

Examination of the thorax

This article has been translated from WikiSkripta; ready for the **editor's review**.

The examination of the chest from the point of view of a pneumologist includes, abnormal chest shapes and the type of breathing. Furthermore, palpation examination, where we examine chest tremors and pleural friction. By percussion, where we compare the symmetry of the tapping (we find out pathological dullness or hypersonic tapping) and the topographic borders of the lungs. We also examine the chest by auscultation, where we evaluate atrial and tubular respiration - we focus mainly on the intensity of respiratory murmurs, the ratio of inspiration and expiration, and the presence of secondary respiratory murmurs.

Inspection

During the examination, we notice the shape, deformities, respiratory movements and soft parts. The shape of the chest changes during growth and adolescence. The normal chest is symmetrical on both sides.

Abnormal Chest Shape

- We recognize these shapes:
 - **Barrel** (emphysematous) - found with obstructive lung disease, in this condition the expiration is prolonged, difficult, the chest is permanently in inspiratory position. The sternum is arched out, and the spine may be kyphotic. (COPD may be present without a barrel chest)
 - **Pegion breast** - protruding breast bone. Is a common sign of Rickets.
 - **Funnel breast** - 2 forms: inverted lower sternum (funnel) or inverted whole sternum (shuttle). Usually without clinical significance.
 - **Kyphoscoliosis** - kyphosis and scoliosis of the thoracic spine. A marked backwards and lateral curvature of the spine. Common in childhood rickets. Can compromise ventilation and overload pulmonary circulation.
 - **Chest Deformities** - most often the consequences of lung or pleural disease (adhesions after inflammation, tuberculosis) due to fibrotic and adhesive changes this may cause chest diameters to shorten. Significant deformity can be observed in patients with congenital heart disease or defect in early childhood. The arched heart puts pressure on the chest wall, which creates a *mound*.

Respiratory Movements

For respiratory movements, we monitor the type of respiration, symmetry and respiratory rate (physiologically 16-20 breaths / min). During normal **eupnoea** respiration, both halves of the chest participate at the same time and equally. In men we observe a more abdominal type of breathing (mainly diaphragmatic movements), in women we observe costal type breathing (raising and lowering of the ribcage).

Respiratory rate may be affected by lung diseases, heart ailments, central nervous system disturbance, blood disorders (anemia) or toxic and metabolic processes.

Accelerated breathing is called **tachypnoea**, it may be an important sign of lung disease, but occurs when agitated, increased body temperature, hypoxia or increased exertion. Deep breathing is called **hyperpnea**. Slow breathing - **bradypnoea** - is found in patients with depression, in patients under the influence of certain drugs, or in patients with increased intracranial pressure. As **dyspnea** is shortness of breath, usually with the need to use auxiliary respiratory muscles. Temporary respiratory arrest is called **apnea**.

Cheyne-Stokes breathing

Breaths deeper, faster and noisier. After reaching the maximum amplitude and frequency the breathing decreases by the same amount and then enters the apneic phase. The entire cycle of increasing and decreasing amplitude and frequency repeats itself. We find it in heart failure, uremia, severe pneumonia, increased intracranial pressure (eg cerebral hemorrhage).

Sighing

The respiratory rhythm is interrupted by a long and deep inspiration and prolonged expiration. Seen in neurotic individuals.

Kussmaul's breathing (acidotic)

Tachypnoea and hyperpnea are present. It is most often encountered in diabetic coma (increased amount of ketone bodies) and metabolic acidosis. Iron

Orthopedics

Forced breathing position. It is most often found in patients with lung or heart disease. It is a sitting or semi-sitting position, the hands rest on the mat, the legs are lowered. In cardiac patients, venous return to the right atrium is reduced.

Biot's breathing

Irregular breaths with different amplitudes. Seen commonly in meningitis, encephalitis , and due to decrease sensitivity of respiratory center.

Prolonged expiratory breathing

Typical of patients with asthma , chronic bronchitis and obstructive pulmonary disease . Additional attention should be paid to tumors arising from soft tissues or cartilage and bone . We also pay attention to breast examinations , where cancer can develop (especially in women, but also in men!).

Palpation

During palpation, we monitor resistance, soreness, chest tremors, pleural friction (pleurisy).

Vocal (Tactile, Pectoral) Fremitus

There were no chest tremors. We examine with the help of both palms, which we place on symmetrical places on the chest, which we compare. We ask the patient to say out loud numbers, for example (1, 2, 3).

In order to obtain vocal fremitus-

- vocal cords must be functional
- trachea and bronchi must be unobstructed
- chest wall has to be elastic
- - We feel the amplification over the infiltrated tissue, such as pneumonia .
 - Weakening or even disappearance is usually during pleural effusion, pneumothorax , adhesions, lung emphysema (not enough normal lung tissue to transmit sound) and when the bronchus is blocked by a tumor or a foreign body with subsequent atelectasis .

Pleural friction

Occurs in pleuritis. If it is present, we can touch it in inspiration and expiration. The most palpable is pleural friction at the lower edge of the lungs and in the axillary surfaces. Broken rib can cause the same phenomenon.

Percussion

The stroke is full, clear , comparable on both sides of the chest in healthy people .

We perform the tapping at the back and front of the chest, preferably while sitting, or we can shoot a lying patient appropriately.

We recognize several types of taps:

Percussion by Comparison

Tapping at the same places on each side. Healthy tap - is clear, towards the bases is less clear.

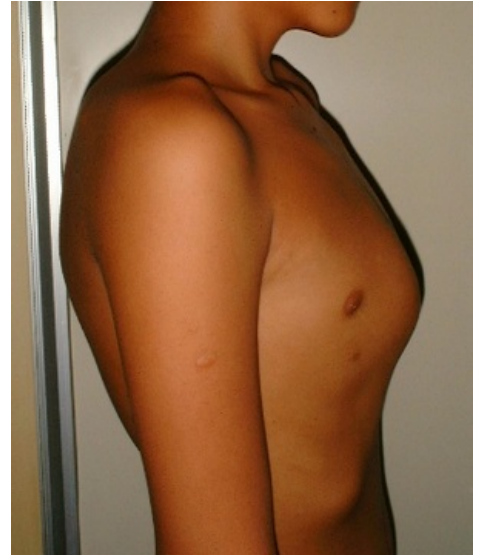
- Anterior comparison - we tap and compare the area of the superclavicular walls, the parasternal area, the medioclavicular area, the middle axillary area, usually from top to bottom.
- At the back - we tap paravertebrally from the seventh cervical vertebra (C7), then in the scapular line and in the middle axillary line, again downwards.

Topographic percussion

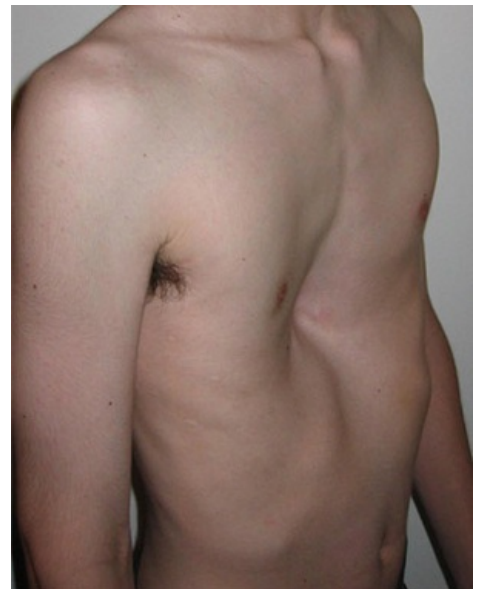
Defining a percussion change - for example, percussion dimming, we proceed perpendicular to the expected area of percussion dimming. Topographic determination of the *lower limits of the lungs* - in the front and on the sides we orient ourselves according to the ribs and intercostal spaces, at the back according to the vertebral spines.

Physiological limits of the lung

If we find an area of dullness during comparative percussion, we try to establish the borders of the dullness by moving vertically from the normal area towards the expected dullness.



pigeon breast



funnel breast

Assessment of the inferior borders of the lung

Anteriorly-

- in the parasternal line - 6th rib
- in the medioclavicular line - 6th interspace
- in the midaxillary line - 8th rib

Posteriorly-

- scapular line - 10th rib

paravertrebral line - spinous process of 10th thoracic vertebra - right side. -- -spinous process of 11th thoracic vertebra - left side

Diaphragm knock

The diaphragm is in the range of *4-8 cm*. Bilateral reduction of the diaphragm shift occurs in emphysema, ascites, increased diaphragm in pregnancy, and pleuropulmonary adhesions. Unilateral reduction of diaphragmatic displacement can be knocked out in the presence of unilateral thoracic pleural effusion, in pneumothorax, in pleuropulmonary adhesions, in atelectasis of the lower lobe of the lung, in paralysis of the phrenic nerve, etc.

Changes in Percussion Sounds Over The Lung

- normal - **sonorous** resonant sound may change due to pathological conditions
 - **Hypersonoric** - if the lungs become filled with air, in emphysema, in the presence of air - pneumothorax.
 - **Drum** - with a lot of air.
 - **Dull** - If lung tissue loses its airiness and becomes more dense; in the thickening of lung tissue - pneumonia, tumor, pulmonary infarction, atelectasis; in pleural thickening; in the presence of fluid in the pleural cavity - fluidothorax (percussion varies according to the amount of effusion).

Auscultation of the lungs

Under physiological circumstances, respiration above the lungs is ventricular, clean, with no side effects. Tubular breathing is only audible above the jugula, upper sternum and between the shoulder blades.

Methods used:

- Direct - placing the ear on the chest.
- Indirect - using a stethoscope.

By listening, we compare both sides, the patient breathes deeply with his mouth open, if not loud.

Basic types of breathing

Vascular breathing

As with exhalation through the mouth set to the letter *f*, sound is heard during inspiration due to air passing from narrow bronchioles to wider alveoli. We hear a murmur throughout the inspiration, but in the expiration nothing is heard and air passes from wider to narrower passage. Inspiration / expiration ratio = 3: 1.

Bronchial (Tubular) breathing

As with exhalation through the mouth set to the letter *ch*, physiological respiration for the larynx and trachea, the expiratory component is greater than the inspiratory. Had short inspiratory and long expiratory phase.

Physiologically can be heard where the large airways are close to the chest wall-

- over the larynx and trachea
- in the area of C7 vertebra
- at the Th4 vertebra to the right (right main bronchus is nearby)
- in the axillae

Changes in breathing sounds

Enhanced atrial respiration

With increased ventilation - eg Kussmaul's breathing. It is important in a unilateral finding in a healthy lung (hyperventilated), when the other lung is affected by, for example, pneumonia or in pneumothorax and inflammatory exudate of the other lung.

Intensified vesicular breathing

Increasing lung ventilation.

Pathologically, we find decreased atrial respiration in:

- Unilateral hyperventilation due to compensation for non functional part of other lung;
- massive pleural effusion
- pneumothorax;
- pulmonary (reduction of the alveoli) when ventilation is reduced.
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Weakened vascular breathing

It may be physiological in obesity. In calm breathing it may be hardly heard so we ask patient to breath deeply with mouth. Occurs in-

- Decreased breathing motion of the thorax due to pain or early pleurisy
- large pleuropulmonary adhesion
- fluid or air in pleural cavity - pneumothorax
- emphysema - loss of elasticity decreases ventilation
- obstructive atelectasis- reduced lung ventilation of affected area

Vascular breathing with prolonged expiration

Can be heard in bronchial asthma and in bronchiolitis. Long expiration due to bronchiolar restriction because of spasms, swelling and presence of secretions. Also heard in Emphysema due to loss of alveoli and reduced elasticity.

Cellar respiration with prolonged expiration

We cultivate in bronchial asthma, bronchitis and bronchioles (resistance in these ways) - spasm, swelling, secretion and emphysema (loss of elasticity).

Pathological tube (bronchial) respiration

Tubular respiration where not normally present. It is present when the alveolar areas are compromised, but the bronchial tree is unobstructed. So alveoli are not filled with air.

- Exclusion of alveolar function:
 - alveolar filling - Alveoli are filled with- inflammatory infiltrate in pneumonia, blood in pulmonary infarction, tumor tissue;
 - pressing the cellars from the outside - during effusion.
- Compressive breathing (bronchocicular) - audible above the upper limit of medium and large effusions; is caused by effusion pressure. It is a combination of atrial and tubular (audible mainly in the expiration) breathing. Alveoli are compressed from the outside eg. fluid in the pleural cavity.
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Abnormal breathing noises [[modify](#) | [edit source](#)]

Rales are not modifications of normal or abnormal breathing sounds but they are formed during air flow in the presence of a viscous or aqueous material in the bronchi, bronchioles or alveoli, or above the pleura under pathological circumstances, also during bronchial spasm.

Rale types-

Dry rales

Arises in the medium or large bronchi when it is filled with thick or semiliquid exudate that adheres to the bronchial wall. The fluid vibrates and produces the sound of whistling or cracking

Are frequently heard in acute and chronic bronchitis, and in bronchial asthma. - **Wheezing**. It is present in both exhalation and inhalation (but may not be present after coughing).

Wet rales

It sounds like bursting bubbles on top of a liquid. Liquid to semi-liquid content. division into small (medium-sized), medium and large bubbles. The sound is created by the bursting of a bubble on the surface of the fluid.

We can divide crackles according to their intensity:

- **accentuated** - clear, coming from close; infiltrated, well-conducting tissue - filled with fluid eg pneumonia, bronchiectasis, and bronchopneumonia.
- **unaccentuated** - dark, comes from afar; airy, poorly conductive tissue.

Inspiratory crepitations

Sounds like fine, clear, sharp crackling rales creating a continuous hum towards the end, like hair being rubbed between two fingers- this sound can only be heard during inspiration.

It arises:

- *physiologically* - in people breathing shallowly (eg after surgery), it disappears after a few deep breaths.
- *pathologically* - in pneumonia, in early and late stage. It can be associated with pulmonary infarction and infiltrative pulmonary tuberculosis, as well as with idiopathic pulmonary fibrosis (dry cracking).
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Stridor

Stridor is a whistling to wheezing , tdue to the narrowing of the large airways, there is an expiratory stridor or an inspiratory. (Eg. in phenomenon)

Pleural frictional murmur

Due to the friction between the inflamed and roughened pleural layers during respiration. The sound doesnt change with coughing but continuous deep breathing may dismiss the friction by smoothening the pleural surface dismisses the sound.

This sound phenomenon sounds like walking on frozen snow, it is best heard in the axillary area at the base of the lung and at the angle of the shoulder blade, it is characteristic of dry pleurisy, it disappears when exudation occurs.

Auscultation of voice sounds - Bronchophony

We examine bronchophony, or chest voice, by asking the patient to count (1, 2, 3), for example, or to repeat the expression "thirty-three." Above a healthy lung, we hear a chest voice very vaguely. The chest voice can be clearly heard over the areas of physiological tube breathing and the spoken words are unclear and indistinct. Above dense areas of the lungs, the syllables are clear and close to the ear due to better conductivity of airless tissue.

- increased bronchophony - over condensed and infiltrative lung tissue; in pneumonia and pulmonary infarction.
- decreased bronchophony - is audible during effusion, in pneumothorax, obstructive atelectasis and in thickening of the pleura.
- exaggerated (whispered)- always pathological , can be heard only over main bronchi and trachea. Indicates an infiltrative process in the lung.

examination methods

- X-ray tomography
- CT scan
- biopsy
- bronchoscopy
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Odkazy

Použitá literatura

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Source

- ws:Vyšetření hrudníku (pneumologie)