

OPTIMIZATION OF TREATMENT OF PATIENTS WITH THERMAL INHALATION INJURY AND ITS IMPACT ON BURN DISEASE OUTCOMES

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Abstract: Thermal inhalation injury (TII) is one of the most severe components of burn disease, significantly worsening its course and prognosis. This paper presents an analysis of clinical, laboratory, and endoscopic data from 144 patients with TII. The causes of unsatisfactory results of traditional treatment are examined and the effectiveness of improved therapeutic methods is assessed. It has been established that the use of a comprehensive treatment approach, including sanitizing fiberoptic bronchoscopy, optimized infusion therapy, and respiratory support, reduces the incidence of complications and mortality. A differentiated treatment strategy based on the severity of airway damage is a key factor in improving treatment outcomes.

Keywords: thermal inhalation injury, burn disease, treatment, bronchoscopy, intensive care.

TERMAL INGALYATSION JAROHATLI BEMORLARNI DAVOLASHNI OPTIMALLASHTIRISH VA UNING KUYISH KASALLIGI NATIJALARIGA TA'SIRI

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Annotatsiya: Termal ingalyatsion jarohat kuyish kasalligining eng og'ir tarkibiy qismlaridan biri bo'lib, uning kechishini sezilarli darajada og'irlashtiradi va prognozini yomonlashtiradi. Ushbu maqolada termal ingalyatsion jarohatli 144 nafar bemorning klinik, laborator va endoskopik ma'lumotlari tahlil qilingan. An'anaviy davolashning qoniqarsiz natijalari sabablari ko'rib chiqilgan hamda takomillashtirilgan terapevtik usullarning samaradorligi baholangan. Sanatsion fibrobronxoskopiya, optimallashtirilgan infuzion terapiya va respirator qo'llab-quvvatlashni o'z ichiga olgan kompleks davolash yondashuvi asoratlar va o'lim holatlari kamayishiga yordam berishi aniqlangan. Nafas yo'llari shikastlanishining og'irlik darajasiga asoslangan differensial davolash strategiyasi davolash natijalarini yaxshilashning muhim omilidir.

Kalit so'zlar: termal ingalyatsion jarohat, kuyish kasalligi, davolash, bronxoskopiya, intensiv terapiya.

ОПТИМИЗАЦИЯ ЛЕЧЕНИЯ ПАЦИЕНТОВ С ТЕРМИЧЕСКОЙ ИНГАЛЯЦИОННОЙ ТРАВМОЙ И ЕЁ ВЛИЯНИЕ НА ИСХОДЫ ОЖОГОВОЙ БОЛЕЗНИ

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Аннотация: Термическая ингаляционная травма является одним из наиболее тяжёлых компонентов ожоговой болезни, значительно ухудшая её течение и прогноз. В данной статье представлен анализ клинических, лабораторных и эндоскопических данных 144 пациентов с термической ингаляционной травмой. Рассмотрены причины неудовлетворительных результатов традиционного лечения и оценена эффективность усовершенствованных терапевтических методов. Установлено, что применение комплексного лечебного подхода, включающего санационную фиброbronxоскопию,

оптимизированную инфузионную терапию и респираторную поддержку, снижает частоту осложнений и летальность. Дифференцированная лечебная стратегия, основанная на степени тяжести поражения дыхательных путей, является ключевым фактором улучшения результатов лечения.

Ключевые слова: термическая ингаляционная травма, ожоговая болезнь, лечение, бронхоскопия, интенсивная терапия.

INTRODUCTION

Thermal inhalation injury remains one of the most severe and prognostically unfavourable components of combined burn disease. Despite the advancement of intensive care, improved respiratory support methods, and the introduction of modern infusion programs, airway damage from exposure to high temperatures and combustion products continues to be associated with a high rate of complications and mortality. In clinical practice, it is the thermal inhalation injury that often determines the severity of a patient's condition, shapes the pattern of early and late complications, and largely determines the outcome of burn disease.

The pathogenesis of thermal inhalation injury is multifaceted and includes thermal damage to the respiratory mucosa, chemical exposure to toxic combustion products, impaired mucociliary clearance, early development of respiratory distress syndrome, and the development of infectious complications. These processes begin within the first minutes after the inhalation of hot air and smoke, making early diagnosis and prompt treatment critical. However, the clinical signs of thermal inhalation injury are often nonspecific, and traditional methods for assessing the severity of airway damage do not fully determine the depth and extent of damage.

In this regard, optimizing treatment and diagnostic approaches aimed at early detection of the extent of damage and timely correction of respiratory dysfunction is particularly important. Current research shows that the use of fiberoptic bronchoscopy, cytological assessment of bronchial lavage, parametric severity scales, and differentiated infusion-transfusion therapy regimens can significantly improve treatment effectiveness. However, in real-world clinical practice, these methods are applied unevenly, and uniform standards for the management of patients with TII still lack a clear path.

Optimizing treatment for patients with thermal inhalation injury requires not only improving diagnostic algorithms but also implementing pathogenetically based treatment measures, including early airway management, correction of gas exchange disorders, prevention of infectious complications, and individualized fluid therapy. The question of how the integrated use of these approaches impacts the course of burn disease and its outcomes remains relevant and requires further study.

This study analyzes the effectiveness of improved diagnostic and treatment methods for thermal inhalation injury, as well as assesses their impact on the clinical course and outcomes of burns. The data obtained allow us to clarify the role of modern diagnostic and treatment technologies and justify their widespread implementation in specialized burn centers.

MATERIALS AND METHODS

The study is based on an analysis of 144 clinical observations of patients with thermal inhalation injury. The patients were treated at specialized burn centers. Of the total number of observations, 91 cases were studied retrospectively, and 53 patients were included in a prospective group to evaluate the effectiveness of improved treatment methods. The patients' ages ranged from 17 to 74 years. All patients had second- to fourth-degree burns covering 25 to 95% of their body

surface, accompanied by respiratory tract damage. The study utilized clinical methods, laboratory tests, including blood gas analysis and biochemical parameters, and instrumental methods, with fiberoptic bronchoscopy playing a key role. To assess treatment effectiveness, a comparative analysis of traditional and advanced therapies was conducted.

The victim's complaints were recorded, the level of consciousness was noted during a physical examination (if consciousness was depressed, the degree of impairment was assessed using the Glaskow Coma Scale), percussion and auscultation of the lungs and heart were performed, the abdomen was palpated, the neurological status was assessed, and the heart rate and respiratory rate were calculated. Systolic and diastolic blood pressure was measured using N.S. Korotkov. Other instrumental

The methods used included chest X-ray, electrocardiography, and, if inhalation injury was suspected, diagnostic FBS was performed (in 98 out of 106 patients) (Fig. 1).

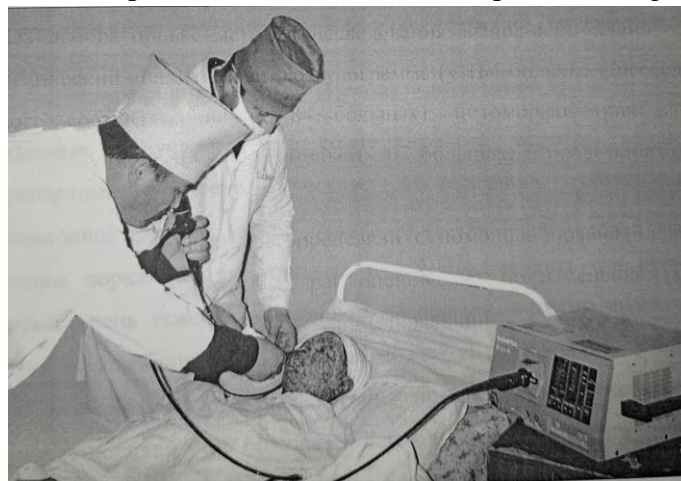


Fig. 1. The moment of performing fiberoptic bronchoscopy.

RESULTS

An analysis of treatment results showed that the course of burn disease in patients with thermal inhalation injury is characterized by a high rate of complications and a severe clinical course. In the early stages after injury, airway obstruction due to mucosal edema and obstruction by combustion products plays a leading role.

Later, infectious complications become more prominent, with pneumonia being the most common. The development of inflammatory processes in the respiratory system is associated with impaired mucociliary clearance, epithelial damage, and decreased immune defense.

Table 1. Main causes of death in patients with TII

Cause of death	Frequency (%)
Shock	30–82
Pneumonia	25.5
Sepsis + pneumonia	28
Multiple organ failure	up to 48.2

The presented data indicate that infectious complications and systemic disorders are the leading factors determining the outcome of the disease.

An important stage of treatment is early stabilization of the patient's condition, aimed at preventing the development of respiratory failure. In the first hours after injury, the main danger is asphyxia caused by laryngeal edema. Therefore, promptly ensuring airway patency is of great importance.

Table 2. Frequency of complications depending on the severity of TII

Degree of TII	Pneumonia (%)	ALI (%)
1st degree	minimal	absent
2nd degree	60	rare
III degree	68	high
Extremely difficult	up to 100	up to 21

It has been established that the frequency of complications directly depends on the severity of the respiratory tract damage.

One of the key treatment methods is sanitizing fiberoptic bronchoscopy, which allows for the removal of combustion products, restoration of airway patency, and reduction of the risk of infectious complications. In severe cases of TII, the procedure is performed multiple times throughout the day.

Table 3. Effectiveness of sanitation bronchoscopy

Indicator	Before treatment	After treatment
Airway patency	reduced	restored
Amount of secretion	high	reduced
Frequency of complications	high	reduced

The use of bronchoscopy in combination with inhalation therapy helps improve bronchial drainage function and reduce inflammatory changes.

Infusion therapy for patients with TII has its own unique characteristics. It has been established that the volume of administered solutions must be increased compared to traditional regimens due to severe microcirculation impairment and increased vascular permeability.

Table 4. Features of infusion therapy for TII

Parameter	Meaning
Increase in volume	+40%
Diuresis	0.5–1 ml/kg/hour
Use of colloids	5–7 ml/kg/day

Optimization of infusion therapy helps stabilize hemodynamics and improve tissue perfusion.

Antibacterial therapy is an integral part of treatment. Given the high frequency of respiratory infections, early antibiotic administration, taking into account the sensitivity of the microflora, is advisable.

Table 5. Comparative evaluation of treatment methods

Indicator	Traditional treatment	Improved treatment
Pneumonia	high	reduced
Sepsis	often	less often
Mortality	up to 50%	significantly reduced

DISCUSSION

The results of the study confirm that thermal inhalation injury is a key factor determining the severity of burn disease. The multifactorial nature of respiratory damage necessitates a comprehensive treatment approach, including both respiratory support and active tracheobronchial

debridement. The use of fiberoptic bronchoscopy allows not only to diagnose the extent of the lesion but also to implement treatment measures aimed at eliminating airway obstruction. Combined with appropriate fluid and antibacterial therapy, this helps reduce the incidence of complications.

A differentiated treatment approach based on the severity of TII is particularly important. This allows for the optimization of the treatment volume and enhancement of its effectiveness.

CONCLUSION

Thermal inhalation injury significantly worsens the course of burn disease and requires a comprehensive approach to treatment. The use of modern diagnostic and therapeutic methods can significantly improve treatment outcomes and reduce complication rates and mortality. The implementation of differentiated treatment strategies based on the severity of respiratory damage is a promising approach to improving the effectiveness of medical care for this category of patients.

References

1. Akhmedov M.G., Aliyev M.A., Tagirov S.A. Combined electrothermal injury, mutual aggravation syndrome. // International Congress "Combustiology at the Turn of the Century". Moscow, 2000. – p.41-42.
2. Bagnenko S.F., Krylov K.M., Kozulin D.A., et al. Department of Thermal Injuries (Years, Problems). In the book: Current Issues of Thermal Injury. St. Petersburg, 2002. pp. 34-36.
3. 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.
4. Orlov A.N. On the indications and effectiveness of tracheostomy and bronchoscopy in the treatment of burns // Vestn. of surgery - 1964, N 4.- P.32-36.
5. Ostrovsky N.V., Mayer E.A., Shulaeva N.M. et al. Epidemiological characteristics of thermal injury in the Saratov region and analysis of defects in providing first aid // Nizhny Novgorod Medical Journal, 2004. - Combustiology, supplement, pp. 50-51.
6. Paramonov B.A., Porembsky Ya.O., Yablonsky V.G. Burns. Manual. St. Petersburg, Special Literature. 2000. - 488 p.
7. Ryabov G.A. Hypoxia of critical conditions. Moscow, Medicine, 1988. – 205 p.
8. Ryabov G.A., Chilina T.Yu., Dorokhov S.I. et al. Modern bronchological research methods in the diagnostic system of adult respiratory distress syndrome // Anesthesiology and resuscitation. - 1998. - No. 3.- P.27-31.
9. Savitska M., Savchenko V., Klishevich O., et al. Non-cardiogenic pulmonary edema in patients with burn disease. // International Congress "Combustiology at the Turn of the Century". Moscow, 2000. - pp. 107-108.
10. Sveshnikov A.I. Pulmonary embolism (PE) in burn patients. // International Congress "Combustiology at the turn of the century". Moscow, 2000. - pp. 83-84.
11. Tursunov B.S., Karabaev H.K., Rafikov M.G. Efficiency of autodermoplasty for deep burns in the elderly. / In the book: International Congress "Combustiology at the Turn of the Century". Moscow, 2000. – p. 151-152.
12. Filimonov A.A., Ryzhkov S.V., Bratiychuk A.N. Structure of thermal inhalation injury in disasters. // International Congress "Combustiology at the Turn of the Century". Moscow, 2000. – pp. 33-34.