

ACUTE RESPIRATORY DISTRESS SYNDROME IN PATIENTS WITH BURN DISEASE**Najmiddinov Z.A**

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Resume: After a burn lesion, Acute Respiratory Distress Syndrome (ARDS) may occur via direct lung injury due to inhaled smoke and fumes or mediated by the inflammatory response associated with the burn or its infectious complications. A prospective cohort study was performed from January to December 2025. Demographic and diagnostic data, prognostic scores, etiology and data on the extent and depth of burns were collected. Data related to risk factors for ARDS and death were also recorded. A total of 85 patients were included in the study. The mean total body surface area burned was 28.3%; 35.3% presented inhalation injuries. ARDS was diagnosed in 38.6% of patients under invasive mechanical ventilation. Mortality rate observed in the study patients was high and associated with ARDS diagnosis.

Keywords: burn unit, acute respiratory distress syndrome, risk factors, mortality.

Introduction. ARDS is characterized by severe acute hypoxemia following alveolar injuries in the lungs. Injuries are inflammatory in nature, leading to protein-rich pulmonary edema and acute respiratory failure. After a burn lesion, ARDS can occur via direct lung injury due to inhaled smoke and fumes or mediated by the inflammatory response associated with the burn or its infectious complications. ⁸ The increase in capillary permeability in patients with extensive burns is not only observed in the lesion site, but also in organs elsewhere. The increase in vascular permeability leads to the leakage of fluid to the interstitial space; under those circumstances, pulmonary edema is aggravated by thermal injuries due to inhaled smoke. Knowledge of epidemiologic data on clinical characteristics, risk factors and prognosis of burn patients who develop ARDS is crucial to the development of preventive and therapeutic interventions to improve clinical outcomes. The purpose of this study was to assess incidence and risk factors for ARDS associated with thermal injury in adult burn patients .

Material and Methods. A prospective cohort study was conducted with adult patients admitted to the Intensive Care Unit (ICU) specialized in the treatment of burn patients at a Samarkand State medical university hospital. A consecutive sampling of all patients admitted to the ICU was performed from 1st January 2025 to 31st December 2012. Data were collected from patients' records. Identification data, demographic characteristics, diagnosis, date of the thermal injury, date of ICU and hospital admission and release were collected. Inhalation injury was suspected in patients with the following symptoms: history of a closed-space fire and facial burns with singed nasal hair, carbonaceous sputum, hoarseness, stridor or laboured breathing. Bronchoscopy was performed in patients suspected of having inhalation injury to confirm diagnosis. If edema or blistering was seen during laryngoscopy, patients were intubated. Intubation and mechanical ventilation were indicated if inhalation injury with respiratory distress was present or anticipated.

The date of ARDS diagnosis was noted, as well as the start of mechanical ventilation and its duration. Time to ARDS diagnosis was expressed in days, considering the date of thermal injury

and ARDS-grading was evaluated at the initial time of ARDS diagnosis. Outcome of the patients in the study was assessed when leaving the ICU.

Results and discussion. The study included 85 patients that met the eligibility criteria. Study patients were admitted to the ICU 2 days (1 – 4) after the thermal injury. In terms of depth, third-degree burns were observed in 70 (82.4%) patients. Fifty (58.8%) patients were deemed healthy before the thermal injury. Invasive ventilatory support was required in 44 ICU patients (51.8%). Duration of invasive mechanical ventilation was 18.5 (8.5 – 33.5) days. Median TBSA was higher among patients requiring invasive mechanical ventilation: 34% (21.5% – 50%) compared to 18% of other burn patients (9% – 28%; $P < 0.001$). Inhalation injuries were frequent (65.9%) among patients who required invasive mechanical ventilation.

ARDS was diagnosed in 17 (20.0%) patients, which corresponds to 38.6% of patients who needed invasive mechanical ventilation. Median TBSA was higher in patients with ARDS: 30 (21 – 54) compared to 23 in those without ARDS (12.5 – 33.5; $P = 0.04$). In multivariate analysis, the presence of inhalation injuries was the only independent risk factor identified for ARDS (OR = 9.75; CI 95% 2.79 – 33.95; $P < 0.001$) (Table III). Hospital mortality was higher for patients with a diagnosis of ARDS (52.9%) compared to patients without ARDS (27.9%, $P = 0.04$).

A high incidence of ARDS was observed in burn patients admitted to a specialized intensive care unit, particularly in those under invasive mechanical ventilation. Diagnosis of ARDS was associated with higher mortality rates in these patients, and inhalation injuries were associated with increased risk for developing ARDS.

Inhaled smoke releases materials that occlude the airway lumen. Such material is composed of fibrin, neutrophils, mucus and epithelial cell debris. Occluded alveoli are hypoventilated, causing an increase in pulmonary shunt fraction that leads to changes in the ventilation:perfusion ratio. Open alveoli are over-distended during mechanical ventilation; the distention of the alveolar wall releases inflammatory cytokines and leads to damage induced by mechanical ventilation. These changes reduce gas exchange and cause hypoxemia.

Our results confirm that ARDS is associated with increased mortality in burn patients. Previous clinical study failed to find this association, while one study reported odds of death increased more than fivefold in moderate ARDS, and ninefold in severe ARDS compared to burn patients without this complication.

High rates of mortality found in the present study might be explained by a number of factors, such as delayed admission after the accident, comorbidities, and association of ARDS with other complications, such as infections and kidney failure requiring dialysis. The observed mean delay of 2 days for admission can be justified by the small number of specialized burn care hospital beds available in the geographical area concerned.

Length of ICU stay was longer for burn patients who developed ARDS, but not hospital length of stay. Prolonged mechanical ventilation and possible complications after ARDS may have prolonged ICU stay, but since these patients have a long hospital stay due to multiple surgical interventions and rehabilitation, it is possible that this small sample could not capture the difference in hospital stay. The main limitation of the present study is that it was a single centre study with a small number of patients. The small sample size might have underestimated the effect of risk factors relevant for the studied outcomes. Besides, data on the ventilatory and fluid resuscitation strategies used were not analysed: these variables may be associated with the high incidence of ARDS observed and might have influenced its prognosis. Additional studies

are required to assess the role of protective mechanical ventilation and restricted fluid therapy to prevent ARDS and reduce mortality rates in these patients

In conclusion, ARDS was common among burn patients admitted to the specialized intensive care unit, particularly among those requiring mechanical ventilation. The pathological mechanisms involved in the occurrence of ARDS in these patients are not fully understood, but are likely to be multifactorial. Inhalation lesions were associated with an increased risk of developing ARDS. ARDS was associated with increased mortality rates in burn patients.

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