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# Comparative Evaluation of The Effectiveness of Treatment of Deep Phlegmon of the Neck and Acute Secondary Mediastinitis

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***Abstract***

*The number of patients with deep phlegmon in the neck and acute secondary mediastinitis is increasing from year to year, which entails an increase in temporary disability, and in severe cases leads to death. Based on the research, we proposed a medical technology for the use of controlled negative pressure in the treatment of patients with acute secondary mediastinitis, developing against the background of a deep phlegmon of the neck. The dynamics of changes in the concentration of pro- and anti-inflammatory cytokines in the blood serum in patients with deep phlegmon of the neck and acute secondary mediastinitis with various methods of treatment was determined. It was found that in the group of patients in the treatment of which vacuum therapy was used, there is a decrease in the acute inflammatory process by 37.5% and by 28.6%, respectively, than with conventional treatment. The use of vacuum therapy in the treatment of patients with deep phlegmon of the neck reduces the duration of treatment in the intensive care unit by 20%, inpatient treatment by 15.4%, reduces the number of repeated surgical interventions and complications by 17.3% and 15.5%, respectively. At the same time, this method of treating patients with acute secondary mediastinitis leads to a decrease in the duration of treatment of patients by 12.2%, the number of complications and repeated surgical interventions by 21.2% and 34.4%, respectively. When used in the treatment of patients with deep phlegmon of the neck and acute secondary mediastinitis of vacuum therapy in the postoperative period on the 5th and 10th days and patients with acute secondary mediastinitis on the 10th and 14th days, there is a low concentration of cytokines in the blood serum by an average of 2 times, which indicates a decrease in the intensity of the acute inflammatory process.*



**Keywords:** *Deep phlegmon of the neck, Acute secondary mediastinitis, Local vacuum therapy*

## 1. Introduction

Acute mediastinitis is one of the most formidable and severe complications of inflammatory processes in the maxillofacial region of the neck and chest (Adoviča et al., 2017). Currently, the problem of diagnosis and treatment of acute mediastinitis remains relevant due to the severity of the disease itself, the lack of unified surgical tactics, the long-term disability of patients and the high probability of adverse outcomes, despite the developed diagnostic algorithms and methods of surgical treatment (Okhunov et al., 2023).

Despite significant advances in treatment associated with the widespread use of antibiotic therapy, the development of anesthesiology and resuscitation, and the introduction of X-ray computed tomography

of the mediastinum into the diagnostic scheme, mortality in acute mediastinitis remains very high and reaches 50% or more (Vural et al., 2012). Currently, there is no universal standard for the treatment of acute mediastinitis, and each case requires an individual approach. In the treatment of this category of patients, surgical care and relief of metabolic disorders accompanying endogenous intoxication remain important (Shen et al., 2020).

Generally accepted methods are drainage of the mediastinum and its lavage with various antiseptic solutions, while a number of authors point to the low efficiency of this method (Beasley & Amedee, 1995). One of the promising methods may be the use of well-proven systems with controlled negative pressure (local vacuum therapy) in the local treatment of surgical infection (Ricciardiello et al., 2022).

Local vacuum therapy can be used to treat surgical infection of the deep cellular spaces of the neck and mediastinum, which will improve the results of treatment of patients with deep phlegmon of the neck and mediastinitis by reducing the severity of the inflammatory process and, as a result, reduce the number of postoperative complications, repeated interventions and deaths (Taub et al., 2021).

Currently, many methods of treating acute mediastinitis have been proposed (Li & Kiemeney, 2019). However, there is no universal standard for the treatment of acute mediastinitis, and each case requires an individual approach (Shen et al., 2017). More than a hundred surgical approaches used in acute mediastinitis have been described in the literature, but there are no clear criteria for surgical tactics in this disease (Linkov & Soliman, 2015).

Previous studies have not shown high efficacy in the treatment of patients with such severe purulent infections as acute mediastinitis. Obviously, each of the proposed methods has advantages and disadvantages, and therefore the surgical approach should be carefully selected depending on the patient's condition, the degree of the disease and the experience of surgeons to maintain a low rate of complications, repeated operations, and mortality (Long et al., 2019, Huy, 2013).

Currently, certain successes have been achieved in controlled local vacuum therapy in the field of surgery, and in particular in the treatment of patients with phlegmon of the neck and primary mediastinitis (Pastene et al., 2020). The positive effect of vacuum therapy in relation to the oxygen transport function and rheological properties of blood, the ability to activate humoral immunity and enhance analgesia explain the widespread use of this method of treatment in clinical medicine. The main task of controlled local vacuum therapy is to improve tissue circulation, it also contributes to a better supply of oxygen to cells, which has a positive effect and accelerates tissue regeneration (Beasley & Amedee, 1995).

## 2. Materials And Methods

The study was approved by the Ethics Committee of the Ministry of Health of the Republic of Uzbekistan (protocol # 32 dated 08.01.2011).

This study reflects the results of a retrospective and prospective analysis of the case histories of 81 patients with deep phlegmon of the neck and 40 patients with acute secondary mediastinitis who were treated in the surgical infection department of the Multidisciplinary Clinic of the Tashkent Medical Academy in the period from 2011 to 2022.

The criteria for inclusion in the study were patients with deep phlegmon of the neck and acute secondary mediastinitis aged 18 to 60 years without concomitant diseases in the stage of decompensation.

Exclusion criteria from the study: the patient's age is less than 18 years and more than 60 years old, active forms of tuberculosis, chronic viral hepatitis B and C of a high degree of activity, severe comorbidities (type I and II diabetes mellitus in the stage of decompensation, chronic kidney disease stage V, chronic renal failure III-IV, chronic pulmonary heart failure in the stage of decompensation, circulatory insufficiency stage III), phenomena of infectious-toxic shock at admission and in the first hours after surgical treatment, death on the first day from the moment of hospitalization.

Depending on the method of treatment, the patients were divided into four groups: Group 1 – comparison group – 44 patients with deep phlegmon of the neck, in the treatment of which standard methods of surgical intervention and intensive care regimens were used; Group 2 – the main group –

37 patients with deep phlegmon of the neck. In patients of this group, guided local vacuum therapy in the 50 mm Hg mode was used as part of the complex treatment. Art.; Group 3 – comparison group – 22 patients with acute secondary mediastinitis, in the treatment of which standard methods of surgical intervention and intensive care regimens were used; Group 4 – the main group – 18 patients with acute secondary mediastinitis. In patients of this group, guided local vacuum therapy in the mode of 30 mm Hg was used as part of the complex treatment. In each group, subgroups A and B were distinguished. These subgroups included 10 patients in whom the concentration of pro- and anti-inflammatory cytokines was determined.

Antibiotic and intensive care in the groups coincided and met the standards approved by the Ministry of Health of the Republic of Uzbekistan.

In the main group of patients with deep phlegmon of the neck, there were 44 patients, including 30 men (68.2%), and 14 women (31.8%) aged 17 to 69 years. The age of the patients was 34 (27; 45) years (median (25%; 75%). In the comparison group, there were 37 patients, including 24 (64.9%) men, and 13 (35.1%) women aged 20 to 67 years. The age of the patients was 42 (30; 51) years (median (25%; 75%).

Both groups were dominated by patients with an odontogenic mechanism for the occurrence of a phlegmon of the neck.

The period of hospitalization in the hospital from the onset of the disease in the main group was 4 (3; 5) days, and in the comparison group – 4 (3; 7) days.

In the comparison group of patients with acute secondary mediastinitis, there were 22 patients, including 15 men (68.2%), and 7 women (31.8%) aged 16 to 69 years. The age of the patients was 47 (30.8; 58.3) years (median (25%; 75%). In the main group, there were 18 patients, including 12 men (66.7%), and 6 women (33.3%) aged 22 to 63 years. The age of the patients was 31.5 (24.3; 49) years (median (25%; 75%).

Both groups were dominated by patients with an odontogenic mechanism for the occurrence of acute mediastinitis.

The average length of hospital admission from the onset of the disease in the study group was 5 (3.3; 7.8) days, and in the comparison group – 4 (2.9; 6.3) days.

All patients upon admission to the hospital on the 3rd and 7th days after surgery underwent a detailed clinical, laboratory and instrumental examination.

Surgical intervention was performed in all patients with deep phlegmon of the neck and acute secondary mediastinitis for revision, excision of necrotic tissues, collection, and discharge for bacteriological seeding. The operation was completed by drainage of the deep cellular spaces of the neck and mediastinum with a 3-lumen drainage system of active aspiration.

Sanitation of the focus of inflammation began in the postoperative period when the patient's drainage system was connected to the vacuum therapy system in the intensive care unit.

To assess the concentration of pro- and anti-inflammatory cytokines (FNO-α, IL-1β, IL-6, IL-8, IL-4) in the blood serum of 40 patients of the previously described groups (in 10 patients of each group), blood sampling was performed in patients with deep phlegmon of the neck at admission, on the 5th and 10th days after surgery or at the time of discharge, patients with acute secondary mediastinitis at admission, on the 5th, 10th and 14th days after surgery or at the time of discharge to patients.

Statistical processing of the obtained data was carried out using the application package "Statistica 7.0" on a personal computer; MS Excel from MS Office 2003 and 2007 package.

The distribution of indicators in groups was checked for normality using the Shapiro-Wilk test. In an abnormal distribution, the data is presented as a median with 25–75% percentiles. Nonparametric methods were used to assess the reliability of differences in indicators when comparing the two groups: the significance of differences in qualitative indicators was determined using the $\chi 2$ Pearson test; in the event that the frequency in at least one cell of the table of expected frequencies was less than or equal to five, then the exact Fisher criterion was used to compare the frequencies of the

qualitative indicator in two independent groups. The degree of difference was considered significant at $p<0.05$.

**3. Results and Discussion**

The presence of background pathology was detected in 22 (27.2%) patients with deep phlegmon of the neck and in 21 (52.5%) patients with acute secondary mediastinitis.

All patients were hospitalized on an emergency basis. The period of hospitalization from the moment of illness in patients with deep phlegmon of the neck was 3 (3; 7) days, with acute secondary mediastinitis - 4 (3; 7) days.

The average score on the APACHE II scale for patients with deep phlegmon of the neck upon admission was 2 (1; 4.25) points, for patients with acute secondary mediastinitis – 9 (5; 10) points, on the MODS scale for patients with deep phlegmon of the neck – 1 (0; 2) score and 4 (2; 5) points for patients with acute secondary mediastinitis, on the SOFA scale for patients with deep phlegmon of the neck – 0 (0; 1) points and 0 (0; 2) points for patients with acute secondary mediastinitis.

In group 1 there were 8 complications, 10 repeated operations (22.7%), and in group 2 – 1 and 2 (5.4%), respectively. In group 3 there were 12 complications, 10 repeated operations (45.5%), 7 deaths, in group 4 – 6 complications, 2 repeated operations (11.1%) and 3 deaths.

The most common complication in the postoperative period was nosocomial pneumonia. The use of the proposed technique led to a decrease in the incidence of this complication by 16.6%. The incidence of such a complication as arrosive bleeding in patients with acute secondary mediastinitis in the comparison group was 25%, and in the main group – 16.7%. This complication occurred in 1 patient with deep phlegmon of the neck from the comparison group, which was 2.3%.

In patients with deep phlegmon in the neck, the development of esophageal-mediastinal fistula was recorded in only one patient from the comparison group (12.5%). In patients with acute secondary mediastinitis, the formation of fistulas of various localization occurred in 3 patients (25%), in the main group – in 1 patient (16.7%).

The frequency of complications in group 4 decreased by 21.2% ($p<0.05$), the number of repeated interventions by 34.4% ($p<0.05$), and the number of deaths by 15.1% in favor of the main group (group 4).

The stay in the intensive care unit for patients with deep phlegmon of the neck of group 1 was 2.5 (2; 4) days, group 2 – 2 (1; 2) days. Thus, the stay in the intensive care unit for the main group was reduced by 0.5 days, which amounted to 20% ($p<0.05$). Drains from neck wounds were removed in group 1 on the 9th (6; 15) and on the 7th (5; 9.5) days in group 2, which is on average 2 days earlier than in the comparison group, which amounted to 20.2% ($p<0.05$).

The duration of stay of patients with acute secondary mediastinitis in the intensive care unit of group 3 was 11.5 (6; 16) days, and group 4 – 8 (4; 9) days, and when comparing the length of stay of patients in the intensive care unit, there was a statistically significant reduction in the stay of patients in group 4 (by 3.5 days) ($p<0.05$).

Drains from the upper mediastinum in patients with acute secondary mediastinitis of the main group were removed 3 days earlier than in the comparison group, and drains from the lower mediastinum – 2 days earlier than in the comparison group ($p<0.05$).

The duration of hospitalization of patients with deep phlegmon in the neck in the comparison group was 13 (10.8; 16), and in the main group – 11 (10; 13). Thus, there is a difference in the treatment time of patients of the main group in relation to the comparison group by 2 days (15.4%) ($p<0.05$).

The duration of treatment of patients with acute secondary mediastinitis in the comparison group was 20.5 (17.5; 28) days, and the main group was 18 (11.5; 26) days. Thus, there is a difference in the duration of treatment of patients of the main group in relation to the comparison group by 2.5 days ($p<0.05$).

The dynamics of changes in laboratory parameters in patients with deep phlegmon of the neck and acute secondary mediastinitis during treatment are presented in Tables 1 and 2, respectively.

**Table 1.** Dynamics of changes in the values of laboratory parameters in patients of the 1st and 2nd groups in the dynamics of the treatment

| STUDY DYNAMICS | GROUPS OF PATIENTS | BLOOD COUNTS | | | |
|---|---|---|---|---|---|
| | | Leucocytosis ($10^9$/l) | Fibrinogen (mg/dl) | Creatinine (μmol/L) | Total protein (g/l) |
| When a patient is admitted to the clinic | Group 1 | 16,2 (13,5; 21,9) | 842 (693; 925,9) | 77,5 (69,4; 103,8) | 69 (63,8; 79,3) |
| | Group 2 | 14,1 (11,1; 19,4) | 785 (589; 843) | 85,1 (73; 96) | 72 (63; 81) |
| 3-day treatment | Group 1 | 13,2 (10,3; 15,9) | 815,3 (683; 874,5) | 80 (61,6; 110) | 70,5 (64,7; 81) |
| | Group 2 | 9 (8; 11,2)* | 669,2 (587; 746)* | 84 (72,5; 93) | 67 (64; 74) |
| 7-day treatment | Group 1 | 10,3 (8,7; 12,1) | 665,9 (645; 728) | 91 (69; 115,5) | 61 (56,8; 68,3) |
| | Group 2 | 8 (7; 10)* | 649,5 (567; 675) | 80 (70; 89)* | 71 (65; 75) |

*p<0,05 – reliably in relation to the comparison group.

**Table 2.** Dynamics of changes in the values of laboratory parameters in patients of the 3rd and 4th groups in the dynamics of the treatment

| STUDY DYNAMICS | GROUPS OF PATIENTS | BLOOD COUNTS | | | |
|---|---|---|---|---|---|
| | | Leukocytosis ($10^9$/l) | Creatinine (μmol/L) | Urea (mmol/L) | Total protein (g/l) |
| When a patient is admitted to the clinic | Group 3 | 16,3 (14,3; 18,1) | 87 (66,5; 106,5) | 6,5 (6,1; 6,7) | 80,5 (61,8; 85,3) |
| | Group 4 | 17,1 (11,7; 9,2) | 80 (69,5; 108) | 6,4 (6,1; 6,7) | 81,5 (66; 85,8) |
| 5-day treatment | Group 3 | 11 (7,4; 13,1) | 68 (58; 85,5) | 6,1 (5,7; 6,5) | 66,5 (63,8; 84,3) |
| | Group 4 | 12,5 (9,3; 17,6) | 63 (53,8; 77) | 4,8 (4,1; 5,6)* | 68,5 (64,3; 72,8) |
| 10-day treatment | Group 3 | 13,2 (9,6; 18,1) | 66,5 (56,8; 74,8) | 5,8 (5; 6,1) | 79,5 (66,5; 84) |
| | Group 4 | 11,8 (10,2; 13,5)* | 56,5 (50,8; 71,8)* | 4,4 (3,4; 5,3)* | 69 (64,5; 71,0) |
| 15-day treatment | Group 3 | 11,7 (7,6; 14,9) | 65 (53,5; 74) | 4,4 (3,5; 5,4) | 69,5 (64,8; 74,3) |
| | Group 4 | 9,5 (6,9; 12,1)* | 58 (44,6; 75)* | 4,2 (3,4; 5,1) | 72,5 (66,3; 74,8) |

*p<0,05 – reliably in relation to the comparison group.

Based on the data in Tables 1 and 2, it follows that the use of the method of controlled local vacuum therapy made it possible to accelerate the rate of reduction of the inflammatory response and, as a result, the normalization of laboratory parameters by 2-4 days.

The results of a comparative assessment of the course of the acute inflammatory process in patients with deep phlegmon of the neck and acute secondary mediastinitis are presented in Tables 3 and 4, respectively.

**Table 3.** Comparative assessment of the dynamics of changes in the concentration of cytokines in patients with deep phlegmon of the neck of the 1st and 2nd groups during the treatment

| CYTOKINE | GROUPS OF PATIENTS | DYNAMICS OF TREATMENT (day) | | |
|---|---|---|---|---|
| | | 0-day | 5-day | 10-day |

| | | | | |
|---|---|---|---|---|
| FNO-α (0-6 pg/ml) | Group 1 | 9,5 (8,4; 10,7) | 8,7 (7,7; 9,4) | 6,8 (5,4; 7,1) |
| | Group 2 | 9,7 (8,6; 10,9) | 8,6 (8,1; 9,3)* | 4,7 (4,2; 5,1)* |
| IL-1β (0-11 pg/ml) | Group 1 | 61,8 (50,2; 73,4) | 65,7 (52,6; 66,3) | 70,1 (65,3; 74,5) |
| | Group 2 | 63,2 (51,9; 75,7) | 58,3 (52,1; 67,1) | 15,6 (13,3; 18,8)* |
| IL-6 (0-10 pg/ml) | Group 1 | 90,3 (86,5; 94,7) | 81,8 (81,7; 83,3) | 54,5 (47,9; 61,2) |
| | Group 2 | 89,4 (81,2; 93,5) | 82,5 (80,4; 83,2) | 29,3 (20,4; 42,5)* |
| IL-8 (0-10 pg/ml) | Group 1 | 31,2 (26,9; 36,2) | 44 (39,1; 44,4) | 22 (19,6; 23,3) |
| | Group 2 | 40,1 (37,6; 42,9) | 38,6 (17,4; 45,5)* | 18,4 (14,8; 21,2) |
| IL-4 (0-20 pg/ml) | Group 1 | 5,0 (4,3; 5,5) | 5,2 (4,6; 5,6) | 15,2 (12,8; 16,8) |
| | Group 2 | 4,9 (4,7; 5,2) | 5,3 (4,7; 5,3) | 22,3 (17,4; 26,1)* |
| IL-1/IL-4 | Group 1 | 12,4 (10,5; 12,8) | 12,6 (11,6; 13,1) | 4,6 (4,2; 5,3)* |
| | Group 2 | 12,9 (10,5; 13,6) | 11 (10,1; 12,2)* | 0,7 (0,6; 1,2)* |

*p<0,05 – reliably in relation to the comparison group.

**Table 4** Comparative assessment of the dynamics of changes in cytokine concentration in patients with acute secondary mediastinitis of the 3rd and 4th groups during treatment

| CYTOKINE | GROUPS OF PATIENTS | DYNAMICS OF TREATMENT (day) | | |
|---|---|---|---|---|
| | | 0-day | 5-day | 10-day |
| FNO-α (0-6 pg/ml) | Group 3 | 9,7 (9,0; 10,2) | 9,5 (8,6; 11,1) | 8,2 (7,8; 9,1) |
| | Group 4 | 8,5 (7,6; 9,7) | 6,7 (6; 7,2)* | 3,8 (3,3; 4,1) |
| IL-1β (0-11 pg/ml) | Group 3 | 68,3 (67; 68,4) | 51,9 (38; 65,6) | 36,9 (30,2; 39,9) |
| | Group 4 | 60,4 (51,8; 64,7) | 30,5 (14,9; 42)* | 14,5 (11,4; 16,7)* |
| IL-6 (0-10 pg/ml) | Group 3 | 90,2 (83,7; 94,2) | 31,7 (30; 33,3) | 19,9 (13,7; 23,8) |
| | Group 4 | 91,1 (83,3; 98,9) | 31,2 (28,3; 35) | 10,3 (7,6; 13,1)* |
| IL-8 (0-10 pg/ml) | Group 3 | 35,5 (23,3; 39,6) | 21 (15,4; 27) | 16,2 (14,5; 17) |
| | Group 4 | 35,4 (29,6; 41,5) | 17,1 (14,6; 18,3) | 10,1 (6,3; 13,1) |
| IL-4 (0-20 pg/ml) | Group 3 | 4,9 (3,3; 6,6) | 10,2 (7,1; 13,2) | 12,2 (8,3; 15,9) |
| | Group 4 | 5,2 (3,8; 6,8) | 15,2 (13,8; 15,9) | 25,2 (22,6; 26,9) |
| IL-1/IL-4 | Group 3 | 13,9 (11,9; 14,5) | 5,1 (3,4; 7,1) | 3 (2,1; 4,8) |
| | Group 4 | 11,6 (9,4; 13,4)* | 2 (1,5; 3,7) | 0,6 (0,2; 1,5)* |

*p<0,05 – reliably in relation to the comparison group.

Thus, there is a more rapid normalization of the cytokine status in patients of the main group by 1.2–3 times, which characterizes more rapid subsidence of the systemic inflammatory reaction.

The use of the technique of controlled vacuum therapy made it possible to reduce the number of complications and the frequency of repeated interventions, the length of stay of patients on mechanical ventilation, in the intensive care unit and in the hospital as a whole, the number of deaths, as well as to normalize laboratory parameters and cytokine status of patients at an earlier date, which made it possible to improve the results of treatment of patients with these purulent-inflammatory diseases of the neck and mediastinum.

Aggressive and fulminant development of deep phlegmon of the neck with severe intoxication and a tendency to spread and increase cases of acute secondary mediastinitis (Ricciardiello et al., 2022). An important feature of deep phlegmon of the neck, especially those that are of odontogenic origin, is that due to the vastness of distribution, complex topography (varying depth of the lesion, the presence of a large number of cellular spaces lying at different depths, the formation of hard-to-reach cavities, "pockets" and folds during inflammation), the unevenness of inflammatory changes in different places of the lesion, inflammatory and restorative wound processes do not have strict sequence and occur simultaneously in different areas / depth of the wound, superimposed on one another (Vieira et al., 2008).

Despite the large number of works devoted to the surgical treatment of deep phlegmon of the neck, many problems of postoperative treatment remain unresolved (frequent development of acute secondary mediastinitis, inadequate wound management in the postoperative period can lead to the

progression of the inflammatory process and the need for repeated operations; secondary nosocomial infection, lack of bacteriological control over discharge from the wound, inadequate antibiotic therapy also lengthen the duration of inpatient treatment) (Taub et al., 2021).
Good results of treatment of patients with deep phlegmon of the neck depend not only on surgery, but also on the subsequent local adequate treatment of a purulent wound (Suyani et al., 2023).
In this regard, the search for optimal methods of postoperative management of patients with phlegmon of the face and neck is an urgent problem of the modern surgeon (Cao, 2020).
Currently, in practical health care, the tactics of treating purulent wounds are based on the principle of sequential treatment of the wound, taking into account the phase of the wound process (Taub et al., 2021).
Management of a purulent wound includes surgical treatment with a further coating of the wound surface with a gauze bandage with drugs. In the first phase (purulent-necrotic), it is customary to prescribe drugs with antimicrobial, necrolytic, dehydration, and sorption properties, and in the second and third phases (regeneration and epithelialization) – drugs with trophic, regenerative, anti-adhesive properties, that is, ointments that can maintain a moist environment in the wound (Spaargaren et al., 2013).
However, the use of such traditional dressings (gauze, synthetic) has significant drawbacks (Rincón-Cervera et al., 2020).
A large number of new methods based on the physical principles of local treatment of purulent wounds have been proposed, such as: active drainage, ultrasound sanitation, hyperbaric oxygenation, laser therapy, light therapy, magnetotherapy, ozone therapy, and more (Collette et al., 2011). In the last decade, scientific works have appeared on the pathogenetic principles of treatment of purulent wounds, based on new biopolymers (Salleh & Halim, 2018). Meanwhile, the use of controlled negative pressure in the treatment of deep phlegmon of the neck in order to prevent the development of acute secondary mediastinitis deserves special attention due to the pronounced positive results that were presented in this work.
The principle of vacuum therapy in the treatment of wounds is becoming dominant in surgical practice (Bene et al., 2015). At the same time, the use of vacuum therapy to prevent the spread of the purulent-inflammatory process, both local (development of acute secondary mediastinitis) and general (sepsis) deserves special attention due to the promising possibilities of reducing the number of complications, unsatisfactory treatment results, and reducing the length of stay of patients in the clinic, including in the intensive care unit (Porter, 1997).

## 4. Conclusion

The use of local controlled negative pressure statistically significantly reduced the incidence of postoperative complications in patients with deep phlegmon of the neck by 15% and the frequency of repeated interventions by 17%. The use of vacuum therapy in the treatment of patients with acute secondary mediastinitis reduced the incidence of postoperative complications by 21.2%, the frequency of repeated interventions by 34%, and the duration of hospital stay by 12%. There was a tendency to reduce the number of deaths with the use of vacuum therapy by 15%.

When using the method of locally controlled negative pressure, there was a decrease in the concentration of pro- and anti-inflammatory (IL-1β, IL-2, IL-4, IL-6) cytokines, as well as the ratio of IL-1β / IL-4 in the blood serum in patients with deep phlegmon of the neck on the 5th and 10th days of the postoperative period by 1.5–2.5 times, and in patients with acute secondary mediastinitis on the 5th and 10th days of the postoperative period by 2–3.5 times, This indicates a lower severity of the inflammatory process in the postoperative period compared to the standard method of sanitation of the focus of inflammation.

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**Ethics approval and consent to participate** - All patients gave written informed consent to participate in the study.

**Consent for publication** - The study is valid, and recognition by the organization is not required. The authors agree to open the publication.

**Availability of data and material** - Available

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