ANNOTATION

of the dissertation work of Bekniyazova Assema Zhanaskhanovna on the theme: "The effect of various modes of vibroacoustic therapy on the course of coronavirus infection complicated by acute respiratory failure", submitted for the degree of Doctor of Philosophy (PhD) on specialty 8D10102- "Medicine"

Relevance of the study

Coronavirus infection is a dangerous infectious disease that can lead to serious lung damage. The disease can occur with varying degrees of damage to the respiratory system, in severe cases it can lead to acute respiratory failure (Cates J.et al, 2020). Treatment of patients with coronavirus pneumonia requires an adequate integrated approach, including physiotherapy (Melitta A. et al, 2022, Smondack P. et al, 2020). Data on the effectiveness of low-frequency chest vibrations in the treatment of lung diseases are limited. Vibroacoustic pulmonary therapy is a component of physiotherapy that improves perfusion and drainage of the lungs without the active participation of the patient (CP of the Ministry of Health of the Republic of Kazakhstan "Vibroacoustic pulmonary therapy").

Despite the end of the pandemic, isolated cases of the disease, as well as kidney-shaped lung lesions, are still found today (Hirawat R.et al, 2023). The use of a vibroacoustic device for the lungs can become a key link in the rehabilitation and comprehensive treatment of this category of patients.

To optimize the use of vibroacoustic lung therapy (VALT) modes in the complex treatment of patients with coronavirus infection complicated by acute respiratory failure (ARF).

Object and subject of research

• The object of the study: patients with coronavirus infection complicated by acute respiratory failure.

• The subject of the study: the effect of various VALT regimens on the course of coronavirus infection complicated by ARF.

Research objectives

1. To compare the effectiveness and safety of the use of vibroacoustic pulmonary therapy regimens in the complex treatment of patients with coronavirus infection complicated by;
2. To evaluate the effectiveness of the «ARDS» regimen in patients with coronavirus infection complicated by acute respiratory failure in arterial blood (PaO2, PaCO2);
3. To evaluate the effectiveness of the "Pneumonia" regimen in patients with coronavirus infection complicated by acute respiratory failure in arterial blood (PaO2, PaCO2);
4. To develop a VALT protocol for patients with coronavirus infection complicated by ARF.

Method.

The study is a simple, blind, pilot randomized trial. The data was collected in the intensive care unit from 2021 to 2022. Immediately before the procedure, arterial blood was taken once in the morning to determine PaO2, PaCO2 and P/F blood, as well as 10 minutes after the session.

All data were entered into the database MC Excel as the researcher registers patients. After the specified period, the data was subjected to statistical processing.
The sample size was not calculated due to uneven registration of coronavirus patients at different times from 2021 to 2022 due to the variability of the peak incidence. The participants were randomly assigned to either the main or the comparison group in a 1:1 ratio using a random number generator on the website. www.randomizer.org . The researcher handed the medical staff a pre-prepared opaque envelope with randomly assigned numbers. Due to the need to select a mode on the device's display screen, all medical staff knew about the selected mode, while it was hidden from the patient. The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20.

The novelty of the study

For the first time, a pilot randomized controlled trial was conducted aimed at a comparative assessment of various modes of vibroacoustic therapy in patients with COVID-19 complicated by acute respiratory failure. New data have been obtained on the effect of the parameters of the vibroacoustic effect on the dynamics of respiratory parameters, which makes it possible to justify the choice of the optimal therapeutic regimen.

Practical significance

Vibroacoustic lung therapy has been introduced into the practice of complex treatment of patients complicated by respiratory insufficiency, which makes it possible to accelerate the restoration of respiratory functions, shorten the duration of hospitalization and increase the effectiveness of rehabilitation. The research materials can be used in the activities of pulmonologists, physiotherapists and rehabilitologists, as well as in the development of clinical recommendations.

The main provisions submitted for defense

- The use of a certain regimen in complex therapy for acute respiratory failure can improve the parameters of gases in arterial blood;
- Choosing a specific regimen will help to purposefully treat a certain respiratory pathology.;
- VALT in complex therapy improves respiratory function and, as a result, reduces the duration of inpatient treatment.

Work approbation

The main results of the research and the provisions of the dissertation were reported and discussed at:

1. Forum of Anesthesiologists and Intensive Care Specialists of Russia 2021 (October 9, 2021);
2. Forum of Anesthesiologists and Intensive Care Specialists of Russia 2022 (October 16, 2022);
3. 5th International Forum of Anesthesiologists of Resuscitators of Kazakhstan (June 24-25, 2022);
4. Republican Scientific and practical conference with international participation "Innovations in Traumatology and Orthopedics" (July 27-28, 2023);
5. Bark Technology Contract with NAO MUA 2022-2023;

6. Act of implementation “Use of vibroacoustic pulmonary apparatus in patients with trauma complicated by respiratory failure” at the N.D. Batpenov National Research Medical Center;
7. Copyright certificate No. 40520;
8. Development of the clinical protocol of the Ministry of Health of the Republic of Kazakhstan dated September 16, 2022. Protocol No. 169 “Vibroacoustic pulmonary therapy".

Manuscripts:

1. Assema Bekniyazova, Aidos K Konkayev, Assiya Kadralinova, Maiya E Konkayeva, Aigerim A Yeltayeva. Case Report: Complex Treatment Using Vibroacoustic Therapy in a Patient With Co-Infection and COVID-19. Frontiers in medicine. 2022 Jun 7:9:893306. doi: 10.3389/fmed.2022.893306. Q1
2. Aidos K Konkayev, Assema Bekniyazova. Vibroacoustic therapy in the treatment of patients with COVID-19 complicated by respiratory failure: a pilot randomized controlled trial. Frontiers in medicine. 2023 Dec 14:10:1225384. doi: 10.3389/fmed.2023.1225384. Q2
3. Aidos Konkayev, Assema Bekniyazova, Zaituna Khamidullina, Maiya Konkayeva. Case series report: Use of vibroacoustic pulmonary therapy in patients with thoracic trauma complicated by acute respiratory failure. Front. Med., 04 September 2024. Sec. Intensive Care Medicine and Anesthesiology. Volume 11 - 2024 | https://doi.org/10.3389/fmed.2024.1399397. Q1

3 articles have been published on the topic of scientific work, which are included in the first quartile (2 articles) and the second quartile (one article) on the impact factor according to the Journal Citation Reports of Clarivate Analytics. In one of the articles, the doctoral student is the first author and the corresponding author.

Results

According to the stated purpose and objectives of the thesis, the influence of modes of the vibroacoustic pulmonary apparatus of domestic production was investigated.

The following results were obtained:

-as for the initial data of patients in both groups, age and gender were not statistically significant, and there were no significant differences when analyzing the APACHE II, qSOFA, and PADUA scales. According to laboratory tests, the patients showed a difference in the average values of CRP, IL-6, and ESR;

-in the «ARDS» group, on the first day, the average PaO2 value increased by 12.5 mmHg after the procedure, the median increased by 7.8 mmHg, 95% CI within [69.8–85.2], and the standard deviation after the procedure was 20.6 mmHg.;

-as for the group using the «Pneumonia» mode, the results on the change in PaCO2 levels on the third day showed the following: the average "Do" value was 43.6 mmHg, median was 37.6, CI was 95% [37.2-50], and the standard deviation was 17 mmHg. and "After": the average value was 48.7, the median was 39.6, 95% CI [40.8–56.6], the standard deviation was 21.1 mmHg.

In addition, vibroacoustic therapy has shown effectiveness in the treatment of patients with coronavirus infection complicated by respiratory failure, against the background of periprosthetic infection and severe comorbid background, despite the high risk of

an adverse outcome. A positive effect was also observed in patients with chest injury complicated by respiratory failure.

Vibroacoustic pulmonary therapy is included in the clinical protocol for the treatment of patients with respiratory disorders, including coronavirus infection complicated by respiratory failure.

Conclusions

Coronavirus infection, despite the end of the pandemic, still occurs today in a milder form and not on the same scale as it was at the beginning of the spread of the virus, but it can also be complicated by respiratory failure and have long-term effects on the respiratory system. An integrated approach using vibroacoustic therapy can improve outcomes.

1. The ARDS and Pneumonia regimens have demonstrated efficacy and safety when used in patients with coronavirus infection complicated by acute respiratory failure.;
2. The «ARDS» mode increases the partial oxygen voltage in arterial blood;
3. The "Pneumonia" mode affects the reduction of the partial voltage of carbon dioxide in arterial blood;
4. The Clinical Protocol of the Ministry of Health of the Republic of Kazakhstan dated September 16, 2022 has been developed. Protocol No. 169 “Vibroacoustic pulmonary therapy".

The scientific direction of the dissertation corresponds to the priority development of science, approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan – Science of Life and Health.

Personal contribution of the dissertant

During the study, the dissertant participated in the formation of the methodological structure, formulation of the aim and objectives, collection of research materials, independently conducted statistical analysis and generalization of the obtained results, performed clinical and laboratory interpretation of patient data, analysis of literary data on the topic of the dissertation work.