Title : Evaluation of Respiratory Tract Injury In Acute Burns

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Introduction. Complications of the respiratory system are a major cause of death in thermally-injured patients.[1] The diagnosis of pulmonary injury in the burn patient has been based on a history of burns sustained in an enclosed space, flame burns involving the face, and singed nasal vibrissae.[2] Other physical signs and symptoms are oropharyngeal erythema, hoarseness, labored respirations, and cyanosis. The frequency of selected signs and symptoms in a group of patients that died with pulmonary complications have been evaluated. A scoring system based on the clinical findings has been developed to assess the presence and severity of injury in an attempt to facilitate the diagnosis of pulmonary damage and direct the management of the burned patient. The development of this scoring system is the subject of this study.

Methods. The hospital records of 42 patients who expired from thermal injury complicated by respiratory tract damage between 1966 and 1976 were reviewed. The most frequent clinical signs and symptoms referable to the respiratory system were evaluated 12 hours after admission and documented. Charts of a group of 42 patients with similar body surface area thermal burns and matched for age without documented respiratory injury were analyzed for the same parameters. The scoring system, as follows, was devised based on the presence and severity of the most consistent presenting signs and symptoms.

| Sign | 0 | 1 | 2 |
|---|---|---|---|
| 1. Singed Nasal Vibrissae: | Absent | Mild | Severe |
| 2. Direct Pharyngoscopy: | Normal | Mild Erythema | Severe Erythema |
| 3. Hoarseness: | Absent | Slight | Severe |
| 4. Labored Respirations: | Absent | Slight | Severe |
| 5. Color: | Normal | Mild Central Cyanosis | Cherry Red or Cyanotic |
| 6. Respiratory Rate: | Normal for Age Group | 10%↑ or ↓ for Age | 20%↑ or ↓ for Age |
| 7. History of Being Burned In Closed Space: | No | N/A | Yes |

Total Score:
Scoring Chart:

10-14, Group I Overt Signs of Respiratory Injury
5-9, Group II Suspected Signs of Respiratory Injury
0-4, Group III Unsuspected Signs of Respiratory Injury

Results. During the 10 year period between 1966 and 1976, 1,175 patients were admitted for treatment of acute thermal injuries. Of these, 132 (11%) died during their hospital course. Respiratory tract complications were noted at autopsy in 42 of these patients. Their average age was 6 years (range 8 months to 15 years). The total body surface area burn (TBSB) was between 13 and 98%, with a mean 66%. Thirty-six patients (86%) were burned in an enclosed area resulting in prolonged exposure to the products of incomplete combustion and toxic fumes. Six patients (14%) sustained respiratory tract damage from burns that occurred in open areas. The overt clinical findings in 42 autopsy cases of respiratory tract injury are described as follows: Thirty-nine patients (93%) had mild to severe singed nasal vibrissae and/or facial burns, as defined as slight discoloration of the nasal mucosa for mild and white necrotic injury to the mucosa as severe. Thirty-seven patients (89%) had mild to severe hoarseness as a direct result of the injury, defined as subjective on the patient's part for being mild and audible objective for being severe. Thirty-six patients (86%) were tachypneic with respiratory rates greater than 20% above expected normal. Evaluation of the oropharynx revealed 39 patients (79%) with mild or severe oropharyngeal erythema. Mild being defined as increased redness of the erythema in the hypopharynx and severe defined as increased redness and edema in the hypopharynx. Thirty-three patients (55%) were noted to have labored respiration and cyanosis was present in 17 patients (41%). Thirty-seven patients (89%) had normal radiographic chest X-ray on admission.

Discussion. A retrospective analysis of patients dying with respiratory tract complications (RTC) with thermal injury has been performed. Clinical signs and symptoms indicating respiratory tract involvement (RTI) present within the first twelve hours of injury have been evaluated and correlate well with those recorded in the literature. We felt that a numerical scoring system based on these common parameters may be useful in abetting the early recognition of RTI and directing a management program. The system was tested in two comparable groups of thermally-injured children of whom one group had evidence of RTC at autopsy and the other did not. This scoring system is particularly useful in that it is simple, effective, noninvasive and can be done in a matter of seconds. Since these findings were documented in our study, as well as in the literature, using the scoring system, respiratory management can be defined in order to decrease morbidity and mortality.

References.

1. Jackson TM, Lee WH: Major Thermal Burns - A Mortality Appraisal and Review. Arch. Surg. 87:937-948, 1963.
2. Stone HH, Martin JD, and Claydon, CT: Management of the Pulmonary Burn. Amer. Surg. 33:616, 1967.