

Examination of the arteries

Arterial examination is part of the examination of the cardiovascular system. Together with the examination of the veins, it gives us comprehensive information about the condition of the patient's blood vessels. In the outpatient clinic, we can use the history and basic principles of physical examination (i.e. looking, feeling, listening) especially for a quick assessment; we can also subject the patient to so-called *functional tests*. For more detailed information, an examination using various **imaging methods** is then indicated.

Medical history

As part of the medical history, we look for factors related to atherosclerosis both in the patient and in the family.

We are particularly interested in:

- disorders of lipid metabolism (hypercholesterolaemia);
- diabetes mellitus;
- hypertension;
- stroke, heart attack, thrombosis, embolization, etc.);
- clotting disorders;
- **Smoking.**

Symptoms

Acute disability

In acute arterial occlusion by embolism (more common) or thrombus, there is usually a progression of symptoms within hours, especially in patients with poor quality collateral circulation. 50% of affected patients develop an **acute ischemic syndrome**, characterized by:

- sharp, severe pain;
- coldness;
- pallor, followed by marbling and cyanosis;
- impaired mobility, reflexes and sensation;
- absence of pulsations.

Similar symptoms are seen in patients with limb bypasses. Because these patients often have peripheral nerve involvement in addition to vascular involvement, **ischemic syndrome** may not be associated with severe pain.

 **Untreated ischemic syndrome progresses to gangrene.**

Chronic disability

The symptomatology of long term arterial impairment is varied and has an underlying **narrowing to closure of the isthmus**. The obstruction is subsequently followed by ischemic areas.

The typical symptom of lower limb artery involvement is **claudication pain** (*claudicatio intermittens*). The patient feels a pinching or cramping sensation when walking, which causes him to slow down or stop, resulting in pain relief within a few minutes. The manifestations are **most often in the calf**, which corresponds to a problem in the femoropopliteal region. With changes in the arteries of the tibia and leg, the localization of the problem shifts to the plantar surface of the leg, and symptoms in the thigh or buttocks are related to the pelvic arteries or aorta. An important piece of information is the **claudication interval** (the interval between stops), which **corresponds to the distance the patient walks without pain**. The interval is used as one of the stages of ischaemic lower limb disease (ICHDK). The shortening of the interval, i.e. the distance the patient walks, is related to the deterioration of the disease. Underlying this symptom is ischaemia. Other complaints may be subjective, such as a cold sensation of the limb and increased sensitivity to cold, but also objective, such as **white finger attacks** (*digiti mortui*), changes in skin quality (e.g. hyperpigmentation, scaling, ulceration, etc.) or oedema.

Upper limb involvement is less common and is characterised by **bleaching of the fingers** rather than pain. Pain is more commonly associated with isthmus syndromes (carpal tunnel syndrome). The manifestations in the hand correspond to damage to the arteries in the forearm. Narrowing or occlusion of the a. subclavia before the a. vertebralis may be a very serious situation. The work of the upper limb produces the so-called **thief syndrome** (*subclavian steal syndrome*), in which blood for the limb is supplied by reversal of blood flow in the arteria vertebralis. Some of the blood destined for the brain is lost through this route, leading to neurological symptoms such as vertigo (dizziness), fatigue, syncope. The set of these neurological symptoms can be summarized by the term **manifestations of vertebrobasilar insufficiency**. Due to the specific anatomical location of the structures in the region of the clavicle, first rib and neck muscles, the entire neurovascular bundle for the upper limb may be depressed. Patients have variable manifestations of vascular and nerve involvement, which often *worsen in association with certain movements*, e.g., hyperabduction.

 For more information see Upper thoracic aperture syndrome.

Physical examination

By sight

During a visual examination we evaluate:

- **skin quality**';
- **adnexa** (hair, glands and nails);
- **colour**';
- **skin surface**'.

When the arteries are affected, the skin gradually **atrophies**, the subcutaneous fat decreases and the typical relief disappears (smoothing of the grooves over the interphalangeal joints). The hair thins, the nails become deformed and grow slowly. Atrophy of the glands is manifested by dryness of the skin. If the patient is lying down, the **limb tends to be paler**, and reddens when the patient is off the bed due to reactive hyperemia. Chronic stagnation of blood in the capillaries may manifest as a reddish cyanotic colouration. If the spot is pressed with a finger, it turns pale. Manifestations on the plantar surface are related to a defect in the patency of the a. tibialis posterior, on the dorsum of the leg cyanosis indicates involvement of the a. tibialis anterior. The skin surface may be affected by abrasions, cracks or ulcerations. Interdigital mycosis is often found in patients. Typical ischemic gangrene most often starts at the fingertips and can be seen in patients with Diabetes mellitus.

Palpation

On palpation, we assess **temperature** and **pulse**.

In particular, we assess the **difference** in temperature within the extremities by placing the dorsal side of the fingers symmetrically on both extremities. There is a **palpable vortex** at the site of narrowing over the major arteries or over the arteriovenous shunt. The pulsations are assessed at the sites of the arteries involved, and it is useful to orientate oneself according to well-palpable anatomical formations. **Non-palpable or attenuated pulses** may be associated with arterial occlusion but also with variability in the course of the artery (a. dorsalis pedis is absent in 8-14% of individuals).

⚠ The disappearance of pulsation may be a sign of acute occlusion of the artery, which in extreme cases may lead to its loss.

HK palpation sites'

Arteries	! Instead of palpation	Note
a. carotis communis	three fingers medial to m. sternocleidomastoideus	CAVE: Irritation of the carotid sinus can lead to bradycardia to syncope. Never squeeze both carotids at the same time!
a. subclavia	medioclavicularly above the clavicle	
a. axillaris	medial axillary line	preferably at the sternum
a. brachialis	medial distal third of the arm between m. biceps brachii and m. brachialis	palpable up to the elbow socket
a. radialis	medial to the processus styloideus radii on the volar surface of the forearm	
a. ulnaris	compression at the wrist against the tendon of m. flexor carpi ulnaris	
a. digitales	on the sides of the fingers against the individual links	

Palpation sites on the DK'

Arteries	! Instead of palpation	Note
a. femoralis	medially from the middle of the lig. inguinale	
a. poplitea	with both hands embracing the knee, thumbs joined above the kneecap, other fingers below the knee socket	with the limb free or in semiflexion
a. tibialis posterior	behind the medial ankle	
a. dorsalis pedis	the instep of the leg between the 2nd and 3rd metatarsus	frequent variability of the course
a. fibularis	anterior to the lateral ankle	

Listening

Listening is used to assess the presence of noises, which are caused by a change in blood flow from laminar to turbulent. At a 60 % constriction of the isthmus, a vortex is audible, but at 80 % constriction the murmur disappears. Auscultation is used to evaluate a. carotis, a. femoralis superficialis, a. poplitea and the abdominal course of the aorta from the abdomen to the processus xiphoideus.

⚠ The murmur can arise as an artefact if the phonendoscope is pressed too hard and the artery is compressed during the examination.

Functional tests

Allen test (modified)

This test can be used to determine the **condition of the arteries distal to the wrist**. The test procedure is as follows:

1. Palpate and mark the sites for palpation of the a. radialis and a. ulnaris.
2. The patient then rhythmically clenches the hand in a fist several times and finally leaves it tightly clenched.
3. In the places we have marked, we squeeze both vessels to prevent blood flow.
4. We let the patient's fist relax, the fingers and palm should be pale. (If they are not, we probably have not sufficiently compressed the feeding arteries.)
5. With steady compression, the patient clamps the hand and we then release pressure on **one** of the arteries. The patency of the artery and the corresponding arch will be evident by reddening of the hand within a few seconds.
6. We repeat the test for the other artery.

Ratschow test

This is a positional test associated with exertion to examine the lower extremities. It can be divided into three phases.

In the first phase:

1. The patient lying on his/her back raises the outstretched legs to an angle of 45-60° relative to the mat.
2. Remain in the position for 30 seconds.
3. Evaluate the discolouration of the flap, if the limb is ischaemic, the flap fades.

In the second phase:

1. The patient, still in the position from the first phase, performs plantar and dorsal flexion as quickly as possible.
2. We measure the time elapsed before the onset of calf pain while monitoring the color of the limb.

In the third phase:

1. The patient sits up on the bed and the limb hangs over the edge.
2. Physiologically, within 5 seconds, the colour on the feet returns, within 10 seconds the veins on the feet fill, within 15 seconds the feet are uniformly red.

⚠ The test cannot be used in patients with ICHDK.

Differential Diagnosis

Differential diagnosis is based on neurological history and musculoskeletal disease.

References

External links

- Allen test: <https://www.youtube.com/watch?v=gdgomN6TsuE>
- Ratschow test: <https://www.youtube.com/watch?v=1mVFTV3ZM0Y>

References used

- BEETLE, Ladislav. *Propedeutics of Internal Medicine-New, completely revised and supplemented edition.* - edition. Grada Publishing a.s., 2007. vol. 243. ISBN 9788024713090.