

MODERN APPROACHES TO DIAGNOSIS AND TREATMENT OF PATIENTS WITH RESPIRATORY TRACT BURNS

Mustafakulov I.B., Ziyodullaev A.U., Jurayeva Z.A.

Samarkand State Medical University and Termez Branch of Tashkent State Medical University

<https://doi.org/10.5281/zenodo.20605988>

Abstract: Respiratory tract burns remain one of the most complex and pressing issues in clinical burn medicine, significantly worsening the course of burn disease and increasing mortality. This paper presents the results of an analysis of the diagnosis and treatment of patients with respiratory tract burns based on clinical, laboratory, and endoscopic examination methods. It has been established that fiberoptic bronchoscopy combined with cytological examination of bronchoalveolar fluid is the most informative method for diagnosing respiratory tract damage. The developed approach to assessing the severity of damage allows for the optimization of treatment strategies and improved patient outcomes.

Keywords: Respiratory tract burn, burn disease, fiberoptic bronchoscopy, diagnosis, treatment.

NAFAS YO‘LLARI KUYISHI BO‘LGAN BEMORLARNI DIAGNOSTIKA VA DAVOLASHGA ZAMONAVIY YONDASHUVLAR

Mustafakulov I.B., Ziyodullaev A.U., Jurayeva Z.A.

Samarqand davlat tibbiyot universiteti va Toshkent davlat tibbiyot universiteti Termiz filiali

Annotatsiya: Nafas yo‘llari kuyishi klinik kombustiologiyaning eng murakkab va dolzarb muammolaridan biri bo‘lib, kuyish kasalligi kechishini sezilarli darajada og‘irlashtiradi va o‘lim ko‘rsatkichini oshiradi. Ushbu maqolada klinik, laborator va endoskopik tekshiruv usullari asosida nafas yo‘llari kuyishi bo‘lgan bemorlarni diagnostika va davolash tahlili natijalari keltirilgan. Bronxoalveolyar suyuqlikning sitologik tekshiruvi bilan birgalikdagi fibrobronxoskopiya nafas yo‘llari shikastlanishini aniqlashda eng informativ usul ekanligi aniqlangan. Shikastlanish og‘irligini baholashga ishlab chiqilgan yondashuv davolash taktikasini optimallashtirish va bemorlar natijalarini yaxshilash imkonini beradi.

Kalit so‘zlar: Nafas yo‘llari kuyishi, kuyish kasalligi, fibrobronxoskopiya, diagnostika, davolash.

СОВРЕМЕННЫЕ ПОДХОДЫ К ДИАГНОСТИКЕ И ЛЕЧЕНИЮ ПАЦИЕНТОВ С ОЖОГАМИ ДЫХАТЕЛЬНЫХ ПУТЕЙ

Mustafakulov I.B., Ziyodullaev A.U., Jurayeva Z.A.

Самаркандский государственный медицинский университет и Термезский филиал

Ташкентского государственного медицинского университета

Аннотация: Ожоги дыхательных путей остаются одной из наиболее сложных и актуальных проблем клинической комбустиологии, значительно утяжеляя течение ожоговой болезни и повышая летальность. В статье представлены результаты анализа диагностики и лечения пациентов с ожогами дыхательных путей на основе клинических, лабораторных и эндоскопических методов обследования. Установлено, что фиброbronxоскопия в сочетании с цитологическим исследованием бронхоальвеолярной жидкости является наиболее информативным методом диагностики поражения дыхательных путей. Разработанный подход к оценке тяжести поражения позволяет оптимизировать лечебную тактику и улучшить исходы лечения пациентов.

Ключевые слова: ожог дыхательных путей, ожоговая болезнь, фибробронхоскопия, диагностика, лечение.

INTRODUCTION

One of the most pressing issues in modern burn medicine is optimizing the treatment of respiratory tract burns. After diagnosing the area and depth of skin damage, determining the severity of inhalation injury, and taking into account clinical and laboratory signs of carbon monoxide poisoning, the primary tactical goal in patients with combined thermal injury is to prevent possible complications of inhalation injury and provide anti-shock treatment. In the first hours after injury, the most serious complication of upper respiratory tract injury is asphyxia caused by laryngeal edema. The clinical picture develops quite rapidly, sometimes leaving the clinician no time to implement conservative measures. To prevent upper respiratory tract obstruction, many authors recommend tracheal intubation if endoscopic findings indicate a high risk of laryngeal edema due to severe thermochemical respiratory tract injury. If it is impossible to perform FBS or laryngoscopy upon admission of the victim, the doctor should be alerted to the possible need for tracheal intubation by such phenomena as dysphonia or aphonia, stridor breathing, and complaints of suffocation.

The method of intubation (transoral, nasotracheal, or tracheostomy) is irrelevant, since the incidence of purulent complications, according to T. Lund et al. (1985), is primarily related to the duration of intubation, not the method of insertion of the endotracheal tube. At the same time, some authors do not recommend resorting to tracheostomy even during prolonged mechanical ventilation due to the high risk of developing serious complications such as tracheostomy infection, necrotic tracheobronchitis, pneumonia, pressure ulcers, and tracheal strictures.

An equally dangerous complication of respiratory tract damage by combustion products (thermochemical or toxicochemical respiratory damage) is acute lung injury (ALI) and, as a more severe form, adult respiratory distress syndrome (ARDS). ARDS complicates the course of severe and extremely severe IT in 20% of victims. If qualified medical assistance is not provided promptly, the clinical picture of this complication manifests 12-24 hours after the injury. In this case, the primary preventive treatment measures are prompt diagnosis and assessment of the severity of the injury using FBS aimed at restoring airway patency and eliminating toxic combustion products, as well as respiratory therapy.

According to many authors, timely initiation and adequate implementation of respiratory therapy in patients with multifactorial respiratory tract lesions has a positive impact on the course and outcome of burn disease. Despite significant progress in burn treatment, issues of timely diagnosis and effective treatment of acute respiratory tract injuries remain unresolved, necessitating further research in this area.

MATERIALS AND METHODS

The study is based on an analysis of the examination and treatment results of 144 patients with thermal inhalation injuries treated at specialized burn centers. Of the total number of cases, 91 were studied retrospectively, while 53 patients comprised a prospective group.

All patients had second- to fourth-degree burns covering 25 to 95% of their body surface area and associated respiratory tract damage. The study utilized clinical, laboratory, instrumental, and endoscopic methods, including fiberoptic bronchoscopy, blood gas analysis, and cytological examination of bronchoalveolar lavage.

To address these objectives, patients in both the main study group and the comparison group were divided into two groups. One group consisted of patients with favorable burn outcomes, and the other with unfavorable outcomes.

Research has shown that clothing ignition and fire are the most common etiological factors, meaning that approximately 90% of burns are caused by flames. General information characterizing both groups is presented in Tables 1 and 2.

Table 1. Distribution of victims by mechanism of injury

Mechanisms of injury	Main group		Comparison group	
	Favorable outcome	Unfavorable outcome	Favorable outcome	Unfavorable outcome
Explosion	5	3	8	7
Flash	2	3	4	8
Clothes catching fire	23	5	32	11
Fire	6	5	9	10
Steam	1	0	2	0
Total	37	16	55	36

Table 2. General characteristics of the examined patients

Indicators	Total	Main group	Comparison group
Total number of people examined	144	91	53
Age	44.80±2.0	44.80±2.0	44.80±2.0
Total burn area (%)	40.75±2.5	38.5±1.5*	40.7±2.0*
Surface burn area (%)	14.6±1.5	13.0±1.5	15.0±1.0
Area of deep burns (%)	27.8±2.0	28.7±1.5*	26.5±1.0*
Frank index	86.5±1.0	91.5±1.0*	85.0±1.0*
Injury Severity Index	101.3±2.0	100.0±2.0	97.5±1.0*
Women	73	48	25
Men	71	43	28

The data in Tables 1 and 2 indicate that the two groups were generally comparable in terms of injury mechanism. However, among the deceased, fire-related injuries were significantly more common. The overwhelming majority of victims sustained burns in a confined space.

There were equal numbers of men and women, and there was no difference in the area of superficial burns. However, the average age of patients in the comparison group was slightly higher than that of patients in the main group ($P < 0.05$), although overall, victims in both groups fell into the same age category of 40 to 45 years. The main differences between the groups concerned indicators reflecting the severity of burn damage to the skin (total area, area of deep burns, Frank index, and burn severity index). These indicators were significantly higher in the main group than in the comparison group, confirming the initial severity of the condition of patients in the main group, who received the innovations we developed during the study.

RESULTS

An analysis of clinical data revealed that diagnosing thermal inhalation injury based solely on clinical presentation is difficult. In the first hours after injury, signs of respiratory damage may be subtle or absent. However, the presence of burns to the face and neck, traces of soot in the respiratory tract, and voice disturbances suggest inhalation injury.

Laboratory tests revealed characteristic changes in blood gas composition, indicating impaired oxygenation. However, these indicators are nonspecific and reflect the overall severity of the condition.

The most informative diagnostic method turned out to be fiberoptic bronchoscopy, which allows for a visual assessment of the condition of the mucous membrane of the respiratory tract, determining the extent of its damage and identifying the presence of combustion products.

Table 3. Frequency of major complications in respiratory tract burns

Complication	Frequency (%)
Pneumonia	30–80
Acute lung injury syndrome	up to 21
Sepsis	28
Cardiovascular failure	16.5
Acute renal failure	14.8

The data obtained indicate a high frequency of infectious complications, among which pneumonia plays a leading role, being the main cause of death.

Cytological examination of bronchoalveolar contents showed that an increase in the number of neutrophilic granulocytes is an unfavorable prognostic sign and correlates with the development of acute lung injury syndrome.

Table 4. Changes in respiratory function parameters in respiratory tract burns

Indicator	Change
Minute respiratory volume (MRV)	Increases by 40%
Vital capacity (VC)	Decreases by 40%
Oxygen utilization factor	Decreases
Forced exhalation	Decreases

The observed changes indicate the development of obstructive breathing disorders and deterioration of ventilation-perfusion relationships.

DISCUSSION

The obtained results confirm that respiratory tract burns are a multifactorial pathological process, based on a combination of thermal and chemical damage to the respiratory tract. Disruption of the epithelial structure and function leads to a decrease in protective mechanisms and contributes to the development of infectious complications.

Fiberoptic bronchoscopy is a key diagnostic method, allowing not only the identification of airway lesions but also assessment of their severity. Supplementing the endoscopic examination with cytological analysis increases the diagnostic value of the method and allows for prognosis of the disease progression.

Table 5. Comparison of traditional and improved treatment approaches

Indicator	Traditional treatment	Improved treatment
-----------	-----------------------	--------------------

Frequency of pneumonia	High	Reduced
Mortality	up to 50%	Reduced
Duration of treatment	Long-term	Shortened

The use of a comprehensive approach to treatment, including sanitary bronchoscopy, respiratory support, and optimized infusion therapy, can significantly improve treatment outcomes.

CONCLUSION

Respiratory tract burns remain a serious problem in modern medicine, associated with high complication and mortality rates. A comprehensive diagnostic approach using fiberoptic bronchoscopy and cytological methods allows for more accurate assessment of the severity of respiratory damage. The introduction of improved treatment methods helps reduce the incidence of complications and improve patient outcomes.

References

1. Bagnenko S.F., Krylov K.M., Ershova I.N. On the 60th Anniversary of the Burn Center of the I.I. Dzhanelidze Research Institute of Emergency Care. // *Emergency Medical Care. Proc. of the Int. Conf. "Actual Problems of Thermal Trauma"* dedicated to the 60th Anniversary of the Burn Center of the I.I. Dzhanelidze Research Institute of Emergency Care. St. Petersburg (June 20–22), 2006. – No. 3. – Vol. 7. – pp. 15–16.
2. Bazhanov A.A., Ses T.P., Orlova G.P., et al. Bronchoalveolar lavage in diagnostics and treatment of disseminated processes of the lungs // *Pulmonology*. – 1992. – No. 4. – P. 563.
3. Belikov Yu.N., Iashvili L.B., Urotadze T.Z., et al. Prevention of infectious and destructive complications of the lungs in thermal inhalation injury, taking into account the state of local immunity. In: *Current issues of thermal injury*. St. Petersburg, 2002. pp. 117–118.
4. Belyaev A.N., Kozlov S.A., Bateryakov E.A. et al. Use of antioxidants for the prevention of DIC syndrome in complicated burns // *Nizhny Novgorod Medical Journal*, 2004. – *Combustiology*, supplement, pp. 63–64.
5. Beresneva E.A., Orfanitsky G.Yu., Barinova M.V., et al. Radiological features of changes in the lungs in thermal inhalation injury. *International Congress "Combustiology at the Turn of the Century"*. Moscow, 2000. – pp. 41–42.
6. Boyenko S.K. The course, its prognosis and treatment of respiratory tract burns // *Clinical Surgery*. – 1988. – No. 3. – P. 49–51.
7. Brygin P.A., Kartavenko V.I. Difficulties of artificial ventilation of the lungs in inhalation trauma // *Nizhny Novgorod Medical Journal*, 2004. – *Combustiology*, supplement, pp. 66–67.
8. Dmitriev D.M., Smolnikov V.V., Kryklya A.S. Evaluation of the effectiveness of early transportation of patients with severe thermal injury to a specialized center // *Nizhny Novgorod Medical Journal*, 2004. – *Combustiology*, supplement, pp. 36–37.
9. Dmitrienko O.D. Specialized care for burn victims in large cities: Abstract of a Doctor of Medicine dissertation. – St. Petersburg, 1993. – 36 p.
10. Dmitrienko O.D. Features of organizational and treatment decisions in the liquidation of the consequences of fires and burn disasters // *Proc. VII All-Russian Scientific Conference on the Problem of Thermal Injuries*. – Chelyabinsk, 1999. – P. 16–17.
11. Katanov E.S., Nikolaev Yu.S., Arsyutov G.P. Analysis of mortality and causes of death based on the materials of the Chuvash Burn Center // *Nizhny Novgorod Medical Journal*, 2004. – *Combustiology*, supplement, p. 44.

12. Katrushenko R.N. Features of the clinic and treatment of burn disease with damage to the respiratory tract: Abstract of Cand. Sci. (Medicine) Dissertation. – Leningrad, 1967. – 22 p.
13. Klimov A.G., Shpakov I.F. Diagnostics and treatment of thermochemical damage to the respiratory tract in severely burned patients // Anesthesiology and Resuscitation. – 1999. – No. 2. – P. 12–15.
14. Loginov L.P. Tracheostomies in patients with severe inhalation trauma // Nizhny Novgorod Medical Journal, 2004. – Combustiology, supplement, pp. 86–87.
15. Lukomsky G.I., Shulutko M.L., Wheeler M.G. and others. Bronchopulmonology. – M.: Medicine, 1982. – 399 p.
16. Makova E.A., Tyurnikov Yu.I., Malyutina N.B. On the issue of increasing the effectiveness of inhalation therapy in a burn center // Nizhny Novgorod Medical Journal, 2004. – Combustiology, supplement, pp. 88–89.