ORIGINAL ARTICLE

Analysis of risk factors of mortality for pediatric burned patients with inhalation injury and comparison of different treatment protocols

Doğuş Güney, M.D.,[1] Hayal Doruk, M.D.,[1] Ahmet Ertürk, M.D.,[1] Can İhsan Öztorun, M.D.,[2] Sabri Demir, M.D.,[1] Elif Emel Erten, M.D.,[1] Gülsen Keskin, M.D.,[3] Müjdem Nur Azılı, M.D.,[2] Emrah Şenel, M.D.[2]

[1]Department of Pediatric Surgery, Ankara City Hospital, Ankara-*Turkey*
[2]Department of Pediatric Surgery, Yıldırım Beyazıt University Faculty of Medicine, Ankara-*Turkey*
[3]Department of Anesthesiology and Reanimation, Ankara City Hospital Children's Hospital, Ankara-*Turkey*

ABSTRACT

BACKGROUND: We present our approach of pediatric burned patients with the suspicion of inhalation injury.

METHODS: This retrospective study was conducted on children with the suspicion of inhalation injury admitted to our burn center from December 2009 to December 2019. We collected data on patient demographics, total burn surface area (TBSA), presence of inhalation injury, level of carboxyhemoglobin, grade of inhalation injury, duration of mechanical ventilation, reintubation rate, total length of hospital stay, and the mortality rate. We also reviewed the required treatment of patients with inhalation injury.

RESULTS: A total of sixty pediatric burn patients were suspected inhalation injury were included in this retrospective study. 40 patients included in the study were male. Age average of the patients was 87.7 months. Total burned surface area average was 32%. 46 of these patients had inhalation injury. Patients with larger cutaneous burn and needed early intubation have a higher risk of inhalation injury. There was no significant relation between inhalation injury grades and mortality and treatment protocols. Higher levels of carboxyhemoglobin and larger TBSA are the risk factors for mortality at univariate analysis. Pediatric patient with inhalation injury whose TBSA is higher than 47.5% has a 5 times higher risk of mortality at multivariate analysis.

CONCLUSION: This study demonstrated that TBSA is the risk factor that independently affects the mortality in pediatric patients with inhalation injury. Among the patients with higher than 47.5% burn surface area, the mortality rate rises 5 times.

Keywords: Burn; children; inhalation injury; mortality.

INTRODUCTION

Despite recent advances in critical care and the management of burn patients, smoke inhalation injury continues to increase the morbidity and mortality of burns.[1] Inhalation injury is generally defined as a direct thermal injury of the upper airway, chemical injury of the lower airway, and systemic toxicity.[2,3] For pediatric patients with a burn injury, inhalation injury affects approximately 20–30% of patients.[4] A recent large series of 850 children with inhalation injury admitted to a Shriners Children's Hospital over 10 years found the overall mortality rate was approximately 16%, with most deaths due to pulmonary complications.[5]

Fiber-optic bronchoscopy is the safest diagnostic tool currently available for the diagnosis of inhalation injury. Before the description of the use of fiber-optic bronchoscopy for the early diagnosis of inhalation injury, the diagnosis of inhalation

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Address for correspondence: Doğuş Güney, M.D.
Ankara Şehir Hastanesi, Çocuk Cerrahisi Anabilim Dalı, Ankara, Turkey
Tel: +90 312 - 552 60 00 E-mail: dous_caliskan@hotmail.com

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injury was mostly clinical. Furthermore, at present in critically ill unstable patients; clinical characteristics, physical signs, and history still may be enough to diagnose.[6]

There are many standards of care for patients with inhalation injury. There is no consensus on this but protocols guiding care of patients with inhalation injury have been described.[7,8]

In our retrospective study, we mainly aimed to compare survivor and deceased patients with inhalation injury to identify prognostic factors of mortality. Although generally accepted that size of the burn is a major contributor to mortality in pediatric burns, to more accurately define the group of pediatric burn patients with inhalation injury, the present study applied multivariate logistic analysis to precisely correlate mortality related factors among demographics, clinical characteristics, and findings. Furthermore, we aimed to compare the different treatment protocols although the protocols were based on the severity of the injury, to determine whether treatments were superior to each other.

MATERIALS AND METHODS

This retrospective study was conducted in children with the suspicion of inhalation injury admitted to our burn center from December 2009 to December 2019. Our hospital's medical ethics committee approved the study (2018–179). The grading system of bronchoscopy findings is shown in Table 1.[9,10]

Demographic characteristics, percentage of total body surface area (TBSA) burned, etiology of burn injury, arriving time to our center, carboxyhemoglobin levels, grades of inhalation injury, need for mechanical ventilation, duration of mechanical ventilation, need for reintubation, required medical treatments, duration of hospitalization, and mortality were obtained from medical records.

We both used carboxyhemoglobin levels, clinical findings, facial burn, closed space injury, and history as diagnostic criteria for inhalation injury and flexible bronchoscopy. For bronchoscopy (Karl Storz, Germany) flexible fiberoptic bronchoscope was used. Bronchoscopy was performed through the laryngeal mask airway or endotracheal tube insertion of a flexible bronchoscope. Diagnostic bronchoscopy is performing all of the patients with the suspect of inhalation injury at admission in our clinic since 2011 routinely. We exclude the patients clinically diagnosed with inhalation injury to make the study objectively evidence-based. We included all the patients in this study who have performed bronchoscopy due to the suspicion of inhalation injury.

Patients were divided into two groups according to treatment protocols: Basic treatment (group A) and advanced treatment (group B); the latter group was further divided according to mortality into survivors and deceased.

All the patients were administered humidified oxygen and respiratory physiotherapy. Treatment protocols were planned according to the patient-specific clinical findings and chest radiography and were arranged according to conditions such as intubation state, findings of bronchoscopy. The administration of nebulized heparin and n-acetyl cysteine treatment were considered as an advanced treatment choice preferred in patients with markedly thickened secretions were shown by deep tracheal aspiration or bronchoscopy, without pulmonary hemorrhage (Table 2).

Serial therapeutic bronchoscopic pulmonary wash was performed, if unresolved atelectasis has occurred; due to obstructive cast formations despite medication and pulmonary physiotherapy. Neither prophylactic antibiotics nor empirical glucocorticoids were used.

Table 1. Bronchoscopic findings of inhalation injury

No injury	
Mild injury	Existence of minor erythema or carbon deposits in proximal and distal bronchi
Moderate injury	Moderate erythema, carbon deposits, bronchorrhea or bronchial obstruction
Severe injury	Severy inflammation with fragility large amounts of carbon deposits, bronchorrhea or obstruction
Massive injury	Mucosal sloughing, necrosis or endoluminal obliteration

Table 2. Treatment protocols administered to patients with inhalation injury

Treatment protocol A Group
- Inhaler cold steam
- Chest physiotherapy (percussion – aspiration – postural drainage – change of position)
- Adrenalin %2.25 0.5 ml nebulised
- Albuterol 1.25–2.5 mg in 3 ml of saline, nebulized
- %3 NaCl nebulised
- Intratracheal Serum Physiological irrigation *
- Pulmonary toilet wash with repetitive flexible bronchoscopy if necessary.

Treatment protocol B group
- Treatment prot A +
- Acetylcysteine (20% solution), 3 ml nebulized
- Heparin (5,000 units/3 ml), 3 ml solution nebulized

*Administered to intubated patients.

Patients with evolving upper-airway obstruction, worsening gas exchange, or deteriorating neurological status were intubated. Patients that are hemodynamically stable with mild respiratory symptoms were followed without intubation or with non-invasive respiratory support interventions (continuous positive airway pressure, high flow oxygen therapy).

Mechanical ventilation was applied to patients with a sustained respiration rate befitting age and the tidal volume 5–8 ml/kg, and through adjusting the positive end-expiratory pressure values that would provide enough alveolar space and oxygenation.

Patients who could not be orally intubated due to severe face burn and inhalation injury (severe edema in vocal cords and fragility) were performed a tracheostomy.

For the analysis of the statistical data, tests included the Chi-square test, t-test, Mann Whitney U test, and correlation test of Spearman were used. Multivariate logistic regression analysis was performed to evaluate risk factors for burns-related mortality. Furthermore, to evaluate the effect of TBSA values on mortality ROC curve and Youden's index was used. In the evaluations, the SPSS 11.5 program was used, and p>0.05 was accepted as the statistical significance border.

RESULTS

Demographics and Characteristics

A total of 79 patients were identified who were suspected of inhalation injury among 289 fire-burn patients that received treatment in the pediatric burn intensive care unit between December 2009 and December 2019. We excluded 19 clinically diagnosed patients due to the lack of objective bronchoscopic findings (Fig. 1). Sixty patients underwent flexible bronchoscopy at admission due to the risk of concomitant inhalation injury. All these patients were burned on a fire, and both clinically and observationally suspected inhalation injury. The demographics of patients

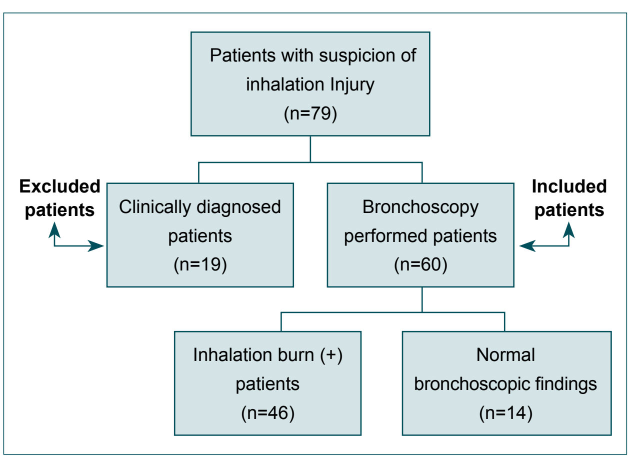

Figure 1. Inclusion chart of the patients.

Table 3. Patients demographics and clinical characteristics

Variable	
Age range, ave.±SD (months)	15 days–17 years, 87.7±67.6
Female/male, n	20/40
Closed space/open space fire, n	51/9
%Total burn surface area ave.±SD	32.6±19.3 (min. 3, max 96)
Carboxyhemoglobin ave.±SD (%)	1.71±4.6 (min 0.1, max 37)
Findings of bronchoscopy, n (%)	
Normal	14 (23.3)
Mild injury	18 (30)
Moderate injury	16 (26.7)
Severe injury	11 (18.3)
Massive injury	1 (1.7)
Mechanical uentilation support, n (%)	40 (66.7)
Duration of MV ave.±SD (day)	7.74±6.76 (min 1, max 30)
Tracheostomy, n (%)	1 (1.7%)
Duration of hospitalization ave.±SD (day)	40.08±29.75 (min 2, max 120)
Mortality, n (%)	6 (10)

MV: Mechanical ventilation; ave.: Average; SD: Standard deviation.

are listed in Table 3. There were 40 (66.7%) males and 17 (33.3%) females, with a median age of 87 months and a male/female ratio of 2:1. Inhalation injury occurs mostly in closed space fires. In the study, we have determined that the percentage of outdoor explosion victims (open space fire) was 15%.

Comparison of the Data between the Patients with Inhalation Injury and without Inhalation Injury Demonstrated with Flexible Bronchoscopy

We found that the percentage of TBSA burned, the number of patients intubated at the arrival of the burn center, and the number of patients that need for MV support during hospitalization were significantly higher in patients with inhalation injury (p=0.032, p=0.021, p<0.001) (Table 4).

Comparison of the Treatment Protocols Through 46 Patients with Inhalation Injury

Age, gender, TBSA, intubation status, duration of intubation, the grade of inhalation injury, duration of hospitalization and survival was comparable in the protocol A and B treatment groups as demonstrated in Table 5. There was no significant difference in the median age, gender, or TBSA between the treatment groups. The number of intubated

Table 4. Comparison of patients with and without inhalation injury

	Patients with inhalation injury (n=46)	Patients without inhalation injury (n=14)	p-value
Gender (male), n (%)	30 (65.2)	10 (71.4)	0.465
Age average±SD (months)	86.8±63	89.3±56	0.895
Carboxyhemoglobin level average±SD	1.98±5.3	0.83±0.8	0.428
Total burn surface area average±SD	35±19	23±15	0.032*
Number of patients exposed indoor fire, n (%)	38 (82.6)	13 (92.9)	0.322
Number of patients intubated at arrival of burn center, n (%)	18 (39.1)	1 (7.1)	0.021**
Number of patients that need for MV support during hospitalization, n (%)	38 (82.6)	2 (14.3)	<0.001**
Duration of Hospitalization average±SD (days)	42±32	31±14	0.080
Mortality, n (%)	6 (13)	0	0.187

*Student t test. **Chi square test. MV: Mechanical ventilation; SD: Standard deviation.

Table 5. Comparison of the treatment protocols

	Treatment A (n=25)	Treatment B (n=21)	p-value
Age average±SD (months)	93.3±62.4	79.2±64.7	0.457
Number of male patients, n (%)	18 (72)	12 (57.1)	0.229
Total burn surface area average±SD (%)	33.8±15	37±23.5	0.573
Carboxyhemoglobin level average±SD	1.07±0.50	3.07±7.8	0.207
Number of patients required MV, n (%)	17 (68)	21 (100)	0.004**
Duration of MV average±SD (days)*	6.7±3.8	8.4±6.8	0.359
Severe + Massive Grade inhalation injury, n (%)	5 (20)	7 (33.3)	0.245
Duration of Hospitalization average±SD (days)	44.8±30	39.9±35	0.615
Mortality, n (%)	1 (4)	5 (23.8)	0.060

*Only 38 intubated patients' data of 'Duration of mechanical ventilation' was given at that comparison. **Chi square test. MV: Mechanical ventilation; SD: Standard deviation.

Table 6. Results of respiratory support with mechanical ventilation through 38 intubated patients with inhalation injury

	Patients weaning successfully (n=25)	Patients requiring reintubation and deceaseds (n=13)	p-value
Age average±SD (months)	84±56	70±64	0.510
Carboxyhemoglobin level average±SD	1.2±0.6	4.1±9.8	0.141
Number of patients >40% TBSA burned, n (%)	6 (24)	9 (69.2)	0.011*
Severe + Massive Grade inhalation injury, n (%)	6 (24)	6 (46.2)	0.153
Treatment B given patients, n (%)	14 (56)	7 (53.8)	0.584

*Spearman Correlation. TBSA: Total body surface area; SD: Standard deviation.

patients in group A was 17 (68%) compared with 21 (100%) in group b (p=0.003). A and B treatment groups also did not differ significantly concerning the duration of mechanical ventilation or in the duration of hospitalization and mortality (Table 5).

Factors Affecting Mortality

We show the comparison between; patients requiring reintubation or deceased's and patients weaning successfully in Table 6. The number of patients with more than 40% TBSA was significantly higher than the patients weaning successfully

Table 7. Distribution of patient variables between survivors and deceaseds

	Survivors (n=40)	Deceaseds (n=6)	p-value
Age average±SD (months)	89±63	68±61	0.439
Number of male patients, n (%)	24 (60)	6 (100)	0.063
Total burn surface area average±SD (%)	32±17	52±21	0.016*
Carboxyhemoglobin level average±SD	1.2±0.6	7.1±14	0.009*
Number of patients intubated at arrival to burn center (%)	13 (32.5)	5 (83.3)	0.028**
Number of patients required MV, n (%)	32 (80)	6 (100)	0.295
Grade of inhalation injury, n (%)			
Mild + Moderate	31 (77.5)	3 (50)	0.173
Severe + Massive	9 (22.5)	3 (50)	
Number of patients required reintubation, n (%)	7 (17.5)	2 (33.3)	0.333

*Mann-Whitney U test. **Chi square test. MV: Mechanical ventilation; SD: Standard deviation.

Table 8. Odds ratio of TBSA in patients with inhalation injury

TBSA %	Regression coefficient	Odds ratio	95% Confidence interval	p
≥47.5	1			
<47.5	1.624 (0.726)	5.075	1.223–21.065	0.025

TBSA: Total body surface area.

in the second group.

Table 7 gives the results of univariate statistical analysis, deceased patients had significantly higher % TBSA, and higher carboxyhemoglobin levels than survivors. The rate of intubated patients at admission to the burn center was significantly higher in the group of deceased patients. Multivariate statistical analysis also yielded that percentage of TBSA was the only one independent predictor of mortality (p=0.002; OR of 2.11 [95% CI=1.31, 3.40]). The area under the ROC curve (AUC) for TBSA is 0.744 (p=0.001) (Fig. 2). It was observed that the TBSA was significant in differentiating mortality and the best cut-off point was found to be 47.5% using Youden`s Index. In the multivariate logistic analysis made to evaluate the independent risk factors for mortality, it was determined that the mortality risk of the inhalation injury patients with a TBSA higher than 47.5% was 5.075 (1.223–21.065) times higher (Table 8).

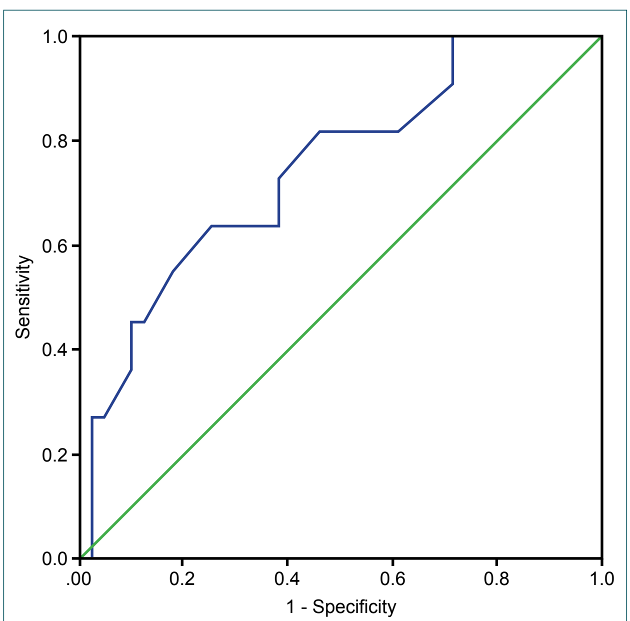

Figure 2. ROC curve for burn percentage values.

DISCUSSION

Inhalation injury is not an uncommon cause of morbidity and mortality in pediatric fire-related burned patients, as evidenced by our 22.3% prevalence rate; it is always an important diagnostic consideration. In the treatment of cutaneous burns, necrotic tissue can be excised and replaced with skin graft but the treatment of injured pulmonary tissue consists of supportive modalities and prevention from secondary injuries. Publications are indicating that the mortality rate is between 20% and 80%.[11–13] Our study is prepared in light of the information gathered from 10 years of burn intensive care unit data. In this period, the mortality rate was 5.2% in 1485 pediatric burn patients and this rate increased to 23% among 46 patients with inhalation injury. In a retrospective study included the 10-year data of four burn centers, the folders of 850 pediatric patients were evaluated who were diagnosed with inhalation injury. In this multi-center study, the mean age of the patients was 91.2 days and the female/male ratio was 1/1.9 and the mean %TBSA was 48.6%.[5] In our study, the mean age is 86.8 months and the female/male ratio is found to be 1/2.

In the same study, 71% of the patients were diagnosed with inhalation injury through bronchoscopic findings, 25% clinical findings, and 4% high COHb level. In our series, 24% of the patients were diagnosed through clinical and 76% bronchoscopic findings, but we excluded the patients diagnosed clinically.

In the mentioned study, the average hospitalization period of the patients was reported to be 44±1.7 days, and the average ventilation period was 15.2±0.8 days. In our study, the patients spent an average of 42 days in the burn intensive care unit and their average mechanical ventilation support duration was 6.3 days. When they compare the data of the survivor and deceased groups in that study by Palmieri et al.,[5] no significant difference was observed between age, sex, and mechanical ventilation period like our study. A significantly higher percentage of TBSA burned was found in the deceased.

Many studies are indicating that the COHb level is an effective value on prognosis as well as is an indicator of CO poisoning. Onishi et al.[14] determined the relationship between the high COHb level and the early intubation. A significant association between COHb levels and bronchoscopic inhalation injury grades was shown.[15,16] In our study, a statistically significant association was found between COHb levels and mortality. Because of being a tertiary care burn center both old and new burn pediatric patients are referred to our hospital. The half-life of COHb on room air is 4–6 h, on a no-rebreather face mask is 50–90 min. Therefore, COHb levels do not reflect the real potency of exposed CO in our study.

The airway management of pediatric patients with a serious burn is a complicated process because both the inhalation injury and the variability of the systemic response to the burn, in addition to the anatomical difficulties related to age must be considered. In the case of a failure to provide a secure nasal or oral airway to the patient and the need for long-term mechanical ventilation, tracheostomy is known to be a lifesaver intervention.[17,18] In recent studies, it has been stated that tracheostomy can be used safely in pediatric burn patients.[19,20] A study examined the data of 45 tracheostomy pediatric burn patients among whom 40% has inhalation injury.[21] In our study, tracheostomy was applied to one patient safely and no complications were observed.

Bronchospasm that develops because of the inhaled chemical irritants in smoke can be treated with sympathomimetics (adrenalin, salbuterol, and albuterol) and antimuscarinics (ipratropium bromur). Other than bronchodilatation, the sympathomimetics effect by stimulating the mucociliary clearance. Following the smoke inhalation, bronchial blood flow could rise to 20 times.[22] Inhalation injury that accompanies cutaneous burns increases the need for fluid resuscitation.[23–25] Especially adrenalin is a non-specific adrenergic receptor agonist, induces vasoconstriction by stimulating the alfa 1 receptors which reduces the pulmonary blood flow and mucus release. Besides stimulating the beta 2 receptors bronchodilation is achieved.

The epithelial slough and the fibrin casts could cause respiratory tract obstructions. To prevent the obstruction inhaler anticoagulant agents could be used. Although in many studies, it was shown that inhaler used heparin has no systemic anticoagulant effect, its use may be limited because there exists medicine absorption from airway and alveoli in critical patients with a tendency for bleeding.[5,8,26–29] Desai et al.[30] examined 90 pediatric patients who were diagnosed with inhalation injury bronchoscopically and received ventilator support, the combined aerosol treatment with heparin and NAC reduces the risk of re-intubation, atelectasis, and mortality.

Although determining the efficacy of different medical treatment protocols could not be the primary goal of this study. We found no significant difference between the two treatment options among the mortality, duration of hospitalization, and duration of MV. Because it is obvious that patients in group B had more critic patients with thicker secretions and without pulmonary hemorrhage that explains why most of them were intubated.

No statistically significant difference between inhalation injury grades and mortality was determined in our study. Sutton et al.,[31] compared three patient groups to each other: one group had no inhalation injury, one group had minor injuries (1st and 2nd grades) and one group had major injuries (3rd and 4th grades). In the multivariate analysis, it was observed that the development rate of acute respiratory distress syndrome (ARDS), pneumonia, multi-organ failure, and the risk of requiring prolonged mechanical ventilation was significantly higher in patients with high-grade inhalation injury. However, it was also observed that there was no significant relationship between the inhalation injury grades and mortality. Furthermore, in many other studies, it was shown that no association between the inhalation injury grade and mortality.[15,16,32] In a study that included 160 adult patients, it was shown that high-grade inhalation burns are related to poor oxygenation. Otherwise, no relationship was determined between age, TBSA, liquid necessity, duration of ventilation, ARDS, and mortality.[32] Endorf et al.[10] observed that mortality is higher in patients with high grade (2nd, 3rd, and 4th grade) inhalation injury.

As it is well known, inhalation injury is an independent predictor of mortality in the burn patient. The study examined the data of 475 pediatric patients to evaluate the predictive factors that affect mortality Dhopte et al.[33] stated that the most important factor was TBSA burned. It was observed that the patients with 25–50% TBSA had 21 times and the patients with 50–75% TBSA had 136 times more mortality risk. Furthermore, the mortality risk was significantly higher in patients with inhalation injury in comparison with patients without inhalation injury (74.2–23.4%). The presence of an inhalation injury in patients with a TBSA of <20% significantly increases the likelihood of death by 25 times.[7] In our study, we have analyzed the TBSA and carboxyhemoglobin levels that have a significant relationship with mortality through univariate analysis and performed multivariate logistic regression analysis by establishing a multivariate model. It was observed among pediatric inhalation injury patients that if the TBSA was higher than 47.5%, the mortality risk increased 5 times more.

In our study, 38/46 (82.6%) of the patients had indications for intubation. In the animal experiment findings related to ventilation and sedation were examined by Burmeister et al.,[34] four pigs were evaluated that were inflicted with inhalation injury and 40% cutaneous burn. The animals were intubated only during the first procedure and the repeating bronchoscopies. The subjects were followed by spontaneous ventilation. Since no mechanical ventilation and anesthesia, the spontaneous healing capacity of inhalation injury in the subjects was considered to be noteworthy. However, there are many limitations to this study. In the treatment of inhalation injury, intubation increases the risk of ventilator-associated pneumonia and subsequent ARDS.[35,36] Ideally, an aggressive pulmonary toilet without mechanical ventilation improves outcomes. However, significant upper airway edema can be life-threatening, or the resuscitation of the cutaneous injury that leads to worsening airway edema. This consequence can be mortal and may progress quickly. Therefore, intubation is essential in appropriate conditions.

There are some limitations to our study. First, the sample size is too small and the allocation of different treatment protocols too intransparent to draw valid conclusions regarding the superiority of one over the other. The second one is the retrospective nature of data collection. Finally, the lack of long-term follow-up of respiratory function.

Conclusion

This study demonstrated fire burn pediatric patients, who were needed intubation at admission before arriving to burn center, and have higher TBSA, they have a higher risk of concomitant inhalation injury. High levels of carboxyhemoglobin and large TBSA are significantly related to mortality but TBSA is the only risk factor that independently affects the mortality in pediatric patients with inhalation injury. Among the patients with higher than 47.5% burn surface area, the mortality rate rises 5 times. Furthermore, a more critical needed treatment protocol that includes the combination of NAC-heparin was all intubated. The NAC heparin combination warrants further investigation in a large, prospective, multi-center, placebo-controlled trial stratified based on inhalation injury grade severity. Moreover, long-term outcomes such as cardiorespiratory performance should be assessed to monitor persistent pulmonary defects of inhalation injury.

Ethics Committee Approval: This study was approved by the Health Sciences University Ankara Child Health and Diseases Hematology Oncology SUAM Clinical Research Ethics Committee (Date: 10.12.2018, Decision No: 2018-179).

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Authorship Contributions: Concept: E.S.; Design: D.G.; Supervision: M.N.A.; Resource: C.I.O.; Data: H.D., A.E.; Analysis: D.G., G.K.; Literature search: A.E.; Writing: D.G., S.D.; Critical revision: E.E.E.

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ORİJİNAL ÇALIŞMA - *ÖZ*

İnhalasyon hasarı şüphesi olan pediyatrik yanık hastalarda mortalite ve morbidite ilişkili faktörler nelerdir?

Dr. Doğuş Güney,[1] Dr. Hayal Doruk,[1] Dr. Ahmet Ertürk,[1] Dr. Can İhsan Öztorun,[2] Dr. Sabri Demir,[1] Dr. Elif Emel Erten,[1] Dr. Gülsen Keskin,[3] Dr. Müjdem Nur Azılı,[2] Dr. Emrah Şenel[2]

[1]Ankara Şehir Hastanesi, Çocuk Cerrahisi Kliniği, Ankara
[2]Yıldırım Beyazıt Üniversitesi Tıp Fakültesi, Çocuk Cerrahisi Anabilim Dalı, Ankara
[3]Ankara Şehir Hastanesi, Anestezi ve Reanimasyon Kliniği, Ankara

AMAÇ: Pediyatrik yanık hastalarda morbidite ve mortalite risk faktörlerini belirlemek için sağ kalan ve ölen hasta verilerinin karşılaştırılması amaçlandı. İkincil amaç olarak, farklı tedavi protokolleri karşılaştırıldı.
GEREÇ VE YÖNTEM: Aralık 2009–Şubat 2019 arasında inhalasyon hasarı riski olan hastalar değerlendirildi. Yaş, cinsiyet, inhalasyon hasarı varlığı, inhalasyon hasar derecesi, karboksihemoglobin düzeyi, entübasyon durumu, uygulanan tedavi, yatış süresi ve mortalite kayıtedildi. İnhalasyon hasarı olan ve olmayan hastalar karşılaştırıldı. İnhalasyon yanığı olan hastalar yaşayanlar ve hayatını kaybedenler olanlar olarak gruplandırılarak karşılaştırıldı.
BULGULAR: Bu geriye dönük çalışmaya toplam 60 inhalasyon hasarı şüphesi olan pediyatrik yanık hastası alındı. Çalışmaya alınan 40 hasta erkekti. Hastaların yaş ortalaması 87.7 aydı. Toplam yanık yüzey alanı (TYYA) ortalaması %32 idi. Bu hastaların 46'sında inhalasyon hasarı vardı. Daha geniş kutenöz yanığı olan ve erken entübasyona ihtiyaç duyan hastalarda inhalasyon hasarı riski daha yüksek olduğu görüldü. İnhalasyon hasarı derecesi ile mortalite ve tedavi protokolleri arasında anlamlı bir ilişki yoktu. Daha yüksek karboksihemoglobin seviyeleri ve daha geniş TYYA, tek değişkenli analizde mortalite için risk faktörleri olarak saptandı. İnhalasyon hasarı olan, TYYA'sı %47.5'in üzerinde olan pediyatrik hasta, çok değişkenli analizde beş kat daha yüksek mortalite riskine sahiptir.
TARTIŞMA: Çalımamız TYYA'nın inhalasyon hasarı olan pediyatrik hastalarda mortaliteyi bağımsız olarak etkileyen risk faktörü olduğunu göstermektedir. Yanık yüzey alanı %47.5'in üzerinde olan hastalarda ölüm riski beş kat artmaktadır.

Anahtar sözcükler: Çocuk; inhalasyon hasarı; mortalite; yanık.

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