

# Hypotension

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## Abstract

If the symptom complex of hypertension with hypertension has become the subject of great debate and has caused the appearance of extensive literature, the same cannot be said about hypotension occurring with low blood pressure. The state of hypotension is usually explained by hypotension, i.e. a decrease in vascular wall tension, but it should be noted that these concepts are not identical, since a decrease in blood pressure, in addition to a decrease in vascular tone, also depends on a decrease in cardiac pumping activity, frequency of contractions and the amount of circulating blood.

**Keywords:** hypotension; low blood pressure; vascular wall tension

## Introduction

Etiological aspects. If the symptom complex of hypertension with hypertension has become the subject of great debate and has caused the appearance of extensive literature, the same cannot be said about hypotension occurring with low blood pressure. The state of hypotension is usually explained by hypotension, i.e. a decrease in vascular wall tension, but it should be noted that these concepts are not identical, since a decrease in blood pressure, in addition to a decrease in vascular tone, also depends on a decrease in cardiac pumping activity, frequency of contractions and the amount of circulating blood. The first description of hypotension phenomena was found in 1903 in Ferranini (Reggatz), then in connection with bradycardia it was noted in 1910 by Hertz, but this symptom complex was reliably established in 1923 by F. Muller. It is, of course, impossible to sharply distinguish the estimated blood pressure from the normal one, due to the large fluctuations of the latter, as well as the deviations of the pressure height in one direction or another from the average figures without any pathological objective or subjective phenomena. Just as there are healthy people who usually have low gastric secretion, or the height of tendon reflexes, or the degree of muscle tension, so deviations in blood pressure height in one direction or another from the usual degrees do not mean pathology. Above, we have given the average figures for the height of blood pressure. They depend on age, gender, constitution, external social factors, lifestyle, profession, geographical conditions, climate, season, etc. When moving to a hot climate, the pressure height is set at lower numbers. Often, workers in hot workshops also experience a decrease in pressure compared to those working in cold workshops. If we assume some conditional schematization in this regard, it is usually considered that the systolic pressure of 110 mm in men is already lowered. The lowest pressure is observed during traumatic shock [1].

Hypotension and hypostigmia. Blood pressure can decrease due to a decrease in both maximum and minimum pressure, i.e. with a decrease in average pressure. Aldo Luisada calls such cases hypotension. At the same time, both types of pressure converge slightly with the transition from normal to lower values [2].

In other cases, the amplitude decreases, and the maximum pressure almost does not decrease, while the minimum pressure may even increase, or the maximum pressure decreases slightly, while the minimum remains unchanged, or increases again. Aldo Luisada calls such conditions "hypostigmia." Usually, both types of pressure will change in parallel, but in some cases, it is possible to meet with hypostigmia and without hypotension. Thus, a decrease in the pumping force of the heart and the preservation or even increase of peripheral obstacles causes a similar condition.; this is more often observed with weak contractions of the heart, when blood does not have time to pass through the arterial system, in which congestion forms. A similar condition develops with insufficient vascular function and weakening of the central heart. In other cases, this is observed with a compensatory increase in arterial tone, for example, in peripheral vessels during the collapse of the vessels of internal organs, which causes the body to delay the height of the falling pressure at a relatively low level. In practice, hypotension and hypostigmia can be combined with a general depression of the entire hemodynamics. In this case, not only does the heart eject blood into the aorta with weak force, but all the factors that normally contribute to the movement of blood through the vascular system, its distribution in organs and tissues, normal tissue metabolism and the return of blood through the veins to the heart are insufficient. A common stasis is obtained. Similar phenomena can be observed in the terminal stages, with infections, hemorrhages, vascular collapse and shock, with lesions of the heart and blood vessels, etc [3,4].

The etiological aspects of low blood pressure are different, and the picture of the disease is not as monotonous as in hypertension, when in general there is almost always the development of circulatory insufficiency, general sclerosis and nephrosclerosis.

The scheme of hypotension. Patients suffering from hypotension can be grouped into one general group. Often this condition depends on any somatic diseases: gastrointestinal diseases, stomach ulcers, pulmonary tuberculosis, obvious damage to the internal secretory organs, blood loss or other forms of anemia. Martinis and Feasts lead to a total of six factors of hypotension: 1) weakness of the heart, 2) increased obstruction of blood flow at the mouth

of the aorta, 3) relaxation of the tone of medium and small arteries, 4) large insufficiency of small vessels, 5) decrease in the amount of blood, 6) decrease in blood viscosity [5]

Hypotension. In some cases, a decrease in blood pressure associated with relaxation of vascular tone appears to be primary, and such hypotension, similar to hypertension, is noted as constitutional — essential. This condition has received various names: hyposfiction (Martinet), a special symptomatic triad (Vincent), permanent idiotic arterial hypotension (Lian and Blondel), hypotension (Garen, Strasser and Lowenstein), ordinary hypotension (Himnes), low blood pressure with hypotension (Kish). The sheer number of these names shows that the authors failed to identify the phenomena. Ferranini initially called this disease chronic arterial hypotension, and then constitutional angiohypotension**Error! Reference source not found.** Kilin, like Martini, looks at this symptom complex as pressure dysregulation, and believes that there is a genetic link between essential hypotension and hypertension in this regard: hypotension may occur at a young age, followed by hypertension in older people. Both patients are vegetatively stigmatized. In general, all classification schemes for hypotension come down to one thing: hypotension can be the result of a decrease in heart strength, a decrease in blood quantity, a decrease in vascular tone (hypotension), and the latter is the result of either external factors (profession, infections or intoxications), or endogenous, constitutional moments — essential hypotension (Munch) [7]

Lesions of the heart and blood vessels. Usually, a change in heart activity is not isolated, but it is also accompanied by damage to blood vessels by the same agent that weakens the heart, for example, a toxic and infectious onset or the effect of working in hot workshops, which is understandable, since the heart and blood vessels represent a common system. However, special detailed studies in other cases make it possible to determine the predominant lesion of a particular part of the circulatory system. So, the school of M. V. Yanovsky (S. P. Zavodskoy) showed that with croup pneumonia, the heart mainly suffers, while with other infections, for example, typhus (S. P. Zavodskoy) or intestinal infections, for example, dysentery (Romberg school, V. A. Waldman, S. P. Zavodskoy), circulatory disorders occur mainly due to a decrease in vascular tone of internal organs [8]. Typhoid fever, diphtheria, and scarlet fever damage both the heart and blood vessels. During the formation of a cardiac infarction with the development of shock, hypotension is observed due to both cardiac weakness and vascular collapse. In the subsequent period after a heart attack, hypotension mainly depends on heart failure. A decrease in blood pressure due to heart weakness is observed in pernicious anemia, in the presence of dilation of the left ventricle and fatty infiltration of the heart. We often observe a weakening of the heart against the background of rheumatic or sclerotic damage to it. The weakening of the heart muscle in hypertension causes a decrease in previously high blood pressure to normal levels, which sometimes leads to an erroneous assessment of the circulatory state [9]

So, heart weakness is usually accompanied by a decrease in the amount of blood discharged into the arterial sac, which leads to a decrease in blood pressure. The presence of bradycardia favors this, and cardiac regulation by increasing heart rate compensates for a decrease in systolic pressure. However, heart weakness does not always lead to a decrease in blood pressure. Quite often, for example, with heart defects, with an obvious insufficient heart muscle, blood pressure is maintained at an elevated level [10].

Blood loss. With blood loss, the pressure level is quickly restored, since the body has enough adaptations to maintain its constancy. Therefore, blood extraction for therapeutic purposes has only a negligible and short-term effect and is not shown at all for a steady decrease in pressure altitude. The pressure height is probably not determined by the amount of circulating blood, and we know that blood transfusion often leads to a decrease in pressure (for example, from 165 to 120 mm) due to reasons that have nothing to do with blood loss [11].

Blood viscosity. One might think that a decrease in blood viscosity, lowering peripheral obstructions, causes hypotension. Usually, however, this does not happen, probably because the blood in such cases, flowing rapidly

through the vascular bed, returns to the heart more freely, and thus the minute volume increases. The latter circumstance contributes to a higher blood pressure level.

Reflex influences. By analogy and in contrast to hypertension, some hypotonic states can be associated with hypersensitivity and excitability of reflex zones. These are the carotid sinus, which physiologically has a depressive attitude, the nasopharyngeal region, etc [12].

Toxic effects. A decrease in vascular tone, due to toxic and infectious beginnings, is possible with both central and peripheral exposure to them. Thus, protein breakdown products (for example, albumoses in croup pneumonia) act hypotonically, even when the cerebral circulation is turned off, from the periphery. Acute hypotension, similar to infectious collapses, develops with traumatic and anaphylactic shock [13]. A factor that acts vasodilatingly mainly in the vascular system innervated by the celiac nerves, while products of protein origin are formed in tissues, for example, when they are crushed in accidents or in anaphylactic states, as a result of interstitial protein changes. The same state of protein poisoning can be considered shock with extensive burns, as well as peritonitis, which we have already mentioned above. Blood retention in the capillary-venous system causes insufficient blood flow to the heart, leading to insufficient filling of the arterial system. Here we also encounter a compensatory involvement of heartbeats, which to a certain extent counterbalances the effect of a reduced amount of blood returning to the heart. The described shock is apparently quite similar to the experimental one obtained with the introduction of histamine (Dale and Laidlaw)**Error! Reference source not found.** Gennerson, who observed the experimental shock, indicates the existence of an insufficiency of the venopressor mechanism, which reduces blood flow to the right heart. As a result, the heart fills up little, its strength decreases, and the arteries are not dilated, but even contracted, which regulates the drop in blood pressure to some extent. Under these pathological conditions, substances with histamine-like effects can form in various tissues, causing the phenomena of capillary toxicosis. The lowest blood pressure figures for infections are found in typhus (60-80 mm).

Constitutional hypotension. In other cases, which are always chronic, lowering blood pressure is either the only sign that distinguishes such patients from the majority of healthy ones, or the main, dominant symptom. The pressure is about 100-90 mm or lower. The complaints of such patients usually come down to depression, hypochondria, lack of initiative, general weakness, fatigue and chilliness. Drowsiness is noted, but sleep does not refresh patients; appetite is decreased, dyspeptic symptoms, a feeling of pressure and fullness, and sometimes nocturnal stomach pains are present. Constipation is often followed by diarrhea; mucosal colitis is observed. Headaches, dizziness, tinnitus, and visual disturbances are noted. Patients move slowly and suffer from shortness of breath. In almost all cases, the constitution is asthenic, patients are pale, their limbs are cyanotic, and their muscles are sluggish. The integuments, especially of the legs, are sometimes pasty. In some cases, Lobry and Mayer acrocyanosis, as well as Dalla Palma, describe changes in the capillaries, namely, the expansion of their venous section, which indicates a peripheral factor that may contribute to a decrease in pressure height [15]. Edema is also indicated by peripheral effects in the absence of common (central) causes contributing to their formation. The heart of patients often has the appearance of a drip; the aorta is narrow. Bradycardia is noted, sometimes extrasystole, hypersecretion and increased gastric acidity are signs of vagotonia. Lymphocytosis is detected in the blood. Phosphaturia is often observed. The pathogenesis of this last symptom complex is not yet completely clear. There is a constitutional anomaly — general asthenia, myasthenia gravis, more common in women. Phosphaturia and increased acidity indicate a violation of the acid-base balance. Such individuals are "vegetatively stigmatized" (Bergman). Their autonomic disorders usually turn out to be congenital, but they can also be acquired, for example, under the influence of neuropsychiatric injuries, infections, syphilis and other external causes.

Vegetative and endocrine disorders. This condition may be due to malnutrition. Thus, Kurshm notes that in hungry years, with general malnutrition, when plant proteins predominate more often in food, as opposed to high-grade animal proteins that are poor in aromatic amino acids

and tryptophan, hypotension should be attributed to insufficient formation of hormones of the adrenal glands, thyroid gland and pituitary gland, which undergo atrophy. More often, there is a lack of function of the posterior lobe of the pituitary gland, but there is evidence indicating hypofunction of the anterior lobe. Vitamin starvation also plays a role. Such patients, like all vegetatively stigmatized patients, have instability and lability in the entire autonomic system (Kraus and Zondek): in the autonomic nervous system, in the endocrine system, and in ion balance. From this point of view, the possible transitions between hypotension and hypertension are understandable, as indicated above by Keelin and Martini, which, however, is far from necessary. The constitutional type of these categories is usually different; Obviously, vegetative lability is found in unequal relationships. Usually, hypotonics, as indicated, are typical asthenics with a hypoplastic cardio-aortic system [16].

Circulatory disorders. Usually, hypotensive forms are characterized by a slow course, against which there are exacerbations of hypotension, most often following tension, emotions, or infectious diseases and intoxications. Such an examination is accompanied by general adynamia and the appearance of the above-mentioned general symptoms. There is no typical course of hypertension, but some of the forms have a progressive character, which is difficult to combat, and lead to a general lack of circulation. It is possible that the peripheral causes of hypotension are joined by some degree of cardiac insufficiency, more often mild. It is difficult to assume, however, that serious forms of damage to the heart muscle can be the result of hypotension alone, as Dumas and Lian think. The latter view is based on the assumption of the possibility of developing so-called "idiopathic" or primary cardiac hypertrophy following a decrease in blood pressure. The increased work of the heart is supposed to compensate for the decrease in blood pressure.

Similar cases of "primary" hypertrophy of Pavio, Boucher and Bonafoe are called "primary big heart", and Lobry and Valse - myocardia. Bard talks about diastolic secondary hypertrophy. Rather, one has to think that in such cases hypotension is secondary or that both cardiac and vascular phenomena depend on vegetative-endocrine influences associated with a number of different factors. It is difficult to think of cardiac hypertrophy as a consequence of hypotension. In addition, the assumption that cardiac hypertrophy depends solely on the degree of blood pressure elevation ignores the undoubted influence of a number of factors that may underlie both hypotension or hypertension, and changes in the heart muscle. The very recognition of the condition of "myocardia" indicates only that in some cases it is not possible to understand the hypertrophy of the heart. In the physiological part, we pointed out that the work of the heart depends on the blood flow to it, and the outflow is equal to the inflow. In the described conditions of "primary hypertrophy" there is no factor similar to an increase in peripheral pressure, which would cause increased cardiac activity while maintaining this equality, arterial hypotension itself is not a factor that increases venous flow to the heart, and therefore its work [17].

With hypotension and asthenia, muscle tone is usually impaired. Due to the loss of such, the effects of gravity begin to prevail in the distribution of blood throughout the body, which can lead to insufficient blood supply to the brain in an upright position, manifested by pallor, dizziness, darkening of the eyes, fainting, etc. Dragonier, Matveev and Petrov have shown that with muscular hypotension in an upright position, blood pressure drops significantly (for example, from 115/90 to 45 maximum with an indefinable minimum; when moving to a supine position, 125/90 again). In an upright position, in such cases, the value of the minute volume of the heart is greatly reduced. Due to the variety of etiological aspects, the patient's further condition with hypotension also cannot be assessed using a template. The prognosis is based on the clinical picture. In general, while maintaining the pressure amplitude, the prognosis is better than when it decreases, as well as in the absence of pronounced tachycardia after small efforts. A slow steady decrease in blood pressure (mean pressure) is always important, indicating either latent bleeding or a progressive weakening of cardiac activity. This pressure drop is also possible with all progressive cachexias.: cancer, tuberculosis, Addison's disease, etc [18]. A rapid drop in blood pressure is usually the result of impaired vascular circulation, circulatory disorders, such as one or

another type of shock. It can be assumed that a drop in diastolic pressure to 45 mm already determines unfavorable conditions for circulation, although cases with a good outcome at a significantly lower pressure have been described in the literature: for example, Rolleston notes that in one case the pressure remained for several weeks at a height of 70-35 mm; In Cheney's case, the pressure was 44-18 mm. Therefore, of course, it is not necessary to establish any standard figures: patients react differently to phenomena associated with low blood pressure.

Prevention and treatment. Treatment of hypotensive conditions, due to the variety of their causes, is heterogeneous. Of course, the question is not to increase blood pressure, but to eliminate disorders in the body, most of all in the circulatory system associated with hypotension. In cases of constitutional hypotension caused by general asthenia, it is necessary to strengthen the body by conventional means (regimen, light hydrotherapy, air baths, strengthening diet). When indications of endocrine disorders are indicated, appropriate medications are used, especially thyroid medications. Adrenal insufficiency cannot be systematically treated with epinephrine or adrenaline, since these drugs have only a short-term effect, therefore it is prescribed only in acute cases of vascular collapse.

In these cases, cortisol or deoxycorticosterone are an indispensable **remedy**! **Reference source not found.**

In case of heart weakness, the use of cardiac drugs is indicated, in case of vascular hypotension, vascular drugs. However, usually circulatory weakness is not isolated, but is combined with a similar condition in other parts of the circulatory system. On the other hand, the pharmacological agents themselves do not have an isolated area of application, but they act on the entire circulatory system. Thus, cardiac products of the digitalis group, while enhancing heart contractions, at the same time have a vasoconstrictive effect in therapeutic doses, thus acting on vascular hypotension. On the other hand, the drugs are predominantly vasomotor — caffeine and camphor, whose main effect on the vascular system is carried out through the vasomotor center, are at the same time cardiac stimulants (caffeine is undoubtedly, camphor is probably). In view of this, in practice, the difference in the fundamental requirements for the use of one or another group of tools is largely smoothed out, especially emphasized on theoretical grounds. Nevertheless, when prescribing treatment, it is necessary, analyzing the case, to try to find out what causes hypotension — damage to the heart or blood vessels, in order to apply the chosen remedy more successfully in this case. Aldo Luisada, based on the work of his and Tremonti, who showed in isolated vessels the predominant effect of certain drugs, such as strychnine, on vascular tone, and other drugs, such as amyl nitrite, on increased vascular contractions that promote blood movement (peripheral heart), recommends in cases of predominant hypotension a combination of conventional treatment with strychnine treatment, and in cases of hypospphygia, where, in his opinion, a decrease in maximum pressure associated with impaired vascular peristalsis can be assumed., a combination of cardiovascular drugs with amyl nitrite.

In cases of acute collapses or vascular shocks, such as collapse in infectious diseases, traumatic or surgical shock, when circulatory disorders depend mainly on vasodilation of internal organs, while cardiac "weakness" is secondary, the use of adrenaline and pituitrin in the form of subcutaneous injections is of particular importance, in addition to the caffeine and phosphorus group. These states are discussed in the next chapter **Reference source not found.** Acute circulatory disorders. Against the background of chronic circulatory insufficiency, the so-called acute cardiac weakness, or collapse, sometimes occurs, which can even lead to death. Similar patterns of cardiac weakness are observed in infectious diseases, when a fatal outcome can also be expected, as well as in a number of conditions characterized as shock and classified as anaphylactic events, for example, shock during surgery, especially in the abdominal cavity, trauma, serum sickness, etc., as well as histamine shock.

Collapse. In some cases of collapse, indeed, the main cause is a rapidly developing weakening of the heart, in which death occurs very quickly with the transition of the ventricles to flicker. In other cases, for the most part, during the collapse of infectious diseases, there is primarily a vascular lesion,

vascular collapse is a sharp expansion of them in the area innervated by the celiac nerves. A huge amount of blood stagnates in the vessels of the abdominal cavity, as shown mainly by the Romberg school, for example, in pneumococcal intoxication. In the future, the heart is "secondarily" affected and weakens due to a lack of nutrition associated with a decrease in blood flow to it, as well as due to the influence of toxins. In cases where death occurs quickly, changes in the heart may not be pronounced (perhaps they are imperceptible or undetectable by our methods), and the patient does not die from acute cardiac weakness, but from vascular collapse. At the beginning of infectious effects, vascular tone decreases, the minimum pressure decreases, while the maximum pressure is maintained at a sufficient height due to increased heart function, and the pressure amplitude increases. The collapse occurs, as Romberg showed, due to damage to the vascular center, as well as the peripheral nerve ganglia. Pal (vascular death) is also expressed in the same way. One should also think about the toxic damage to the muscle vascular fiber itself. In some cases, damage to the adrenal glands may also affect muscle tone [typhus — Tixier, Danielopolu and Simici].

In order to change the vasomotor theory of acute circulatory attenuation of the Romberg school, a student of Wenckebach Kucher-Eichbergen has recently been putting forward an adrenal theory. In infectious diseases, in cases of death accompanied by "heart weakness", as opposed to cases where this was not observed, he determined in the cortical and medullary layers of the adrenal glands: 1) reduced amount of loosely bound, coarse-dispersed lipoid and cholesterol (increased in hypertension); 2) an increased amount of finely dispersed, colloidically bound to protoplasm lipoid, especially phosphatides, as well as an increased total phosphorus content (decreased with hypertension).

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