Chest “Tightness” in an Elderly Woman

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A 76-year-old woman presents with chest pain—which she describes as “muscle tightness”—that began when she awoke in the morning. The pain is constant, exacerbated by deep inspiration, and accompanied by a subjective sense of slight dyspnea; she rates its severity as 3 on a scale of 1 to 10. She denies pain radiation, nausea, diaphoresis, palpitations, and light-headedness. Her only cardiac risk factors are hypertension and a distant history of smoking.

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DISCUSSION:
The ECG reveals evidence of ST-segment elevation, most notable in limb leads I, II, and aVF, and precordial leads V\textsubscript{3} through V\textsubscript{6} (Figure 1). Slight PR-segment depression is also seen in these leads. There is evidence of reciprocal PR-segment elevation and ST-segment depression in aVR. T waves are not prominent. Because of the ST-segment elevation, the computer's interpretation of this tracing is "acute MI." However, the morphology of the ST segments is concave, unlike the convex shape commonly seen in MI (Figure 2). In addition, the wide distribution of ST-segment changes suggests a nonterritorial distribution (that is, one that is not consistent with the anatomic vascular supply of the myocardium); this also makes acute MI less likely. Concave ST-segment elevation can be seen in BER. However, in BER, the concave ST-segment elevation is usually most evident in the right and mid precordial leads and is commonly associated with prominent T waves. Here, the ST-segment elevation is broadly distributed in both limb and precordial leads, and the T waves are not prominent. The findings on this ECG are most consistent with acute myopericarditis (choice B).

Pathophysiology of myopericarditis. The underlying causes of this diffuse inflammation of the pericardial sac and superficial myocardium include infection (primarily viral), immunologic disorders, uremia, trauma, malignancy, cardiac ischemia, and infarction. Affected patients complain of sharp, pleuritic, precordial, or retrosternal pain, which can radiate to the left upper back, shoulder, or arm. The pain is worsened by recumbency, cough, swallowing, and inspiration, and is relieved by an upright or forward-leaning position. In patients with subacute or chronic pericarditis, significant pericardial effusions may develop or the illness may progress to constrictive pericarditis. In some patients with myopericarditis, the myocardial component of the presentation (acute pulmonary edema, hypotension, and dysrhythmias) may predominate; that is, the presentation may be essentially the same as that of acute myocarditis. Electrocardiographic findings. ECG abnormalities are evident in up to 90% of patients with acute myopericarditis. These changes are a result of repolarization abnormalities in the atrium and ventricle that arise from epicardial inflammation and injury. The most common changes are in the PR segment (caused by atrial repolarization) and in the ST segment and T wave (caused by ventricular repolarization). Because depolarization occurs normally, the P wave and QRS complex are usually unaffected. Classic 4-stage progression. Spodick\textsuperscript{3,4} described a classic 4-stage evolution of the ECG changes seen in acute myopericarditis. The 4 stages of the progression involve different elements of the ECG (Table):

- Stage 1 is notable for diffuse ST-segment elevation and PR-segment depression; it occurs during the first few days and lasts up to 2 weeks.
- Stage 2 is characterized by ST-segment normalization and is variable in duration, lasting generally from 1 to 3 weeks; T waves may flatten or their amplitude may decrease during this time.
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- Stage 3 is notable for the occurrence of full T-wave inversion; it occurs in the second or third week of the illness and may be transient or prolonged, lasting from days to several weeks.
- Stage 4 is characterized by resolution of T-wave abnormalities and return to the baseline ECG.

Fewer than half of patients pass through all 4 stages, however, and atypical progression is common. Stage 1 abnormalities--particularly PR depression--are detected more frequently and are considered "quasi-diagnostic." ST-segment elevation. In patients with myopericarditis, this is usually less than 5 mm and occurs simultaneously throughout all limb and precordial leads (I, II, III, aVF, aVL, and V\textsubscript{2} through V\textsubscript{6}) with the exception of aVR and V\textsubscript{1} (in which reciprocal ST-segment depression is often seen). There is usually no clear territorial distribution; however, in postinfectious myopericarditis, in which inflammation may be localized, findings can be focal (eg, in the inferior distribution). The elevated ST segments seen in myopericarditis are concave or obliquely flat on their initial upslope, with an indistinct J point. The T waves remain concordant without flattening or inversion. It can be difficult to differentiate between the ST-segment elevation associated with acute myopericarditis and ST-segment elevation of other origins, such as that seen in BER, acute MI, or ischemia. However, close examination reveals useful distinctions. The elevated ST segments in BER are similar in morphology to those seen in myopericarditis, with an initial concave upslope and indistinct J point. However, ST-segment elevation in BER is limited primarily to the precordial leads and is most prominent in the right precordial leads. In BER, the J point is minimally elevated and T waves are prominent. In myopericarditis, both the J point and ST-segment elevation are more pronounced; T waves are less prominent. This difference can be assessed through use of the ST:T ratio (ratio of ST-segment elevation to T-wave amplitude) in lead V\textsubscript{6}. Using the PR segment as baseline, measure ST-segment elevation (at the J point) and T-wave amplitude. An ST:T ratio of 0.25 or greater suggests myopericarditis, while a ratio of less than 0.25 suggests BER (Figure 3). In acute MI, the initial morphology of ST segments is often convex or obliquely flat. Moreover, the distribution of ST-segment elevation is usually territorial. T-wave inversion often occurs along with ST-segment elevation in acute MI, whereas in myopericarditis, it occurs only after resolution of the ST-segment abnormalities. The presence of Q waves suggests acute MI, while PR-segment depression suggests myopericarditis. Finally, the ECG abnormalities evolve over a much shorter time in acute MI (hours to a few days) than in myopericarditis. PR-segment depression. This is usually transient, but it may be the earliest and most specific sign of acute myopericarditis. Like ST-segment elevation, PR-segment depression occurs diffusely in the limb and precordial leads (most prominently in II, V\textsubscript{5}, and V\textsubscript{6}), except for aVR and V\textsubscript{1}, which may have reciprocal elevation (Figure 4). In assessing the PR segment, it is important to use the TP segment as baseline; otherwise any depression may be misinterpreted as ST-segment elevation. T-wave inversion. T-wave inversions are encountered diffusely later in the progression of myopericarditis, after ST-segment elevations have resolved. This stage often does not occur or is not detected. Electrocardiographic rhythm. The rhythm most commonly associated with acute myopericarditis is normal sinus rhythm or sinus tachycardia. Because of the proximity of the sinus node to the pericardium, it was previously thought that the inflammation could precipitate atrial fibrillation or flutter. However, recent studies suggest that the sinus node is virtually immune to surrounding inflammation. While myopericarditis can occur in conjunction with dysrhythmias (most commonly supraventricular dysrhythmias), these disturbances are generally attributable to underlying cardiac disease. Outcome of this case. This patient’s ECG shows classic signs of stage 1 myopericarditis. There are ST-segment elevations--most prominent in leads I, II, aVF, and V\textsubscript{4} through V\textsubscript{6}--with a concave morphology. PR-segment depressions are seen in the same leads, without prominent T waves. In lead aVR, there is evidence of reciprocal PR-segment elevation and ST-segment depression. The patient was admitted, and acute MI was ruled out. An echocardiogram revealed a small pericardial effusion but was otherwise unremarkable. Her symptoms and ECG abnormalities resolved, and she recovered uneventfully.

References: REFERENCES:


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