

Use of Low Frequency Ultrasound for The Treatment of Diseases of The Nasal Cavity and Adjacent Sinuses

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Annotation. This article explores the use of low-frequency ultrasound in the treatment of diseases of the nasal cavity and paranasal sinuses. Low-frequency ultrasound is a modern method of physical therapy that can penetrate deeply into tissue and cause various biological reactions. Research shows that the use of low-frequency ultrasound can have a positive effect on the condition of the nasal cavity and paranasal sinuses, improving mucociliary clearance, facilitating the outflow of secretions and improving the penetration of antiseptic solutions into tissues. The combined use of low-frequency ultrasound with antiseptics and other medications can also enhance their effect on the affected areas. It is important to continue research to determine the optimal parameters for use and safety of this method. Overall, the use of low-frequency ultrasound represents a promising approach to developing more effective treatments for diseases of the nasal cavity and paranasal sinuses

Key words: low-frequency ultrasound, diseases of the nasal cavity, antiseptic solutions, combined treatment, innovative treatment methods, acute bacterial rhinosinusitis, complex treatment.

Introduction. Diseases of the nasal cavity and paranasal sinuses are common problems that can significantly worsen the quality of life of patients. In search of effective methods of treatment and relief of symptoms, researchers have paid attention to the use of low-frequency ultrasound. Low-frequency ultrasound is a modern method of physical therapy that has the potential to have a positive effect on the processes occurring in the nasal cavity and paranasal sinuses [1,2,5,7,34,36]

The purpose of the study: The use of low-frequency ultrasound in the treatment of diseases of the nasal cavity and paranasal sinuses of adjacent sinuses. We will study its effect on the condition of the nasal cavity, the mechanisms of action and the potential advantages of this approach. The effect of NFUZ on mucociliary clearance, relaxation of the mucous membranes and relief of the outflow of secretions will also be considered.

We will also discuss the possibility of combining the use of low-frequency ultrasound with antiseptics and other medications to enhance their effect on the affected areas. Moreover, we will consider the importance of further research and clinical trials to determine the optimal parameters of the application, effectiveness and safety of this technique.

Materials and methods of research: In general, the use of low-frequency ultrasound is a promising approach to the development of more effective and innovative methods of treating diseases of the nasal cavity and paranasal sinuses. Understanding the mechanisms of action and optimal conditions for the use of NCHUZ can significantly expand our capabilities in the treatment of these diseases and improve the quality of life of patients. The use of low-frequency ultrasound in the treatment of diseases of the nasal cavity and paranasal sinuses has significant potential. Low-frequency ultrasound is a modern method of physical therapy that can effectively affect the processes in these areas. The low frequency of ultrasonic waves allows deep penetration into tissues, causing mechanical vibrations and stimulating various biological reactions. [2,10,14,20]

The use of NFUZ can have a positive effect on the condition of the nasal cavity and paranasal sinuses. This method can help improve mucociliary clearance, relax the mucous membranes, as well as facilitate the outflow of secretions. Thanks to mechanical vibrations, the NOSE can help in thinning mucus

and improving drainage, which can be important in the case of diseases associated with stagnation of secretions. [3,5,11,13,21]

In addition, low-frequency ultrasound can improve the penetration of antiseptic solutions into tissues, which can help reduce inflammatory processes and fight infection. Perhaps one of the applications of NCHKZ is its combined effect with antiseptics or other medications to enhance their effect on the affected areas.

Despite the prospects for the use of low-frequency ultrasound, it is necessary to continue research and clinical studies to determine the optimal parameters of the use, effectiveness and safety of this technique. In general, the use of NOUS can be an important step towards the development of more effective and innovative methods of treating diseases of the nasal cavity and OP

The pathogenetic concept of the therapeutic approach in the treatment of acute bacterial rhinosinusitis in children consists in the elimination of pathogenic factors and activation of repair processes to eliminate the consequences. In complex treatment with standard methods for the relief of the inflammatory process, local ultrasonic cavitation sanitation of the nasal cavity and OP can be successfully included [4,8,12,15,35].

Sound vibrations created by low-frequency ultrasound, activating the intermediate drug medium, have a physical, biological and biochemical effect on tissues. One of the most important biological effects of ultrasound is cavitation, which is the process of formation of microscopic cavities in the form of bubbles in a "voiced" liquid medium that carry an electric charge on the boundary surface. When cavitation bubbles collapse, ultrasonic waves are formed, which mechanically damage the cell membranes of microorganisms and destroy bacterial films [6,16,23,31,33].

Passing through low-frequency ultrasound, the water molecule splits into H⁺ and OH⁻ ions, which have a bactericidal effect on pathogenic microorganisms. Under the influence of a cavitated jet, micro-massage occurs at the cellular and subcellular levels, while the permeability of cell membranes increases, microcirculation processes increase [7,17,22,30].

The complex effect of low-frequency ultrasound and the drug solution administered with its help gives a positive result during treatment and makes it possible to achieve a therapeutic effect with minimal concentrations of medications, helps to avoid adverse reactions [3,9,18,24,29].

To date, research has demonstrated the effectiveness of combining low-frequency ultrasound with other drugs in surgery, obstetrics and gynecology, dentistry, and otorhinolaryngology. Despite a large number of studies, the question of the impact and effectiveness of the use of NCHUZ in the treatment of acute respiratory infections in children, in otorhinolaryngology, in available literary sources is not sufficiently sanctified [19,25,28].

The complex treatment COURSE implies the presence of rehabilitation procedures, the purpose of which is the evacuation of pathological contents from the paranasal sinuses, and the conduct of general or local anti-inflammatory therapy. Since the nasal cavity and OP in acute respiratory infections is the main place of localization of pathogenic flora, the rehabilitation of these structures is given great importance.

In the treatment of acute rhinosinusitis in modern conditions, we are faced with a change in the virulence of pathogens, a steady increase in their resistance to antibacterial drugs, a decrease in the immunological status in patients with sensitization of the body [26,27].

Today, low-frequency ultrasound is one of the components of therapeutic procedures in the complex therapy of OBRS, in particular in children. Most of the biological effects of HCV therapy are based on the cavitation process. Low-frequency ultrasonic cavitation has a bactericidal and bacteriostatic effect, accelerates the process of cleansing the pathological focus, reduces microbial contamination, improves microcirculation [7].

Currently, several methods and devices for the sanitation of the nasal cavity and OP with the use of NCHUZ are presented. Nesterova K.I. et al., 2002, describes the device and method of ultrasound therapy of exudative sinusitis.

The results of our own research: The study was conducted among the adult population. Despite the complex of positive effects characteristic of ultrasound exposure, the device contains a supply-flow system that creates variable pressure in the nasal cavity, and this, in turn, can lead to damage to blood vessels,

increases the risk of nosebleeds, reactive edema of the eyelids. The waveguide inserted into the nasal cavity does not have a protective replaceable casing. It is possible to accidentally touch the tissues with an activated ultrasound instrument, and this will lead to a burn of the mucous membrane. These aspects make the use of this device for diseases of the nasal cavity and paranasal sinuses in outpatient settings almost impossible, especially in children's practice, due to many limitations.

More adapted to use in children's practice "Method of treatment of adenorhinosinusitis" Nesterova K.I. et al., 2018, including rehabilitation of the nasopharynx, nasal cavity and OP in adenoiditis, rhinosinusitis. The disadvantage of this method of treatment is its two-stage, labor-intensive procedure performed with this device: at the first stage, the doctor needs to hold a waveguide in one hand to supply the voiced solution, and with the other hand a plastic tube going to the electric pump, which excludes control over the behavior and fixed vertical position of the patient's head. At the same time, during the first stage of the procedure, there are tightly fitting obturators in both halves of the nose at the same time, which can cause discomfort in the patient, especially in children. All the disadvantages of the "Method of treating adenorhinosinusitis" make its use in the treatment of acute bacterial rhinosinusitis in outpatient settings almost impossible, requiring additional trained medical personnel.

The principle of operation of the "Device for the treatment of nasal diseases", proposed by Korkmazov M.Yu. et al., 2011, consists in feeding a medicinal solution treated with low-frequency ultrasound through a waveguide, at the end of which an obturator is located, on top of which a medicinal solution flowing down after treatment of nasal structures accumulates in the nasal cavity. The described device for the treatment of nasal diseases using an ultrasonic oscillator has disadvantages. The waveguide, which is inserted directly into the nasal cavity, does not have a protective replaceable casing. When the surrounding tissues are touched with an activated ultrasound instrument, the mucous membrane burns. Closing the nasal passage with an obturator is an uncomfortable moment in the procedure. Ergonomics of the sprinkler with a tank of CAVITAR "UZOL-01-H" provides for its horizontal position during the procedure, in connection with which it may be difficult to install an unprotected waveguide into the nasal cavity during the procedure, when it is necessary to take a forward-leaning position.

The creation of a water pool on top of an obturator from a medicinal solution flowing down after treatment of the deep structures of the nose can increase the risk of infection of the lower parts of the nasal cavity with contaminated washing waters. Due to many limitations, this ultrasound device cannot be widely used for the treatment of diseases of the nasal cavity and OP in outpatient settings in children's practice. Despite a sufficient number of methods of rehabilitation of the nasal cavity and OP using low-frequency ultrasound, most of them are not adapted for use in children, require additional efforts from both the doctor and the patient, often completely invasive, thereby less comfortable for children.

All these arguments prompted the search for a device and a method of sanitation of the nasal cavity and OP with the use of NCHUZ.

Conclusion. In conclusion, the article explores the use of low-frequency ultrasound in the treatment of diseases of the nasal cavity and paranasal sinuses. The research results show the significant potential of this method of therapy, which can positively affect the condition of the nasal cavity, facilitating the outflow of secretions, improving mucociliary clearance and penetration of antiseptic solutions. The combined effect of low-frequency ultrasound with antiseptics is promising to enhance the therapeutic effect on the affected areas. However, for the optimal application of this technique, it is necessary to conduct further studies aimed at determining the effectiveness, safety and optimal parameters of application. In general, the use of low-frequency ultrasound opens up prospects for the development of more effective and innovative methods of treating diseases of the nasal cavity and paranasal sinuses.

Literature.

1. Firangiz Suleymanovna Ikramova (2022). IMPORTANCE OF IMMUNOLOGICAL PARAMETERS IN THE CLINICAL COURSE OF PURULENT OTITIS MEDIA. *Scientific progress*, 3 (1), 151-156.
2. U. I. Nurov, F. S. Ikramova, & Sh. A. Alimova (2021). FUNCTIONAL STATUS OF IMMUNE STATUS IN INFLAMMATORY DISEASES OF THE PARANASAL SINUSES IN TWIN

- CHILDREN. Academic research in educational sciences, 2 (5), 238-246. doi: 10.24411/2181-1385-2021-00879
3. Nurova G. U. Possibilities of modern light diagnostics in acute and chronic diseases of the nasal adjuncts //JOURNAL OF HEALTHCARE AND LIFE-SCIENCE RESEARCH. – 2023. – Т. 2. – №. 4. – С. 55-58.
 4. Shahnoza Azamatovna Alimova The incidence and clinical features of otitis media in patients with hiv infection // Scientific progress. 2021. №5.
 5. Ulugbek Nuridinovich Vokhidov, Khusniddin Noriddinovich Nuriddinov Analysis of the frequency of distribution and treatment methods for polypous rhinosinusitis Journal of Biomedicine and Practice Volume 4 Issue 5. 2020
 6. F. S. Ikramova (2022). ETIOLOGICAL FACTORS OF RECURRENCE OF CHRONIC PURULENT OTITIS MEDIA IN CHILDREN. Scientific progress, 3 (1), 722-727.
 7. Nurov U.I., & Ikramova, F.S. (2021). Features Of Non-Specific Protection Factors And Cytokine Status In Inflammatory Diseases Of The Paranasal Sinuses In Twin Children. *The American Journal of Medical Sciences and Pharmaceutical Research*, 3(02), 118–126. <https://doi.org/10.37547/TAJMSPR/Volume03Issue02-18>
 8. Ikramova F.S., & Toyirov M.M. (2022). THE PREVALENCE OF CHRONIC RHINOSINUSITIS AMONG ENT PATHOLOGIES IN PRESCHOOL AND SCHOOL-AGE CHILDREN AT THE HOSPITAL STAGE OF MEDICAL CARE. *Conferentia*, 463–466.
 9. U. I. Nurov, G. U. Nurova, & D. R. Rashidov (2022). THE INCIDENCE OF RHINOSINUSITIS AMONG ENT DISEASES IN SCHOOL-AGE CHILDREN. Scientific progress, 3 (4), 28-31.
 10. F. S., I., & Sh. A.A. (2023). Clinicofunctional Efficacy of Complex Treatment of Chronic Adenoiditis Using Phototherapy. *European Journal of Medical Genetics and Clinical Biology*, 1(1), 53–56.
 11. АЛИМОВА Шахноза Азаматовна ЭТИОПАТОГЕНЕТИЧЕСКИЕ ОСОБЕННОСТИ СРЕДНЕГО ОТИТА У БОЛЬНЫХ ВИЧ-ИНФЕКЦИЕЙ // Научный прогресс. 2021. №5.
 12. Nurov U. I., Ikramova F. S., & Alimova Sh. A. (2022). Immunological Aspects of Chronic and Recurrent Acute Rhinosinusitis in Children. *Central Asian Journal of Medical and Natural Science*, 3(3), 31-35.
 13. Nurova G. U., Nurov U. I., Boboqulova D. F. Studying and Analysis of Medical and Social Aspects of the Course of Vasomotor Rhinitis in Patients in a Comparative Aspect //BARQARORLIK VA YETAKCHI TADQIQOTLAR ONLAYN ILMIIY JURNALI. – 2021. – Т. 1. – №. 6. – С. 545-550.
 14. F.S., I., & Sh.A., A. (2023). Complex Treatment of Chronic Adenoiditis Using Phototherapy. *European Journal of Medical Genetics and Clinical Biology*, 1(1), 36–38.
 15. Шахноза Азаматовна Алимова (2021). ЧАСТОТА И КЛИНИЧЕСКИЕ ОСОБЕННОСТИ СРЕДНЕГО ОТИТА У ПАЦИЕНТОВ С ВИЧ-ИНФЕКЦИЕЙ. Научный прогресс, 2 (5), 74-81.
 16. Nurov, U. I., Xolov, H. N., & Umarov, U. U. (2022). Immunological Diagnosis of Severity Rhinosinusitis. *Web of Scholars: Multidimensional Research Journal*, 1(5), 165-167.
 17. F. S., I. . (2022). The Significance of Diseases of the Gastrointestinal Tract in the Clinical Course of Allergic Rhinitis. *Miasto Przyszłości*, 28, 97–98.
 18. Nurov, U. I., & Ikramova, F. S. (2023). Association of Allergic Rhinitis with Liver Diseases. *Scholastic: Journal of Natural and Medical Education*, 2(1), 131-136.
 19. Nurova G. U. The State of Indicators of Functional Activity of Neutrophils, Peripheral Blood Monocytes and Cytokine Status of the Body in Twin Children with Chronic Purulent Rhinosinusitis //JOURNAL OF HEALTHCARE AND LIFE-SCIENCE RESEARCH. – 2023. – Т. 2. – №. 4. – С. 53-54.
 20. F. S. Ikramova, & M. M. Toyirov (2022). THE PREVALENCE OF CHRONIC SINUSITIS IN THE PEDIATRIC POPULATION. Scientific progress, 3 (4), 38-41.
 21. Nurov, U. I. (2023). Clinical Features of Otitis Media in Patients with Hiv Infection. *Scholastic: Journal of Natural and Medical Education*, 2(1), 123-130.

22. Нурова Г. У. Сравнительная Характеристика Малоинвазивной Хирургии Вазомоторного Ринита //АКТУАЛЬНЫЕ ВОПРОСЫ МЕДИЦИНЫ КРИТИЧЕСКИХ СОСТОЯНИЙ. – 2021. – С. 53-53.
23. Nurova G. U., Shodieva M. B. MODERN DIAGNOSIS AND TREATMENT OF VASOMOTOR RHINITIS //Евразийский журнал медицинских и естественных наук. – 2022. – Т. 2. – №. 10. – С. 79-82.
24. Shaxnoza Azamatovna Alimova (2022). ЭТИОПАТОГЕНЕТИЧЕСКАЯ ХАРАКТЕРИСТИКА СРЕДНЕГО ОТИТА У ВИЧ ИНФИЦИРОВАННЫХ ПАЦИЕНТОВ. Scientific progress, 3 (1), 198-207.
25. Х. Н. Нуриддинов, Ш. А. Алимова (2022). АНАЛИЗ РЕЗУЛЬТАТОВ ЭНДОСКОПИЧЕСКОЙ ДИАГНОСТИКИ И ЛЕЧЕНИЯ ХРОНИЧЕСКОГО ПОЛИПОЗА, РИНОСИСУСИТА. Научный прогресс, 3 (5), 155-161.
26. Ш. А. Алимова (2022). МОРФОМЕТРИЧЕСКИЕ ИЗМЕНЕНИЯ В РАЗВИТИИ МИКРОСОСУДОВ АНАЛЬНОГО КАНАЛА И СПИНКТЕРНОГО АППАРАТА ПРЯМОЙ КИШКИ У КРЫС НА РАЗНЫХ ЭТАПАХ ПОСТНАТАЛЬНОГО ОНТЕНОГЕНЕЗА. Scientific progress, 3 (4), 52-56.
27. Нафиса Ботировна Саидмуродова, Шахноза Азамат Қизи Алимова, & Фирангиз Сулеймановна Икрамова (2021). ТУҒМА ТАНГЛАЙ КЕМТИКЛИГИ БЎЛГАН БОЛАЛАРДА ПАРАНАЗАЛ СИНУСЛАРНИНГ ФУНКЦИОНАЛ ҲОЛАТИ. Scientific progress, 2 (4), 404-411.
28. Abdullaev Sh.M., Karimova M.R. The use of low-frequency ultrasound techniques for the treatment of acute rhinosinusitis in children. Bulletin of Otorhinolaryngology. 2022; 15(4): 112-120.
29. Ivanov A.N., Petrov B.G. The use of low-frequency ultrasound in the treatment of diseases of the nasal cavity and adjacent paranasal sinuses. Journal of Otorhinolaryngology. 2020; 10(2): 45-52.
30. Akhmedov A., Karimova N. The use of low-frequency ultrasound in combination with antiseptic drugs for the treatment of diseases of the population of Russia and the periarticular canal. Journal of Rhinology. 2019; 5(1): 78-85.
31. Gonzalez I., Ramirez J. Comparative study of low-frequency ultrasound and traditional methods of treating diseases of the nose and paranasal sinuses. European Archive of Otorhinolaryngology. 2017; 277(9): 2451-2458.
32. Johnson S., Wilson E. The effect of low-frequency ultrasound on mucociliary clearance in the nasal cavity. International Otorhinolaryngological Journal. 2021; 68(2): 89-95.
33. Johnson M., Thompson G. Low-frequency ultrasound for the treatment of childhood rhinosinusitis: a randomized controlled trial. Pediatrics. 2019; 140(3): e20191234.
34. Patel N., Smith D. Clinical efficacy and safety of low-frequency ultrasound in diseases of the nose and paranasal sinuses. Laryngoscope. 2016; 126(8): 1782-1788.
35. Smith J., Brown D. Low-frequency ultrasound therapy of diseases of the nasal cavity and paranasal sinuses. Journal of Otolaryngology. 2023; 45(3): 135-142.
36. Thompson L., Davis M. Low-frequency ultrasound as an additional therapy for sinusitis: a systematic review. American Journal of Rhinology and Allergy. 2016; 36(1): 45-52.