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THE IMPACT OF FUNCTIONAL KINESITHERAPY ON SUBSEQUENT COMPLICATIONS OF CHRONIC CARDIOVASCULAR DISEASE IN THE ELDERLY¹⁴

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***Abstract:** Heart failure (HF) represents the biggest problem in cardiology, due to high mortality, impaired quality of life and high treatment costs. The goal of this paper is to structure in home conditions a kinesitherapy program for elderly patients with cardiovascular diseases (CVD) in chronic stage, to overcome hypokinesia and subsequent complications, to reduce risk factors and help to restore normal activities. Carrying out a properly structured complex rehabilitation program in patients with cardiovascular diseases, which are not contraindicated, and periodic monitoring of the results, improves their independence in everyday life and their quality of life.*

***Keywords:** Heart failure (HF), Kinesitherapy program for elderly patients, Clinical case*

INTRODUCTION

Relevance and importance of the issue

Heart failure (HF) represents the biggest problem in cardiology, due to high mortality, impaired quality of life and high treatment costs. The incidence of the disease is increasing in the population of developed countries (affecting 1-2% of the adult population). The age factor plays a significant role in the epidemiology of the disease, with prevalence reaching over 10% in people over 70 years. Between 140-150 thousand people are registered in Bulgaria (Petrovski, P., 2018; Baychev, H., A. Alexiev, 2019).

The inclusion of kinesitherapy in the general treatment plan for heart failure was contraindicated until 10-15 years ago (Chervenкова, L., 2016). The accumulation of data from randomized trials proved the benefit of the application of dosed physical activity. Regular aerobic exercise is recommended to reduce oxidative stress, decrease peripheral vascular resistance and increase cardiorespiratory endurance.

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EXPOSITION

Theoretical setting of the research

- **Definition**

Heart failure, also called congestive heart failure, is a clinical syndrome of impaired pumping function of the heart – the latter is unable to eject the amount of blood needed to provide the metabolic demands of body tissues. Since the pumping work of the heart is mainly done by the ventricular musculature, heart failure is usually due to impaired function of one or both heart chambers. A large number of diseases of the heart and blood vessels often increase the risk of heart failure.

- **Pathoanatomy**

Left-sided heart failure is manifested mainly by venous stasis in the small circulatory system; right-sided heart failure by venous stasis in the systemic circulation; total heart failure by stasis in both circulatory systems

Etiology and pathogenesis of the disease

Heart failure (HF) is due to two main groups of causes:

- Abnormally increased workload of the heart, which can be either volumetric (e.g. valvular defects) or tensional (arterial hypertension).

- Reduced contractile capacity of the myocardium due to myocardial disease (Boyadzhiev, K., Yurukova, C., 2007).

Causes leading to the occurrence of cardiovascular disease (CVD):

Common causes of CVD are strain on the left side of the heart due to high blood pressure (hypertension), lung disease, congenital or acquired heart valve defects and heart rhythm abnormalities, atherosclerosis, etc.

Pathogenetic mechanisms of CVD

Heart failure occurs when hypertrophy and dilatation of the cardiac cavities are no longer able to compensate for existing disorders, stroke volume and cardiac output decrease progressively (Boyadzhiev, K., Yurukova, C., 2007).

- **Risk factors**

- **Factors that can be controlled:** high cholesterol, high blood pressure, excessive alcohol use, smoking, overweight, mental overstrain, hypodynamia.

- **Factors that cannot be controlled:** family history, gender, age.

- **Clinical picture**

Typical symptoms of heart failure (HF) according to the European Society of Cardiology are: shortness of breath, reduced exercise tolerance (easy fatigue), weakness, fatigue, increased recovery time after exercise, swelling around the ankles. In practice, the functional classification of the New York Heart Association is used (NYHA), based on symptom severity and physical activity (Chervenkova, L., 2016).

Table 1. Classification of HF according to New York Heart Association (NYHA)

Stage I	No restriction of physical activity: usual physical exertion does not cause fatigue, shortness of breath and palpitations
Stage II	Mild limitation of physical activity: no complaints at rest, but normal physical activity leads to the appearance of fatigue, palpitations or shortness of breath
Stage III	Marked limitation of physical activity: no complaints at rest, but less than usual physical effort leads to the onset of subjective complaints
Stage IV	Inability to perform any physical action without the onset of discomfort: manifestations of HF are present even at rest, increasing with each physical effort

According to studies of recent years, physiotherapy is recommended for Class I-III patients with stable indicators.

Own research

- **Object and subject of the research:**

The object is to develop an efficient and optimal methodology for the application of functional kinesitherapy in a patient with heart failure and accompanying chronic diseases.

The subject of the study is the impact of the applied physiotherapy program on the patient's subjective complaints, his functional status and his ability to perform daily household activities

- **Goal of the research:**

The goal of this work is to structure and appropate in home conditions a physiotherapy program for elderly patients with cardiovascular diseases (CVD) in chronic stage, aimed at their functional improvement, promoting their autonomy in daily life and improving their quality of life.

- **Objectives of the research:**

1. Selection of methods and tools for designing a comprehensive rehabilitation program for patients with cardiovascular disease (CVD).

2. Development of an appropriate toolkit to assess the condition and degree of functional recovery of patients with CVD.

3. Comparative follow-up of the effectiveness of the conducted rehabilitation program.

Clinical case presentation:

Our patient is 84 years old.

Diagnosis: Chronic heart failure Stage 3, Hypertension Stage 3.

Comorbidities: history of ischemic stroke in the vertebrobasilar system; generalized spondyloarthritis with marked lumbar pain when moving.

Functional tests:

- Orthostatic test

RR: Occipital position – 135/65 mmHg; Standing position-145/75 mmHg;

In 3 minutes: Occipital position 139/65 mmHg, Standing position 145/70 mmHg ;

Pulse: Occipital position – 68, Standing position -73; In 3 minutes: Occipital position - 70, - Standing position 75;

- Chest circumference measurement:

Measured over the mamillae: upon inhaling 101,5cm, upon exhaling 99cm, Breathing span 2,5cm – out of norm.

- Measurement of chest mobility (Barakova, P., 2016):

Measured at three levels: under the axillae, through the mamillae, in the area of the floating ribs
Study Results:Hirtz I: 103cm, Hirtz II: 95cm. Hirtz III: 89cm.

- Measurement of spinal mobility (centimetry):

Tom-Mayer-31cm.,

Lateral inclinations: Left – 56cm, Right – 55cm.

Ott test, 5cm; Schober test, 2,5cm

- Examination:

- A frontal view reveals a difference in shoulder height. The body is inclined to the left. The shapes and symmetry of the waist triangles are not the same. The chest and abdominal musculature is relaxed.
- When viewed from the side, a deep thoracic kyphosis can be observed, the posture of the body is relaxed, the shoulders are depressed and protracted together with the head.
- When viewed from behind, there is again a tilt of the spine to the left, the muscles of the back and buttocks are relaxed.

- On examination of the gait, the patient is found to drag his feet and his knee joints remain slightly bent. During the support phase, the body tilts to the side.



Pic.1 and 2. Measuring chest mobility and gait inspection

- Pain assessment – Visual Analogue Scale (VAS)

The visual analogue scale (VAS) is used to record the degree of pain, whose severity the patient determines himself/herself. 0 – lack of pain, 1-2 minimal pain, 3-4 light pain, 5-6 moderate pain, 7-8 sharp pain, 9-10 unbearable pain (Zhelev, V., 2011).

The visual analogue scale (VAS) is a scale used to determine the pain intensity, which has been widely used in diverse adult populations. It consists of a line, with the left side signifying no pain with a smiling face image and the right side signifying the worst pain ever with a frowning face image. The VAS can be used as a rapid measure of symptom severity. It can also be used to monitor disease and pain progression (fig.1).

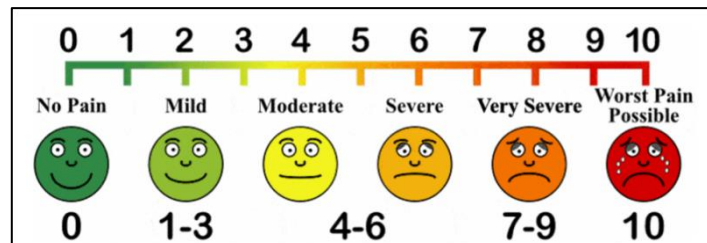


Fig. 1. Visual Analogue Survey Scale

At the beginning of the work with the patient, the assessment of pain according to the VAS was grade 8 - severe pain during movement in the lumbar spine, but as a consequence of the kinesiotherapy program it decreased to grade 5 - moderate pain, usually with physical exertion.

- Barthel test total points – 16/12/2020 – 55p.; 04/05/21 – 65p.

The Barthel Scale/Index (BI) is an ordinal scale used to measure performance in activities of daily living. Ten variables describing activities of daily living and mobility are scored, a higher number reflecting greater ability to function independently following hospital discharge. The Barthel Index measures the degree of assistance required by an individual on 10 items of mobility and self-care ADL. Proposed guidelines for interpreting Barthel scores are that scores of 0-20 indicate total dependence, 20-39 indicate very dependency, 40-59 indicate partially dependency, 60-79 indicates minimally dependency, and 80-100 indicates independency.

The possibilities for independent performance of specific daily activities and their changes in the course of kinesiotherapy are assessed. The test contains 10 indicators, the maximum number of

points of the study is 100. An increase in the score is associated with an improvement in the patient's functional status and independence.

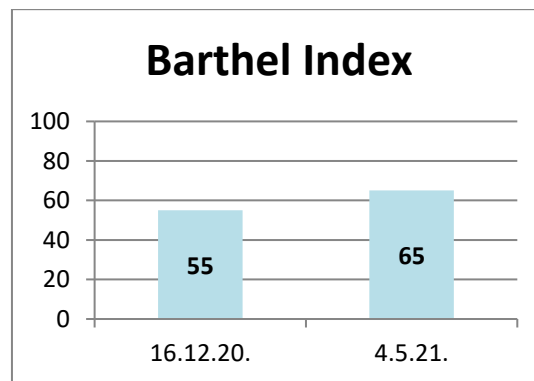


Fig. 2. Results from the daily life activities study

At the beginning of our work with the patient in the activities of daily living (ADL) study, we observed that he had difficulty performing some of them (putting on/taking off clothes; picking up objects from a high position; walking longer distances; climbing stairs). Visits to the patient occurred twice a week and the outcome at this stage was achieving minimal dependence in daily living (Diagram1).

One of the main causes of the socially significant diseases is the reduced physical activity of the modern man. Under the influence of regular physical activity the cardiac and respiratory activity becomes more effective and easy going, improves the muscle power, the bone and the tendon strength (Zaharieva, K., Sherbanov, O., Nedeva, T., 2018).

In a study conducted by Karaganova, I., Mindova, S., (2020) they found that the gradual exercise of difficult and painful motor activities (and in particular the usual household and workloads) can support the recovery process in patients with chronic low back pain, contributing to a more complete reduction of the pain syndrome, improving functional status and the ability to perform daily work and household activities.

Kinesitherapy programme

Kinesitherapy goal:

Kinesitherapy aim to overcome hypokinesia and subsequent complications, to reduce risk factors and help to restore normal activities.

Kinesitherapy objectives:

1. Psychoemotional effect;
2. Facilitating and supporting the heart function and vascular tone;
3. Helping blood supply to organs while improving oxygen uptake;
4. Improving the functional relationship between CVD and the breathing system (BS)
5. General tonic effect and improvement of orthostatics.
6. Training for proper posture at rest and when moving.
7. Training in compensatory mechanisms, in the presence of irreversible consequences of the disease, which prevent the performance of certain activities of everyday life.

In the chronic phase of heart failure, active physiotherapy is the most widely used.

Tools:

Positional therapy (due to low back pain and heart failure) (Pic. 3), Breathing exercises, Analytical exercises, Relaxing exercises, General developmental exercises, Active exercises with gradually increasing load, Exercises in an open kinetic chain, Dosed walking, Exercises for balance and coordination.

Kinesitherapy is performed carefully and at a slow pace, and the duration of the procedure should not exceed 20 minutes - 25 minutes. What is special about people with heart disease is that

it works from the distal parts of the limbs to the proximal parts. The procedure is full of breaks and the load is from mild to moderate without causing pain or fatigue in the patient. The occipital hemisphere position is most suitable for elderly people with vascular diseases because it burdens the heart.

To prepare the body for physical activity, we start with lighter exercises, such as: breathing exercises (abdominal-diaphragmatic), which can be applied from the starting position occipital hemisphere with one hand on the abdomen and the other on the chest with light pressure. Again, from the starting position - the occipital hemisphere – the patient compresses the fingers into fists and holds for 3-4 seconds; this exercise is performed with the legs as well, and there is a possibility for alternating or simultaneous performance. We keep the position, the legs are bent at the knees, the heel of one leg is slid on the bed, and then it returns to the starting position, the same movement is repeated with the other leg. From the occipital position, with legs bent at the knees, the pelvis is lifted up 6-7 times. Active exercises are performed in the small joints of the limbs, such as circular movements for the ankle and wrist joints. We train the patient's equilibrium reactions - walking in a straight line, first with arms out to the side then taken down to the body. We also apply a pain-inhibiting lumbar position "Pearl position" (Pic. 3).



Pic.3. A pain-inhibiting lumbar position



Pic.4. Muscle pump exercise



Pic.5. Measurement of heart rate after training

Indications:

The patient's physical capabilities, cardiovascular risk profile, comorbidities and neuropsychological stress are always considered.

During training, it is necessary to monitor indicators such as respiration, RR, pulse, expression and complexion, as people with cardiovascular disease can very quickly reach the limit of their physical abilities.

Signs of overload of the cardiovascular system are sweating, weakness, pain in the heart, arrhythmia, shortness of breath and increasing cyanosis. Occasionally there is a whitening of the nose-mouth triangle. These symptoms are a criterion for the cessation of all forms of exercise.

An important component of kinezitherapy is the consistency in its performance. It should be an integral part of the patient's daily life. Throughout the period, regular specialist supervision, corrections and adaptations of the procedures are required.

Contraindications:

Acute heart failure, presence of an inflammatory process (myocarditis, pericarditis), pulse over 110 beats/min. at rest, respiratory rate above 30 beats/min at rest, deep venous thrombosis, high fever, etc.

Anaerobic exercises are contraindicated - fast pace and intense strength, as well as pain when performing the exercises; avoiding fatigue.

• **Massage**

The massage in these patients is individual. We work selectively on the areas of the body with the aim of reflexively influencing the structures. We massage the tense muscles and strengthen the weakened ones (Minchev, A., Alexandrova, A. Mihailova, S., Andreev, A., 2020). The objectives we aim to achieve through massage in the patient described above are:

- To prevent lymphatic stagnation;
- To improve blood and lymph circulation;
- To improve muscle trophism;
- To prevent contractures (muscle and joint);
- To increase the tone of weakened muscles.

• **Occupational therapy**

With heart patients, occupational therapy should serve for:

- Overcoming the disease;
- Improving the capacities;
- Influencing the 3 risk factors;
- Reintegration into everyday life in the family, work and society.

Motor therapy, general physical training, is the main load in the training of the cardiovascular system. Occupational therapy has the objective to reintroduce the patient in the workload of everyday life, but also in future professional requirements. In addition, occupational therapy prescriptions should contribute to fading of the disease. Particular attention should be paid to the following therapeutic conditions:

- Competitive training programs should be avoided;
- Treatment should not be monotonous;
- Patients should be given some creative space to develop their own creativity and imagination, indulging their leisure interests and hobbies.;
- The patient should be given a task coordinated with him, through which he/she could increase his/her self-esteem;
- Group work is preferred to independent work, as it has a stimulating character (Mihailova, N., Megova, T., 2010).

CONCLUSION

The applied functional kinesitherapy shows an improvement in the general condition of the patient, the work of the cardiovascular, respiratory system and musculoskeletal system. Carrying

out a properly structured complex rehabilitation program in patients with cardiovascular diseases, which are not contraindicated, and periodic monitoring of the results, improves their independence in everyday life and their quality of life.

REFERENCES

Baychev, H., A. Alexiev, (2019) *Cardiac rehabilitation in patients with heart failure, regardless of etiology*, Medical Journal, iss. 4 (**Оригинално заглавие:** Байчев, Х., А. Алексиев, (2019) *Кардиорехабилитация при пациенти със сърдечна недостатъчност, независимо от етиологията*, Medical Magazine, брой 4)

Barakova, P. (2016) *Basic and special methods for functional research in kinesitherapy practice*, Mediatech-Pleven (**Оригинално заглавие:** Баракова, П. (2016) *Основни и специални методи за функционално изследване в кинезитерапевтичната практика*, Медиатех-Плевен)

Boyardjiev, K., Yurukova, Ts., (2007) *Clinical pathology of the cardiovascular system*. In: Textbook of Clinical Pathology. Knowledge Publishing House (**Оригинално заглавие:** Бояджиев, К., Юрукова, Ц., (2007) *Клинична патология на сърдечносъдовата система*. В: *Учебник по клинична патология*. Издателство Знание)

Zhelev, V. Physiothera, (2011), *Methods for functional research and evaluation in physiotherapy*, Avangard Prima (**Оригинално заглавие:** Желев, В. *Физиотерапия*, (2011), *Методи за функционално изследване и оценка във физиотерапията*, „Авангард Прима“)

Zaharieva, K., Sherbanov, O., Nedeva, T., (2018) *The influence of physical activity on physical work capacity and functional condition of the cardiovascular system*, Eurasian Union of Scientists, № 3 (48), ISSN 2411-6467

Karaganova, I., Mindova S., (2020) *Dynamics of the clinical, functional and psychological manifestations of the pain syndrome after application of experimental method for "biopsychosocial rehabilitation" in patients with chronic lower pain*, Proceedings of the Union of Scientists – Ruse, Book 4, Medicine and ecology, Volume 10, (**Оригинално заглавие:** Караганова, И., Ст. Миндова, *Динамика на клиничните, функционални и психологични прояви на болковия синдром след прилагане на експериментален метод за „биопсихосоциална рехабитация“ при пациенти с хронични кръстни болки, сп. Известия на Съюза на учените – Русе, Серия 4, Медицина и екология, 2020*)

Minchev, A., Alexandrova, A., Mihailova, S., Andreev, A. (2020). *Modern aspects of kinesitherapy for chronic pain in the Thoracolumbar spine*, (**Оригинално заглавие:** Минчев, А., Александрова, А. Михайлова, С., Андреев, А., 2020, *Съвременни аспекти на кинезитерапията при хронична торако-лумбална болка*). Научни трудове на Русенския университет, Том 59, Серия 8.4.

Mihailova, N., Megova, T. (2010) *Occupational therapy in cardiovascular diseases*, Proceedings of the University of Ruse, volume 49, series 8.1 (**Оригинално заглавие:** Михайлова, Н., Мегова, Т. (2010) *Ерготерапия при сърдечно-съдови заболявания*, Научни трудове на Русенския университет, том 49, серия 8.1)

Petrovski, P., (2018) *Chronic heart failure - a modern global pandemic*, Medical Journal, iss. 4, (**Оригинално заглавие:** Петровски, П., (2018) *Хронична сърдечна недостатъчност – съвременна световна пандемия*, сп. Medical Magazine, брой 4)

Chervenкова, L., (2016) *Modern kinesitherapy and physical activity in arterial hypertension, ischemic heart disease and heart failure*, Publishing house "St. Kliment Ohridski", monography (**Оригинално заглавие:** Червенкова, Л., (2016) *Съвременна кинезитерапия и физическа активност при артериална хипертония, исхемична болест на сърцето и сърдечна недостатъчност*, Изд. „Св. Климент Охридски“, монография)

https://www.physio-pedia.com/Visual_Analogue_Scale

<https://greatbrook.com/visual-analog-survey-scale/>

https://www.physio-pedia.com/Barthel_Index