

# Differential diagnosis of chest pain/PGS (VPL)

## Symptoms

Subjectively perceived **PRESSURE, TIGHTENING, PAIN** on the front surface of the chest in its middle part (from the jugular to the *processus xiphoides*).

## Target

The goal is to relieve symptoms, search for the cause (differentiate high-risk or life-threatening conditions from a number of diagnoses with a negligible risk of critical deterioration), and choose an appropriate treatment tactic based on it.

- We start from the anamnesis (ancillary examinations will only exceptionally help the decision about the fate of the patient).
- The patient can distinguish essential symptoms well, ask targeted questions and observe non-verbal signs of difficulties.

## Anamnesis

### Pain history

- Differentiates PRESSURE from PAIN or TIGHTENING;
- comes from the CHEST WALL or INSIDE the chest (emotionally and vegetatively more significant);
- we let the hand show where (or from where) it spreads.

### Key Pain Questions

- Localization (Where does it hurt?).
- Promotion (Where does the pain spread?).
- Character (What is the pain like?).
- Duration (How long does the pain last?).
- Provoking mechanisms (Is the pain dependent on any activity?).
- Relief mechanisms (Is the pain relieved by any position, stopping, pharmacotherapy?).
- Side symptoms (Is the pain accompanied by palpitations, vegetative symptoms?).

### History of accompanying symptoms

- As for additional problems, we especially look for: discomfort, restlessness, fear or anxiety, weakness, sweating, Shortness of breath, nausea, feelings of fullness, pyrosis, weight loss, irregular heartbeat, compulsion to cough, restriction of movement;
- we ask about the BEGINNING of the difficulties (write !!), the same intensity or changes in the character of the difficulties, repeatedly or for the first time, what medicines he is taking for them and what he has already taken now, whether he fell, bumped,...

### Family and personal history

- Risks (age, smoking, diabetes, hypertension, etc.) for suspected angina.

## Basic physical, laboratory and instrumental examination

- pressure on the sternum, change in pain during free deep inspiration (causes transferred pain to the articulation of the ribs - mostly vertebrogenic in nature)
- pressure on a painful place (causes pain in case of rib injury, but also in case of pleural irritation in case of pulmonary infarction)
- echocardiography - key imaging examination in suspected cases without clear ischemic changes on a 12-lead ECG
- repeated EKG, X-ray lungs, blood sampling (targeted according to prevailing suspicions).

## The most common causes of chest pain

### Cardiovascular causes

- Coronary ischemia,
  - angina pectoris (stable, unstable),
  - myocardial infarction,
  - pulmonary embolism;

- aortic stenosis (valvular, subvalvular),
- pericarditis,
- pulmonary hypertension,
- aortic dissection.

## **Pulmonary causes**

- Pleuritis,
- pleuropneumonia,
- tracheobronchitis,
- pneumothorax,
- neoplastic lung disease and mediastinum,
- mediastinitis.

## **Gastrointestinal causes**

- Gastroesophageal reflux – most often;
- esophageal spasm,
- Mallory-Weiss syndrome,
- peptic ulcer,
- pancreatobiliary diseases.

## **Chest wall causes**

- Tietz syndrome – most often,
- vertebrogenic problems;
- damage to the shoulder area (joint, tendons, bursa),
- damage to intercostal muscles (inflammation, spasm),
- Herpes zoster,
- breast disease (breast tumours, breast inflammation).

## **Psychogenic causes**

- Common - neurasthenia (neurocirculatory asthenia).

# **Characteristics - Etiology**

## **Cardiovascular (common and severe)**

- Angina pain (angina) - in the case of myocardial ischemia, there is an imbalance between the need and supply of O<sub>2</sub> (due to the closure/stenosis of the coronary artery). Relative ischemia is caused by physical ev. mental stress (exertion, excitement, stress) in case of narrowing of the coronary artery; by increasing pressure in the chamber (aortic stenosis, pulmonary hypertension). There is a constricting flat pain behind the sternum, the patient does not indicate the point where exactly, there is often propagation to the HK (more often left) or to the neck area, lower jaw, between the shoulder blades or to the epigastrium. Atypical images are also common. Typical-looking angina can be present even in a patient without cardiac disease.
- Pain in pulmonary embolism:
  - with massive embolism (acute pulmonary hypertension), the pain may resemble angina pectoris;
  - in the case of a minor embolism, lung infarctions are formed, irritating the adjacent pleura, evoking a pleuritic type of pain usually within a few hours of the event.
- Pericarditis is usually accompanied by pleuritic pain, sometimes also pain transferred to the L arm (common innervation from spinal segments C3-4).
- Pain in aortic dissection is caused by irritation of the nerve endings in the adventitia of the aorta. It is sudden, devastating, located behind the sternum or between the shoulder blades.

## **Pulmonary causes**

- In pleuritis – well-defined, stabbing pain, dependent on deep breathing or coughing.
  - This type of pain also occurs in embolism, pericarditis, pneumothorax, and in some affections of the chest wall (dependence on breathing, i.e. also on the movements of the ribs and intercostal muscles).
- Tracheobronchitis, accompanied by burning pain behind the sternum, may resemble angina pectoris or pain in gastroesophageal reflux.
- Pain in tumours – it is variable, it depends on the location (in the pulmonary apex (Pancoast's tu) it soon directly irritates the C8 and Th1-2 nerves, it is associated with severe pain from the shoulder to the ulnar surface of the upper limb).

## **Gastrointestinal causes**

- Reflux esophagitis is usually accompanied by burning pain from local irritation of the nerve endings, if it is combined with a spasm of the oesophageal muscles, then it is similar in character to angina pectoris.
- Mallory-Weiss syndrome (from injury to the lower oesophagus and cardia during violent vomiting) evokes severe pain.
- Other GIT causes usually cause pain in the epigastrium, but it can also be felt (possibly mainly) behind the

lower sternum.

## Chest wall causes

- Vertebrogenic causes (from irritation of the intercostal nerves).
- Tietz syndrome (painful swelling (swelling) of the sternocostal junction) - painful to touch.
- It worsens during movements of the chest (not only respiratory), it is well localized and there is also palpation sensitivity in this place, especially noticeable in Tietz syndrome over the affected chondrocostal junction.

## Psychogenic causes

- Pains sometimes of a peculiar character, or similar to any of those mentioned, often angina pectoris. A short (secondary) stabbing pain under the left nipple is also relatively common.

## Roughly from the most severe - options

- Acute forms of CHD: medical history (risk factors for RA and OA, difficulties the patient already knows or the first occurrence?).
  - ECG: STEMI x NONSTEMI, unstable AP
    - Acute myocardial infarction, associated with polymorphic ventricular dysrhythmias, with signs of cardiogenic shock or pulmonary edema.
    - Unstable angina pectoris.
- Dissecting aortic aneurysm:
  - risk factors (hypertension, smoking), typically immediate onset of pain;
  - often symptoms from other organ systems complicating dg.;
    - dissecting aneurysm of the aorta with increasing pallor, pain and drop in blood pressure.
- Pericardial tamponade.
- Contusion of the chest and lungs with shortness of breath (with signs of injury to the large airways), penetrating injury to the myocardium - gunshot, or stabbing.
- Myocardial contusion with signs of ventricular dysrhythmia and hypotension.
- Overdose of cocaine and psychomimetic amphetamines with hypertension, tachycardia and risk of tachyarrhythmia.
- Acute pulmonary embolism (embolism to a. pulmonalis with development of shortness of breath, cyanosis);
  - risk factors (vessel wall disruption, venostasis during immobilization, hypercoagulable state (malignancies, inflammation, smoking, contraception, etc.));
  - tachycardia always, shortness of breath mostly, chest pain is not one of the main symptoms.
- More extensive pneumomediastinum in case of injury to the airways, especially the trachea and main bronchi
- Rupture of the oesophagus or oesophageal diverticulum - accompanied by shocking pain.
- Fluidopericard, gradually multiplying to the point of outflow obstruction, especially from the right ventricle.
- Myocardial coma (with risk of dysrhythmias).
- Tachyarrhythmia, tachycardia of supraventricular origin.
- Infectious tracheitis in the initial hyperaemic phase, or chemical after inhalation lung irritants.
- Spontaneous pneumothorax: chronic diseases - COPD, emphysema;
  - often in healthy young men, often a typical physical finding allowing correct dg.
- Oesophageal spasms:
  - the nature of the difficulties is almost identical to angina pectoris, the reaction to NTG is the same;
  - mostly linked to food intake, history of reflux disease of the oesophagus (pyrosis);
  - Pain over the cardia (from the accumulation of irritating drugs) with insufficient drinking, difficulties with reflux esophagitis.
- "Wall pains": - Vertebrogenic problems, pleuritic problems, neuralgia in herpes zoster, pain in the places of sternocostal joints, infraction of ribs, etc.
  - many causes, most often vertebrogenic and musculoskeletal;
  - binding to the movement of the chest or trunk;
  - often localized pain;
  - algic and vegetative problems in hyperventilation syndrome, in exhaustion syndrome.
- Psychogenic origin:
  - panic attack (pain, spasm, throat tightening, fear of death) with cardiac symptoms (hypertension, tachycardia, possibly dysrhythmia);
  - depression (heaviness, shortness of breath);
  - neurotic (typically inability to catch your breath).

## Examination procedure (in the field / first contact)

### Focusing on coronary, pulmonary and trauma causes

1. Distance of the ST segment on the EKG, frequency, rhythm disturbances + with an oximeter whether the Hb oxygen saturation is not below 90% + palpable pulse, measurable pressure, breathing audible bilaterally the same.
2. Will provide i.v. cannula, oxygen, depending on the condition, anxiolytics, analgesics, ev. nitrate, antiaggregant, etc.
3. For trauma - support of vital functions + transport to hospital.

### From the objective findings, they are diagnostic

1. Significant – hypotension, bradycardia, sweating and pallor, cyanosis, poor filling of the peripheral watercourse, changes in the ECG curve.
2. Little significant – shortness of breath without objective evidence of hypoxia, tachycardia, anxiety, the drama of the event.

**In summary: a report of chest pain is always a symptom requiring attention.**

**Anamnestic data are often crucial for the further fate of the patient (more than the results of auxiliary examinations).**

**Weigh the risk of reversal - the risk of deterioration.**

## Procedure

1. The most serious acute coronary events or contusions of the chest and lungs → preferably to a cardiology department with the possibility of intervention → + cardiomarkers, rest and oxygenation.
2. For dissection → for surgery of the heart and large vessels (helicopter), it is best to ensure crossed blood as well.
3. In case of psychomimetics overdose → do not induce vomiting (there is a risk of ventricular fibrillation or tachycardia).

## We have

- Anamnesis and physical examination, ECG (representative summation lead, 12-lead ECG), rarely expensive POCT (basic biochemical screening (Point-of-Care Testing), cardiomarkers with special disposable kits).
- In the hospital – cardiomarkers + troponin C (in case of suspected focal lesion of the myocardium), X-ray of the chest (in case of suspected pneumothorax, pneumomediastinum, in case of contusion of the myocardium, lungs, or myocardial failure), ECHOKg (in case of suspected cardiac tamponade, fluid pericardium), blood group and CT (for suspected aortic aneurysm dissection), lung scan (for suspected a. pulmonary embolism).
- → The first measures (for the current diagnosis) take into account the specific side of the cause of the condition - we grade them according to the risk according to the anamnesis and initial examinations:
  - i.v. entrance: infusion of FR 1/1, Ringer-lactate, analgesia rather i.v. (than i.m.) up to 50% of the single dose tramadol 2 x 50 mg i.v., fentanyl 2 x 50 mg i.v. (cave! bradycardia), event. morphine 2 x 5 mg i.v. (cave! asthma bronchiale) – opioids indicated for severe pain. Anxiolytics for most (diazepam 5 mg i.v., midazolam 2.5 mg i.v. (cave hypotension)), inhalation of O<sub>2</sub> when SpO<sub>2</sub> drops below 90%, shortness of breath, anemia, in pregnant women 3-5 l O<sub>2</sub>/min.
- → Depending on the possible revealed cause, we further add:
  - susp. AMI, unstable AP – nitrate (buccally), antiplatelet agent (e.g. sodium salicylas in a dose of 100-250 mg IV, if the patient has not yet taken antiplatelet agent) – ! the first attack of AP usually responds well to administered nitrate and anxiolytics - nevertheless, it is best to continue the examination for 24 hours in bed and then send for observation and long-term treatment;
  - susp. myocardial infarction - i.v. trimecain, lidocaine 50-100 mg bolus + give in 100 ml FR 100 mg of the same preparation (at a rate of approx. 2 hours);
  - susp. overdose of psychomimetics (amphetamine, cocaine): repeated diazepam at 5-10 mg i.v. until total relaxation approx. 5-10 min. With hyperkinetic hemodynamics, non-asthmatics can be given i.v. 0.5 mg metipranolol (possibly 10 mg p.o.);
  - susp. aortic aneurysm dissection: we control BP until the eventual operation – preferably isosorbide dinitrate 2 mg / 100 ml FR at a rate that keeps the systolic pressure between 100-110 mmHg, connect a slowly dripping infusion (colloid/crystalloid) in time;
  - chest trauma with shock: we deal with specific SHOCK;
  - susp. vertebrogenic problems: after orientation neurol. examination of possible recommend X-ray spinee, it is possible to give ibuprofen p.o., i.m., infusion of guaiaphenesin, spray 0.5% trimecaine/lidocaine into the painful zone;
  - susp. panic attack small dose of diazepam i.v. - vegetative symptoms with hyperventilation often subside.
- → If we expect a serious cause - we have resuscitation aids nearby (before defibrillation it is NECESSARY !!! to disconnect from oxygen!!! (oxygen goggles, half mask, AMBU bag with O<sub>2</sub> supply further from places attached electrodes) + peel off and remove and wipe the skin from the patch with glycerol trinitrate (nitroglycerin!) – RISK of burns, fire!).

## Further referral and referral of patients for resolution and care

- Cardio-coronary events at the coronary unit, according to other indications at the workplace of invasive cardiology;
- overdose (amphetamine, cocaine) – on ARO, metabolic ICU;
- chest trauma, esophageal rupture in the surgical-trauma department;
- dissecting aneurysm aorta to cardiac surgery departments;
- vertebrogenic problems, etc., after the symptoms have subsided, it is sufficient for an outpatient check-up, rehabilitation.

## Recommendations for patients

Heart problems, angina pectoris:

- Prevention of seizures by a calm lifestyle, dressing well for the cold, not showering with cold water, not smoking (if an addicted smoker is unable to comply, it is necessary to apply a spray dose of glycerol trinitrate or nitrate before lighting a cigarette, as always before greater exertion, climbing the stairs, before a stressful meeting (**top-up** principle)). Take antiaggregants regularly and always have a dosing spray with you (even if you use slow-release preparations).
- If the AP ceases to be stabilized, in the state after an MI, in the case of acute chest pain without a traumatic cause → call the RLP as soon as possible. If he is instructed by the cardiologist to take antiplatelet drugs regularly, he applies one extra dose outside the schedule in case of acute problems. A patient at risk (AP attacks do not go away or they occur repeatedly, especially after an AMI) should always carry spray with nitrate, glycerol trinitrate, for quick application of 1-2 doses in case of difficulties. Keep your body calm, don't eat. Drink at most in small sips every 5 to 10 minutes, just to moisten the dry mouth - possibly. rather wait for the doctor's advice.

Other events - all acute events associated with unusual pain inside the chest must be professionally investigated. Sudden and severe pain, unrelenting, associated with symptoms such as shortness of breath, sweating, etc., requires examination and urgent treatment!

- Although unpleasant pains in the back, between the shoulder blades, at the level of the lower ribs, when the diaphragm is attached during and after coughing, alleviated with success after tramadol, ibuprofen, are most likely not urgently serious. If it does not subside after the cough disappears, massaging the muscles along the spine → recommended for further diagnosis, albeit non-urgent.

## Links

## References

- Lecture *Differential diagnosis of chest pain* by the primary MUDr. Jiří Zika, adult emergency department, FN Motol, IPVZ medical first aid course
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- Overview of the 12th question - *Differential diagnosis of chest pain*, Michaela Janková, 3.LF
- HORÁK, Jan. *Differential diagnostic seminars in internal medicine* [lecture for subject Internal pre-state internship, specialization General medicine, 6th year, 1.LF Charles University]. Prague. 26/03/2012.