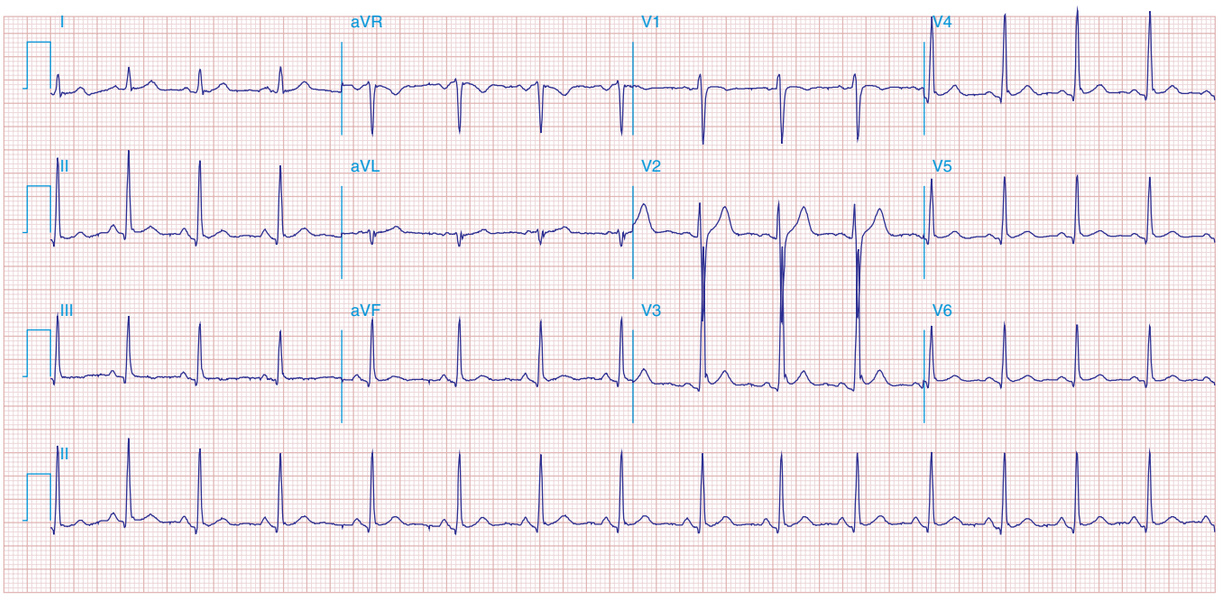

Figure e28-29 Normal variant ST-segment elevations in a healthy 21-year-old male (commonly referred to as *benign early repolarization pattern*). ST elevations exhibit upward concavity and are most apparent in V_3 and V_4, and less than 1 mm in the limb leads. Precordial QRS voltages are prominent, but within normal limits for a young adult. No evidence of left atrial abnormality or ST depression/T wave inversions to go along with **LVH**.

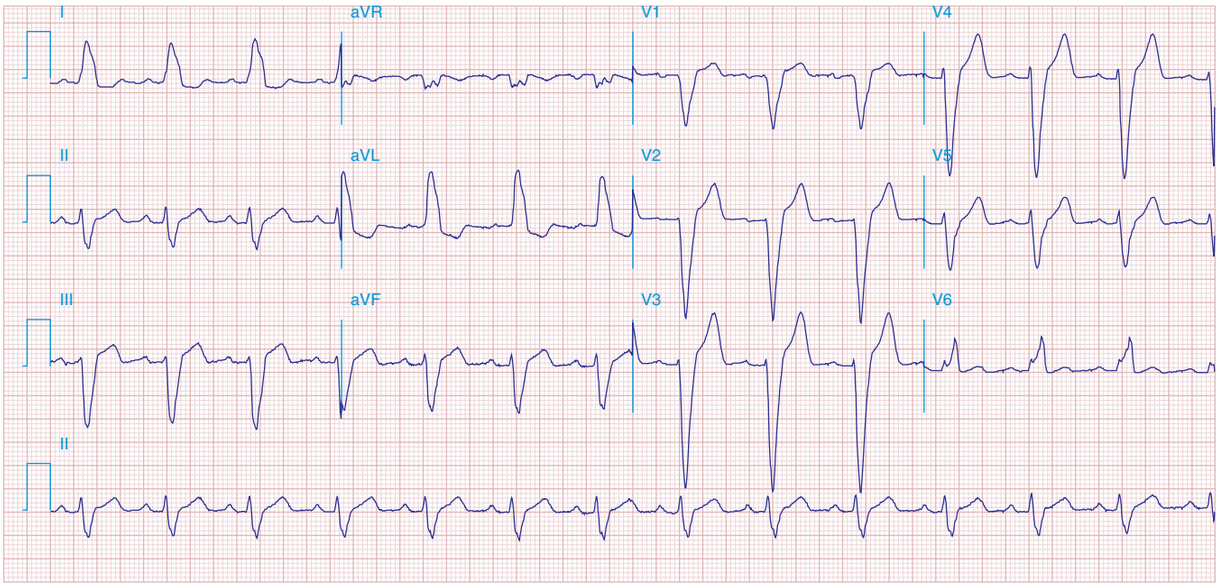

Figure e28-30 **NSR with first-degree AV "block"** (PR interval = 0.24 s) and complete **left bundle branch block**.

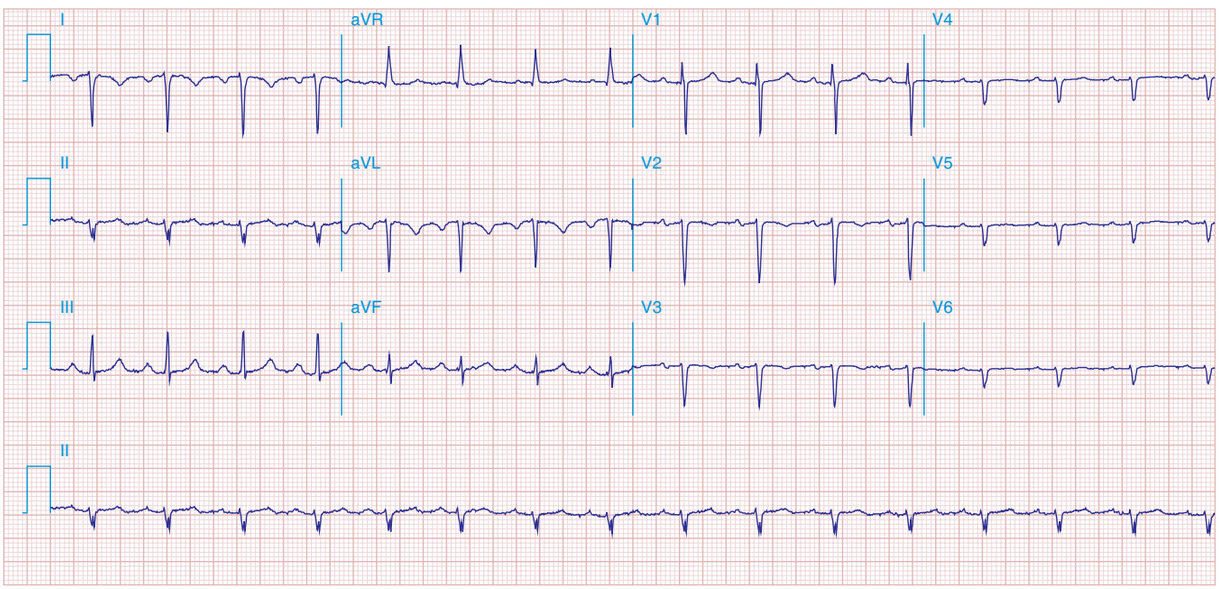

Figure e28-31 **Dextrocardia** with: (1) inverted P waves in I and aVL; (2) negative QRS complex and T wave in I; and (3) progressively decreasing voltage across the precordium.

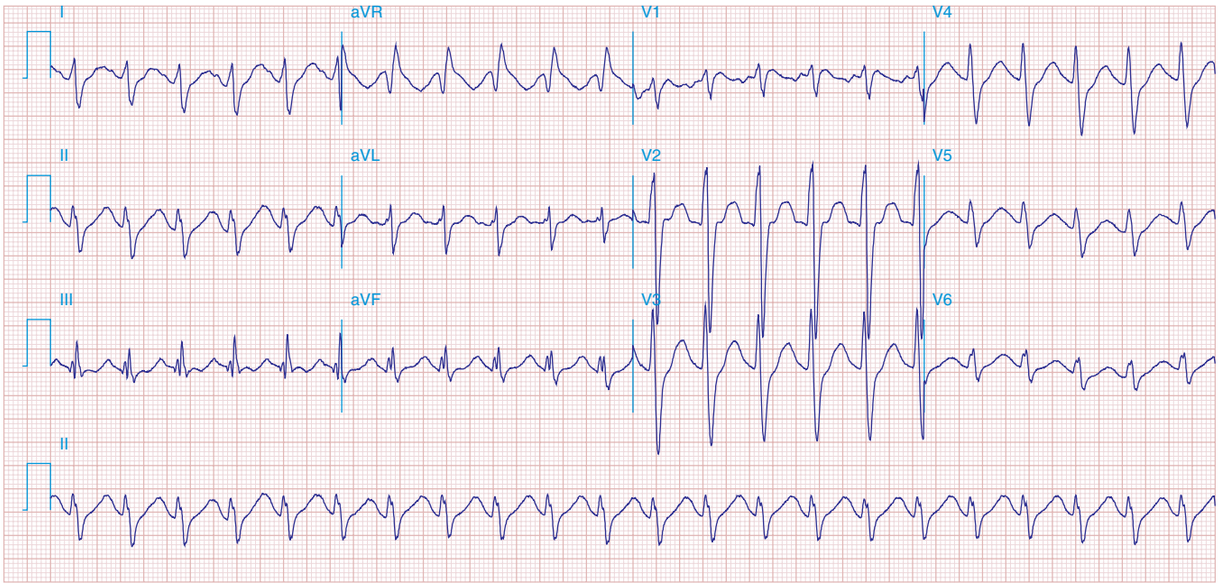

Figure e28-32 Sinus tachycardia; intraventricular conduction delay (IVCD) with a rightward QRS axis. QT interval is prolonged for the rate. The triad of sinus tachycardia, a wide QRS complex, and a long QT in appropriate clinical context suggests **tricyclic antidepressant overdose**. Terminal S wave (rS) in I, and terminal R wave (qR) in aVR are also noted as part of this IVCD variant.