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ORIGINAL ARTICLE

Blood pressure alterations in burn patients with septic shock under hydrocortisone treatment

Faranak Alinejad[1], Mahnoush Momeni[1*], Mohammad Javad Fatemi[1], Mohsen Saberi[2], Mahboobeh Sattarzade[1], Rafat Babajani[1], Hossein Rahbar[1]

[1]Burn Research Center, Iran University Of Medical Sciences, Tehran, Iran
[2]Department of Community Medicine, Faculty of Medicine, Baqiyatallah University of Medical Sciences, Tehran, Iran

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ABSTRACT

Background and Objectives: Hydrocortisone is widely used in septic shock cases resistant to fluid and vasopressor therapy. It may result in increased blood pressure and survival. However the efficacy is no established among patients with severe burn and septic shock. Accordingly it was assessed in this study.
Materials and Methods: The patients older than 14 years of age with resistant septic shock were enrolled during one-year period. The hydrocortisone was prescribed 100 mg three times per day and the alterations in systolic and diastolic blood pressures were recorded.
Results: Twenty-nine patients were enrolled including 19 men and 10 women. The mean age was 37 ± 19 years and the mean burn surface area was 60 ± 20. Fourteen patients had positive blood culture. The most common isolated microorganism were *Pseudomonas aeuroginosa* in 34.6%(10 cases), and then *Acinetobacter* in 13.8%(4 cases). The infection was from wound in 79% and the remaining 21% had pneumonia. Twenty-one patients had good response to hydrocortisone and the increase in systolic and diastolic blood pressures was significant; but the mortality rate was similar.
Conclusion: Treatment with hydrocortisone would result in increase in systolic and diastolic blood pressure in burn patients with resistant septic shock.

Keywords: Septic Shock, Burn, Hydrocortisone

INTRODUCTION

The most common and important complication of burn is infection leading to more than 75 percent of deaths in these patients (1, 2). Septic shock is one of the most serious complications seen in 2 to 20 percent of infection cases (3). Infection and related mortality are affected by age, gender, type, and cause of burn (2). It is generally as wound infection and with less frequency it may be seen as sepsis, urinary tract infection, and pneumonia (4).

Use of hydrocortisone has been matter of debates for years. Hydrocortisone prescription is common for control of resistant hypotension cases, defined as septic shock persisting for minimally one hour despite fluid-therapy and vasopressor medications, results in decreased mortality (1, 5). Some tests have

*Corresponding author: Mahnoush Momeni MD. Assistant Professor in General Surgery, Burn Research Center, Motahari Burn Hospital, Iran University of Medical Science, Tehran, Iran.
Tel: +982188770037
Fax: +982188770048
E-mail: mah_momeni@yahoo.com

shown that hydrocortisone level in critically ill patients is low and use of hydrocortisone would lower the mortality rate (2). Also a study among burn patients demonstrated that low hydrocortisone levels (200-300 mg per day) would more rapidly alleviate the burn shock and decrease the mortality rate (3). All these studies reveal the improvement of shock patients who receive hydrocortisone. Accordingly, in this study the efficacy of hydrocortisone in burn patients with resistant septic shock was evaluated after shock was improved.

MATERIALS AND METHODS

In this descriptive study, all eligible admitted patients were enrolled. The inclusion criteria were aging more than 14 years, established sepsis according to criteria (6), persistent shock despite fluid-therapy and vasopressor use for more than one hour, presenting as systolic blood pressure less than 90 mmHg or reduction of more than 40 mmHg in systolic blood pressure. The patients were excluded if had history of immunosuppression such as diabetes, AIDS and history of corticosteroid use in last six months.

The sampling was performed for blood culture and complete blood cell count. In addition to required antibiotics and other medications, fluid-therapy was performed with 1-2 liter of normal saline serum and also vasopressors were administered as dopamine with dose of 15-20 microgram per kilogram per minute for one hour. In non-responding cases, the hydrocortisone 300 mg daily (Hydrocortisone Hemi-Succinate injection, 2 ml) was added.

For all patients, a checklist of demographic and clinical data (age, gender, burning percent, burning grade, burning cause, and inhalation burn) was fulfilled. Also the blood pressure before and after treatment, results of tests and blood cultures, type of preexisting disease, and origin of initial infection were recorded. The efficacy of hydrocortisone was defined as increase in systolic blood pressure to more than 90 mmHg after treatment. This study was approved by local ethical committee.

Data analysis was performed among 29 subjects by SPSS (version 18.0) software [Statistical Procedures for Social Sciences; Chicago, Illinois, USA]. Chi-Square and independent-sample-T tests were used and were considered statistically significant at P values less than 0.05.

RESULTS

The most common isolated microorganism was *Pseudomonas aeuroginosa* in 34.6% (10 cases), and then *Acinetobacter* in 13.8%(4 cases). Totally, 29 patients were enrolled including ten women (34.5%) and 19 men (65.5%). Demographic data are shown in Table 1. The most common cause of burn was gas explosion (14 patients), and then, gasoline (5 subjects), fire (3 patients), melting material (2 subjects), petroleum (2 patients), diesel (1 patient), alcohol (1 case), and scald burn (1 subject). Eight patients (27.6%) had positive history of preexisting diseases such as psychological diseases, hypothyroidism, hypertension, and epilepsy. Also 21 patients had no history of preexisting disease.

Leukopenia (white blood cell count less than 3500 per mm^3), leukocytosis (white blood cell count more than 15000 per mm^3), simultaneous leukopenia and thrombocytopenia, thrombocytopenia alone, and normal white blood cell count were seen in 11 (37.9%), 4 (13.8%), 6 (20.7%), 3 (10.3%), and 5 patients (17.2%), respectively.

Twenty-one patients (72.4%) showed therapeutic response to hydrocortisone and eight subjects (27.6%) had no response. Those with response included 14 men and 7 women (Table 2). The age, gender, burning percent, inhalation burn, and the other factors such as preexisting disease, type of contributing germ, and cause of infection, were not related to therapeutic response (Table 2). Also there was no difference in mortality rate among those with and without hydrocortisone response ($P > 0.05$).

DISCUSSION

In this study, the gas explosion and gasoline were the most common causes of burn. However, in majority of the other studies, fire and scald burn were the major causes (7-9). The difference may be due to cultural causes or feasibility of materials. In a systematic study by Brusselaers et al, preexisting disease was common especially cardiovascular and pulmonary diseases and diabetes (9). However in our study, the psychiatric diseases were the most common disorder that may be expected regarding high prevalence of suicide as the cause of burn.

The most common complications in burn patients are wound infection, respiratory problems (acute

Table1. Demographic characteristics among the patients

	Improved	Not Improved	P value	
	Male	**Female**	**Total**	**P value**
Age (Mean ± SD)	39 ± 18	33 ± 22	37 ± 19	0.91
Burn Percent (Mean ± SD)	59 ± 22	66 ± 20	60 ± 20	0.99
Inhalation Burn	10 (35%)	7 (24%)	17 (59%)	0.3
Blood Culture				
Pseudomonas	7 (24%)	3 (10%)	10 (34%)	0.3
Acinetobacter	1 (4%)	3 (10%)	4 (14%)	
Negative	10 (34%)	4 (14%)	15 (53%)	
Infection Cause				
Wound	13 (45%)	10 (34%)	23 (79%)	0.17
Pneumonia	6 (21%)	-------	6 (21%)	
Blood Pressure				
Initial Systolic Blood Pressure	83 ± 8	82 ± 9	83 ± 8	0.71
Initial Diastolic Blood Pressure	41 ± 6	44 ± 9	104 ± 18	0.21
Final Systolic Blood Pressure	106 ± 20	102 ± 11	42 ± 7	0.04
Final Diastolic Blood Pressure	62 ± 21	58 ± 22	61 ± 21	0.90
Therapeutic Response	14 (48%)	7 (24%)	21 (72%)	0.58

Table 2. Characteristics according to therapeutic response

	Improved	**Not Improved**	**P value**
Gender			
Male	14 (29%)	5 (17%)	
Female	7 (24%)	3 (10%)	
Age (Year)	37 ± 20	36 ± 18	0.86
Burn Percent	57 ± 20	68 ± 23	0.56
Inhalation Burn	11 (38%)	6 (21%)	0.25
Blood Culture			
Positive	12 (41%)	2 (7%)	0.25
Negative	9 (21%)	6 (21%)	
Infection Cause			
Wound	15 (52%)	8 (27%)	0.11
Pneumonia	6 (21%)	------	

respiratory distress syndrome), and septicemia (10). In this study, the most common cause of infection was wound infection and the pseudomonas was the most common isolated bacterium as well as other studies (10, 11).

In this study, the hydrocortisone was prescribed with daily dose of 300 mg for those with resistant septic shock (systolic blood pressure lower than 90 mmHg despite one hour of fluid and vasopressor therapy). Hydrocortisone resulted in improvement of septic shock in burn patients, but the mortality was not decreased. In a similar study by Charles et al, the hydrocortisone had no effect on increase of the blood pressure in case and control groups and only resulted in shortening of shock improvement interval. It had no additional effect on reduction of mortality in first month of admission (3). In a study by Fox et al the corticosteroid both improved the shock and reduced the mortality rate.

In this study, the improvement of resistant shock

in patients who received hydrocortisone was significant. Accordingly, use of hydrocortisone is definitely effective in treatment of resistant septic shock and this increase is not differed according to the age, gender, burning percent, and contributing factors for the burn. Hydrocortisone had no effect on mortality rate among patients.

Conflict of interest

No conflict of interest

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