
Characteristics of Patients with Injury Secondary to Smoking on Home Oxygen Therapy Transferred Intubated to a Burn Center

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- BACKGROUND:** The aim of this study was to compare outcomes of patients who sustained burn and ostensible inhalation injuries while on home oxygen therapy with those suffering equivalent injuries via other mechanisms.
- STUDY DESIGN:** Between December 2002 and January 2006, 109 burn patients were transferred to our center intubated. Their charts were retrospectively reviewed. Patients who sustained injuries while on home oxygen therapy were age and total body surface area matched to patients with inhalation and burn injuries secondary to other mechanisms.
- RESULTS:** Fourteen of 109 patients were injured while smoking on home oxygen therapy (15.26%). All 14 had COPD. Mean age was 63 years (range 53 to 77 years) and average total body surface area burned was 4% (range 0% to 10%). Charges for the 14 hospitalizations totaled \$1,097,860 (\$8,003 to \$284,835; mean \$78,418 per admission). Average time to extubation was 5.7 ± 10.2 days and average length of stay was 11.4 ± 15.2 days. No significant differences in the average time to extubation, length of stay, cost of hospitalization, or clinical signs of inhalation injury (ie, soot and edema in the pharynx) were noted between our series and the control group.
- CONCLUSIONS:** Injury secondary to smoking on home oxygen therapy is a perennial problem, and guidelines for prescribing home oxygen therapy for smokers should be reassessed. Despite underlying lung disease, patients in our series did as well as patients without COPD who sustained similar injuries. (J Am Coll Surg 2014;218:1182–1186. © 2014 by the American College of Surgeons)
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Home oxygen therapy (HOT) is the standard of care for treatment of individuals suffering from hypoxic chronic obstructive pulmonary disease (COPD) because it confers a survival benefit in this population.¹⁻³ Unfortunately, anywhere from 10% to 50% of patients treated with HOT continue to smoke,⁴⁻⁶ putting them at an increased risk of inhalation and burn injuries.⁶⁻¹¹

CME questions for this article available at
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A recent increase in the number of transfers to our burn unit of intubated patients with presumed inhalation injury secondary to HOT prompted a review of this population. A priori, one might expect that COPD patients requiring HOT and suffering from inhalation injury significant enough to require intubation and transfer to a burn center would have high mortality and morbidity, a prolonged time to extubation (TTE), and an extended hospital length of stay (LOS). On the contrary, we observed that these patients usually do well and are extubated and discharged relatively early. This study explored the characteristics of patients who were transferred to our burn center intubated for inhalation injury secondary to HOT, with emphasis on causative agent for the injury, clinical findings, TTE, LOS, cost, and outcomes.

METHODS

Approval for this study was obtained from the Bridgeport Hospital Institutional Review Board. Data from all patients with a presumed inhalation injury transferred intubated

Abbreviations and Acronyms

HOT = home oxygen therapy
 LOS = length of hospital stay
 TBSA = total body surface area burned
 TTE = time to extubation

from outside hospitals to the Connecticut Burn Center between January 2006 and December 2012 were retrospectively analyzed. Patient demographics, comorbidities, total body surface area burned (TBSA), associated trauma, mechanism of injury, LOS, and TTE were reviewed. Comorbidities were scored according to the age-adjusted Charlson Comorbidity Score.¹²

Fourteen patients transferred intubated to our burn center with presumed inhalation injury secondary to HOT were identified. They were age and TBSA matched to 14 patients transferred intubated with presumed inhalation injury not secondary to HOT. Unpaired *t*-test was used to compare means and chi-square test was used to compare proportions between the 2 groups. Continuous data are presented as mean \pm SD.

RESULTS

One hundred nine patients were transferred intubated secondary to presumed inhalation injury from outside hospitals to our burn center during the 6-year period from January 2006 to December 2012. Home oxygen therapy was the cause of injury in 14 of the 109 patients transferred (15.26 %). Each of the 14 patients had COPD and sustained injury while smoking on HOT. These patients were then age and TBSA matched with 14 controls injured by another flame mechanism. The predominant mechanism was fire in a confined place

with high suspicion of inhalation injury. Table 1 shows patient characteristics on admission. Mean age was 63.8 years (range 53 to 77 years) and mean TBSA was 4% (range 0% to 10%). Female to male ratio was 4:10 in the HOT group compared with 9:5 in the control group ($p = 0.06$). Thirteen patients (93%) in the HOT group sustained facial burns compared with 6 patients (43%) in the control group ($p = 0.05$). Laryngoscopy and/or bronchoscopy revealed soot in the pharynx in 12 of 14 patients (86%) in each group. Posterior pharyngeal swelling was seen in 4 patients (29%) of the HOT group and in 5 patients (36%) of the control group ($p = 0.70$). The HOT group had a significantly higher Charlson comorbidity score than the control group (4.0 vs 2.5, $p = 0.02$). Patients injured while on HOT were more likely to have another active substance abuse diagnosis (36% vs 0%, $p = 0.01$). Two patients (14%) in each group sustained third degree burns and none of the patients in either group had an associated trauma (Table 1). One patient in the HOT group and 2 patients in the control group required skin grafting.

Table 2 shows patient outcomes. Mean TTE was 5.7 ± 10.2 days in the HOT group compared with 5.9 ± 7.3 days in the control group ($p = 0.94$). Median TTE was 1.9 days in both groups. Mean LOS was 11.4 ± 15.2 days in the HOT group compared with 16.2 ± 14 days in the control group ($p = 0.039$). Median LOS was 4.8 in the HOT group and 13.4 in the control group. The total cost for the 14 admissions was \$1,097,860 (range \$8,003 to \$284,835), with an average cost of $\$78,418 \pm \$86,344$ per HOT admission compared with $\$116,102 \pm \$107,799$ for the control group ($p = 0.32$). No patient died within the duration of hospitalization in either group (Table 2). None of the patients required reintubation or noninvasive positive pressure ventilation.

Table 1. Patient Characteristics

Characteristic	HOT-related injury	Control	p Value
n	14	14	
Age, y, Mean \pm SD	63.8 \pm 7.72	62.5 \pm 8.98	0.70
Female: male ratio	4:10	9:5	0.06
Total body surface area burned, % \pm SD	4.0 \pm 0.039	4.0 \pm 0.037	
Age-adjusted Charlson comorbidity score \pm SD	4.0 \pm 1.25	2.5 \pm 1.24	0.02*
Active substance abuse, n (%)	5 (36)	0 (0)	0.01*
Facial burns, n (%)	13 (93)	6 (43)	0.05
Soot in the oropharynx, n (%)	12 (86)	12 (86)	
Swelling of the oropharynx, n (%)	4 (29)	5 (36)	0.70
Third degree burn, n (%)	2 (14)	2 (14)	
Associated trauma, n (%)	0 (0)	0 (0)	

*Statistical significance.

HOT, home oxygen therapy.

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