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NON-INVASIVE LUNG VENTILATION IN ACUTE RESPIRATORY FAILURE CAUSED BY NEW CORONAVIRUS INFECTION COVID-19

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✓ ***Resume***

Relevance. Treatment of acute respiratory distress syndrome caused by coronavirus infection remains an urgent problem in the world community.

Objective of the study: Improving the results of treatment of patients with acute respiratory failure by differentiated use of non-invasive ventilation methods.

Material and methods: In the intensive care unit of the Zangiot infectious diseases hospital No. 1 from 08.2020 to 11.2020, 124 patients with COVID-19 and complicated acute respiratory failure were examined, of which 68 were men and 56 women. The male to female ratio was 4: 3. The patients' age is from 67 to 87 years. (average age 60.8 ± 4.8).

The patients were divided into three groups depending on the type of respiratory therapy.

As a result of the study, the tidal volume (TO) was 319.59 ± 7.74 ml in the CPAP mode and 329.47 ± 7.15 ml in the DUAL-LEVEL mode. On the third day, DO increased by 18.8% in CPAP mode and by 23.2% in DUAL-LEVEL mode. In phase III of the study, DO increased in both groups and increased to 521.31 ± 13.83 ml in the CPAP mode and to 583.77 ± 15.37 ml in the DUAL-LEVEL mode, that is, in the DUAL-LEVEL mode, the DO was by 10 , 6% higher than in CPAP mode.

Conclusion: Both modes of non-invasive pulmonary ventilation give positive clinical results, improve indicators of central hemodynamics, normalize blood gas composition and parameters of external respiration. In this case, DUAL-LEVEL mode is much more effective than CPAP mode.

Key words: COVID-19, acute respiratory failure, non-invasive ventilation, external respiration.

НЕИНВАЗИВНАЯ ВЕНТИЛЯЦИЯ ЛЕГКИХ ПРИ ОСТРОЙ ДЫХАТЕЛЬНОЙ НЕДОСТАТОЧНОСТИ, ОБУСЛОВЛЕННОЙ НОВОЙ КОРОНАВИРУСНОЙ ИНФЕКЦИЕЙ COVID-19

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✓ ***Резюме***

Актуальность. Лечение острого респираторного дистресс-синдрома, вызванного коронавирусной инфекцией, остается актуальной проблемой в мировом сообществе.

Цель исследования: Улучшение результатов лечения больных с острой дыхательной недостаточности путём дифференцированного применения неинвазивных методов вентиляции.

Материал и методы: В отделении реанимации инфекционной больницы Зангиота №1 с 08.2020 по 11.2020 года обследовано 124 пациента с COVID-19 и осложненным острой дыхательной недостаточностью, из них 68 мужчин и 56 женщин. Соотношение мужчин и женщин было 4:3. Возраст пациентов от 67 до 87 лет. (средний возраст 60,8 ± 4,8).

Пациенты были разделены на три группы в зависимости от вида респираторной терапии.

В результате исследования дыхательный объем (ДО) составил 319,59 ± 7,74 мл в режиме CPAP и 329,47 ± 7,15 мл в режиме DUAL-LEVEL. На третий день ДО увеличился на 18,8% в режиме CPAP и на 23,2% в режиме DUAL-LEVEL. В фазе III исследования ДО увеличился в обеих группах и увеличился до 521,31 ± 13,83 мл в режиме CPAP и до 583,77 ± 15,37 мл в режиме DUAL-LEVEL, то есть в режиме DUAL-LEVEL ДО был на 10,6% выше, чем в режиме CPAP.

Вывод: Оба режима неинвазивной легочной вентиляции дают положительные клинические результаты, улучшают показатели центральной гемодинамики, нормализуют газовый состав крови и параметры внешнего дыхания. В этом случае режим DUAL-LEVEL намного эффективнее, чем режим CPAP.

Ключевые слова: COVID-19, острая дыхательная недостаточность, неинвазивная вентиляция легких, объем дыхания, внешнее дыхание.

ЎТКИР НАФАС ЕТИШМОВЧИЛИГИ БИЛАН АСОРАТЛАНГАН ЯНГИ КОРОНАВИРУС ИНФЕКЦИЯСИ COVID-19да НОИНВАЗИВ ЎПКА ВЕНТИЛЯЦИЯСИ

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✓ ***Резюме***

Долзарблик. Дунё ҳамжамиятида коронавирус инфекцияси оқибатида келиб чиққан ўткир респиратор дистесс синдромини даволаш долзарб муаммо бўлиб қолмоқда.

Тадқиқотнинг мақсади: ноинвазив ўпка вентиляциясини қиёсий қўллаш орқали ўткир нафас етишмовчилиги бўлган беморларни даволаш натижаларини яхшилаш.

Материаллар ва усуллар: 1- сонли Зангиота юқумли касалликлар шифохонасининг реанимация бўлимида 08. 2020 дан 11. 2020 йилгача COVID-19га чалинган ва ўткир нафас етишмовчилиги билан асоратланган 124 та беморда илмий тадқиқот олиб борилди, улардан 68 нафари эркаклар ва 56 нафари аёллар. Эркаклар ва аёлларнинг нисбати 4:3 ни ташкил қилди. Беморлар 67 ёшдан 87 ёшгача эди. (ўртача ёш 60,8±4,8 ни ташкил қилди).

Хулоса: Ноинвазив ўпка вентиляциясининг ҳар иккала режими ижобий клиник натижалар беради, марказий гемодинамика кўрсаткичларини яхшилайди, қоннинг газ таркиби ва ташқи нафас олиш кўрсаткичларини меёрлаштиради. Бунда DUAL-LEVEL режими CPAP режимига қараганда анча самаралироқдир.

Калит сўзлар: COVID-19, ўткир нафас етишмовчилиги, ноинвазив ўпка вентиляцияси, нафас ҳажми, ташқи нафас.

Relevance

The number of patients with infection complicated by severe acute respiratory syndrome caused by coronavirus-2 (SARS-CoV-2) is growing steadily all over the world [1,2], including in Uzbekistan. The new coronavirus infection, dubbed COVID-19, is characterized by a severe course and a high mortality rate [3, 4]. The most common complication of COVID-19 is viral pneumonia, which leads to the development of acute respiratory distress syndrome and acute respiratory failure (ARF), which in most cases requires the appointment of oxygen therapy and respiratory support [5,6].

The study in recent decades of generally accepted methods of artificial respiration has revealed their adverse effects on some vital functions of the body, in particular on central hemodynamics, pulmonary and peripheral circulation.

The most important task in the treatment of ARF is to ensure adequate tissue oxygenation to prevent tissue dysfunction and the development of multiple organ failure. For this it is extremely important to maintain the partial pressure of oxygen in arterial blood (PaO2) within the normal range (95 - 98%). In this regard, it seems significant to use non-invasive ventilation (NVL), which allows RP without tracheal intubation [7].

NVL allows you to safely and effectively achieve unloading of the respiratory muscles, restoring gas exchange and reducing dyspnea. During NVL, the patient-respirator relationship is carried out using nasal or face masks, the patient is conscious and, as a rule, the use of sedative and muscle relaxants is not required. Mask ventilation allows to reduce to a minimum the number of infectious and "mechanical" complications of RP and at the same time to effectively improve gas exchange and reduce the load on the respiratory apparatus [7,8].

NVL is not expensive, is well tolerated by patients and is a more comfortable procedure than conventional ventilation. However, attempts to determine the role and place of NVL in patients with ARF are very few. The results obtained are very contradictory; moreover, in the literature there are various opinions about the effect of NLV on hemodynamics, blood gas composition and external respiration in patients with ARDS, depending on the clinical course of the disease.

Objective of the study: To improve the results of treatment of patients with acute respiratory failure by differentiated use of non-invasive ventilation methods.

Material and methods

In the intensive care unit of ZIB No. 1 from 08.2020 to 11.2020. under our supervision there were 124 patients with COVID-19 complicated by ARF, of which 68 were men and 56 were

women. The ratio of men and women was 4: 3. Patients were aged 67 to 87 years. (average age 60.8 ± 4.8 years).

The patients were divided into three groups depending on the ventilation mode. Group 1 consisted of 40 atients who underwent traditional methods of treating patients with COVID-19, oxygen therapy through Venturi masks. Group 2 included 42 patients who, together with traditional methods of treatment, underwent non-invasive ventilation in (Constant Positive Airway Pressure – CPAP) mode. 42 patients of group 3, in contrast to the second, underwent DUAL-LEVEL mode, i.e. generally recognized Bilevel positive airway pressure - BiPAP regimen.

All three groups were representative in terms of key indicators. Group 1 included 21 (52.5%) men and 19 (47.5%) women, group 2 included 29 (69%) men and 13 (30.9%) women, and third group 30 (71.4%) men and 12 (28.5%) women ($p > 0.05$).

At the age of 40 to 50 there were 20 (16.1%) patients, from 51 to 60 years - 35 (28.2%), from 61 to 70 years - 43 (34.6%), over 71 years 38 (30.6%). Most of the patients were between 61 and 70 years of age. The average age of patients in the main group was 60.8 ± 4.83 years, in the control group - 60.3 ± 3.28 years, $p > 0.05$ ($t = 0.11$, $p > 0.05$).

The diagnosis of COVID-19 in all patients was made based on the results of general clinical and laboratory-instrumental research methods (fever, cough, fatigue, shortness of breath, headaches, palpitations, sore throat, runny nose, decreased sense of smell and taste, confirmation of PCR analysis of COVID- 19.). On admission, all patients studied the level of D-dimer, CRP, ALT, AST, coogulograms and, indicators of CHD, blood saturation and external respiration.

Clinical manifestations of ARF were: shortness of breath, diffuse diffuse cyanosis and acrocyanosis, tachycardia, fever.

Treatment included antibiotics, anticoagulants, antiplatelet agents, proton pump inhibitors, and symptomatic therapy. Oxygen therapy was carried out using Venturi masks under the control of SatO2 (SatO2> 90%) and arterial blood gas composition.

The function of external respiration was determined by the apparatus for respiratory support Aventa-M "Ural Instrument-Making Plant", Russia, intended for both invasive and non-invasive ventilation of the lungs (Fig. 1).

Figure: one. External view of the Aventa-M artificial ventilation apparatus and the face mask for NVL.

Respiratory volume (VT), frequency (f), minute ventilation (MV), mean airway pressure (P medium), positive airway pressure (PEEP), compliance (C), airway resistance (R), oxygen fraction were determined in the inhaled mixture (FiO2). The parameters of external respiration were recorded at the beginning of the NVL and at the stages of the study.

NVL technique: Non-invasive ventilation of the lungs was carried out using a face mask with the same Aventa-M apparatus in CPAP and DUAL-LEVEL modes, i.e. generally recognized BiPAP regimen. (fig. 2).

The parameters of the positive airway pressure were set taking into account the generally accepted norms: in the CPAP mode, the constant positive airway pressure was from 7 to 25 cmH2O; in the DUAL-LEVEL mode, inspiration was maintained with a pressure of 25 cmH2O. Art., and a positive end-expiratory pressure (PEEP) 5-15 cm H2O. FiO2 in the inhaled mixture was selected so as to provide sufficient oxygenation of arterial blood above 94-95%. On average, FiO2 was 70%.

Inspiratory and expiratory triggers were individually selected to maximize patient respiratory comfort.

Fig. 2 General view of the patient during non-invasive ventilation.

From the moment of admission and during treatment, continuous non-invasive monitoring of systolic blood pressure (SisBP), mean arterial pressure (MAP), diastolic arterial pressure (DiasBP), HR, RR, SatO2 was carried out, and continuous ECG monitoring was performed using a heart monitor.

The indicators of external respiration were studied at the stages: I-outcome; II - on the 3rd day; III - on the 6th day of the study.

The results of the studies were processed statistically on a computer using Excel 70 programs. For each series of results, the arithmetic mean (M), standard deviation (σ), and error of the mean (m) were calculated. In addition, the median was calculated for the indicators with the wrong distribution. In tables and graphs, the results are presented as M ± m. Student's t-test was used to compare the mean values. To assess the correlation, nonparametric methods were used, in particular, Spearman's correlation analysis.

Comparative analysis of nonparametric features was carried out according to contingency tables using the ,2 criterion. In order to identify factors of independent significance, multivariate logistic regression analysis was used. The level of reliability of statistical indicators was taken as $p < 0.05$.

Result and discussion

The state of external respiration in patients with ARF was judged by such indicators as tidal volume, respiratory rate, total tidal volume, minute ventilation of the lungs, lung compliance or compliance (compl ml / cm water column).

In patients of the 1st group, before treatment, d / o was 3.99 ± 0.03 ml / kg, the NPV as the first sign of respiratory failure reached 31.03 ± 0.42 per minute, the DO was 323.21 ± 8.59 ml, MV was at the level of 10006.31 ± 288.16 ml, compliance-compl. 22.68 ± 0.63 ml / cm water column (Table 1).

Patients in this group had all the clinical signs of ARF: shortness of breath, diffuse cyanosis. The patients were started with a standard therapeutic measure: drug treatment and oxygen therapy.

At the second stage, the indicators of external respiration were re-studied, the d / o increased to 4.45 ± 0.07 ml ($P < 0.001$), the respiratory rate decreased to 25.15 ± 0.48 per minute, i.e. by 19%, DO increased to 397.26 ± 23.01 ml ($P < 0.05$), there was an insignificant decrease in MV to 9907.54 ± 545.92 ml, ($P > 0.05$), sompl. increased to 29.66 ± 1.69 ml / cm of water column, significantly ($P < 0.05$) compared with the initial indicator.

Patients continued intensive therapy and, on the 6th, day repeated all the above studies to determine the parameters of external respiration (Table 1). d / o increased to 5.37 ± 0.06 ml / kg ($P < 0.001$), NPV decreased to 22.68 ± 0.42 per minute, significantly compared with the initial value and the second stage. The DO increased significantly to 481.08 ± 27.48 ml, significantly compared to the initial state and the previous stage.

Minute ventilation of the lungs increased to 10916.69 ± 671.45 ml, i.e. by 8.3%. Compl increased to 37.31 ± 2.10 ml / cm of water column, significantly compared with stages I and II.

Study of the saturation of xylene in the blood, i.e. saturation (SatO2) showed that in patients of the 1st group in the initial state oxygenation was at a low level. Subcompensated respiratory acidosis was noted. One of the most important indicators of the state of the respiratory function is SatO2, this indicator 3 days after the start of traditional therapy in patients of the 1st group

significantly increased by 3% from the initial one.

Thus, in patients with ARF who took traditional therapy, there is an increase in d\o, D\O, sompl., Most pronounced on the 6th day from the start of therapy.

Table 1. Respiratory function indicators in patients of the control group

Index	Research phase		
	initial	3-rd day	6-th day
t/v, ml/kg	3,99±0,03	4,45±0,07***	5,37±0,06***
respiratory rate per minute	31,03±0,42	25,15±0,48***	22,68±0,42***
Tidal volume, ml	323,21±8,59	397,26±23,01*	481,08±27,48**
MV, мл	10006,31±288,16	9907,54±545,92	10916,69±671,45
compl., ml/sm вwater column	22,68±0,63	29,66±1,69*	37,31±2,10***

*Note * P <0.05. ** p <0.01. *** p <0.001. compared to the original state.*

Table 2 shows that before treatment in patients of this group, d / o was 3.95 ± 0.03 ml / kg, on the 3rd day after the start of therapy in the Constant Positive Airway Pressure-CPAP mode, this indicator significantly increased to 4.88 ± 0.08 ml (p <0.001.), and on the 6th day 6.43 ± 0.07 ml / kg, i.e. by 38.5% compared to the initial state and by 24.1% compared to the previous stage. The NPV on the 3rd day was equal to 24.29 ± 0.57 / min (before treatment 31.79 ± 0.47 / min) (p <0.001), and on the 6th day it was within the normal range.

Three days later, there was also an increase in DO from 319.59 ± 7.74 to 393.86 ± 9.52 ml. (p <0.001), and on the 6th day up to 521.31 ± 13.83 ml (P <0.001) compared with the initial state (P <0.001) compared to stage II.

On the part of MV, no significant changes were observed, which is probably associated with a decrease in NPV despite an increase in DO. Compliance in the initial state was 22.25 ± 0.58 ml / cm of water column, after on the 3rd day 31.44 ± 0.85 (p <0.001), on the 6th day 44.90 ± 1, 27 is reliable in relation to stages I and II.

In group 2 patients, before treatment, oxygenation was at a low level: Sat O2 - 84.6 ± 0.54% against the background of hypoxia. At the second stage of the study, after the start of treatment, it showed that SatO2 increased by 6.2%. On the 6th day of the study, an increase in SatO2 was noted - by 10.4% (in control, by 7%).

Table 2. Respiratory function indices in patients receiving NVL in CPAP mode.

Index	Research phase		
	initial	3-rd day	6-th day
t/v, ml/kg	3,95±0,03	4,88±0,08***	6,43±0,07***
respiratory rate per minute	31,79±0,47	24,29±0,57***	20,69±0,31***
Tidal volume, ml	319,59±7,74	393,86±9,52***	521,31±13,83****^
MV, ml	10140,3±278,6584	9552,7±312,2	10838,5±377,3
compl., ml/sm вwater column	22,25±0,58	31,44±0,85***	44,90±1,27***

*Note * P <0.05: * * - p <0.01. *** p <0.001. compared to the original state.*

When comparing the indicators of patients in groups 1 and 2 (Table 3), it was found that in the CPAP - d / o group it was 16.4%, the NPV was 8.7% higher than in patients receiving traditional therapy. On the part of MV, no significant changes were noted.

Table 3. Respiratory function indices in patients receiving traditional therapy (numerator) and NLV in CPAP mode (denominator).

Parameters	Groups	initial	3-rd day	6-th day
t/v, ml/kg	1-gr.	3,99±0,03	4,45±0,07***	5,37±0,06***
	2-gr.	3,95±0,03	4,88±0,08***	6,43±0,07***^
respiratory rate per minute	1-gr.	31,03±0,42	25,15±0,48***	22,68±0,42***
	2-gr.	31,79±0,47	24,29±0,57***	20,69±0,31***^
Tidal volume, ml	1-gr.	323,21±8,59	397,26±23,01*	481,08±27,48**
	2-gr.	319,59±7,74	393,86±9,52***	521,31±13,83***

MV, ml	1-gr.	10006,31±288,16	9907,54±545,92	10916,69±671,45
	2-rp.	10140,3±278,6	9552,7±312,2	10838,5±377,3
compl., ml/sm	1-rp.	22,68±0,63	29,66±1,69*	37,31±2,10***
вwater column	2-rp.	22,25±0,58	31,44±0,85***	44,90±1,27***^

*Note * P <0.05: ** p <0.01. *** p <0.001. compared to the original state.*

Tidal volume compared with the control increased by 7.71% ((Fig. 3.9), comp. by 16.9%.

Thus, in patients with ARF who took CPAP therapy, there is a more significant increase in tidal volume, total tidal volume, and lung compliance, which indicates the effectiveness of this NVL regimen.

In group 3 patients, before treatment, oxygenation was at a low level - SatO2 - 83.4 ± 0.50%, which indicates severe respiratory failure. On the 3rd day after the onset of NVL in the DUAL-LEVEL mode, an increase in SatO2 by 9.2% was observed.

At stage III, SatO2 increased by 13%, significantly compared with the baseline and stage 2 of the study.

Table 4 shows that in patients with ARF who received NLV in the DUAL-LEVEL mode on the background of traditional therapy, the d / s in the initial state was 4.0 ± 0.03 ml / kg; on the 3rd day after the start of therapy, the d / o increased to 5.2 ± 0.04 ml, (p <0.001), and on the 6th day, 7.07 ± 0.09 ml / kg, i.e. by 43.4% of the original data. The NPV in the initial state was 32.00 ± 0.31 per minute, which confirms the presence of respiratory failure, on the 3rd day it decreased to 22.24 ± 0.31 per minute (p <0.001), on the 6th day it was within normal limits values -19.62 ± 0.22 min.

Table 4. Respiratory function indices in 0 patients who received conventional therapy and NVL in the DUAL-LEVEL mode.

Parameters	Research phase		
	initial	3-rd day	6-th day
t/v, ml/kg	4,0±0,03	5,2±0,04***	7,07±0,09***
respiratory rate per minute	32,00±0,31	22,24±0,31***	19,62±0,22***
Tidal volume, ml	329,47±7,15	429,38±10,43***	583,77±15,37***
MV, ml	10545,1±245,67	9586,1±298,68*	11469,04±343,5**
compl., ml/sm вwater column	23,01±0,54	35,07±0,86***	52,24±1,34***

*Note * p <0.05: ** p <0.01. *** p <0.001. compared to the original state.*

Three days after the start of therapy, the DO increased to 429.38 ± 10.43 ml (p <0.001), i.e., by 23.2% on the 6th day to 583.77 ± 15.37 ml, or by 43.5% of the initial and 26.4% of stage II. On the part of minute ventilation of the lungs, no significant changes were observed in stage II, only at stage III there was a significant increase in MV (p <0.01).

Comp. in the original was 23.01 ± 0.54 ml / cm. water column, after three days 35.07 ± 0.86 (p <0.001), at stage III 52.24 ± 1.34 (P <0.001 compared with the initial state; P <0.001 - compared with stage II).

Thus, in patients who received NVL in the DUAL-LEVEL mode, the d / o was 24% higher, and the respiration rate was 13.4% lower than in patients receiving traditional therapy. On the part of minute ventilation of the lungs, no significant changes were registered.

As for DO, on the 6th day after the start of therapy, it increased to 583.77 ± 15.37 ml (P <0.001), i.e. by 43.5%. compared with the initial state and by 26.4% compared with stage II. The preschool education at the II stage increased by 17.3%, at the III stage - by 14.1%.

In the groups that received respiratory support, NVL was successful in 86.6% of patients. In these patients, when using NVL, resolution of DN phenomena was observed, and subsequently they were transferred to spontaneous breathing.

Ineffectiveness of NVL was noted in 20 patients, signs of ineffectiveness of NVL were a decrease in PaO2 below 60 mm Hg, blood saturation up to 70%, an increase in PaCO2 more than 50 mm Hg. and hemodynamic instability, in connection with this NVL was discontinued and the patients were transferred to mechanical ventilation in the IPPV mode.

In the control group, in 16 cases against the background of traditional therapy, no decrease in DN was observed, and then they were transferred to absolute indications of mechanical ventilation and ventilated in the IPPV mode. In the same group of the environment who received mechanical ventilation, only one patient was extubated due to an improvement in the parameters of the blood gas composition and indicators of central hemodynamics. The duration

of mechanical ventilation in the surviving patient was 1 day.

In order to assess the effectiveness of NVL regimens, we carried out a comparative analysis of external respiration indicators. Table 4.3 shows that the d / o in the examined patients before treatment was below normal values - respectively 3.95 ± 0.03 and 4.0 ± 0.03 ml / kg. Three days later, there was a significant increase in d / o in both modes (P <0.05), and significant changes were found between the groups (P <0.05). On the 6th day, there was a significant increase in d / o by 38.5% in the CPAP mode and by 43.4% in the DUAL-LEVEL mode (Table 5).

The NPV in patients with ARF was higher than normal values - 31.79 ± 0.47 in the CPAP mode and 32.00 ± 0.31 in the DUAL-LEVEL mode, respectively. After three days, there was a decrease in NPV in both groups within 22-24 min (P <0.05). Already on the 3rd day, the NPV reached normal values: up to 20.69 ± 0.31 per minute in the CPAP mode and 19.62 ± 0.22 in the DUAL-LEVEL mode. There was a significant decrease in both groups, the value of this indicator in comparison between the groups was significant (P <0.05).

Table 5. Respiratory function indices in patients with ARF who received NVL in CPAP (numerator) and DUAL-LEVEL modes (denominator)

Показатель	Groups	initial	3-rd day	6-th day
t/v, ml/kg	2-gr.	3,95±0,03	4,88±0,08***	6,43±0,07***
	3- gr	4,0±0,03	5,2±0,04***^	7,07±0,09***^
respiratory rate per minute	2- gr.	31,79±0,47	24,29±0,57***	20,69±0,31***
	3- gr	32,00±0,31	22,24±0,31***^	19,62±0,22***^
Tidal volume, ml	2- gr.	319,59±7,74	393,86±9,52***	521,31±13,83****
	3- gr	329,47±7,15	429,38±10,43***^	583,77±15,37***^
MV, ml	2- gr.	10140,3±278,6	9552,7±312,2	10838,5±377,3
	3- gr	10545,1±245,67	9586,1±298,68	11469,04±343,5**
compl., ml/sm вwater column	2- gr.	22,25±0,58	31,44±0,85***	44,90±1,27***
	3- gr	23,01±0,54	35,07±0,86***^	52,24±1,34***^

*Note * P <0.05: ** p <0.01. *** p <0.001. ^ compared to the original state.*

As a result of the research, it was found that the DO in the CPAP mode was 319.59 ± 7.74 ml, in the DUAL-LEVEL mode it was 329.47 ± 7.15 ml. On the 3rd day, TO increased by 18.8% in CPAP mode and by 23.2% in DUAL-LEVEL mode. At stage III of the study, both groups showed an increase in tidal volume up to 521.31 ± 13.83 ml in CPAP and up to 583.77 ± 15.37 ml in DUAL-LEVEL mode, i.e. in the DUAL-LEVEL mode, the DO was 10.6% higher than in the CPAP mode (Fig.4.4).

Minute ventilation of the MV lungs in both modes did not lead to significant changes at all stages of the study (P> 0.05).

As you know, the value of compliance depends on the volume of air in the lungs. In our studies, compliance in the initial CPAP mode was 22.25 ± 0.58 ml / cm H2O, in the DUAL-LEVEL mode 2323.01 ± 0.54 ml / cm H2O. On the 3rd day from the start of treatment, there was a significant increase in this indicator in both groups (P <0.05), there was a significant difference between the groups. When treating patients with both modes at stage III, a significant increase in compliance was recorded up to 44.90 ± 1.27 ml / cm H2O. in CPAP (p <0.001) and 52.24 ± 1.34 ml / cm water column. (p <0.001) in DUAL-LEVEL mode.

In the initial state, in patients with ARF, external respiration parameters were below normal (except for NPV); during treatment with the CPAP and DUAL-LEVEL regimens, there was a significant increase in P / C, DO, compliance and NPV. There were no significant changes on the part of MV.

Output

Thus, the comparative analysis of gas composition disturbances in patients with ARF who received NVL in the CPAP and DUAL-LEVEL modes showed that in the initial state the patients have blood gas disturbances and a decrease in SatO2. After treatment with

traditional therapy in combination with NLV in the CPAP and DUAL-LEVEL modes, the patients showed an improvement in blood oxygenation, but when comparing both modes, it was found that DUAL-LEVEL is somewhat more effective than CPAP.

The parameters of external respiration in patients with ARF in the initial state were lower than normal values (except for NPV). In the course of treatment in the CPAP and DUAL-LEVEL modes, there was a significant increase in d / c, DO, compliance. There were no significant changes on the part of MV.

Consequently, both NVL regimens give positive clinical results: the indicators of central hemodynamics, blood gas composition and external respiration improve. In this case, the DUAL-LEVEL mode is more effective than CPAP.

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