

Vanderbilt Burn Center

Practice Guideline

Smoke Inhalation Injury

Author(s): Jeffrey S. Guy, MD

Date of Last Revision: September 10, 2002

Inhalation injury occurs when patients inhale superheated gasses, steam, hot liquids of products of incomplete combustion. [1] Approximately 20% of patients admitted to the burn center can be suspected having experienced an inhalation injury. [2] Patients often exhibit an initial “honeymoon period” ranging between 24 to 72 hours prior to developing respiratory difficulty. [3] Therefore, vigilance must be exercised. Initial emphasis is initially placed on securing the airway and making the diagnosis of smoke inhalation. One cannot quantify the severity of inhalation injury. Fiberoptic bronchoscopy has been determined as the “gold standard” for the diagnosis of smoke inhalation. Bronchoscopic findings consistent with inhalation injury include: carbonaceous debris, mucosal pallor, mucosal ulceration, or mucosal erythema. [4, 5] Chest x-rays obtained shortly after injury are routinely normal, but are routinely obtained to evaluate endotracheal tube placement, as well as a baseline.

One must have a great deal of caution regarding the airway in patients with suspected smoke inhalation. There is no role for the prophylactic intubation of these patients. However, progression of facial and airway edema is progressive especially in a patient undergoing fluid resuscitation. It is for these reasons, continuous monitoring of the airway in the burn ICU and early elective intubation as required.

There is no role for treatment of smoke inhalation with either antibiotics or steroids. Ventilator strategy will focus on limiting transpulmonary inflation pressure. Attempts will be made to limit PIP to less than 40 cm H₂O pressure and the acceptance of permissive hypercapnia. [6-8] Pressure limited modes of ventilation are preferred over volume-limited modes. [9] When airway pressures remain persistently above 40 cm H₂O, the adequacy of chest wall escharotomies will be reevaluated and consideration will be given to abdominal compartment syndrome (ACS). Higher airway pressure might be tolerated due to decreased chest wall compliance, and the PIP might not accurately reflect true transpulmonary pressures. [10] Inhalation therapy with nebulized heparin and acetylcystein will be started and continued for five days in those patients with smoke inhalation. [11] High frequency percussive ventilation (VDR) may be used in patients perceived as having severe inhalation injury or as a rescue modality. VDR ventilation has been shown to be beneficial in this group of patients. [12]

1. JW, D., *Toxic chemicals versus lung tissue - an aspect of inhalation injury revisited. The Everett Idris Evans memorial lecture. J Burn Care Rehabil, 1986. 7: p. 213-22.*

2. Shirani KZ, P.B.J., Mason AD Jr, *The influence of inhalation injury and pneumonia on burn mortality*. Ann Surg, 1987. **205**: p. 82-7.
3. Pruitt BA Jr, E.D., Morris A, *Progressive pulmonary insufficiency and other complications of thermal injury*. J Trauma, 1975. **15**: p. 369-79.
4. Moylan JA, A.K., Birnbaum M, *Fiberoptic bronchoscopy following thermal injury*. Surg Gynecol Obstet, 1975. **140**: p. 541-3.
5. Mansanes MJ, L.C., Lioret N, Maillard D, Saizy R, Lebeau B, *Fiberoptic bronchoscopy for the early diagnosis of subglottic inhalation injury: comparative value in the assessment of prognosis*. J Trauma, 1994. **36**: p. 59-67.
6. Corbridge TC, W.L., Crawford GP, Chudoba MJ, Yanos J, Sznajder JI, *Adverse effects of large tidal volume and low PEEP in canine acid aspiration*. Am Rev Respir Dis, 1990. **142**: p. 311-5.
7. Sheridan RL, K.R., McEttrick MM et al., *Permissive hypercapnia as a ventilatory strategy in burned children: effect on barotrauma, pneumonia, and mortality*. J Trauma, 1995. **39**: p. 854-9.
8. Hickling KG, W.J., Henderson S, Jackson R, *Low mortality rate in adult respiratory distress syndrome using low-volume, pressure limited, ventilation with permissive hypercapnia: a prospective study*. Crit Care Med, 1994. **22**: p. 1568-78.
9. Rappaport SH, S.R., Yoshihara G, Wright J, Chang P, Abraham E, *Randomized, prospective trial of pressure-limited versus volume control ventilation in severe respiratory failure*. Crit Care Med, 1994. **22**: p. 22-32.
10. Hernandez LA, P.K., Moise AA, Parker JC, *Chest wall restriction limits high airway pressure-induced lung injury in young rabbits*. J Appl Physiol, 1989. **66**: p. 2364-8.
11. Desai MH, M.R., Richardson J, Nichols R, Herndon DN, *Reduction in mortality in pediatric patients with inhalation injury with aerosolized heparin / acetylcystein therapy*. J Burn Care Rehabil, 1998. **19**: p. 210-2.
12. Cioffi WG, R.L.I., Graves TA, McManus WF, Mason AD Jr, Pruitt BA Jr, *Prophylactic use of high-frequency percussive ventilation in patients with inhalation injury*. Ann Surg, 1991. **21**: p. 575-80.