

Guideline Based Management of Inhalational Burns

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Abstract

Majority of the fire-related deaths results not from burns but from inhalation of the toxic products of combustion and inhalation injury has high mortality rate especially when patients require ventilator support for more than 1 week after injury. Early diagnosis of bronchopulmonary injury is thus critical for survival and is conducted primarily clinically, based on a history of closed space exposure, facial burns, and carbonaceous debris in mouth, pharynx, or sputum. Chest radiographs are routinely normal until complications, such as infections, have developed. Neither normal oxygenation nor normal chest radiographs exclude the diagnosis of inhalational burns. However, signs such as hoarseness, carbonaceous sputum, wheeze, and dyspnea are strongly suggestive of inhalation injury. A proper guideline-based management is needed for early diagnosis of inhalational burns and also for keeping a check on unwanted interventions. Here we present a case report on a patient who suffered thermal burns due to kerosene over face, breast and right upper limb who on presentation had clinical signs suggestive of inhalational burns and was managed with International Society For Burn Injuries (ISBI) guidelines.

Keywords: Inhalational, burn, bronchoscopy

Introduction

Inhalation injury can affect the airways as well as result in systemic toxicity. Based upon the primary localization of the insult, inhalation injury is classified into injuries of the upper airway, the tracheobronchial system or the lung parenchyma.

Upper Airway Injury – The leading injury in the upper airway (above the vocal cords) is thermal injury due to the efficient heat exchange in the Oro- and nasopharynx. The immediate injury results in erythema, ulcerations, and edema. In combined burn and inhalation injury, aggressive fluid administration required to treat burn shock promotes early edema formation.

Tracheobronchial Injury – With the exception of inhalation of steam, injury to the tracheobronchial tree is usually caused by chemicals in smoke. However, toxic inhalation of noxious gases, liquids, and direct airway fire can also be associated with a similar process.

Parenchymal Injury – Damage to the lung parenchyma is delayed. injury to the lung parenchyma is characterized by atelectasis and alveolar collapse resulting in increased trans vascular fluid flux, a decrease in surfactant, and a loss of hypoxic vasoconstriction and therefore impaired oxygenation.

Systemic Toxicity – Direct systemic effect of inhalation injury is caused by breathing toxic



Fig. 1: Facial burns with signs of inhalational injury

substances formed via combustion or pyrolysis. The two most relevant gases associated with increased morbidity and mortality are carbon monoxide and hydrogen cyanide.

Bronchoscopy has three key roles in the intensive care management of II. Firstly, severity of airway injury as witnessed by direct visualization in bronchoscopy has been shown to be predictive of outcomes. Secondly bronchoscopy can be used to provide a functional washout of the bronchial tree; this may improve ventilation and reduce risk of atelectasis and pneumonia. Finally, it is a useful tool for bronchioalveolar lavage, in order to obtain fluid for culture and, therefore, targeted antimicrobial therapy.

Methods and Materials

Here we present a case of 35-year-old female who presented to JIPMER emergency department with alleged history of accidental thermal burns due to kerosene over face, breast and right upper limb for a duration of 10 seconds at her residence. She sustained second degree superficial and deep burns over face, breast with total burn surface area of 15%. She also had features and signs suggestive of inhalational injury but without any

respiratory symptoms. (figure 1). She had facial edema, singeing of nasal hair and hair burning. Patient was managed with International Society For Burn Injuries (ISBI) guidelines. Initially she was resuscitated with 100% oxygen by face mask, ringer lactate based on parklands formula and adequate analgesics were given. Burned area was thoroughly washed, any necrotic area removed and dressing was kept over it. Even though she did not have any respiratory symptoms she was planned for emergency tracheostomy since she had clinical signs that were suggestive of respiratory tract involvement. To make sure, she underwent flexible bronchoscopy done by pulmonologist which did not show any sort of inhalational injury in the respiratory tract. For the superficial burned area dressing with collagen, silver based ointment and for deeper burns skin grafting.

Results

By following guidelines inhalation injuries were ruled by bronchoscopy avoiding prophylactic tracheostomy which would have done and burn wounds healed well.

Discussion

Inhalation injury remains a critical area of burns research, with significant implications in the overall survival of burns. Inhalational injury has important implications as it increases resuscitation fluid volumes by up to 50% and there is a significant increase in the need for ventilatory support. Inhalational injury is a leading cause of mortality amongst burns patients.¹

When assessing criteria for intubation, it is important to weigh the risks and benefits of the procedure. Theoretically, traditional prophylactic intubation can be used to assure the airway will not be lost in a patient who may develop airway swelling.² However, intubation can be associated with significant morbidity and mortality. Additionally, intubation is associated with increased rates of pneumonia in burned patients. Intubation is also associated with higher total volumes of crystalloid resuscitation. Both pneumonia and large volume crystalloid resuscitation are associated with increased mortality risk in the burned patient. This evidence suggests that these adverse outcomes may be attenuated by avoiding unnecessary intubation. So burns patients with suspected inhalational injury with no immediate respiratory symptoms should

undergo a bronchoscopy so that the respiratory tract can be assessed and the need for tracheostomy or intubation can be planned. This will also lead to reduction in unnecessary procedures and its complications on the patient.³

When fire victims are brought to the Emergency Department, intubation should be performed immediately if the patients show signs of respiratory distress, any stridor, or if they have severe face or neck burns. If patients do not present with these signs but have erythema in the oropharynx, bronchoscopy, or laryngoscopy can be performed to assess for upper airway edema.⁴ If edema is visualized, patients should be prophylactically intubated as airway patency can quickly become compromised as edema worsens. If no edema is appreciated, patients can be observed closely and should not be discharged.

Conclusion

By this case report we come to the conclusion that by following burns guidelines in case of inhalational burns overall morbidity & mortality can be reduced.

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