EMERGENCY RADIOLOGY

SELF-ASSESSMENT

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DEDICATION

To Our Families:

Kathe, Chuck and Teddy (C.F.M.)
and
Sue Ellen (D.A.R.)

PREFACE

This book is intended to present the radiology of emergency medicine in a way which is probably most effective for the clinician; the material is presented in the context of individual case studies. By viewing the radiograph as it applies to a specific clinical problem the clinician enters into an activity of interpreting x-rays as they apply to real patients with real medical problems.

While it is not possible for a text of this size to cover completely the entire discipline of radiology as it pertains to emergency medicine, we have attempted to present material which is relevant to common clinical problems, serious clinical problems, or to problems where the radiograph is of critical importance in guiding the management of the patient.

This case method approach should be helpful to students, house officers, emergency physicians, primary care physicians, and radiologists. The text is written in such a way that it can be used as a supplement to a standard text or as a self-assessment method where the reader initially interprets the radiograph and then checks his interpretation with that of the radiologist.

It is hoped that the text will enable physicians to improve their skills in ordering and interpreting radiographs and that its ultimate outcome will be high quality care for emergency and primary care patients.

C.F.M.
D.A.R.

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Most importantly, Sandy Lewis and Chris Dailey, our secretaries, have remained cheerful, willing and extremely capable through the many drafts and revisions of this manuscript. We hope they share our joy of accomplishment.

C.F.M.
D.A.R.

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SECTION 1

Cardiovascular Emergencies

Case 1

HISTORY

A 56 year old man was brought to the emergency department by his son. His complaint to his son was that he was having indigestion and some epigastric discomfort after dinner. Further questioning revealed that the patient had been a one pack per day smoker for 35 years and for the last several years had been found to have mild elevation of blood pressure on routine physical examination, but he was never given any medication. He was counseled by his own physician to lose weight and avoid salting his food. The patient had complained in the past that he had noticed occasional chest discomfort and shortness of breath while walking up flights of stairs, but these symptoms subsided completely when he would rest for a short while.

Today the patient ate supper, was watching televsion, and noted increasing epigastric discomfort. He tried to relieve the discomfort with two antacid tablets, but the pain persisted. His son became concerned and brought him to the hospital.

PHYSICAL EXAMINATION

General appearance:	The patient appeared apprehensive, was slightly obese and moderately diaphoretic.
Vital signs:	BP 160/100, P 100, R 28, T 37.5°C.
Chest:	Scattered rales diffusely throughout both lungs, most predominant at the bases.
Heart:	S_1 and S_2 were normal, and the left ventricular apex impulse was noted at the fifth interspace in the midclavicular line. A third heart sound was present, but there was no murmur and no rub.
Abdominal:	Unremarkable.
Extremities:	No pedal edema or evidence of phlebitis was noted.

CLINICAL DISCUSSION

In many emergency departments this patient would be stabilized immediately with an intravenous line, nasal oxygen and a cardiac monitor. When the history is less suggestive of a serious problem, the evaluation proceeds with a history, physical examination, EKG, and x-ray studies, if appropriate.

A chest x-ray was obtained in this patient.

INITIAL X-RAYS

CASE 1

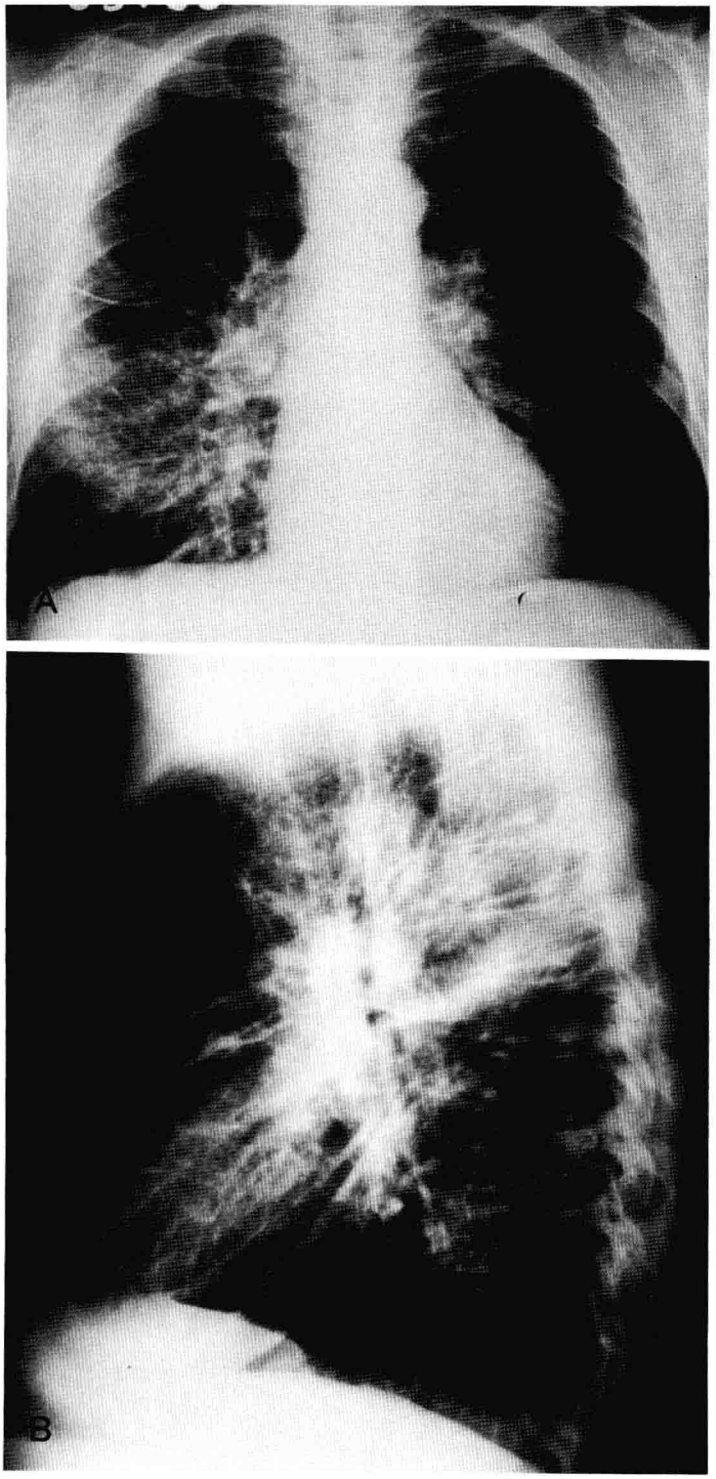

Figure 1.1 A-B

CASE 1

FURTHER X-RAYS

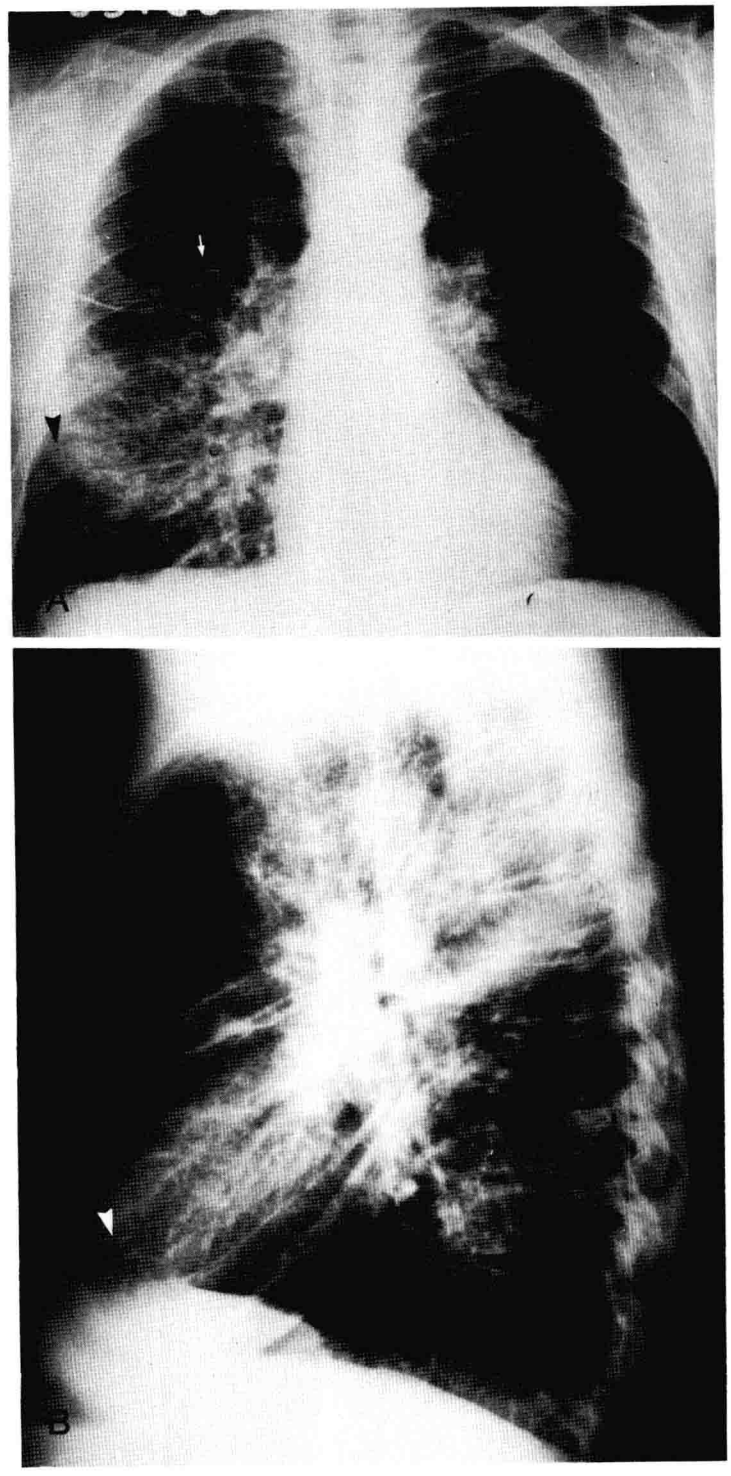

Figure 1.2 A-B

CASE 1

DISCUSSION

The chest x-ray in acute myocardial infarction provides a rapid, safe, simple technique for the assessment of pulmonary vascularity, which mirrors left ventricular function. These upright films, Figure 1.2, *A* and *B*, on this ambulatory patient demonstrate the degree of vascular congestion that is possible in the face of a fairly normal physical exam. Had an acute myocardial infarction been more strongly suspected clinically, supine films would have been performed and the redistribution of blood from base to apex would have been less obvious. One outstanding sign of interstitial pulmonary edema and hence a reflection of left ventricular failure are the Kerley-B lines, small linear opacities perpendicular to the lateral pleural surfaces at the costophrenic angles (*arrowheads*). Kerley-B lines reflect congestion in the normally invisible septal walls separating secondary pulmonary lobules of the lung; they become visible when the veins or lymphatics within them become engorged. More centrally located interstitial lung fluid in interlobular septa and perivascular channels causes the lungs to look rather hazy, particularly around the perihilar areas where the normal vessels are obscured. Bronchial walls are also thickened and may be seen end on as "ring signs" (*small white arrow*) and in their long axis as "tram lines" (*black arrows*) in the midlung zones slightly more peripheral from the hila. While pleural fluid is not present at this time, it might well be suspected or even seen a little later in this patient's clinical course. Note should be made that the heart is not enlarged; this is usually the case in acute myocardial infarction. When cardiomegaly is present, its usual cause is not the current cardiac injury but pre-existing hypertension or valvular heart disease. Routinely, less than 5% of patients with the first acute myocardial infarction will show cardiomegaly.

Less than half of all the patients with an acute myocardial infarction, however, will show any changes, so that the diagnosis of an acute myocardial infarction cannot be excluded by a normal chest x-ray. In those patients the treatment should be symptomatic until enzyme studies, EKG changes or other parameters clarify the true diagnosis. Appropriate medical therapy was undertaken in this patient, and the very next day's PA and lateral chest roentgenograms reflect the dramatic mobilization of interstitial edema fluid from the lung and the accumulation of some fluid in the posterior pleural space, Figure 1.2, *C* and *D*. Failure to improve radiologically and clinically while under treatment is an ominous finding and suggests a more severe infarction or extension of the initial insult.

The Dressler syndrome or postmyocardial infarction syndrome develops about two weeks after the acute infarction episode in only 4% of patients. It is said to be an autoimmune reaction to the infarcted myocardium and may present as pleuritis, pericarditis, and occasionally pneumonitis associated with fever and pain. A different patient with an acute myocardial infarction, Figure 1.3*A*, developed the Dressler syndrome about two weeks after the infarction and had the radiographic changes of pericardial and left pleural effusion and some parenchymal lower lobe consolidation, Figure 1.3*B*. These changes may be difficult to differentiate from complicating pneumonia or pulmonary thromboembolism.

A later roentgenologic complication of myocardial infarction is demonstrated in Figure 1.4, the roentgenogram of a patient who developed a left ventricular aneurysm. The localized bulge along the left heart margin (*arrowheads*) identifies an area of myocardium which moves paradoxically with systole, expanding as the rest of the wall contracts (dyskinesis). A more frequent occurrence with left ventricular aneurysm is simply reduced wall motion (hypokinesis) or absence of wall motion (akinesis); these may only be discovered at the time of cardiac catherization.

Coronary artery calcification can be seen on plain films occasionally with optimum technique and even more easily at fluoroscopy. Figure 1.5 is a closeup oblique view of a young patient with renal osteodystrophy (rib fractures, too) and considerable calcification deposited in the left coronary artery and its branches, the left anterior descending (*arrowheads*) and left circumflex (*small arrow*) arteries. When ischemic coronary artery disease is suspected, the fluoroscopic dem-

onstration of calcium alone correlated highly with those having more than 75% stenosis of one or more coronary arteries; those with calcification had poorer survival rates at all ages. The calcium does not necessarily indicate an obstruction; it is only a manifestation of the age of the atheroma.

Radionuclide imaging of acute myocardial infarction, as with thallium-201, and blood pool scans for visualizing wall motion defects by EKG gated radionuclide imaging and computer processing has added immeasurably to the evaluation of the hospitalized patient; it is rarely employed in the emergency room, however.

Diagnosis: Acute myocardial infarction.

SELECTED ADDITIONAL READING

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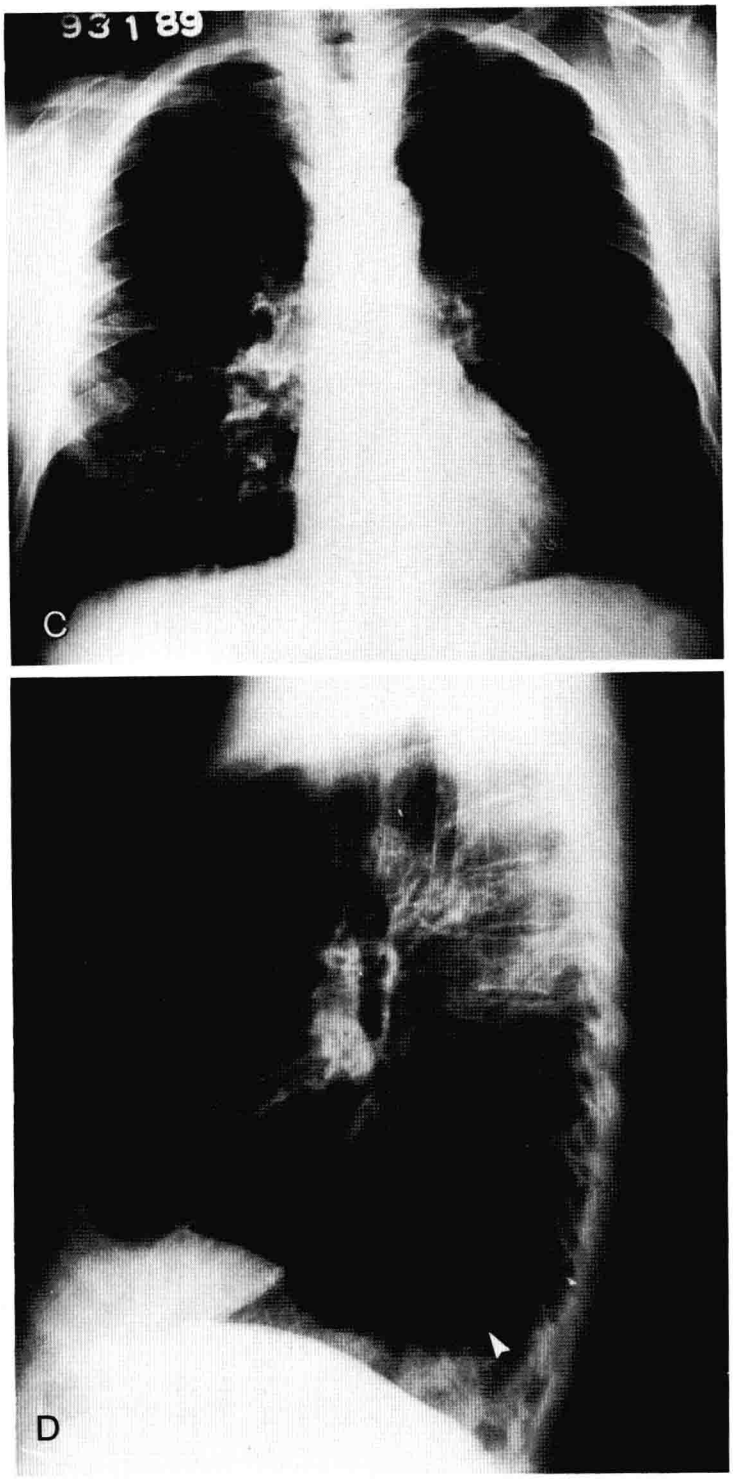

Figure 1.2 C-D

CASE 1

FURTHER X-RAYS—*Cont.*

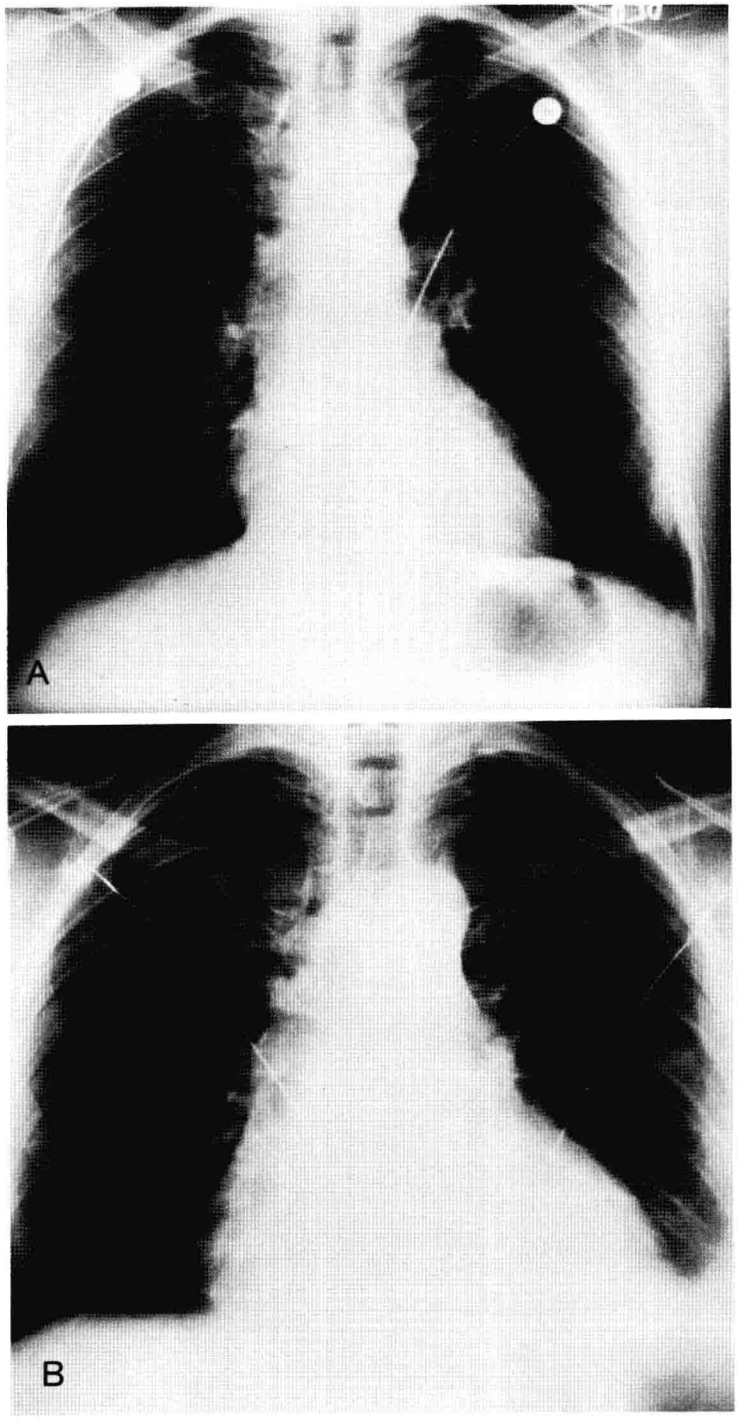

Figure 1.3 A-B

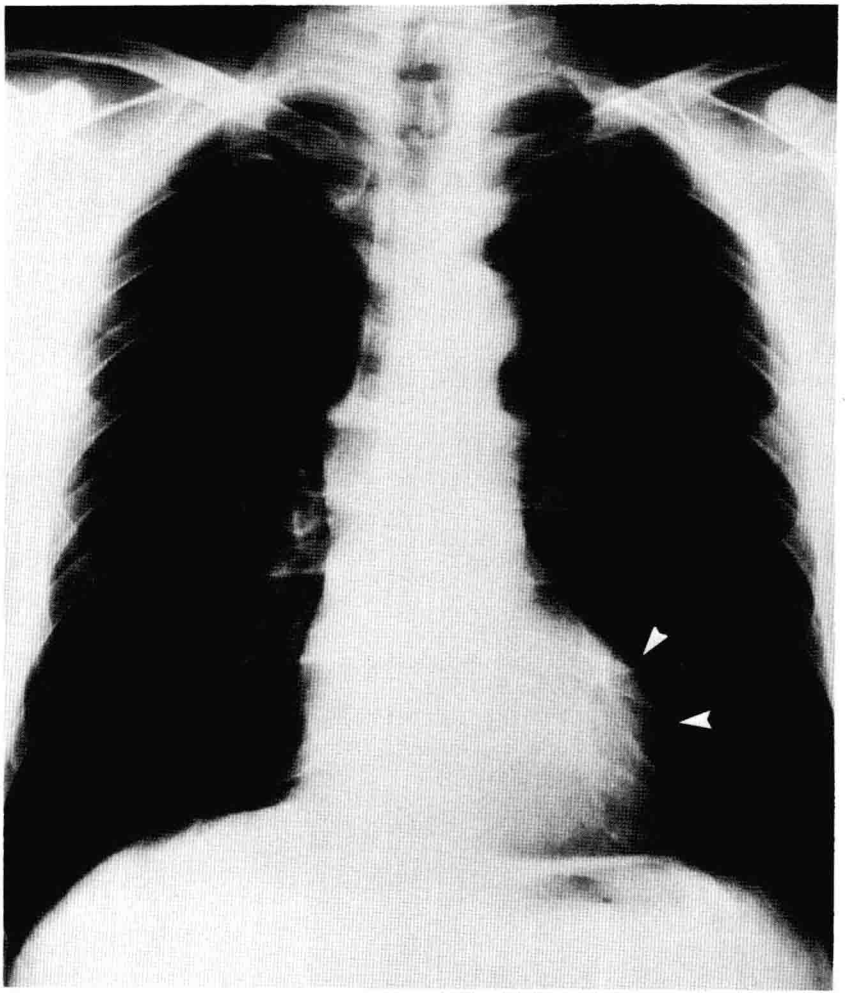

Figure 1.4