

Clinical Course and Outcome in Inhalational Injury in Burn Patients: An Observational Study

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ABSTRACT

Inhalational injuries, often resulting from burns or explosions, can lead to life-threatening complications, particularly involving the upper airway due to edema and subsequent respiratory distress. This study outlines a series of nine cases managed at a tertiary care center in the Lucknow region, focusing on the clinical trajectory and outcomes of patients affected by inhalational injury. Each of the nine individuals presented with varying severities of airway involvement. Initial evaluation was performed using nasolaryngoscopy, and seven patients underwent early prophylactic intubation before further definitive airway and burn management using fiberoptic bronchoscopy. All patients were successfully weaned off ventilatory support and discharged in stable condition. Given the range of potential complications associated with inhalational injury, this study suggests a structured protocol to guide the clinical management of such cases.

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INTRODUCTION

Burn injuries often involve multiple organ systems, with the skin being the most frequently affected. The damage typically leads to hypovolemic shock due to extensive fluid loss through evaporation, followed by increased risk of infection, which can trigger systemic inflammatory response syndrome (SIRS), sepsis, and potentially progress to multi-organ failure and death.¹ Among the various complications, respiratory failure stands out as the leading cause of mortality in burn victims, particularly when accompanied by inhalational injury.^{2,3}

Inhalational injuries, particularly when associated with facial burns, are commonly seen in individuals

exposed to flames in confined spaces. These injuries may affect the upper and lower respiratory tracts and sometimes involve exposure to toxic gases. Clinical features may include airway swelling, bronchospasm, obstruction due to soot deposits, pneumonia, acute respiratory distress syndrome (ARDS), carbon monoxide poisoning, and cyanide toxicity. The presence of facial burns and other traumatic injuries can further complicate the condition. Therefore, timely triage and an organized approach to management are crucial. This study highlights a case series of nine patients to better understand the clinical course and management outcomes in such scenarios.

CASE SERIES

This case series includes nine patients who sustained burn injuries with associated inhalational trauma, admitted to a tertiary care center in the Lucknow region. All patients were exposed to fire in enclosed environments, resulting in varying degrees of airway involvement.

Upon admission, patients underwent an initial assessment including clinical signs such as hoarseness of voice, singed nasal hair, carbonaceous

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sputum, and stridor. Nasolaryngoscopy was utilized to evaluate upper airway edema, and seven of the nine patients were intubated prophylactically due to anticipated airway compromise.

Subsequent management included fiberoptic bronchoscopy to assess lower airway injury, identify soot deposits, and monitor mucosal damage. Supportive treatment included humidified oxygen therapy, nebulized bronchodilators, pulmonary toilet, and appropriate antibiotic coverage based on microbial surveillance.

All patients received multidisciplinary care involving intensivists, pulmonologists, and burn specialists. No cases of tracheostomy were required. All nine patients responded well to treatment, and were successfully extubated, and discharged in stable condition. This outcome underscores the value of early airway intervention and a coordinated treatment protocol in managing inhalational injuries in burn victims.

DISCUSSION

Inhalational injury significantly complicates the management of burn patients, contributing to increased morbidity and mortality.^{4,5} The presence of facial burns, singed nasal hair, and carbonaceous sputum often raises suspicion for airway involvement, necessitating prompt evaluation and intervention. In our case series, early identification and proactive airway management played a pivotal role in achieving favorable outcomes.

Prophylactic intubation, particularly in patients at risk of progressive airway edema, ensured airway protection and facilitated safe transport and stabilization.^{6,7} Fiberoptic bronchoscopy provided direct visualization of airway damage and guided therapeutic decisions, such as suctioning of soot deposits and assessing the extent of mucosal injury. The judicious use of mechanical ventilation combined with targeted supportive measures, including humidified oxygen, bronchodilators, and pulmonary hygiene, helped mitigate pulmonary complications.

Importantly, the early institution of a standardized airway protocol helped reduce variability in care and contributed to consistent recovery across patients. Despite the severity of inhalational injury,

all patients in our study were extubated successfully and discharged in stable condition, underscoring the effectiveness of structured intervention and multidisciplinary coordination.

Nevertheless, limitations such as small sample size and single-center design must be acknowledged. Further prospective studies with larger cohorts are warranted to validate these findings and optimize clinical pathways for patients with combined thermal and inhalational injuries.

CONCLUSION

Inhalational injuries, when associated with burns, pose significant challenges in critical care due to their rapid progression and potential for severe respiratory compromise. This observational study emphasizes the importance of early recognition, structured airway management, and multidisciplinary care in improving outcomes. By implementing a proactive and standardized approach—including timely intubation, fiberoptic evaluation, and comprehensive supportive therapy—favorable patient recovery can be achieved, even in severe cases. Establishing clear clinical protocols and early intervention strategies remains essential for optimizing survival and minimizing complications in this high-risk population.

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