

## **The experience of the using plasma radiations at treatment of the pulmonary breaches beside sick with critical conditions.**

**Z. Kheladze, S. Jaiani, B. Tsutskiridze, Zv. Kheladze  
(Critical Care Medicine Institute, Tbilisi, Georgia)**

One of the most important problems in modern critical medicine is a warning of the development of pulmonary frustration and treatment of out of hospital and respirator-associated hospital pneumonia beside the sick with heavy combined pathology.

Using of plasma flows in critical medicine became actual in the most last years, when one of the priority directions of the technical advances in some countries use was determined the using of the plasma complex. Alongside with flow of the plasma they radiate such components, as ultraviolet rays, ozone and nitric oxide. Using the plasma presents itself as an essential breakout in the field of physical methods of the influence on biological fabrics, and in medicine of the critical conditions

There exists imperative need of the determination of modern economic approach to reduction of the expenses and cost of the treatment that finds its acknowledgement at determination of the economic motivation of the using of plasma installation in critical medicine, in particular.

The purpose of the study was generalization of the first experience of the using of the flow of plasmas in critical medicine in purpose of the determination of the possibility of prevention pulmonary frustration and improvements of the result of treatments of the sick with respirator-associated pneumonia.

By us was conducted the study of the influence of component plasma radiations on zone of the projections by pulmonary flap under pulmonary complications with the sick with critical conditions, found on treatment in Institute at period 2007 – 2008.

On material, founded on the first experience of the treatment plasma flow 10 sick with critical conditions, bound, including pulmonary breaches, author is recommended new methods plasma preventive maintenances and treatments to pneumonia.

As checking group were considered 20 sick, being on treatment in our Institute during 2006 - 2007, with critical conditions, similar with under investigation group and diseases, bound, in particular, with pulmonary breaches.

The treatment of the all sick was conducted on traditional method and scheme of the treatment, received a visit at Institute of medicine of critical condition. In obligatory order was executed correction water and electrolytic of the balance and acid-alkaline balance, was conducted enteral and parenteral power supply, antioxidant and adaptive therapy. The 4 sick under investigation groups immediately at arrival were put on induced ventilation of light device "Puritan Bennett 7200 But" in mode of the ventilations SIMS.

The Preparation of the choice for empirical therapy were an parenteral Cephalosporine III generations in combination with aminoglycoside . At reception of the result of sowing of micro flora from bronchi and their sensitivity on antibiotics moved to corresponding to ethiotropic antibiotic therapy.

85 Sessions of plasma irradiations were organized in under investigation group to all sick, to 3 of them 5 sessions, to the 7 of the sick 10 sessions.

In checking group all stages of treatments were similar, with the exclusion of plasma irradiations.

During disease of the sick under investigation group by us was noted row of the positive moments, as follows:

- a more favorable current to pneumonia with smaller degree of the clinical manifestations and intoxication;
- a reduction to death-rate amongst sick with critical conditions;
- a reliable improvement of general and biochemical factors shelters;
- a reduction to average length of the treatment on 5 - 7 days and more;
- a reduction of the average cost berth-day on 20 - 25 u. e. and the overall value of the treatment to account of the reduction of the expenses antibiotic, immunomodulators and reduction berth-days.

In checking group was defined higher length of the treatment, heavy current pneumonia, and high death-rate.

The more favorable current of the disease, reduction degree clinical manifestations and intoxication, reliable improvement general and biochemical factors shelters and reduction to average length of the treatment prove the advantage given methods. Significant economic effect is received to account of the reduction of the average cost berth-day, reductions of the expenses antibiotic and immunomodulators. The got results allow using the plasma flows at treatment sick with inflammatory diseases light, including under critical conditions. Efficiency, simplicity, reliability and significant economic value are an important particularity given methods.

**Key words:** plasma flows, critical conditions, disease light.

**Intraduction.** One of the most important problems in modern critical medicine is a warning of the development of pulmonary frustration and treatment of out of hospital and respirator-associated hospital pneumonia beside the sick with heavy combined pathology. The respirator-associated pneumonia remain the most wide-spread form of hospital pneumonia, which in the sick, residing on induced ventilation of light, appears in 20 times more often, but risk of the disease after 3 days from intubation with each daytime increases on 1% [13; 15].

According to different authors the development of similar complications exists in 70 - 90% of the sick with plural trauma, breaches of the brain address shelters, endotoxic shock and polyorgan by insufficiency. The necessity of searching for of the new methods of the treatment is conditioned by inefficiency of satisfactory result of the treatment, high lethality and extremely significant cost of the treatment [2; 14].

Using of the high temperature methods of influence on biological fabrics is effectively and known since old times. At present in different areas of medicine broad spreading varied electro and thermo devices, laser radiation have been found. The

experience of their using has shown the unconditional prospect of the heat methods of the influence under different type of pathology [6; 9; 11].

However any methods alongside with positive characteristics also possess some defects (insufficient efficiency and reliability, difficulty of the using, high cost and others.). So the search for and the other ways to cart heat energy to the centre of the pathological change goes on. One of the most perspectives is the use of the temperature plasma flow. Using of the plasma in modern medicine, in surgery particularly, is confessed by many authors [1; 5; 7].

Using of plasma flows in critical medicine became actual in the most last years, when one of the priority directions of the technical advances in some courtiers use was determined the using of the plasma complex. These installations are compact, reliable and technically easy for functioning and service. Alongside with flow of the plasma they radiate such components, as ultraviolet rays, ozone and nitric oxide. The flexible design of carts of plasma flows allows working freely practically in any area. The flows of the plasma do not render the bad action on sick and medical workman. Using the plasma presents itself as an essential breakout in the field of physical methods of the influence on biological fabrics, and in medicine of the critical conditions [3; 10].

Also at present does not raise doubts in need of spare facilities in the field of public health. Given tasks is rather actual in such and area with high expenditure, as medicine of the critical conditions, particularly in connection with its insufficient financing. There exists imperative need of the determination of modern economic approach to reduction of the expenses and cost of the treatment that finds its acknowledgement at determination of the economic motivation of the using of plasma installation in critical medicine, in particular. All foregoing positions confirm imperative need of the introducing the new methods of the treatment and new medical technology with the way of corresponding economic motivation that has found its motivation and in persisting work [8; 12].

**The purpose and problems of the study.** The purpose of the study was generalization of the first experience of the using of the flow of plasmas in critical medicine in purpose of the determination of the possibility of prevention pulmonary frustration and improvements of the result of treatments of the sick with respirator-associated pneumonia.

In accordance with this purpose of the study were put forward the following tasks:

- conduct the comparative estimation of the results of efficiency of the clinical using of plasma irradiations by pulmonary flap beside the sick with critical conditions and develop the methods of the using of the plasma in purpose of the ensuring the preventive maintenance of the pulmonary complications and under their complex treatment;
- define the prospect of the use of the plasma in critical medicine at treatment the sick with heavy combined pathology.

**Material and methods.** By us was conducted the study of the influence of component plasma radiations on zone of the projections by pulmonary flap under pulmonary complications with the sick with critical conditions, found on treatment in Institute at period 2007 – 2008. The device, based on argon plasma radiation was used (the patent - P 2075 31. 03. 98. «Материалы лечения патологических процессов»).

The methods was based on 5 or 10 multiple irradiation by all component of plasmas of the zones projection of lungs on front and back surface of the thorax in mode "plasma irradiation" daily, during 5 - 7 minutes, at the temperature of plasma radiations 40 - 450

C, did not require preliminary preparation and did not depend on gravity of the condition of the sick.

The whole new method was approved on the 10 sick, distributions on sex and age are presented in table 1.

Table 1. Distribution sick on sex and age Sex

Husband The Age	Male		Female		Whole	
	Abs. number	%	Abs. number	%	Abs. number	%
До 30	1	10	-	-	1	10
30 – 49	2	20	1	10	3	30
50 – 69	2	20	1	10	3	30
70 and above	1	10	2	20	3	30
Whole	6	60	4	40	10	100

The majority of the sick entered as by "Ambulance" - 5, so and by the system of "Medicine of the catastrophes" - 3, the rest by translation from the other permanent establishment - 1, or by themselves - 1.

The deterioration of the general state of the sick and development of the critical condition before arrival in our permanent establishment approached, as a rule, in home condition - 8 persons, in the street - 1, in the other medical permanent establishment - 1.

At arrival the sick in diagnosis prevailed the breaches of the brain address shelters and quipping respiratory insufficiency. In process of the examination and treatments was fixed the final diagnosis, based on clinic-instrumental, laboratory, X-ray photography, ultrasonic, endoscopy and other methods. The structure of the final diagnosis, made to the sick in Institute, is presented in table 2.

Table 2. Structure final diagnosis

Main diagnosis	Abs. number	%
Intracerebral heart attack	5	60
Pneumonia, quipping respiratory insufficiency	2	20
Polytrauma, brain trauma, closing trauma light	1	10
Endotoxical shock, tumor liver	1	10
Cirrhosis liver	1	10
Whole	10	100

As can be seen from brought tables, the main types to pathology were connected with breach vascular and respiratory function, as well as diseases of liver.

In structure accompanying diagnosis, made to the sick, prevailed the diseases of the pulmonary system - pneumonia and quipping respiratory insufficiency.

Coming from aforesaid, it is possible to establish that the main type of the breaches of life function organism of the presented sick were a different types of respiratory frustration, basically pneumonia.

Also following accompanying diagnoses were revealed in the sick under investigation group: ischemia disease of the heart in 5, atherosclerosis aortas and coronary artery in 4, sugar diabetes in 2 and chronic hepatitis "D" in 1.

As checking group were considered 20 sick, being on treatment in our Institute during 2006 - 2007, with critical conditions, similar with under investigation group and diseases, bound, in particular, with pulmonary breaches.

All the sick under investigation and checking groups for the reason of discovery pathogenic microbiological flora was conducted study of the contents of bronchial tree. The phlegm selected in sufficient amount, was shown easy by available data for study, but on reliability of results yielded the invasive method receptions of the bronchial secret (bronchopulmonary lavage, protected brush biopsy), as it was a more subject to contamination by micro flora of the upper respiratory ways, gulp and pra.

All the sick were conducted general and necessary biochemical studies shelters and urines. Also X-ray photography of the study light were executed if required - spiral computer, or magnetic resonance imaging.

With medical and diagnostic purpose were executed bronchoscopic of the study with preliminary introduction mucolithic and obligatory clarification of bronchial tree.

**Results and discussion.** The treatment of the all sick was conducted on traditional method and scheme of the treatment, received a visit at Institute of medicine of critical condition. In obligatory order was executed correction water and electrolytic of the balance and acid-alkaline balance, was conducted enteral and parenteral power

supply, antioxidant and adaptive therapy. The 4 sick under investigation groups immediately at arrival were put on induced ventilation of light device "Puritan Bennett 7200 But" in mode of the ventilations SIMS.

The Preparation of the choice for empirical therapy were an parenteral Cefalosporine III generations (the Cefataxime or Ceftriaxone) in maximum dose if required in combination with aminoglycoside . At reception of the result of sowing of micro flora from bronchi and their sensitivity on antibiotics moved to corresponding to ethiotropic antibiotic therapy.

85 Sessions of plasma irradiations were organized in under investigation group to all sick, to 3 of them 5 sessions, to the 7 of the sick 10 sessions. 2 Subgroups were chosen:

- four sick, to whom plasma irradiation was fixed on arrival immediately, in connection with suspicion on already existing pneumonia;
- The rest six sick, which plasma flows were fixed for 3 - 5 day, at appearance of sign of forming pneumonia.

In checking group all stages of treatments were similar, with the exclusion of plasma irradiations.

According to microbiological result, in most cases in the sick of the both groups were revealed several types of microorganism simultaneously, was more often revealed Gram-negative flora (*Pseudomonas aeroginoza* - beside 55% sick, *Klebsiella* spp. - beside 27,5%, *Enterobacter* spp. - beside 12,5%, as well as *E. coli*, *Proteus* spp., *Acinetobacter* spp.) and *S. aureus* (17,5%). The Specific gravity of mushroom sort of *Candida* did not exceed 3,5%. Under "respirator-associated" pneumonia, often caused by association of the instants, *Ps. aeruginosae* was defined in 80% events, *Klebsiella* spp. - beside 32%, *S. aureus* - in 27%, *Proteus* spp. - in 7,5%.

Amongst the sick, which plasma irradiation began to be conducted right after arrivals, in 2 events pulmonary frustration did not develop and, accordingly, did not take undertaking an antibiotic therapy. In checking group of such events were not revealed.

During disease of the sick under investigation group by us was noted row of the positive moments, as follows:

- a more favorable current to pneumonia with smaller degree of the clinical manifestations and intoxication;
- a reduction to death-rate amongst sick with critical conditions;
- a reliable improvement of general and biochemical factors shelters;
- a reduction to average length of the treatment on 5 - 7 days and more;
- a reduction of the average cost berth-day on 20 - 25 u. e. and the overall value of the treatment to account of the reduction of the expenses antibiotic, immunomodulators and reduction berth-days.

In checking group was defined higher length of the treatment, heavy current pneumonia, high death-rate.

**The findings.** In conclusion it is necessary to note that in executed study for the first time generalized positive experience of the use plasma radiations is defined in the sick with critical conditions for preventive maintenance and treatments pulmonary frustration.

Got by us preliminary data are indicative the availability of the use the thread plasma duct in critical medicine; require the further study of the given problem and more broad introduction of the given methods bin the sick with festering-inflammatory diseases light.

კრიტიკულ მდგომარეობაში მყოფ ავადმყოფთა პნევმონიის მკურნალობა პლაზმური სხივებით  
ზ. ხელაძე, ს. ჯაიანი, ბ. ცუცქირიძე, ზვ. ხელაძე  
(კრიტიკული მედიცინის ინსტიტუტი, თბილისი, საქართველო)

## რეზიუმე:

მოყვანილია ხელოვნურ სუნთქვაზე მყოფი კრიტიკული ავადმყოფების პნევმონიის პლაზმური სხივებით მკურნალობის შედეგები. პლაზმით დასხივების სეანსები ამ ავადმყოფებს უტარდებოდათ დღეში ერთხელ ან ორჯერ. მკურნალობის კურსი მოიცავდა 5-10 დასხივების სეანსს, ხოლო დასხივება წარმოებდა ორივე ფილტვის საპროექციო ზედაპირზე. კვლევის შედეგები მიუთითებენ ამგვარი მკურნალობის პერსპექტიულობაზე კრიტიკულ ავადმყოფებში აღმოცენებული პნევმონიის მკურნალობის მიზნით, თუმცა მათი გამოყენება ეფექტური ჩანს ამ სახის პნევმონიების პრევენციისთვისაც.

## Reference:

1. Е.И. Брехов., Н.П.Козлов, В.Ю. Ребизов и др. Экспериментальное и клиническое изучение и перспективы применения плазменных потоков // Хирургия. – 1989. – № 7. – С. 94–96.
2. А.В. Боровик., В.А.. Руднов Нозокомиальная пневмония при проведении продленной искусственной вентиляции легких.// Вестник интенсивной терапии, 1995. – № 2–3. – С. 29–34.
3. П.Г. Брюсов., Б.П. Кудрявцев Плазменная хирургия. – М., 1995. – 118 с.
4. Е.К. Гуманенко Политравма. Актуальные проблемы и новые технологии в лечении / Материалы конференции «Новые технологии в ВПХ и хирургии повреждений мирного времени. – СПб., 2006. – С. 4–14.
5. С.В. Джаиани., Б.Н. Цуцкиридзе., Г.И. Мгалоблишвили Экспериментальное обоснование применения плазменных потоков в лечении огнестрельных ранений конечностей // Georgian Medical News. – 2006. – № 3. – С. 116 – 121.

6. Е.Г.Жилиев, В.И.Хрупкин, Л.А. Марахонич и др. Перспективы применения воздушных плазменных потоков в медицине // Воен. мед. журн.– 1998. – № 6. – С. 46–50.
7. А.И.Нечай, В.М Трофимов., Г.А. Костюк и др. Плазменный диссектор // Вопросы онкологии. – 1989. – № 8. – С. 1005–1006.
8. Г.М. Петров., А.А. Морецкий Некоторые вопросы экономии в военном здравоохранении // Воен. мед. журн. – 2000. – № 3. – С. 9–13.
9. С.Г.Подольский, Ю.Б. Мартов., С.А. Габеша Лечение огнестрельных ранений мирного времени / Материалы конференции «Новые технологии в ВПХ и хирургии повреждений мирного времени. – СПб., 2006. – С. 241-242.
10. Б.Н. Цуцкиридзе Применение плазменных потоков при боевых повреждениях конечностей: Дис. ... акад. ст. доктора медицины – Тбилиси, 2007. – 161 с.
11. Б.Н. Цуцкиридзе С.В. Джаиани., Г.И. Мгалоблишвили Применение плазменных потоков в хирургической обработке гнойно-септических осложнений при повреждениях конечностей // Georgian Medical News. – 2007. – № 6. – С. 19 – 22.
12. Argon Plasma Coagulation Ease and Safety with the APC – 300 / Healthcare Update. – 1997. – P. 51.
13. J.Y.Fagon, J.Chaster, Y.Domart, et al. Nosocomial pneumoniae in patients receiving continuous mechanical ventilation // Am. Rev. Respir. Dis. 1989; 139: 877-84.
14. A.Torres, R.Aznar, J.M. Gatell., et al. Incidence, risk, and prognosis factors of nosocomial pneumoniae in mechanically ventilated patients // Am. Rev. Respir. Dis. 1990; 142: 523-8.
15. M.L Metersky., D.Skiest Ventilator-associated pneumoniae: current concepts // Complications in Surg. 1997; 14: 16-22.