elaborated in the inflammatory process inhibit collage synthesis. The fibrous structure of the plaque is further compromised by matrix metalloproteinases released by macrophages. Degradation of the plaques' fibrous structure makes them prone to rupture. Systemic inflammatory conditions may also play a role in plaque rupture in some patients. It is possible to have multiple sites of plaque ulceration or rupture.

Plaque rupture leads to platelet adherence and subsequent activation at the site of rupture. As platelets aggregate, the thrombosis cascade is triggered, leading to progressive accumulation of intravascular thrombus. The severity of myocardial ischemia and MI depends on the degree to which thrombus occludes the vessel. It is also possible for ACS to occur as a result of embolization of platelet aggregates or thrombus.

## Clinical Presentation

ACS may manifest as a first symptom of angina pectoris in a previously asymptomatic patient. Alternatively, patients with preexisting angina pectoris experience more frequent angina, angina at lower levels of exertion, or angina at rest. Patients who have developed ACS commonly experience their typical symptom of angina in terms of location and radiation but with increased intensity and duration. Patients with subtotal or total occlusion of a coronary artery may be much less responsive or completely unresponsive to the effects of nitroglycerin.

Physical examination during myocardial ischemia may reveal a patient is who is clearly anxious and uncomfortable and who may also be experiencing dyspnea, nausea, or vomiting. Sinus tachycardia and hypertension is a common response to the discomfort of ACS, but in some instances sinus bradycardia and varying degrees of heart block may be observed. Bradyarrhythmias may also be associated with hypotension. Auscultation may reveal the presence of an $S_4$, reflecting diminished LV compliance, or an $S_3$ if there is extensive LV dysfunction. In the case of ischemia-induced papillary muscle dysfunction, the systolic murmur of mitral regurgitation can be heard. Patients with large areas of ischemic myocardium develop elevated LV filling pressures leading to pulmonary congestion, dyspnea, and the physical finding of rales on lung auscultation.

## Diagnosis

Patients presenting with ACS require urgent care directed at rapid diagnosis and treatment. The ECG is critically important in early diagnosis of presumed ACS. The finding of ST elevation in multiple leads (Fig. 8-5) is diagnostic of STEMI and portends a more extensive MI and the need for prompt revascularization. The distribution of ST elevation reflects the region of myocardium affected by thrombotic coronary occlusion. For example, ST elevation in leads II, III, and aVF reflects an inferior MI due to occlusion of the right coronary artery (or circumflex coronary artery in some cases). ST elevation in leads $V_2$ through $V_6$ (see Fig. 8-5) reflects an anterior MI caused by obstruction of the left anterior descending coronary artery.

Unstable angina or NSTEMI is caused by subtotal vessel occlusion by thrombus leading to reduced coronary blood flow. This results in subendocardial ischemia and the characteristic ECG changes of ST depression (Fig. 8-6). It is important to recognize that up to half of patients with acute MI do not have significant ECG abnormalities on the initial study. Sequential ECGs are frequently required to establish a diagnosis. If there is a high index of suspicion for MI and ECGs are persistently nondiagnostic, the use of leads extending to the patient's back ($V_7$ to $V_9$) may demonstrate ST changes related to posterior LV ischemia (usually a circumflex coronary artery occlusion). Echocardiography showing regional wall motion abnormalities can also help to establish the diagnosis of acute MI.

Serum biomarkers also play an important role in the diagnosis of acute MI. Myocardial necrosis leads to the release of biomarkers that can be measured in serial fashion to document the occurrence of MI. The presence of specific biomarkers is

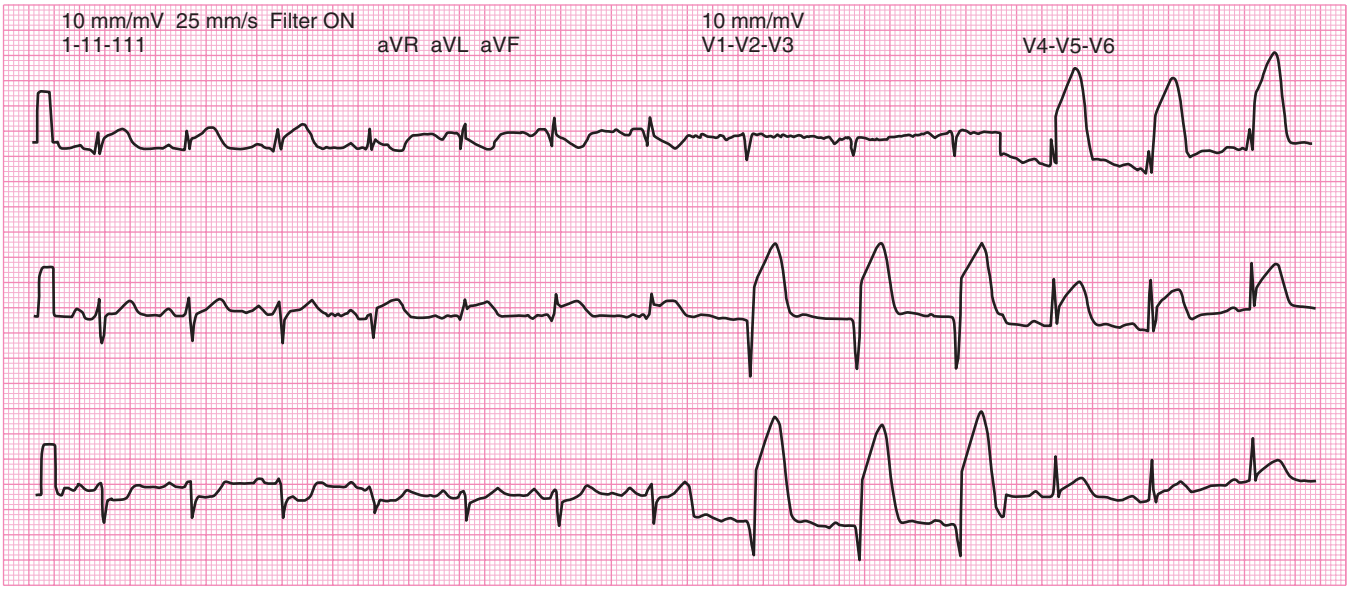


**FIGURE 8-5** Acute anterolateral myocardial infarction. Leads I, aVL, and $V_2$ to $V_6$ demonstrate ST-segment elevation. Reciprocal ST-segment depression is seen in leads II, III, and aVF. Deep Q waves have developed in leads $V_2$ and $V_3$.