Definition

- **Epidemiology**
  Widespread in Western industrialized countries • Overall incidence increases with life expectancy • Prevalence approximately 4% • Present in approximately 5–10% of the male population • More common in males than in females (4:1).
- **Etiology, pathophysiology, pathogenesis**
  Endothelial damage from "atherogenic risk factors" • Formation of atheromatous plaques • Reduction of luminal diameter (becomes critical at 70% narrowing) • Diminished coronary flow reserve.
  Risk factors: Hyperlipoproteinemia, hypercholesterolemia, nicotine misuse, diabetes mellitus, arterial hypertension, obesity, familial disposition.

Imaging Signs

- **Modality of choice**
  Invasive coronary angiography.
- **Chest radiograph findings**
  Findings depend on the severity of the disease • Cardiopulmonary findings are initially normal • In severe cases LV enlargement, pulmonary venous congestion, and/or pleural effusion is seen.
- **Echocardiographic findings**
  (Stress-induced) LV dysfunction (regional hypo- or akinesia) • LV dilatation may precede dilatation of the LA, depending on disease severity • Secondary mitral insufficiency • Chronic congestion leads to pulmonary vein dilatation.
- **Nuclear medicine and PET findings**
  Detection and quantification of myocardial perfusion defects and dysfunction.
- **CT findings**
  Calcified plaques (calcium scoring) and soft plaques on multidetector CT angiography • Coronary stenoses • Signs of left-sided heart failure.
- **MRI findings**
  Same as echocardiography • MRA may show coronary stenoses • Decreased myocardial perfusion in response to pharmacologic stress (adenosine) • Myocardial infarction is detected by delayed contrast enhancement of the myocardial scar after gadolinium-DTPA administration (IR GE sequence).
- **Invasive diagnostic procedures**
  Coronary angiography: One or more stenotic coronary arteries • *IVUS:* More accurately delineates plaques and stenoses.

Claussen et al., Direct Diagnosis in Radiology. Cardiac Imaging
(ISBN 9783131451118), © 2008 Georg Thieme Verlag KG

Fig. 1.1 P-A chest radiograph in CHD. Marked enlargement of the LV due to heart failure, and increased pulmonary vascular markings due to chronic pulmonary venous congestion. A goiter with tracheal narrowing was noted as an incidental finding.

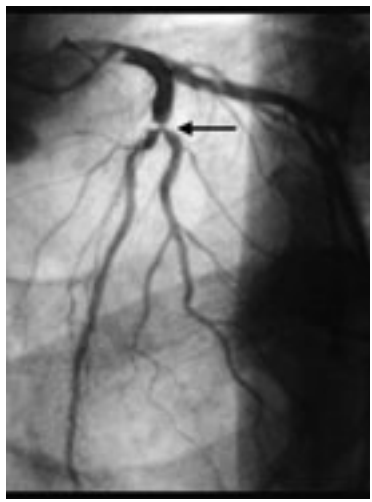


Fig. 1.2 High-grade stenosis of the LCX shown by coronary angiography.

Claussen et al., Direct Diagnosis in Radiology. Cardiac Imaging
(ISBN 9783131451118), © 2008 Georg Thieme Verlag KG

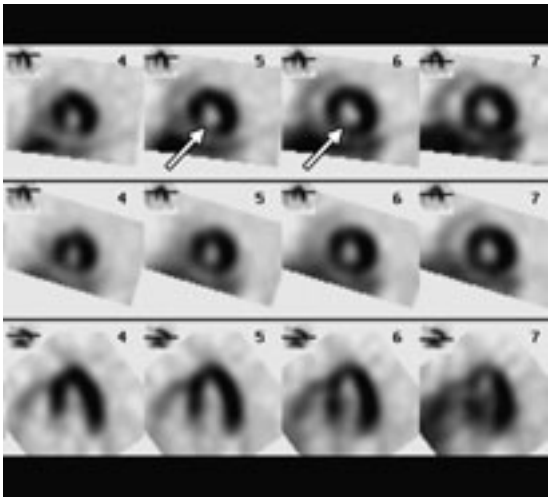


Fig. 1.3 Myocardial scintigraphy. An apical perfusion defect (arrow).

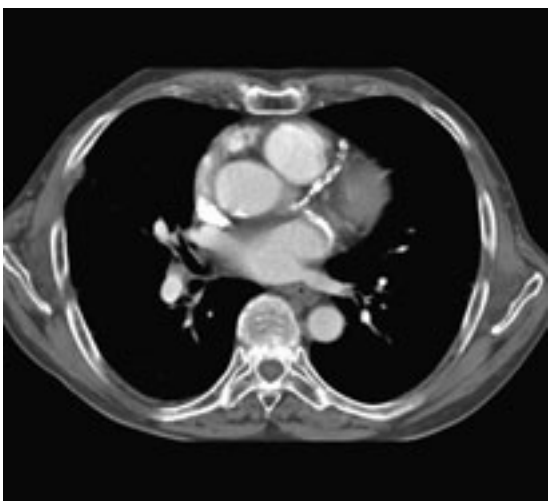


Fig. 1.4 Multi-detector CT. Diffuse sclerosis of the LCA.

Claussen et al., Direct Diagnosis in Radiology. Cardiac Imaging
(ISBN 9783131451118), © 2008 Georg Thieme Verlag KG

Fig. 1.5 Coronary stent in a 65-year-old woman with known CHD. Curved MPR of a stent in segment 3 of the right coronary artery shows no morphologic evidence of in-stent restenosis.

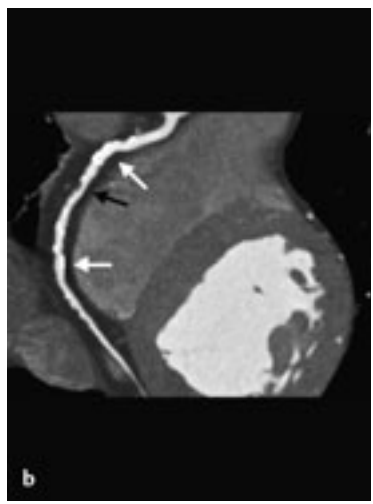
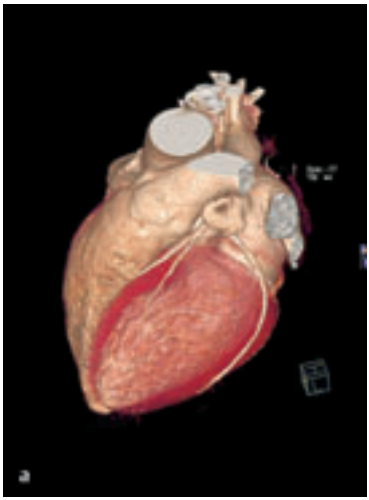


Fig. 1.6 a, b Coronary plaque in a 56-year-old man with nonspecific chest discomfort. The patient had no ECG abnormalities and an echocardiogram also showed normal findings. Coronary status was investigated by cardiac CT. Two mildly stenosing mixed plaques (arrows) are seen in segments 6 and 8 of the LAD artery (**a**). Curved MPR of the right coronary artery shows moderately stenosing calcified plaques (white arrows) in segments 2 and 3 and a moderately stenosing soft plaque (black arrow) in segment 2 (**b**).

Claussen et al., Direct Diagnosis in Radiology. Cardiac Imaging
(ISBN 9783131451118), © 2008 Georg Thieme Verlag KG



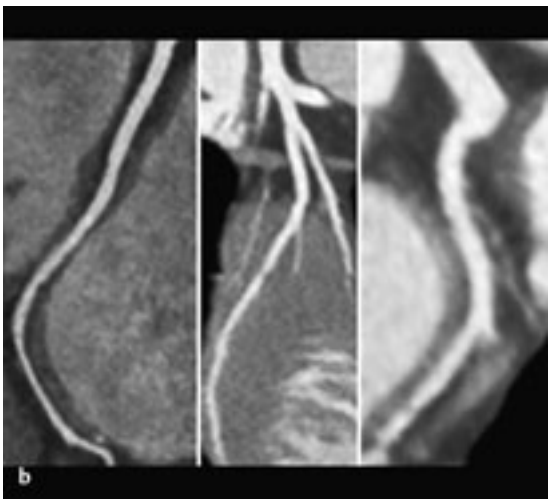


Fig. 1.7 a, b Coronary status in a 60-year-old woman with a familial disposition for CHD, current dyspnea, and nonspecific ECG changes. Cardiac CT was done to exclude CHD, and VRT was used for three-dimensional cardiac imaging. This technique is useful for demonstrating findings (**a**), but the actual diagnosis should always rely on thin reconstructed slices or MPRs (see below). Curved MPRs of normal coronary vessels (**b**). Left panel: RCA; center panel: LAD; right panel: LCX.

Claussen et al., Direct Diagnosis in Radiology. Cardiac Imaging
(ISBN 9783131451118), © 2008 Georg Thieme Verlag KG

Clinical Aspects

- **Typical presentation**
  Angina pectoris • Exertional dyspnea • Heart failure • Cardiac arrhythmias.
- **Treatment options**
  Medical treatment for ischemic heart disease and cardiac insufficiency • Interventional (PTCA, stent implantation) or surgical (aortocoronary bypass) myocardial revascularization.
- **Course and prognosis**
  Depend on the location and degree of coronary stenosis, myocardial ischemia, LV function (EF), and continued exposure to risk factors • *Complications:* Arrhythmias, myocardial infarction, left-sided heart failure, sudden cardiac death.
- **What does the clinician want to know?**
  Number, location, and degree of coronary stenoses • Signs of heart failure • LV enlargement • EF (important prognostic indicator!).

Differential Diagnosis

Coronary anomalies	– Anomalous origin of the coronary arteries – Life-threatening variant: ALCA, most symptomatic during exercise
Syndrome X	– Angina pectoris – Angiographically normal coronary arteries
Cardiomyopathies	– Impaired LV function – Angiographically normal coronary arteries

Tips and Pitfalls

Suspicion of CHD warrants early investigation of coronary status and individualized risk assessment to assess prognosis and provide optimum treatment.

Selected References

Raff GL et al. Diagnostic accuracy of noninvasive coronary angiography using 64-slice spiral computed tomography. J Am Coll Cardiol 2005; 46: 552–557

Sardanelli F et al. Three-dimensional, navigator-echo MR coronary angiography in detecting stenoses of the major epicardial vessels, with conventional coronary angiography as the standard of reference. Radiology 2000; 214: 808–814

Smith SC. Current and future directions of cardiovascular risk prediction. Am J Cardiol 2006; 97: 28A–32A

Claussen et al., Direct Diagnosis in Radiology. Cardiac Imaging
(ISBN 9783131451118), © 2008 Georg Thieme Verlag KG