3.17 Syncope

Syncope is a transient disturbance or loss of consciousness, caused by a sudden lowering of the cerebral blood flow as a result of the low arterial blood pressure. The syncope differs from shock in that in case of syncope there is no systemic disturbance in the micro circulation.

Brain utilizes mainly glucose and has no ability to store substrates of the metabolic energy. It has got a relatively stable rate of oxygen utilization, and its function depends only on adequate cerebral blood flow. The main factor, that determine the amount of the cerebral blood flow are: the systolic cardiac output, the perfusion pressure and the vascular resistance.

The perfusion pressure in the cerebral blood field depends on the difference between the mean arterial and the mean venous blood pressure.Upon changing the position from horizontal to vertical the pressure above the heart level decreases and the drop of the venous pressure is more pronouced than arterial one. The increase the pressure gradient will prevent the lowering of the cerebral blood flow.

The resistance in the cerebral blood field increases upon increasing the systolic cardiac output and inversely upon lowering the cardiac output it becomes less. This feedback regulation is more prominent in the cerebral circulation than in the systemic. It is one of the mechanisms, by which an adequate blood flow via the brain is maintained despite the common deviations of the systemic arterial blood pressure. The most important mechanism that regulates the cerebral blood flow is the intracerebral regulation of the vascular tonus. The local metabolic effects and mainly those of pCO_2 and pO_2 have a dominant role in the adaptation of the cerebral vessels to the changing haemodynamics in the systemic circulation. The local hypercapnea or hypoxia as well, that occur upon a lower blood flow via the brain will result in a vast cerebrovascular dilatation. Changes in the vegetative tonus, that are realized via the sympathetic and the parasympathetic nervous endings have a minor role in the maintenance of the cerebral blood pressure.

There are actually two basic mechanisms that end up by syncope: a disturbance at the level of heart itself (cardiac syncope) and an extracardial disturbance in the regulation of the circulation and venous return (vasomotor syncope).

3.17.1 Cardiac syncope

The basic of its occurrence is the sudden drop in the cardiac output. This occurs commonly during some serious disturbances of the cardiac rhythm. It might be also provoked by paroxysmal tachycardia, ventricular ectopics in runs, paroxysmal atrial fibrillation (in the period between the decrease of systolic cardiac output and the following reflex vasoconstriction). A typical cardiac syncope is the Stokes-Adams attacks, during which the ventricular contraction stops till the accessory ventricular rhythm takes over. As this pause last for few seconds there will be a transient loss of consciousness.

The cardiac syncope can occur even in some cases of haemodynamic disturbances of the heart, mainly when the body activity requires a sudden increase of the cardiac output, that can not be obtained by the injured heart. This might occur in cases of valve diseases (aortic stenosis, mitral stenosis) where the syncope occurs due to inability of the heart to obtain an increased output upon physical activity. In cases of congenital heart diseases with left-to-right shunt, syncope is mainly the result of the low oxygen saturation in the arterial blood.

The clinical picture of the cardiac syncope is characterized by a sudden loss of consciousness occurring without any prodromal vegetative symptoms. Its length doesn't exceed one minute and the gain of consciousness will return the patient to his normal condition. If the loss of consciousness lasts for longer that 3 min. there might occur an ischemic injury of the brain. Therefore if the cardiac syncope doesn't end spontaneously it is necessary to start up with resuscitation (a hit to the cardiac apex, cardiac massage, artificial breathing).

3.17.2 Vasomotor syncope

The primary cause of vasomotor syncope is the drop of blood pressure and an inadequate brain perfusion caused extracardially – most commonly we are dealing with a disturbance of the reflex adaptation of the organism to orthostasis with an inability to maintain the postural tonus.

3.17.2.1 The vasodepressoric syncope

The causative factor is a transient low activity of the sympathicus and a consequent dilatation of the peripheral vascular field. The typical representative is the vasovagal syncope. Occurs in some people upon fear, pain, and psycho emotional stress (venopunction, the sight of blood etc.). A predisposing factor is an upright posture and a residence in an oppressive environment. The cause is a reflex depression of the vasomotor center that causes dilatation of the peripheral vessels. The syncope is preceded by malaise, nausea, pallor, sweating, hyperventilation, confusion, blurred vision and tachycardia, that will change into bradycardia during the synchope. Putting the patient to the horizontal position the loss of consciousness will fade away and the patient returns to normal soon after.

Carotid sinus syndrome occurs in normal conditions upon massaging or exposing pressure on the carotid sinus that will lead to bradycardia and hypotension. In some cases and mainly in sick people with hypertension or atherosclerosis, loss of consciousness occurs upon a very slight stimulation of the carotid sinus (a narrow tight collar, pressure upon shaving, turning the head). Cardiac, vasomotor, and cerebral factors all share in the pathogenesis of its occurrence. That is why the sick carotid sinus syndrome might present in three variable types:

- the hypersensitive type, characterized by a prominent hypotension without changing the heart rate
- the cardioinhibitory type in which there is a prominent bradycardia without any change in the blood pressure
- a cerebral type where collapse occurs with no change in the heart rate or in the blood pressure, that indicate a disturbance in the higher regulatory centers

Syncope during miction occurs in men and it is mainly nocturnal after the intake of a large amount of fluids. It is most probably a case of some reflex mechanism (emptying the overfilled urinary bladder, Valsalva maneuver).

3.17.2.2 Syncope due to the primary failure of venous return

The primary failure of venous return can cause syncope upon venous stasis in the large dilated veins, during gravitational overload and during an increased intrathoracic pressure.

Orthostatic syncope is always characterized by an inadequate response of the sympathetic nervous system to the change of position from horizontal to vertical. The typical orthostatic syncope occur upon a sudden standing upright in those people with inadequate reactivity of the sympathetic nervous system, in patients treated with antihypertensive drugs, and also in cases of diseases of the central and peripheral nervous system (atherosclerosis of the CNS, diabetic neuropathy). Long standing may predispose to syncope in patients with tendency to cumulate blood in the lower limbs due to the insufficiency of the venous valves.

Gravitation syncope occurs with increasing the gravitation, and here it depends on the intensity of this increase, its direction (from head to feet), and upon previous experiences. In sensitive patients it might occur in elevators or upon a fast start. It occurs within 2–4 seconds after the beginning of gravitational overload and it gets soon to normal.

Syncope during cough: Syncope occurs in the case of heavy cough in patients with airway obstruction or pulmonary emphysema, where the increasing intrathoracic pressure will prevent the venous return. This case as well might occur in troublesome defecation – in old patients can a prolonged Valsalva maneuver be the cause of the transient lower venous return with the occurrence of syncope.

3.18 Shock states

The heart ensures blood flow via the vascular system. The speed of blood flow depends on the arterial pressure, that has to reach a certain value to obtain adequate perfusion via the large capillary network. The value of the blood pressure in the central area of the vessels is determined by two factors. **The**