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Hirudotherapy as an Effective Method for Treatment of Migraine - a Disease of Unknown Etiology

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Abstract---This scientific work contains the results of a study conducted in patients with migraines, the effectiveness of hirudotherapy in people with headaches, in particular with migraines. The features of the manifestation of migraine from other diseases, as well as the economic costs associated with migraine, are described. The objective to study the effectiveness of hirudotherapy for migraines. The materials of our study were patients who received hirudotherapy on an outpatient basis. The patients' age ranged from 20 to 60 years, but the main contingent was made up of women aged 30-45 years. In a significant number of patients who received hirudotherapy, an improvement in the clinical picture was noted, while the therapeutic effect was felt after the first session. As the results of the study showed, treatment with leeches restores microcirculation and local immunity, correcting some pathological processes (microcirculation disturbance, hypoxia, etc.).

Keywords---costs, disease, effectiveness, hirudin, hirudotherapy, migraine.

Introduction

Headache is the most common reason people see a doctor. Every person has experienced a headache at least once in his life. According to the WHO, about 10-15% of the adult population suffer from it periodically, and 3% have a chronic headaches. One of the topical forms of headache is migraine. According to the WHO, in 2000, migraine was in 19th place as a cause of disability in the world in men, and in women in 12th place. According to new data from the WHO, tension headache and migraine are recognized as the 2nd and 3rd most common diseases in the world among men and women; migraine took 7th place (out of 289 diseases) among specific causes of disability and entered the top 10 disorders causing disability in 14 out of 21 regions of the world, mainly in developed countries ([World Health Organization, 2011](#); [Tabeeva & Yakhno, 2011](#)).

Migraine has become the leader among neurological diseases in terms of decreased performance. The underlying causes of the development of migraine are unknown, the disease is associated with a combination of environmental and genetic factors. It manifests itself in several family members in about two-thirds of cases and is rarely due to a monogenic defect. There was a misconception that migraines are more common among people with a high level of mental development. It can be associated with several psychological factors (depression, anxiety, and bipolar disorder), with many biological processes or provoking factors (Osipova et al., 2012; Amelin et al., 2011).

Migraine has a wide variability in clinical presentation and is based solely on clinical diagnosis. The main clinical criterion for migraine is the presence of the following signs:

- At least five seizures with the following characteristics:
- Headache lasting 4–72 hours.
- The presence of two of the following symptoms:
 - one-way localization;
 - pulsating character;
 - the intensity of pain - from moderate to significant;
 - The headache gets worse with normal physical activity.
- Is accompanied by at least one of the symptoms:
 - nausea;
 - vomiting;
 - photo and/or phonophobia.
- There is no association with another disease.

Economic losses associated with various types of headaches are made up of several indicators: loss of working days decreased performance (Koreshkina, 2011). The economic losses due to migraines have been studied in the United States and European countries in population studies, according to which 14% of the population in these countries suffers from migraines. Both studies analyzed the costs (direct and indirect) associated with migraines. For example, in the United States, the total cost was estimated for 22 million patients aged 20–65 with migraines. The total cost was \$ 14.4 billion per year. Direct costs (drugs, consultations, research, and hospitalization) were about \$ 1 billion, while indirect costs were over \$ 3 billion. For women with migraines, 80% of both direct and indirect funds were spent. In Europe, the total amount spent per patient was 579 euros, and for 41 million patients - 27 billion euros.

In the UK, 4% of all general practitioner consultations are for migraine patients. More than 190,000 migraine attacks are recorded every working day in the UK, an estimated 100,000 people are absent from work or school due to migraines, which is more than 25 million lost workdays a year. Diagnosing migraine is not an easy task. Despite the achievements in the organization of medical care in one of the most developed countries of Europe, Germany, there are difficulties in managing patients with migraines (Kostikova, 2016). For effective management of a patient with migraine, it is necessary to establish the correct diagnosis already at the first visit. This is very important because the patient thinks he is suffering from a complex and unknown disease that is difficult to treat.

The International Association for the Study of Headache published the 1st edition of the International Classification of Headache in 1988 and the 2nd edition in 2004. This classification has changed the management of migraine patients according to the migraine identification standards. According to these criteria, migraine is diagnosed simultaneously based on both confirmation and exclusion: the signs of migraine are confirmed and signs of secondary headache are excluded. In recent years, several different versions of questionnaires and scales have been developed to simplify the process of diagnosing migraine and assessing the effectiveness of treatment. In European and world practice, there have been many attempts to create screening questionnaires, various scales, and questionnaires for patients with migraine (Singh, 2010; Kulbida et al., 2019; Archana et al., 2016).

Based on the European study Euro head, it became possible to introduce the migraine diary into the practice of headache treatment centers. To assess the quality of migraine treatment, the TOQ (Treatment Optimization Questionnaire) questionnaire is used, the decrease in functional activity in migraine - the MIDAS scale, etc. The criterion for assessing the MIDAS scale is the total number of days with reduced or lost workability. If the number of such days in 3 months did not exceed 20, this indicates a moderate degree of loss of working capacity, if it exceeds 20, it indicates a pronounced degree (Gerashchenko, 2008; Savinov, 2019; Savinov, 2008).

Studies on migraine have found significant gender differences. In addition to information that migraine is more common in women, the following data were obtained: most often migraine in women begins at puberty, more than 55% of women have migraine attacks associated with menstruation, most women note a decrease in the frequency of migraine attacks during pregnancy and menopause. In publications devoted to the gender aspects of migraine,

differences in sex hormones in men and women and their levels at different periods of life are analyzed. Changes in the hormonal background in women during the reproductive period affect the frequency and intensity of migraine and lead to a greater decrease in working capacity than in men and an increase in the cost of treatment. For example, in the United States, women spend 80% of the budget for migraine treatment throughout the year (Loeser et al., 2020; Çakmak et al., 2018).

The type of migraine is also associated with a hormonal background: migraine without aura and migraine with aura develop with the predominance of various female sex hormones. The incidence of migraine triggers also varies by gender. Women are more likely to mention caffeine among the provoking factors, and smoking and alcohol are equally often triggered by an attack. In women, in comparison with men, a decrease in working capacity is more pronounced, according to the data of the MIDAS scale.

An important and frequent provoking factor for migraines is sleep disturbance. The association between the severity of sleep disturbance and the frequency of migraine attacks has been shown in several studies. Sleep disorders associated with headaches include difficulty falling asleep, sleep apnea, early awakening, insomnia, daytime sleepiness, anxious awakenings during sleep, and drowsiness when getting up. Thus, the identification of trigger factors is a prerequisite for the successful treatment of patients with migraines (Ashina et al., 2021; Gabrielli et al., 2003).

Materials and Methods

We were contacted by patients who complained of throbbing headaches, mainly on the one hand, from time to time there was nausea and vomiting, the headache was not associated with other diseases. The patients' age ranged from 20 to 60 years, but the main contingent was made up of women aged 30-45 years. Methods that have been successfully used by our ancestors for millennia are again attracting special attention. One of these methods is hirudotherapy - the use of medicinal leeches for medicinal purposes. The use of leeches for medicinal purposes has a thousand-year history and is rooted in the medicine of Ancient Egypt (1500-300 BC). Studying the history of the use of a medical healer - leeches, we decided to apply leech treatment for headaches. There are about 400 species of leeches on the globe. Many of them live on the territory of Russia and the CIS countries. But only 2 types of blood-sucking jaw leeches are useful and suitable for medical purposes.

- Medicinal leech (*Hirudomedicinalis*)
- Nile leech (*Limnatisnilotica*, *Limnatisurcestanica*) is sometimes called horse.

Often the Nile leech is confused with a predatory jaw leech - the so-called pseudo-cone (*Haemopissanguisuga*), which does not suck blood, but completely swallows various invertebrates or parts of their body. Three subspecies are common among medicinal leeches.

- Medicinal or medical leech - brown-olive color with 6 red-yellow stripes on the back, mottled with black dots along the length of the body with a variegated abdomen and rough rings. Has 10 small eyes on the head and is arranged in semicircles, six in front and four on the back of the head. Both ends of the body are equipped with fleshy suckers - suckers, on their front end there is a mouth, and on the back end of the powder. With both ends, it can freely stick to foreign bodies.
- Pharmacy leech - unlike the medicinal one, it has a dark green color, with the same six dorsal stripes, but without dots; the abdomen is yellowish without spots, the rings are smooth (it is also called Hungarian). For the most part, it lives in Moldova, Krasnodar Territory, Armenia, its variety is found in the Transcaucasus.
- Eastern leech - brighter than the previous ones. Along its back, there are narrow orange stripes covered with black 4-sided spots at regular intervals. The belly of the leech is black, with green spots, located in pairs at regular intervals.

The leeches are considered unsuitable for medical use, one-color, without stripes on the back, hairy, cylindrical, and with blunt heads. Such leeches are popularly known under the general name-horse, although they often refer to completely different species (Kostikova, 2016; Gerashchenko, 2008; Savinov, 2019; Savinov, 2008). Nile leeches (horse) are of the same size and shape as medical ones but differ from them in insufficiently developed jaws, and on them with blunt teeth. Therefore, they cannot bite through the skin but only stick to it. There are two subspecies of the horse leech, which are easily mixed with the medical one:

- greedy bloodsucker - differs from the medical one in that its back is smooth, dull green in color, the abdomen is dark with side yellow or reddish-brown stripes, it secretes a lot of mucus.
- blackish trickle - greenish-yellow with a yellowish abdomen. These leeches live in the reservoirs of Armenia, Georgia, in the southeast of Russia.

The basis of the therapeutic effect of hirudotherapy is leech saliva, which contains a large amount of biologically active substances that contribute to the normalization of the internal homeostasis. These include hirudin. Modern researchers have proven that leeches should be considered as a single living, very complex, and peculiar non-specific irritant about the human body as a whole, and not just a local method of mechanical extraction of blood from capillaries corresponding to "problem organs". It is currently recognized that leeches are the only means of bloodletting at the level of the microcirculatory bed, as a system, it is here that subtle metabolic processes that are important for the body take place: delivery of nutrients to cells and tissues (removal of toxins, waste from them) through the capillaries of arterioles, lymphatic vessels venules. Leeches can be used for almost all human diseases, but there are exceptions, it cannot be used for hemophilia in all stages, with advanced stages of cancer and hypersensitive (leech) patients (Cursiefen et al., 2000; Olesen et al., 2009).

Placing leeches at one point or another of the body is a procedure, in general, not at all complicated. But still, only a doctor should put leeches, who determines the number of leeches for each patient and the place of their setting (depending on the general condition of the patient and the severity of the disease process). Doctors and without the help of leeches have learned to delay blood clotting with the help of certain drugs. However, dissolving an already formed blood clot is a more difficult task. If they are old, then even the best medicines cannot dissolve them, but leeches with their enzymes successfully cope with old blood clots. During the last 6 months, patients with headaches have come to us. After that, we started setting up leeches. We started with 3 leeches. The leeches were placed on the acupuncture points of the painful areas of the head.

Table 1
The incidence of migraine in the age aspect

Age	Sex		Number of	Disease	Number of	Treatment
	husband	wives	patients		leeches	course
20- 30 years	3	7	10	Migraine	3-7 pieces	3-7 sessions
31- 45 yearsold	10	50	60	Migraine	3-7 pieces	3-7 sessions
Over 45 years old	4	6	10	Migraine	3-7 pieces	3-7 sessions

After the first session of treatment with leeches, the intensity of headaches in patients moderately decreased, and their mood improved. After the first session, the patients were prescribed electroencephalography (EEG), fundus examination, hormonal studies, and computed tomography of the brain. No significant changes were found in the conducted studies. We started the second session. As a result of the examination, examination, and questioning of patients, from 3 to 7 leeches were prescribed individually for each of them. After the second session of treatment with leeches, the condition of the patients improved significantly, the intensity and frequency of headaches decreased markedly. The throbbing headaches disappeared. One day later, the patient has prescribed the third session of treatment with leeches. After the next session, the condition of the patients improved markedly, headaches practically did not bother. The patients' mood rose, and they did not complain of feeling unwell (Bahra et al., 2001; Cady et al., 2000).

After the third session of treatment with leeches, the patients were recommended, based on their wishes and general condition, to continue the treatment up to 7 sessions. Patients aged 20-30 years, general condition of moderate severity, pain syndrome is less intense, reaction to pain is not reactive. After the first session, pulsating pains disappeared in all patients. The state of health became vigorous. On repeated sessions, the desire to continue the treatment increased. For patients aged 31-45 years, the general condition in comparison with the first group is more severe. The pain syndrome is more intense. The reaction to pain is pronounced. After the first session, the pulsating pain persisted in all patients, the mood was depressed, but the desire to continue the treatment remained.

For patients over 45 years old, the general condition, in comparison with the previous two groups, was assessed more severely. In addition to headaches, patients complained of palpitations, fear, and general malaise. After the first session, they had throbbing headaches, but their health improved markedly. According to the patients who received the second session of hirudotherapy at the age of 20-30, their state of health noticeably improved, the frequency of headache attacks halved. The interest in life has increased. We agreed with pleasure for the 3rd session.

In the age group 31-45 years after the second session, pulsating headaches disappeared, the frequency of pains significantly decreased. Complaints of palpitations, anxiety, and general malaise were not presented. In all categories of patients, after the third session of hirudotherapy, the general condition improved, pain and other syndromes that patients complained about before treatment disappeared. During treatment with leeches, all patients continued to take medications for the underlying disease.

Results and Discussions

All groups of patients who received hirudotherapy showed positive dynamics of the clinical picture, and the therapeutic effect came after the first session. As the results of this study have shown, treatment with leeches restores microcirculation and local immunity, correcting some pathological processes (microcirculation disturbance, hypoxia, etc.). Hirudotherapy affects the course of the basic mechanisms of the development of the pathological process, controls the totality of reactions that occur at different structural and functional levels of the formation of the disease. Hirudotherapy has a normalizing effect on the vascular-motor center of the autonomic nervous system, leads to positive changes in peripheral and central hemodynamics, improves the adaptive capabilities of the body. Thus, the clinical study of hirudotherapy is explained by the ability of leech enzymes to eliminate tissue ischemia and hypoxia, as well as microcirculatory disorders that determine the basic mechanisms of the development of the disease, which leads to the disappearance of pulsating pain during migraine.

The problem of migraine treatment remains one of the problems of neurology. The lack of specific treatment encourages scientists to search for new methods of therapy, especially the traditional direction. Hirudotherapy has been used in neurology for a long time, but we have not found experience in its application in the treatment of migraines. In our practice, we used hirudotherapy in the complex treatment of migraine and received positive dynamics in the course of the disease, but the mechanism of the specific effect of hirudin on the course of the disease has not been fully understood. We started the session with 3 leeches and increased it to 5, but the exact effective number of leeches in the treatment of migraine has not been determined, we believe the amount is prescribed individually, and this also applies to the duration of hirudotherapy. The use of hirudotherapy in the treatment of migraines will help to further increase the positive effects of it, as well as prevent the dubious long use of chemicals and expensive treatment.

Conclusion

The results of the study allow us to reliably state that hirudotherapy is a fairly effective and safe method of treating migraine and can be recommended for inclusion in the complex of therapeutic measures in this contingent of patients.

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