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COAGULATION INDICATORS BEFORE AND AFTER THE USING OF LEECHES DURING HYPERTENSIVE CRISIS

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Annotation: The article discusses the use of hydrotherapy as a treatment method for hypertensive crisis (HC), which is an emergency situation with a sharp increase in blood pressure that requires immediate intervention. The mechanism of action of leeches is described, their effect on lowering blood pressure, improving microcirculation and relaxing blood vessels. The advantages of hydrotherapy for GC are considered, including reducing the dosage of medications and minimizing side effects. Possible risks and contraindications associated with the use of leeches are also outlined, and recommendations for using the method in emergency situations are provided. The article emphasizes the importance of a professional approach and strict control when using hydrotherapy in conditions of hypertensive crisis.

Key words: hypertensive crisis, hydrotherapy, leeches, blood pressure, anticoagulant effect, microcirculation, treatment, emergency care, contraindications, risks.

Introduction. Hypertensive crisis (HC) is an acute condition characterized by a sharp increase in blood pressure (BP), which requires urgent intervention. In medical practice, various methods of treating hypertensive crisis are used, including drug therapy and non-drug approaches. One of these unusual and at the same time effective methods is hydrotherapy, that is, treatment using leeches. This method, although part of alternative medicine, has a long history and deserves attention in the context of emergency cases of hypertensive crisis. This article discusses the use of leeches in hypertensive crisis, their mechanism of action, effectiveness, possible risks and contraindications.

A hypertensive crisis is a sharp increase in blood pressure, often accompanied by a deterioration in the patient's general condition. It is important to note that HA can occur both against the background of pre-existing hypertension and against the background of normal blood pressure. Hydrotherapy, or treatment with leeches, is the use of these living creatures for therapeutic purposes. The history of using leeches' dates back thousands of years and they have been used in various cultures to treat a variety of ailments, including hypertension. However, with the development of modern medicine, hydrotherapy began to be considered as an alternative method of treatment, albeit with proven effectiveness in a number of cases [1].

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Leeches have several biologically active substances that affect the human body:

1. Hirudin is the main anticoagulant that prevents blood clotting and improves microcirculation.

2. Histamine - promotes the dilation of blood vessels, which can be useful during a hypertensive crisis.

3. Proteases and other enzymes - have anti-inflammatory and analgesic properties, improving blood circulation in areas where leeches are applied.

Materials and methods. To evaluate the effectiveness of hydrotherapy in emergency cases of hypertensive crisis (HC), a study was conducted that included observation of patients who underwent hydrotherapy as part of complex treatment. The study used a descriptive method with an analysis of clinical cases, as well as the results of laboratory tests before and after hydrotherapy sessions. The study included 30 patients (16 men and 14 women) aged 40 to 75 years, suffering from chronic hypertension and having experienced a hypertensive crisis in the last 48 hours. All patients were diagnosed with hypertensive crisis based on the clinical picture and blood pressure readings above 180/110 mmHg. Art. Patients with acute illnesses such as stroke, myocardial infarction, and allergy to leeches were excluded from the study [2].

1. Hydrotherapy: Leeches have been used as an additional method of treating hypertensive crisis. For each patient, an individual place for attachment of leeches was selected, based on the patient's condition and the location of the problem areas. On average, 3–5 leeches were used per patient.

Leeches were placed in the following areas:

- Neck area (spine, cervix);
- Upper back (shoulder blade area);
- Place of projection of the carotid arteries.

The time the leeches spent on the patient's body ranged from 20 to 40 minutes. The procedure was carried out once a day in a hospital setting under the supervision of medical personnel.

2. 2. Monitoring the patient's condition: during all hydrotherapy sessions and after their completion, blood pressure was monitored using an automatic tonometer and constant monitoring of the patient's clinical indicators (pulse, temperature, state of consciousness). Blood pressure was measured before the session, during the session and 30 minutes after removing the leeches [3,4].

Laboratory blood tests were also performed before and after the session, including indicators of hemoglobin, hematocrit, blood coagulation system (bleeding time, clotting time), as well as a test for the presence of antibodies to leech enzymes (to identify an allergic reaction).Основные методы оценки эффективности:

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Blood pressure: Measurement using a tonometer before and 30 minutes after a hirudotherapy session.

Clinical assessment: General condition of the patient (headache, dizziness, weakness, nausea).

Laboratory tests: Complete blood count and coagulation system analysis.

Assess side effects: Record possible side effects such as allergic reactions, bleeding or inflammation at the sites where leeches are applied.

For comparison with the results of treatment with hydrotherapy, the study included a control group of 30 patients who received only standard drug treatment for hypertensive crisis (antihypertensive drugs - ACE inhibitors, diuretics and beta blockers). These patients also underwent continuous blood pressure monitoring and laboratory testing. All data were analyzed using standard statistical methods. To assess the effectiveness of treatment, the parameters of the mean value (arithmetic mean) and standard deviation were used. To compare indicators in different groups, Student's t-test was used. Differences between groups were considered statistically significant at $p < 0.05$ [5].

All patients were informed about the treatment methods and gave written consent to participate in the study. All procedures were carried out in accordance with ethical standards and standards of medical practice. For hirudotherapy, medicinal leeches grown in certified laboratories that meet sanitary standards were used. Leeches were sterilized and used only once per patient [6,7].

Discussion. Hypertensive crisis (HC) is an acute condition that requires immediate intervention to prevent severe complications such as stroke, myocardial infarction, or acute kidney failure. Traditionally, antihypertensive medications are used to treat HC, aimed at rapidly lowering blood pressure (BP). However, considering the potential side effects of pharmacological therapy, as well as the chronic complexity of some cases of hypertension, alternative treatment methods such as hydrotherapy have attracted the attention of researchers and clinicians. Hydrotherapy, or leech therapy, has a long history in medicine, starting from ancient Egypt and continuing with modern approaches in alternative medicine. Despite the successes of pharmacotherapy, there is an interest in using leeches for the treatment of hypertensive crises, as this method may offer certain advantages, such as minimizing side effects and maintaining more stable blood pressure in the long term. One of the main factors determining the effectiveness of leeches in hypertensive crisis is their unique effect on the vascular system. During the bite, the leech secretes a large number of biologically active substances, including hirudin, histamine, heparin, and other enzymes, which affect the blood and blood vessel walls. These substances contribute to the expansion of blood vessels, improvement of microcirculation, reduction of blood viscosity, and ultimately, the lowering of blood pressure [8].

1. Anticoagulant effect: Hirudin, the main anticoagulant, prevents blood clotting, which improves microcirculation and reduces the load on the blood vessels.
2. Vasodilatory effect: Histamine, which is released during the leech bite, contributes to the expansion of blood vessels, reduces resistance within them, and consequently lowers

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blood pressure. This is especially important during a hypertensive crisis, when it is necessary to rapidly reduce blood pressure without strong side effects.

3. Anti-inflammatory and analgesic effect: The proteases and other enzymes in leeches have a local analgesic and anti-inflammatory effect, which also contributes to the overall improvement in the patient's condition.

Review of scientific research. Studies dedicated to the use of leeches in the treatment of hypertensive crisis confirm the positive effect of hydrotherapy. A number of clinical trials have noted a significant reduction in blood pressure following leech therapy sessions. For example, one study conducted in 2019 showed that patients with hypertensive crises who underwent hydrotherapy experienced a reduction in average blood pressure levels by 20–30 mm Hg within 2–3 hours after the session, while the control group, which only received standard treatment, showed a less pronounced reduction (Gusev et al., 2019). Furthermore, another study published in 2021 demonstrated that leeches, when used in combination with traditional antihypertensive medications, can reduce the dosage of the latter, which is especially important for patients with contraindications to the use of strong medications [9].

Hypertensive crisis is not just a condition of elevated blood pressure but a complex disease that requires rapid intervention. Unlike traditional methods, hydrotherapy allows for a quick effect without the need for medications with pronounced side effects. For example, the use of antihypertensive drugs such as nitroglycerin or captopril can lead to various side effects, such as headaches, dizziness, tachycardia, or even hypotension. In contrast, leeches, by acting on the body more gently, can be used as a means of stabilizing blood pressure in emergency situations. Importantly, hydrotherapy, due to its mechanism of action, can be used in addition to traditional treatment methods, enhancing their effect and reducing the dosage of medications, which is especially important in chronic hypertension or the presence of comorbid conditions such as diabetes or kidney diseases. Safety and minimal side effects: One of the key advantages of hydrotherapy is the low risk of side effects. Unlike pharmacological drugs, leeches do not cause allergies in most cases and do not have a destructive effect on organs such as the kidneys or liver. Studies have shown that leeches, when used correctly, virtually do not lead to serious side reactions (Rogov & Smirnova, 2020) [10].

Reduction of medication dosage: As mentioned earlier, hydrotherapy can reduce the need for high doses of antihypertensive medications. This is especially relevant for individuals with chronic conditions who may experience side effects from standard medications. Overall improvement in the patient's condition: In addition to lowering blood pressure, hirudotherapy contributes to the improvement of the patient's overall condition, reducing stress and anxiety, which can also have a positive effect on the course of a hypertensive crisis [11].

Despite the positive results, existing studies on the use of leeches in hypertensive crises do not always have high-quality evidence. More extensive randomized controlled trials are needed for more confident conclusions. In rare cases, patients may experience allergic reactions to the components of leech saliva or inflammation at the bite sites. There is also a risk of infections if the procedure is not performed under strict sanitary conditions. Hydrotherapy requires a professional approach and strict supervision by medical staff.

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Uncontrolled use of leeches can lead to undesirable outcomes, such as severe bleeding or deterioration of the patient's condition.

Like any therapeutic procedure, hydrotherapy has its contraindications. These include:

- Blood coagulation disorders, such as hemophilia or diseases associated with a high risk of bleeding.
- Severe cardiovascular diseases, such as acute myocardial infarction or stroke, especially during the acute phase.
- Active infections or inflammatory skin diseases in the area of leech application.
- Individual intolerance to the components of leech saliva.

Compared to traditional treatment methods, hydrotherapy has several advantages. In particular, it does not cause side effects such as hypotension, tachycardia, or dizziness, which may occur with the use of traditional antihypertensive medications such as nitroglycerin or beta-blockers. However, despite this, hydrotherapy should not be considered as the sole method of treating a hypertensive crisis. It should only be used as part of a comprehensive therapy, which includes medication and other methods of stabilizing the patient's condition. Hydrotherapy is an interesting and effective method that can be used in emergency situations to treat a hypertensive crisis. When applied correctly, leeches have a significant impact on lowering blood pressure, improving microcirculation, and the overall condition of the patient [12].

Nevertheless, like any medical method, hydrotherapy requires caution and a professional approach to minimize risks and achieve the best results. Hydrotherapy should be performed only by experienced specialists in environments that meet sanitary requirements, and with consideration of all contraindications and individual characteristics of the patient.

Conclusion. The use of leeches in emergency cases of hypertensive crisis represents an interesting and promising treatment method, which can become an effective complement to traditional therapeutic methods. Hydrotherapy has a multifaceted effect on the patient's body, including lowering blood pressure, improving microcirculation, relaxing blood vessels, and enhancing the overall resilience of the body to stress. The main advantages of the method lie in its low invasiveness and minimal side effects, which make hydrotherapy a safe alternative or complement to pharmacological treatments, especially in cases where the use of traditional medications is limited or causes undesirable reactions. However, despite the positive results obtained in individual studies, hydrotherapy requires further investigation. More large-scale and strictly controlled clinical trials are needed for a final assessment of its effectiveness and safety. Furthermore, the method should only be applied by experienced specialists, as uncontrolled use of leeches can lead to complications such as bleeding or allergic reactions. Thus, hydrotherapy can be a useful adjunct to the comprehensive treatment of hypertensive crisis, but its use should be justified and strictly monitored, taking into account the patient's condition and existing contraindications. In the future, with the development of scientific research, the method may take on a more significant role in the arsenal of tools for the emergency treatment of hypertensive crises.

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