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Clinical examination of a patient with acute chest pain

- The examination of each patient with acute chest pain is based on the anamnesis received from the patient, his/her accompanying persons or family members, and on quick identification of the need for immediate treatment through simple basic examinations.
- The possibility of aortic dissection and pulmonary embolism should be remembered, particularly if the ECG does not show any findings of ST-elevation myocardial infarction.
- On admission, myocardial infarction is painless in 20–50% of patients with diabetes, renal insufficiency, and dementia as well as among the elderly.
- Only stabbing chest pain dependent on breathing or position observed in thoracic palpation of a patient without significant risk factors for coronary disease justifies the exclusion of cardiogenic causes can be excluded.
- Patients presenting at the emergency department with so-called typical chest pain should always be admitted to the hospital for monitoring until a coronary event has been excluded.
- Only patients suffering from so-called non-anginal chest pain but having no risk factors for arterial disease can be discharged from the emergency department without any monitoring.

PEER-REVIEWED



The development of imaging and laboratory test methods has significantly improved the diagnostics of chest pain. As a result, the importance of traditional physical examination methods (inspection, palpation, percussion, and auscultation), in particular, has decreased (1). On the other hand, the change has also led to underestimation of the importance of the anamnesis.

The diagnosis of a patient suffering from chest pain is still based on the anamnesis and status, especially in the identification of conditions requiring immediate treatment. The operational culture emphasizing speed and efficiency does not promote taking an unhurried anamnesis.

Epidemiology of chest pain

Chest pain is one of the most common reasons for seeking treatment. However, most of the patients consulting a general practitioner do not experience cardiogenic chest pain. Similarly, only one in five patients in outpatient emergency care but more than half of the patients admitted to the emergency department of a central hospital suffer from cardiogenic chest pain (Table 1). Consequently, the positive predictive value of chest pain symptoms related to a heart condition is 2.5 times higher in a hospital emergency department than in outpatient care. Nevertheless, clearly fewer chest pain patients attending a hospital emergency

department spontaneously suffer from a serious heart condition compared to those arriving with a referral or by ambulance.

Chest pain requiring immediate treatment

In most cases, the diagnostics of acute chest pain requires monitoring of the patient and repeated clinical examinations and laboratory tests. Chest pain is a nonspecific symptom caused by many factors; consequently it is advisable to commence by estimating the acute risk primarily through the anamnesis, the status and an ECG: Does this chest pain require immediate treatment? If tachycardia, low blood pressure, or signs of cardiac insufficiency are observed, the patient may need immediate emergency treatment of vital functions even if the diagnosis has not been confirmed yet.

Potentially life-threatening conditions include at least acute myocardial infarction and other events related to coronary artery disease, massive pulmonary embolism, aortic dissection, tension pneumothorax, and esophageal rupture (3, 4). Rare life-threatening causes of acute chest pain include ruptured sinus of Valsalva and tendinous cord rupture of the mitral valve.

Aortic dissection

Myocardial infarction is the most common

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cause of chest pain requiring immediate treatment. However, aortic dissection (Figure 1) should be considered to be the cause of extremely severe acute or sudden chest pain until proved otherwise, e.g., by ECG and troponin testing of myocardial lesions, sometimes by imaging (echocardiography and computer tomography). Ascending aortic dissection is sometimes associated with myocardial infarction resulting from a rupture reaching the base of the right coronary artery. Typical fea-

tures of chest pain caused by aortic dissection are presented in Table 2.

Patients with aortic dissection often have high blood pressure and may also have been smokers. Aortic dissection may also be caused by high-energy chest trauma (7).

Pulmonary embolism

Dyspnea and chest pain are early symptoms of pulmonary embolism equally often (Table 3). In order to receive the right treatment, so-called massive embolism causing hemodynamic instability should be recognized as early as possible. Pulmonary embolism is characterized by so-called pleuritic chest pain causing dyspnea as well as other inexplicable dyspnea and an increased ventilation rate. In such cases, changes in the acute loading of the right side can often be seen in the ECG (Figure 2). Milder embolisms do not usually cause changes in the

TABLE 1.

Epidemiology of chest pain during the primary health care appointment and at the hospital emergency department (1, 2).

Diagnosis	Patients with chest pain, %	
	Appointment	Emergency department
Musculoskeletal	29	7
Gastrointestinal	10	3
Acute cardiogenic pain or pulmonary embolism	13	54
Stable angina pectoris	8	13
Unstable coronary artery disease	-	13
Psychosocial or psychiatric	17	9
Pneumonia, pneumothorax, lung cancer	20	12
Nonspecific chest pain	11	15

FIGURE 1.

Aortic dissection and frequency of manifestation types (5). About 30% of dissections cannot be observed in conventional transthoracic echography.

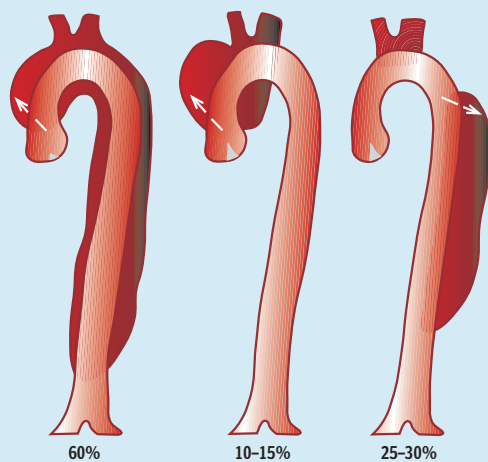


TABLE 2.

Typical features of chest pain caused by aortic dissection (6).

- Sudden onset
- Extremely sharp and severe, sometimes tearing nature of pain
- In more than half of the patients, the pain is located in the frontal thorax area
- Shoulder pain in almost a third of the patients
- Back pain in half of the patients
- Radiating pain in more than one quarter of the patients
- Migrating pain in less than one fifth of the patients
- Association with Marfan syndrome or Ehlers-Danlos syndrome or familial annuloaortic ectasy

TABLE 3.

Symptoms of pulmonary embolism (8).

Symptom or finding	Patients, %
Chest pain	33-66
Dyspnea at rest	60
Dyspnea during exercise only	13-18
Cough	37-44
Hemoptysis	13
Abnormal thorax image	84
Tachypnea > 20/min	51-70
Abnormal finding at auscultation	32-45
Tachycardia > 100/min	21-30

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ECG. Bedridden, trauma, and cancer patients are susceptible to pulmonary embolism (9).

Myocardial infarction and other coronary events

ST-elevation myocardial infarction in a patient suffering from acute chest pain must be recognized as quickly as possible. Therefore, an ECG should be taken while recording the anamnesis, today often in the patient's home. If the patient's ECG and general status are normal and there are

no signs of disturbances in vital functions, the cause of chest pain is initially identified by determining the type of pain and other symptoms:

- Onset of pain
- Location of pain
- Intensity of pain
- Nature of pain
- Radiation of pain
- Factors causing pain
- Factors relieving pain.

Typical features of chest pain caused by coronary artery disease include the retrosternal location of the pain, undefinable, the unpleasant or squeezing nature of the pain, radiation of the pain to the left upper extremity, in particular (10) (Table 4), the recurrence of similar pain, short duration, the occurrence of pain during physical or mental strain, and alleviation of the pain at rest or with nitrate administration in less than 5 minutes. On the other hand, the diagnostic significance of relief brought by nitrate administration in patients with acute chest pain may be questionable, for example, because rest and antianginal medication can also relieve esophageal pain, although not as quickly as cardiogenic pain (11, 12, 13). Studies have shown that the association between adjuvant symptoms, such as nausea and sweating, and cardiogenic pain is questionable (12).

Actually, cardiogenic causes, with the exception of carditis, can be excluded with over 70% probability, if only shooting chest pain dependent on the breathing or position is observed in thoracic palpation of a patient with no significant risk factors (including age) for coronary disease (12). However, the significance of chest pain anamnesis in estimating a cardiogenic cause is particularly weak among female patients, diabetics, patients with renal insufficiency, and dementia patients, as well as among the elderly. In these cases, the pain may even be absent altogether (Figure 3) (14). Similarly, cardiogenic chest pain in young people (under the age of 40) is often atypical (15).

The probability of acute cardiogenic chest pain is decreased by palpatory sensitivity of the chest, radiation of pain to the lower extremities, pain causing dyspnea (pain caused by pleuritis and pericarditis), as well as sharp or shooting pain. Change of position worsens or relieves the pain in some of the patients with perimyocarditis, but not in patients with

FIGURE 2.

ECG manifestation of massive pulmonary embolism is the S1Q3T3 pattern related to overload of the right ventricle:

S wave in lead I (1) and Q wave and inverted T wave in lead III (2). In addition, bundle branch block on the right side sometimes progressing "hour by hour" in lead IV (3). These ECG manifestations are sometimes interpreted to be caused by ischemic heart disease or cardiac insufficiency.

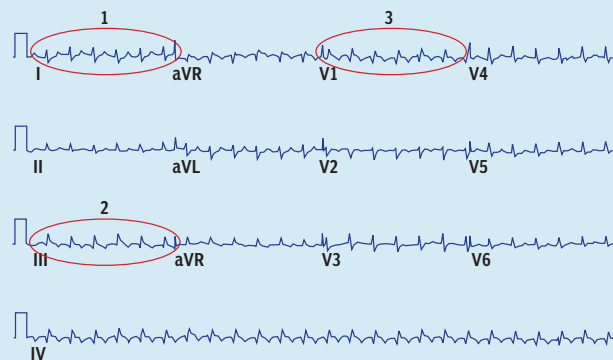


TABLE 4.

Definition of chest pain typical of coronary artery disease (1).

Main criteria	Squeezing or unpleasant retrosternal pain Onset or worsening of the pain in physical exercise The pain is relieved by rest or nitroglycerine within minutes
Additional criteria	The pain radiates to the left upper extremity or elsewhere The pain occurs after a meal Repeated similar episodes of pain Dyspnea is associated with the pain
Determination	Chest pain is typical of coronary artery disease, if all the main criteria are met The chest pain is atypical, if any of the main criteria is not met The chest pain is non-anginal, if only one of the main criteria is met

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ischemic cardiac pain. Neither the visceral leaf of the pericardium nor most of the parietal leaf feels pain. Therefore, acute myopericarditis in fact causes pain only when the process of pericarditis is spreading, for example, into the pleura or esophagus (5). In these cases, coughing and pain in swallowing may appear as additional symptoms. Other causes of acute lung-

related chest pain include pneumothorax, pneumonia and pleuritis. When no obvious "extracardiac reason" can be observed, a coronary event should be suspected.

Who can be discharged from the hospital?

It is estimated that 1-4% of patients with myocardial infarction is discharged from hospital by mistake (16). This happens most easily in cases where the myocardial infarction patient does not have any chest pain (Figure 3). According to research, the prognosis is worse for these patients than for others - not least because the patients remain untreated. Cost-benefit analyses indicate it is worthwhile to admit patients for treatment including heart monitoring if the probability of myocardial infarction exceeds 20%. If the probability is lower than that, less stringent cardiac monitoring is sufficient.

If a coronary event is suspected of having caused the chest pain, an ECG is necessary and as important as the information about the nature and risk factors of the chest pain. In elderly patients with chest pain, a previous coronary event is the only important risk factor regarding the prognosis, because age as such is a strong risk factor that "covers" the rest of the factors. In about 80% of patients with myocardial infarction, the so-called admission ECG shows changes concurrent with ischemic heart disease. A recent change in the ST segment is thus a reasonably sensitive but extremely specific change, independent of the symptoms or absence of symptoms (Figure 4). Unfortunately, an ECG is not of much use in the evaluation of a patient with chest pain in cases where it already shows findings of left fascicular block or hypertrophy of the left ventricle. The staff in the emergency department must require access to previous ECG recordings, to be used for comparison, because even minor changes in the ECG are often significant in the evaluation of a patient suffering from acute chest pain.

Patients with so-called typical chest pain admitted to the emergency department (Table 4) should always be monitored in the hospital until a coronary event has been excluded through repeated ECG and troponin testing (17). Despite relief of the symptoms, patients with atypical chest pain also need repeated troponin testing for up to 12 hours from the onset of the symptoms. Only

FIGURE 3.

The proportion (%) of myocardial infarctions occurring without chest pain on admission to the hospital among different age groups and groups of diseases (patients with cardiac insufficiency or diabetes, and female patients) (14).

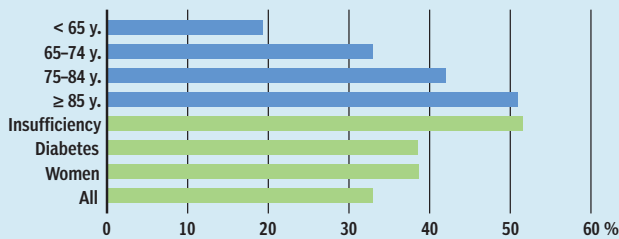


FIGURE 4.

ECG changes in diagnosing myocardial infarction. Recent changes in ST segment shifts and the Q wave are extremely specific but only relatively sensitive signs of myocardial infarction: in 40-50% of the infarction patients, these changes are not observed in the so-called admission ECG. So-called "old changes" increase the chance of myocardial infarction in patients with chest pain. However, they increase the chance of wrong positive diagnosis even more (16).

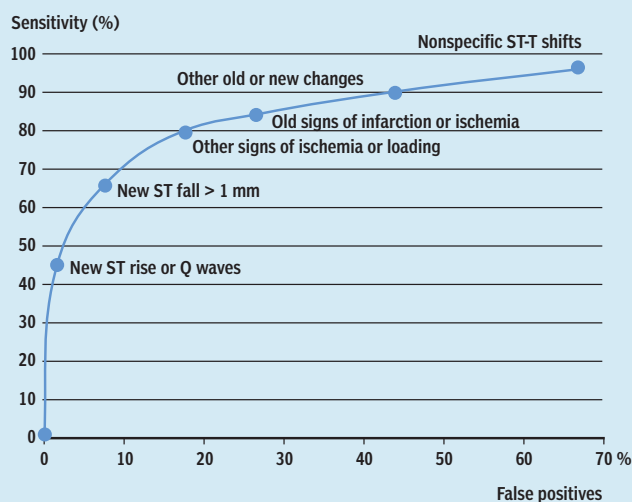
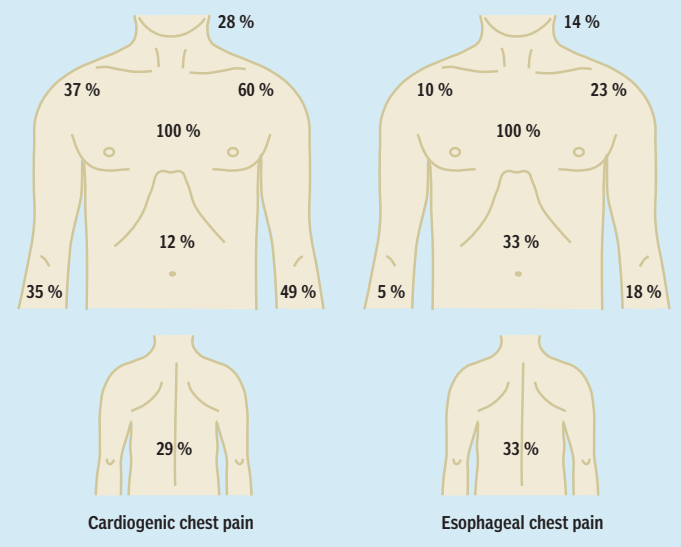


FIGURE 5.

In many cases cardiogenic and esophageal chest pain resemble each other, and both often occur in the same patients. Esophageal chest pain radiates more rarely than cardiogenic chest pain (1, 19).



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Financial ties:

Raimo Kettunen has made presentations at events organized by pharmaceutical companies (MSD, Orion, Schering-Plough).
Taisto Talvensaari has not reported any financial ties.

patients without risk factors (old age, history of coronary artery disease, disease of the lower extremities or jugular veins, elevated blood pressure, disturbance in lipid metabolism and sugar metabolism or diabetes) suffering from so-called non-anginal chest pain can be discharged from the emergency department without monitoring and repeated ECG and troponin testing (18).

Esophageal chest pain

Burning chest pain together with nausea is a sign of a coronary event as often as it is a sign of reflux in patients with a normal ECG (10). The concomitant incidence of reflux and angina pectoris is very common (Figure 5). Epigastric pain also associated with nausea may be of cardiac origin. The significance of the antacid drug test (the “GI cocktail”), used as a diagnostic tool in Anglo-Saxon countries, has been questioned in differentiation diagnostics (13).

Muscular and skeletal chest pain

With unknown origin, costal cartilage inflammation (costochondritis) causing tender palpation finding, known as Tietze’s syndrome when associated with local swelling, is a rather com-

mon cause of chest pain particularly in children and young adults (1). The pain begins gradually and is worsened by coughing. The pain is continuous, often radiates to other parts of the thorax or even to the epigastrium and the back. Degenerative arthritis or mobility disturbance of the zygapophyseal articulation (facet joint) of the thoracic vertebrae can, apart from local back pain, also cause acute chest pain (1). Although the pain occurs in most cases when twisting or bending the thoracic vertebrae, it can also occur as pain radiating to the upper extremities alone, and dyspnea may be involved. Clinical examination shows unilateral, local sensitivity to pressure at the articulation.

Psychogenic chest pain

Psychogenic chest pain is characterized by the concomitant occurrence of other functional disorders of the nervous system (for example, benign palpitations, sweating attacks, low blood pressure), diversity and changes in the syndrome (as a result of repeated visits to the doctor), other previous functional symptoms (headache, back pain, dyspepsia), and repeatedly negative test results. Chest pain can be a nearly dominant symptom also in patients with hyperventilation syndrome. Closer examinations reveal panic disorders, anxiety, and depression among these patients more frequently than among other patients.

Final remarks

Even though the anamnesis of a patient with chest pain provides important information about the probability of an acute coronary event, at present the decision to discharge the patient from the emergency department cannot be based solely on the anamnesis. A recent ECG, often troponin testing and, particularly for patients taken to a hospital emergency department, monitoring and repeated tests are needed (12, 17). When evaluating a patient with acute chest pain, traditional risk factors are considerably less important than the ECG and troponin testing (13).

The working conditions of doctors on call must be amended to enable careful and appropriate examination of patients (20). Triage nurses must be trained to record the information in the patient’s anamnesis so precisely that the medical examination and admission to hospital can be made faster, as needed, and can be focused correctly. ■