been described in patients with sickle cell disease and acute chest syndrome [8]. This syndrome, which is responsible for 25% of all deaths in sickle cell disease, is characterized by fever, pleuritic pain, dyspnea, leukocytosis, and new lung opacities on chest radiographs. Possible causes are fat embolism from bone infarcts or “in situ” thrombosis secondary to increased blood viscosity. Recently, a transient thrombus in the descending aorta has been reported in a young patient with sickle cell disease and severe chest pain [9].

The evaluation of patients presenting with chest pain is challenging for the clinicians. Although clinical history, physical examination, and the presence of risk factors are important in establishing the etiology of symptoms, imaging modalities are frequently utilized to confirm or to refute a provisional diagnosis. In fact, radiologists are commonly involved in the diagnostic work-up of patients with chest pain, particularly when a cardiac disease has been ruled out.

Non-cardiac causes of acute chest pain are reviewed in this chapter with special reference to the most recent published literature and emphasis on acute aortic diseases. The emerging role of multidector-row CT (MDCT) in patients with acute chest pain is also discussed. Pulmonary embolism is discussed in Chap. 4.2.

4.1.2 Diagnostic Imaging in Non-cardiac Acute Chest Pain

Chest radiography usually represents the first imaging modality performed in patients presenting with acute chest pain. It may be diagnostic in patients with pneumothorax, pneumomediastinum, rib fractures, and acute infections. Other conditions producing acute chest pain of non-cardiogenic etiology, such as aortic aneurysms or dissections, and pulmonary embolism, may be suspected from the chest film, but the overall sensitivity is much lower. Widening of the superior mediastinum and displacement of aortic wall calcifications, in the appropriate clinical setting, may suggest the diagnosis of aortic dissection; however, these findings may be difficult to evaluate since most patients with suspected dissection are examined with
portable radiography. Comparison with previous films, if available, may be extremely helpful and reveal changes in the aortic contour that are nearly pathognomonic for aortic dissection. The presence of a Hampton hump, Westermark sign, or pulmonary artery enlargement may indicate pulmonary embolism, although the sensitivity of these findings is quite low.

Computed tomography (CT) using helical technology is fast and easy to perform and, most importantly, can be obtained at any time of day or night. Newer CT scanners, especially those using multidetector arrays, can cover large anatomic areas with good spatial resolution and short scan duration [15]. The CT can help validating the diagnosis of pulmonary embolism, aortic aneurysms and dissection, pericardial effusions and thickening, and mediastinal hematomas. In patients with pneumothorax or pneumomediastinum, high-resolution CT scans can be useful in defining the cause of disease.

Appropriate technique is important to maximize the sensitivity and specificity of CT. Non-contrast CT scans are mandatory in patients with clinical suspect of aortic disease in order to better visualize calcifications, which may be seen in association with atheromas, within longstanding luminal thrombi, or along the intimal flap of a dissection (Fig. 1) [20, 36]. Moreover, acute hematomas, either in the aortic wall or leaking into the mediastinum, are best seen before contrast due to their high density as compared with flowing blood or mural thrombus (Fig. 2). Thin collimations in the order of 3–5 mm are recommended in CT scanning of thoracic aorta in order to improve spatial resolution and visualization of subtle abnormalities and small vascular branches [20, 43]. Use of contrast material should also be optimized in vascular studies with accurate selection of scan delay. Multiplanar and 3D reformatted images can be useful for better evaluation of the anatomic relationships and extent of vascular diseases.

Magnetic resonance imaging (MRI) allows noninvasive assessment of the mediastinum and thoracic aorta in multiple projections. Although the relatively long scan duration and the limited access to the patient may represent a drawback of MRI, this imaging modality can be useful in the assessment of patients presenting with acute chest pain and suspected aortic dissection by either showing the intimal flap or demonstrating associated findings of aortic regurgitation and branch vessel involvement. The MRI also has some utility in showing spinal abnormalities and nerve root compression as a source of chest pain [44].

A variety of sequences are available. The ECG-gated spin-echo studies provide excellent anatomic detail of the heart and thoracic aorta and remain the basis for many MRI algorithms [15]. Cine MRI and other gradient-echo techniques allow visualization of flowing blood and may help differentiate slow flowing blood from clot [13]. Gadolinium-enhanced 3D MR angiography techniques now permit rapid acquisition of MR angiograms of both aorta and branch vessels [22].

Echocardiography is also frequently performed in patients with acute chest pain. When compared with other imaging modalities, transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) have the unique advantage of portability and can be readily available in the emergency department or easily performed at the bedside. Echocardiography can help define the cardiac origin of chest pain in patients with elusive clinical findings and non-diagnostic electrocardiogram by demonstrating ventricular wall motion abnormalities [44]. More importantly, the absence of regional wall motion abnormalities makes the diagnosis of myocardial infarction unlikely with a negative predictive value of about 95% [2]. Echocardiography may additionally be helpful in diagnosing other causes of chest pain such as pericarditis, pericardial effusion, pulmonary embolism, and aortic dissection.

Films of the cervical and thoracic spine may be indicated to establish vertebral abnormalities, whereas barium