Chapter 16
Chest Pain

Magda M. Amer

Introduction

Chest pain is a diagnostic challenge given the wide array of possible etiologies. Chest pain is caused by conditions that range from benign and self-limited (e.g., chest wall pain, anxiety) to serious or life threatening (e.g., unstable angina, aortic dissection, and pulmonary embolism). Accurate identification of life-threatening and serious causes of chest pain must be accomplished expeditiously in the primary care setting [1].

Key History and Physical Exam

When assessing a patient with chest pain, the history should address the following characteristics:

- *Onset* of chest pain—sudden or gradual
- *Location* of chest pain—left side, retrosternal, epigastric, or right side.

M.M. Amer, MD, FACP (✉)
Department of Internal Medicine, Florida Hospital Flagler/
Florida Health Care Plans FHCP,
60 Memorial Medical Pkwy, Palm Coast, FL 32164, USA
e-mail: magdaamer@ymail.com

E. Sydney et al. (eds.), *Handbook of Outpatient Medicine*,
https://doi.org/10.1007/978-3-319-68379-9_16

- *Radiation* of pain—to the neck, throat, lower jaw, teeth, or shoulder.
- *Quality* of chest pain—pleuritic, positional, sharp, dull, ripping, tearing, reproducible with palpation.
- *Exacerbating factors*: exertion, cold, emotional stress, meals, or sexual intercourse.
- *Associated symptoms*: nausea, diaphoresis, palpitations, orthopnea, fever, chills, productive cough, heartburn, dysphagia, trauma, or weight loss.

The physician should focus on past history of similar chest pain, cardiac disease, hypertension, diabetes, and hyperlipidemia. Family history of coronary artery disease, clotting history, and smoking history should be elicited.

Vital signs are a critical component of the physical examination of a patient presenting with chest pain. Hypoxia, tachycardia, hypotension, or hypertension may indicate pulmonary or cardiac causes. Fever and hypoxia may indicate infection such as pneumonia. Blood pressure should be checked in both arms to identify the possibility of aortic dissection.

Inspect the chest and upper abdomen for abnormal pulsations, abnormal patterns of breathing, or external physical injuries. Palpate for localized tenderness. Auscultate the lungs for any abnormal lung sounds (e.g., crackles, wheezing, asymmetric breath sounds). Auscultate the heart noting any abnormal or extra heart sounds (e.g., murmurs, s3/s4 gallop).

Gender and Cardiac Disease Presentation

The epidemiology has shown that the clinical manifestation and the progression of coronary artery disease are different in both sexes. Women develop cardiovascular disease about 10–20 years later than men, partly by the influence of hormones and partly by the genetic sex.

At the time of the first episode of an acute myocardial infarction, women are more likely to have diabetes mellitus or heart failure compared to men [2].

Several studies have indicated that women have “atypical” symptoms such as back pain, dyspnea, indigestion, nausea/

vomiting, and weakness. Frequently, women report pain in the jaw and neck and describe their symptoms with more of an emotional component compared with men [2].

The atypical presentation may explain the rate of underdiagnosed acute myocardial infarction in women. Overall women are undertreated for acute coronary syndromes and have worse outcomes characterized by increased hospital morbidity, higher mortality, and fewer evidence-based therapies [3].

For these reasons above, it is vital that the primary care physician carefully evaluate any female patient presenting with GI type symptoms as they may be presenting with cardiac ischemia.

The sensitivity of noninvasive diagnostic tests is lower in ECG exercise stress test in women compared to men because of the higher incidence of false-positive ST-segment depression during exercise and inadequate exercise to induce ischemia during stress testing, especially among elderly women [4].

For women with typical or atypical chest pain, stress echocardiography and stress nuclear imaging are the noninvasive modalities of choice for detecting coronary artery disease [4].

- *Differential Diagnosis*: (see Table 16.1) (Fig. 16.1)

Cardiac Causes:
Chest pain due to cardiac ischemia typically tends to be retrosternal or epigastric and tight and crushing in quality and may radiate to the arms, shoulders, neck, or jaw.

Stable angina is likely if chest discomfort or dyspnea is associated with effort, emotion, food, or cold weather and if the symptoms are stable in character (e.g., onset and duration of symptoms have been consistent over time). Stable angina symptoms generally last for minutes and are relieved by rest and/or NTG (nitroglycerin).

Unstable angina/myocardial infarction is defined as a new pattern of chest pain or a worsening pattern of an existing chest pain or dyspnea.

Noncardiac Causes:
Aortic dissection tends to cause pain with a tearing quality that may radiate to the back.

TABLE 16.1 Chest pain causes

Cardiac causes	Vascular causes	Pulmonary causes	Gastrointestinal causes	Musculoskeletal causes
Acute coronary syndrome	Acute aortic dissection	Pulmonary embolism	GERD	Costochondritis
Stable angina	Primary pulmonary hypertension	Pneumothorax	Esophageal spasm	Chest wall pain
		Pneumonia	Gastritis	
		Pleurisy	Peptic ulcer/biliary colic	

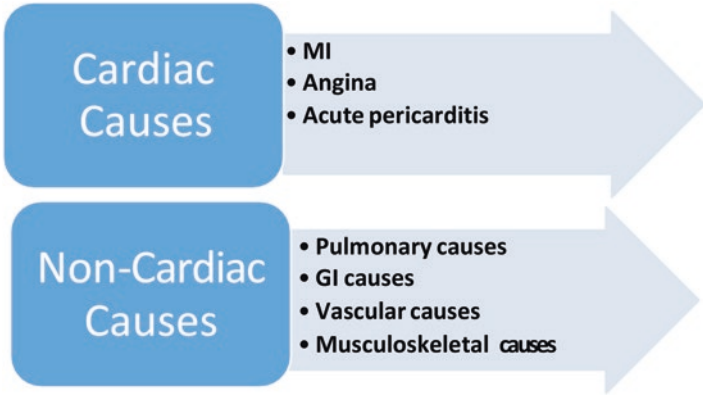

FIG. 16.1 Chest pain causes

Pericarditis pain tends to be worse on inspiration (pleuritic) and improves with sitting up and leaning forward.

Pulmonary embolus causes breathlessness (may be acute or slower onset) and sharp chest pain worse on inspiration and may be associated with hemoptysis and/or syncope.

Pleurisy causes sharp, localized chest pain, worse on inspiration.

Pneumothorax causes sudden onset of pleuritic chest pain or increased breathlessness with or without pallor and tachycardia.

Esophageal spasm or gastroesophageal reflux disease (*GERD*) pain is usually centrally located in the chest and may be associated with acid reflux.

Gallstones may present with right-sided chest pain with radiation to the shoulder.

Acute pancreatitis may present with central chest pain, although it is usually accompanied by epigastric tenderness.

Musculoskeletal pain is usually localized pain, worse on movement and reproducible with external compression.

Costochondritis is inflammation of the costochondral junctions, which manifests as localized tenderness over the costochondral junction on palpation of the chest wall.

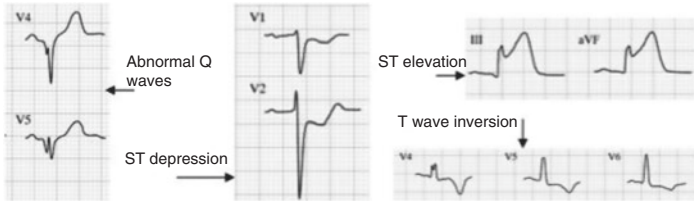

FIG. 16.2 ECG changes associated with ischemic heart disease

- *Decision-Making*

Assessment of chest pain in primary care is difficult. There is no need to admit every patient with chest pain, but caution is needed to prevent missing significant and serious disease.

Blood Tests:

Helpful blood tests to include are a complete blood count to exclude anemia and as an indicator of infection, urea and electrolytes, fasting glucose, d-dimer and a fasting lipid profile.

ECG (*Electrocardiogram*):

ECG is indicated to identify signs of ischemia (e.g., abnormal Q waves, ST elevation or depression, abnormal T waves—see Fig. 16.2). ECG may also identify arrhythmias and evidence of left ventricular hypertrophy.

Imaging

Consider a chest X-ray to assess cardiac size or exclude pneumonia or pneumothorax.

Management depends on suspected differential diagnosis. Table 16.1 lists the common differential diagnoses of acute chest pain in primary care. Evaluating symptomatology in conjunction with risk factors (see Table 16.2) and modifiable risk factors (see Table 16.3) can help to predict likelihood of a cardiac etiology.

Table 16.2 Risk factors

Age 55 years or older in men; 65 years or older in women
Known CAD or cerebrovascular disease
Pain not reproducible by palpation
Pain worsens during exercise
Patient assumes pain is cardiogenic

Table 16.3 Modifiable risk factors

Smoking
Diabetes mellitus/ hypertension
Dyslipidemia/obesity
Alcohol consumption
Psychosocial stressors
Physical activity/diet

Cardiac stress testing is an important diagnostic and prognostic tool in the evaluation and management of patients.

The following patients should be referred for stress testing on presentation:

- Symptoms suggesting angina
- Known CHD (coronary heart disease) and new or worsening symptoms
- Prior coronary revascularization CABG (coronary artery bypass grafting) >5 years or percutaneous coronary intervention >2 years
- Chronic left ventricular dysfunction and CHD in patients who are candidates for revascularization (Fig. 16.3; Table 16.4)

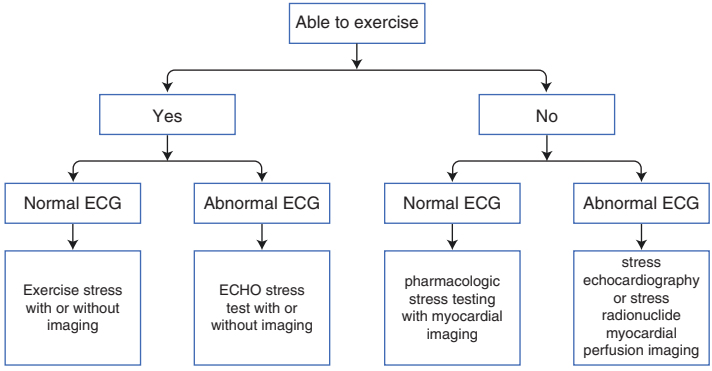

FIG. 16.3 Approach to choosing the optimal stress test

TABLE 16.4 Sensitivity and specificity for detecting coronary artery disease

Test	Sensitivity (%)	Specificity (%)
Exercise treadmill ECG test	45–61	70–90
Exercise nuclear perfusion imaging	73–92	63–88
Dobutamine stress myocardial perfusion imaging	88–91	75–90
Exercise echocardiography	70–85	77–89
Dobutamine stress echocardiography	72–90	79–95
Coronary CTA (not widely used)	93–90	64–90

Adapted from Heart Int. 2012; 7(1):e2. [6]
CTA computed tomography angiogram

- Preoperative evaluation for non-cardiac surgery in patients deemed to be at high risk [5]
- *Treatment*

Unstable Angina

In patients with chest pain with or without new ECG changes (ST or Q waves) and high to moderate cardiac risk (Table 16.2), give aspirin 162–325 mg by mouth, oxygen, and NTG, obtain IV access, do cardiac monitoring and blood work which includes cardiac enzymes, and refer to the ER. Patients with chest pain and no ECG changes and low cardiac risk may be referred for outpatient stress testing. See Fig. 16.4.

Stable Angina

In patients with stable ischemic heart disease, the first-line therapy to reduce anginal episodes and improve exercise tolerance is beta-blockers. Furthermore, beta-blockers are the only antianginal medication shown to prevent reinfarction

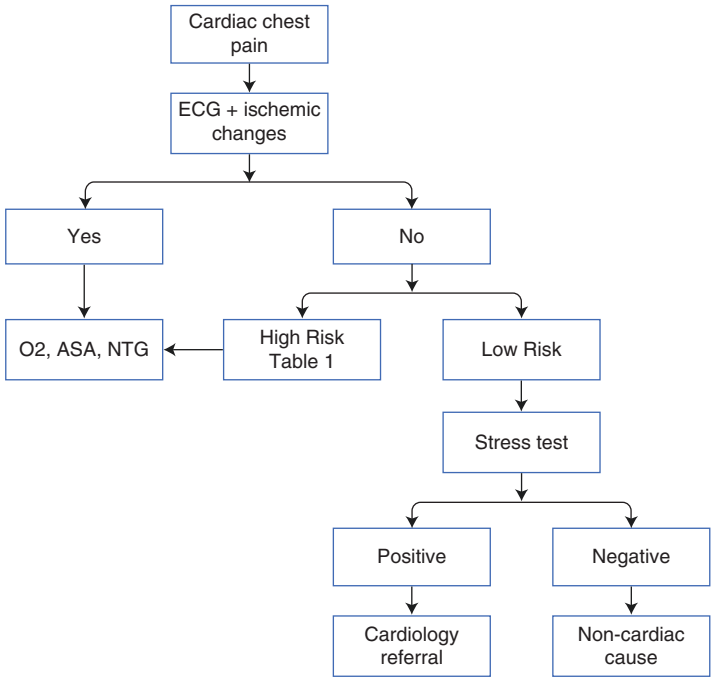

FIG. 16.4 Clinical approach for cardiac chest pain

and to improve survival in patients who have already had a myocardial infarction [7].

Nitrates should be used for relief of acute anginal symptoms, and they may also help to prevent recurrent angina episodes through coronary vasodilation.

All patients should be treated with aspirin in doses from 75 to 325 mg provided there is no contraindication to antiplatelet therapy.

Ranolazine, a piperazine derivative, was approved by the FDA in 2006 as a new antianginal agent to treat chronic stable angina. It is intended for use as combination therapy when angina is not adequately controlled with other antianginal agents [8].

The following patients should be referred to the emergency room:

- Aortic dissection: unequal blood pressures bilaterally
- Pneumonia: fever and cough, infiltrates on chest X-ray, Curb 65 score ≥ 2
- Pneumothorax: decreased lung sounds unilaterally. Changes in fremitus and percussion. Diagnosis made by chest X-ray
- Pulmonary embolism: hemoptysis and dyspnea in a patient with risk factors

Young patients with low cardiovascular risk presenting with heartburn, and epigastric pain, may be sent home with an antacid and followed up after 2–3 weeks. Patients who have a low cardiovascular risk, are afebrile, and present with localized pain and tenderness, may be managed with NSAIDs and pain control for costochondritis. See Fig. 16.5.

Clinical Pearls

- Comprehensive history and examination are vital to the diagnosis.
- Consider the differential diagnosis when interpreting symptoms and signs and investigating results.
- Evaluate risk factors for cardiac disease when assessing a patient.

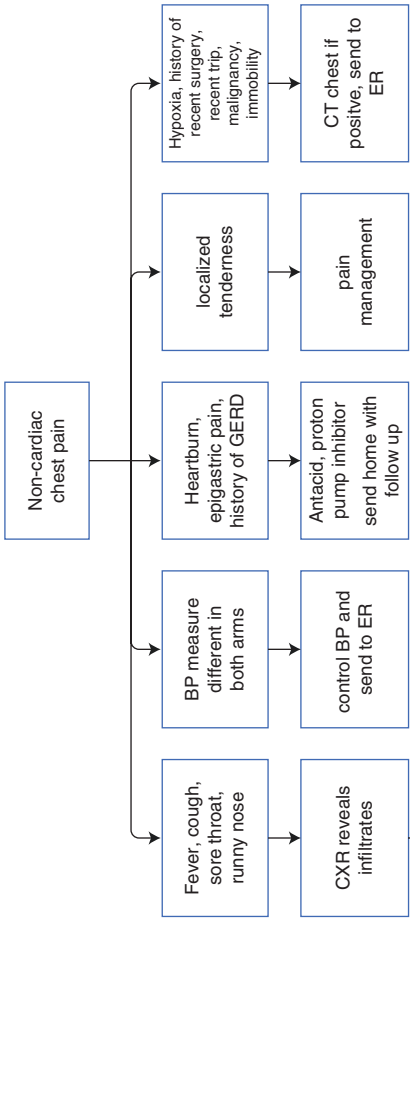

FIG. 16.5 Clinical approach for noncardiac chest pain

Don't Miss This!

- If a patient is acutely unwell with chest pain and the cause is not clear, err on the side of caution and send the patient to ER for further assessment.
- Remember that women can present atypically with cardiac ischemia that may mimic GI distress.

References

1. Sekhri N, Feder GS, Junghans C, et al. How effective are rapid access chest pain clinics? Prognosis of incident angina and non-cardiac chest pain in 8762 consecutive patients. Heart. 2007;93(4):458–63. Epub 2006 Jun 21
2. Shaw LJ, Bugiardini R, Bairey Merz CN. Women and ischemic heart disease: evolving knowledge. J Am Coll Cardiol N. 2009;54:1561–75.
3. Vaccarino V, et al. Sex-based differences in early mortality after myocardial infarction. National Registry of Myocardial Infarction 2 Participants. N Engl J Med. 1999;341:217–25.
4. Stangl V, Witzel V, Baumann G, Stangl K. Current diagnostic concepts to detect coronary artery disease in women. Eur Heart J. 2008;29:707.
5. Miller TD. Exercise treadmill test: estimating cardiovascular prognosis. Cleve Clin J Med. 2008;75:424.
6. Arbab-Zadeh A. Stress testing and non-invasive coronary angiography in patients with suspected coronary artery disease: time for a new paradigm. Heart Int. 2012;7(1):e2. https://doi.org/10.4081/hi.2012.e2.
7. Fihn SD, Gardin JM, Abrams J, et al. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease: a report of the American College of Cardiology Foundation/American Heart Association task force on practice guidelines, and the American College of Physicians, American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. Circulation. 2012;126:e354.
8. Rayner-Hartley E, Sedlak T. Ranolazine: a contemporary review. J Am Heart Assoc. 2016;5:e003196.