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# Therapeutic treatment in the elderly with heart failure

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## Abstract

Heart failure (HF) is a clinical syndrome that is the last common stage in many cardiovascular diseases. The main causes leading to the development of HF are, among others, primary impairment of myocardial contractility, volume and / or ventricular congestion, and obstruction of the diastolic duct due to pericardial diseases. The methods of detecting heart failure include: an accurate interview with the patient, laboratory tests and echocardiography. Treatment options include non-pharmacological, pharmacological and surgical treatment. A very important aspect of cure is also physical activity and appropriate nutritional treatment.

**Key words:** heart failure, therapeutic treatment, elderly patients

## Introduction

Heart failure (HF) is a clinical condition during which metabolic disorders and functions of many organs occur due to abnormalities in the structure and function of the heart [1]. The etiological factors of HF include: ischemic heart disease, hypertension, various heart defects, prolonged arrhythmia, pericardial disease, but also aging [2]. HF is one of the most frequent causes of hospitalization of elderly people with the highest risk of death [3]. The phenomenon of the dual aging process that we can observe in the 21st century describes the fact that the population lives longer and at the same time increases the number of older people over the age of 85. What causes the increasing involvement of all areas of medicine in the treatment and care of geriatric patients. Treatment of HF in older people is in many cases very difficult due to the presence of comorbidities. The Framingham Heart Study study showed that the prevalence of HF increases markedly with age. In the group of 50-year-olds it is 1%, while among 80-year-olds it is 10% [4]. In all age groups, women more often suffer from heart failure [5].

## Heart failure - definition, epidemiology, etiology

Heart failure (HF) is a clinical syndrome that is the final common stage of many cardiovascular diseases. According to Collucia and Braunwald, it is a pathological condition in which the heart cannot pump blood in such quantity that it would meet the metabolic demand of tissues, or it is able to do so with increased filling pressure. The most common symptoms are dyspnoea at rest or exercise, night cough, night paroxysmal dyspnoea, edema of the distal parts of the lower limbs, reduction of tolerance to physical exertion, fatigability. Physical examination may include widened jugular veins, crepitations or rales over the lungs, peripheral edema - around the cross, crotch. The existence of morphological and functional abnormalities in the resting heart such as the third heart tone, enlargement of the heart, occurring murmur in the heart, ECG abnormalities or elevated natriuretic peptide concentration are assumed to be objective data indicative of HF [6,7].

The main causes leading to the development of HF include, among others, loss of muscle mass and primary impairment of myocardial contractility, volumetric and/or ventricular congestion, and obstruction of diastole due to pericardial diseases. Rarely, the reason for the presence of HF are arrhythmias, anemia, kidney failure, thyroid disease, or the use of cardiodepressive drugs. However, they can lead to exacerbation of already existing heart failure. Based on data from the Framingham study, it can be concluded that hypertension is the most common cause of HF. It was considered that it preceded the development of HF in 75% of cases, and coronary heart disease was the cause of HF in about 50% of patients. The hypertrophy of the left ventricle and diabetes mellitus correlated well with the development of HF. In 90% of HF cases in the Framingham population, the development was related to hypertension and ischemic heart disease, which occurred jointly or alone [6,8].

In the classification of heart failure the most important is its division into systolic and diastolic, taking into account the degree of left ventricular dysfunction. A characteristic feature of systolic heart failure is reduced left ventricle ejection fraction (EF). In systolic failure, the left ventricle is enlarged and its walls are thinner, which causes a weakening of the contraction force, and as a result, the ejection fraction is unable to press the appropriate amount of blood that is necessary to maintain the correct cardiac output. In diastolic heart failure, the left ventricle is normal or slightly lowered, but due to the hypertrophy and / or stiffening of the left ventricular walls, the end-diastolic dimension of the ejection fraction is reduced. Which results in a reduction, stiffening of the left ventricle, making it unable to fulfill the required volume to ensure a correct cardiac output [6,9].

In order to assess the severity of heart failure in medical practice, the HF classification according to the New York Heart Association (NYHA) - the New York Heart Association is most often used. This division is based on the assessment of the severity of symptoms and exercise capacity. According to NYHA, heart failure is grouped into four classes. In patients in class I, normal physical activity does not contribute to greater fatigue, there is no dyspnoea or palpitation. Class II - the disease slightly limits physical activity, does not cause health problems at rest, but after the usual physical effort, patients feel tiredness, palpitations, shortness of breath or coronary pain. Class III - there is a significant reduction in physical activity without rest discomfort, but less than normal activity causes symptoms. Class IV - the disease prevents any effort, any kind of physical activity causes problems even

at rest. Class IV - the disease prevents any effort, any kind of physical activity causes problems even at rest [8,9].

In the Framingham Heart Study, the incidence of HF increases with age and in the group of 50-year-olds is 1%, while among 80-year-olds it is already 10%. Women are more likely to get ill in all age groups. The increasing stiffness of blood vessels and walls of the left ventricle, endothelial dysfunction, impaired relaxation, as well as increased activity of inflammatory processes leading to myocardium fibrosis favor the development of HF. Reflex control disorders and cardiac arrhythmias are more common (eg atrial fibrillation). Therefore, in people over 65, HF is not only one of the most common, but also the most expensive reasons for hospitalization, with a high risk of death. Although HF often occurs in the elderly, there is no binding data on the proper diagnosis and effective treatment of this group of patients. Patients over 70 years of age are less frequently included in clinical trials, and their treatment is hampered by co-morbidities [8,9,5].

Heart failure is a disease entity with very poor prognosis. HF prognosis is primarily determined by the clinical condition of the patient. Indicators of 5-year survival in HF are worse than survival rates of people with cancer (except for lung cancer), because in advanced HF (NYHA class IV) about 50% of patients die within one year. This is justified by the results of both European and American research. The prognosis in HF is closely related to the degree of advancement determined according to the NYHA functional classification. Depending on the severity of the disease, the annual survival rate of patients is 40-80%. The annual mortality rate, which depends on the symptoms of HF, according to NYHA, is as follows:

- class I (patients without symptoms) - mortality up to 10%;
- class II (patients with minor symptoms during moderate physical exertion) - mortality 10-20%;
- class III (patients with HF symptoms during a small effort) - mortality 20-40%
- class IV (patients with rest dyspnoea) - mortality 40-60% [8,10].

The literature reports that over half of patients with full-blown HF die within 4 years of follow-up, while 80% of men and 66% of women die after 10 years of illness [6,7].

**Pharmacological treatment**

Pharmacological treatment of heart failure aims to improve the clinical condition, exercise capacity, quality of life, prevention of hospitalization, as well as reducing mortality

[11]. It was found that the improvement of the above factors is an important indicator of the effectiveness of therapy. Pharmacological treatment uses antagonists of neurohormonal systems, e.g. ACEI (angiotensin converting-enzyme inhibitors), MRA (mineralocorticoid / aldosterone receptor antagonists) and LBA (β-blockers), so they allow survival in patients with HFrEF heart failure with reduced ejection fraction) and are recommended for everyone who has no contraindications [12].

ACEIs should be increased gradually until adequate inhibition of the renin-angitensin-aldosterone system (RAAS) is achieved. These drugs should also be used in people with asymptomatic LV systolic dysfunction. LBA therapy is used in stable patients. Initially, very low doses are administered, gradually increasing them to the maximum tolerated by the body. This type of treatment should be implemented very carefully. These drugs should be used in people who have had MI and asymptomatic LV systolic dysfunction. The aim is to reduce the risk of death and improve functioning in everyday life. Administration of MRA (spironolactone and eplerenone) aims to block aldosterone-binding receptors and other receptors that bind hormones, e.g. corticosteroids, androgens. When using this type of pharmacotherapy, special care should be taken in people with impaired renal function [12,13].

In ambulatory patients who, despite full therapy, have failed to achieve satisfactory treatment results, as a replacement for ACEI, a combination of sacubitril and valsartan is used. In this type of treatment, inhibition of neprilesin reduces the distribution of NP, bradykinin and peptides, which increases the relaxation of the myocardium, inhibits remodeling, as well as the secretion of renin and aldosterone [14].

In order to reduce the symptoms of stasis, diuretics are used, e.g. furosemide, bumetanide, torasemide, bendroflumetiazide, hydrochlorothiazide, metolazone, indapamide, spironolactone / eplerenone, amiloride, triamteren [13]. These drugs are selected individually, and their choice depends on the clinical condition of the patient. In patients with sinus rhythm the invabadine, which is an inhibitor of the If channel, may also be used.

It reduces HR by inhibiting the If channels in the sinus node. Digoxin should also be used to reduce symptoms, and the use of this medicine should be particularly controlled in women, as well as in elderly patients and people with impaired renal function. Digoxin can be used as well as other digitalis and n-3 polyunsaturated fatty acids [12,15].

## Surgery

There are many surgical methods for treating heart failure in the elderly. In the last decades, a significant increase in surgical treatment of heart failure has been observed.This development is conditioned by the lack of satisfactory results in the pharmacological treatment of patients with advanced disease.

Orthotopic heart transplantation is a common curative treatment with a very good long-term effect [16]. The main cause of heart failure with impaired left ventricular function is coronary artery disease. This is about 30 % of patients considered for heart transplantation. [17]. Unfortunately, the immunosuppressive treatment that is associated with heart transplantation does not remain indifferent to the body. The effect of using drugs can be tumor incidence and chronic vascular transplant disease.

In treating heart failure, stem cells are also used to stimulate the development of cardiomyocytes in damaged myocardium [18]. Bone marrow stem cells are used to treat heart failure. They are to replace the damaged tissue with a new healthy tissue.

In the case of ischemic heart failure, ais applied, which may improve the patient's clinical condition and reduce the severity of the disease [19].

In surgical treatment of heart failure, cardiac resynchronization therapy (CRT) is used, especially in the case of advanced systolic HF. Due to abnormal intraventricular conduction, there is a lack of synchronous ventricular contraction. This situation occurs in about 30% of patients [20]. This clinical situation may lead to further impairment of the cardiac systolic function and its minute capacity. Current indications for CRT are NYHA functional class III to IV, LV ejection fraction <35%, and a QRS duration> 120 ms [21].

There are many methods for the treatment of surgical heart failure, some of them at the stage of clinical trials. In the last decades, this field has been developing very dynamically.

## Nutrition in heart failure

The period after cardiac surgery is a good time to change eating habits in order to reduce body mass and correct any irregularities. American Heart Associations recommends base your diet on vegetables and fruits, both fresh and frozen, or from a can, but without the

addition of sugar, salt and high-calorie sauces. The same organization recommends whole grain mill products, poultry and skinless fish. Particular attention is paid in the recommendations on the amount of consumed table salt. When recommending products with low sodium content, limiting the daily intake of sodium to 1500 mg is a desirable habit and helps lower blood pressure [22].

The most similar diet to the correct nutritional recommendations turns out to be the Mediterranean diet. In the Seven Countries Study, it has been proven that the longest life time and the lowest frequency of cardiovascular disease are characterized by inhabitants of areas located on the Mediterranean Basin. However, the highest percentage of ischemic heart disease related to the population from Finland, the Netherlands and the United States, what is more, in these countries the highest consumption of animal fats rich in saturated fatty acids was observed [23].

In Poland in the 90s of the last century, mortality due to cardiovascular diseases decreased by 32% on average in both sexes, which is largely associated with the improvement of the dietary habits of Poles. Consumption of fruit increased by 75%, vegetable fat by 100% (which means increased consumption of mono- and polyunsaturated fatty acids, vitamins and flavonoids), and butter consumption decreased by 47%, while other animal fats - by 16% (which means decrease in consumption of saturated fatty acids) [24].

In addition to the basic principles of rational nutrition, it is worth mentioning individual vitamins and minerals. Noteworthy is vitamin B12 and folic acid, whose metabolism is associated with the reduction in the body of homocysteine. The increased concentration of this amino acid contributes to atherosclerosis of the coronary and peripheral arteries, and increases the risk of stroke [25].

Another vitamin worth attention is vitamin E, whose increased intake reduces the risk of heart attack by as much as 77% [26]. Researchers also pay attention to the intake of dietary fiber. It is the basis of diet in obesity, diabetes, cardiovascular diseases. Epidemiological studies have shown a relationship between increased dietary fiber and the risk of ischemic heart disease [27].

**Kinesitherapy in heart failure**

The stable clinical picture of heart failure is not indicated as a contraindication to physical activity of older people. On the contrary, properly selected activity is an important

point of rehabilitation. Pre-diagnosis is important in physiotherapy. It allows you to choose the right intensity of exercise. Each training should be preceded by an assessment of the patient's clinical condition. Patients with heart failure, depending on the severity of the disease, are characterized by reduced physical capacity. In the advanced stage we use exercises of low intensity and short duration, gradually increasing their frequency. On the other hand, in people with better performance, we choose exercises of greater intensity and longer duration. When planning a rehabilitation process, contraindications to the use of physical exercise should be taken into account [28,12,29].

Contraindications [28,29]:

- Relative contraindications:
    - 4th class NYHA
    - pulse at rest> 100 / min
    - decrease in systolic pressure during effort
    - shortness of breath at rest
- Absolute contraindications:
    - heart attack in the last 3 weeks
    - acute post-cardiac disease or fever
    - acute endocarditis, myocarditis or pericardium
    - fresh atrial fibrillation

To properly plan the rehabilitation process, a preliminary diagnosis should be made. To assess the patient's condition, the physiotherapist may use a 6-minute walk test (6 MWT), an ergospirometric test, an exercise test. Based on the parameters assessed, the patient can be qualified for the appropriate rehabilitation model. Depending on the severity of the disease and physical capacity, patients can be divided into three groups. Qualification to the appropriate group is based on the peak oxygen absorption and the result in 6 MWT [29].

Tab.1. Classification of patients due to physical fitness [29].

| | Group 1 | Group 2 | Group 3 |
|---|---|---|---|
| | Impaired physical capacity | Moderately impaired physical capacity | Good tolerance of physical exercise |
| Peak oxygen absorption | ≤ 10 ml/kg/min | > 10 ≤ 18 ml/kg/min | > 18 ml/kg/min |
| Distance in 6 MWT | < 300 m | > 300 < 450 m | > 450 m |
| After qualifying patients to the appropriate group, we use the following training parameters. | | | |
| The duration of the effort | Initially 5 -10 minutes; target 30 - 45 minutes | Initially 10-15 minutes; target 45-60 minutes | Initially 15-20 minutes; target 45-60 minutes |
| Target heart rate | 40-60% heart rate reserve | 50-70 % heart rate reserve | 60-80% heart rate reserve |

In the training of patients with HF we use:

- endurance training,
- resistance training,
- breathing exercises.

**Endurance training**

Endurance training is called aerobic or aerobic training. Its essence is dynamic exercises that involve large muscle groups. Aerobic training is the basis for cardiac rehabilitation. One of the basic forms of training is walking training. It is popular for its ease of implementation and low cost. Training starts with a 40-50% load of top oxygen absorption (VO2max). At low physical performance, a walking speed of 50 m/min is recommended, while at good efficiency 100 m/min. The modification of walking training is Nordic Walking. Another commonly used form of training is training on a cycloergometer. The interval method is recommended. The working time should last from 30 seconds to 4 minutes, while the time of "return" should be 1-3 minutes. During the "return" the patient should pedal without load.

As a result of training, the blood flow through the muscles increases. There is an improvement in oxygen uptake by working muscles. Exercise also has a beneficial effect on endothelial function, which is particularly advantageous because endothelial dysfunction occurs in ischemic disease [28, 29 ,30].

**Resistance training**

Resistance training is also called strength training. Its purpose is to increase muscle mass and strength. In the course of heart failure there is a reduction in physical performance, therefore we observe a reduction in muscle mass. Properly selected training improves muscle strength and endurance. We implement the resistance exercises after at least a week of using well-tolerated endurance training. It is recommended to engage small muscle groups of one limb alternately with the other limb. Strength training for older people with NS is composed of two series of about 8 exercises each series. We do the training 2-3 times a week, initially involving about 30% -50% of the maximum muscle strength [28,29,30].

**Breathing exercises**

Breathing exercises are an essential element of any rehabilitation process. In the course of heart failure, respiratory function disorders occur. These exercises improve the mechanics of breathing. We start the training with the intensity of 30% of the maximum inspiratory pressure (PImax). The intensity is gradually increased, so as to reach the value of 60% PImax. It is recommended that the training takes 20-30 minutes a day. During the week, 2-3 training sessions should be performed. The recommended exercises include: resisting diaphragm and abdominal muscle exercises, breathing exercises, exercises with the use of special equipment [29,30].

**Discussion**

The aim of the study was to present therapeutic progress. In patients with heart failure, there are bad prognosis. Unfortunately, research confirms that half of patients with full-blown heart failure die within 4 years [31]. Even the basic diagnosis, such as a detailed interview and the use of electrocardiography, is enough to make an initial diagnosis of heart failure, which is confirmed by observations in scientific publications on this topic [32].

Physical activity has a protective effect on the risk of HF. At the time of heart failure, properly selected activity is an important point of rehabilitation and should be used if there are no contraindications [33]. Programs of multidisciplinary teams - treatment programs, can reduce the mortality and morbidity of patients with heart failure [33]. HF treatment is based on pharmacology. Research shows that the use of diuretics, β-blockers and antagonists of neurohormonal systems allow to extend the life of patients and improve their current conditio [31]. An important factor in the management of HF is a diet that should limit salt, sugars and saturated fats [34].

The information presented in specific chapters forms a whole that contains important facts that play an important role for society due to the fact that heart failure is a disease with poor prognosis and an important factor is prevention and therapeutic treatment in case of having this disease.

## Conclusions

Heart failure is a disease entity with a multifactorial etiology and often coexists with other diseases. With age, the number of patients increases, mainly women get sick. This disease is the most common cause of hospitalization among geriatric patients. In assessing the severity of changes, a four-level NYHA classification is most commonly used. Treatment options include non-pharmacological, pharmacological and surgical treatment. Physical activity is important, which should be matched to the clinical condition of the patient and a suitable diet with proven effectiveness, eg the Mediterranean diet.

A patient with heart failure should be put under the care of an interdisciplinary team, thanks to which continuity of care is ensured and the prognosis improves.

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