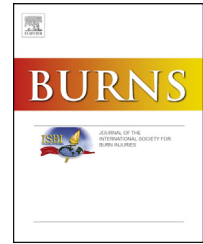


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The association between plasma gelsolin level and prognosis of burn patients

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ARTICLE INFO

Article history:

Accepted 25 February 2014

Keywords:

Burn

Plasma gelsolin levels

Sepsis

Prognosis

ABSTRACT

Objective: To observe the change in plasma gelsolin levels among burn patients, and explore its impact on patient prognosis.

Methods: This prospective cohort study includes 98 burn patients with burns $\geq 30\%$ TBSA, who were admitted to our institution between January 2010 and June 2013. Patients were grouped according to burn sizes, development and severity of sepsis, and survival from sepsis. The plasma gelsolin levels among different groups were compared by repeated measure ANOVA. The relationship between plasma gelsolin levels and the presence of sepsis and prognosis was examined by logistic regression.

Results: The plasma gelsolin levels decreased with increasing burn sizes and increasing sepsis severity, with the lowest gelsolin level observed at 7 days after the burn. The plasma gelsolin concentrations were significantly lower among patients with sepsis than those without ($P < 0.001$), and were lower among those who died after sepsis than those who survived ($P < 0.001$). Logistic regression suggested that plasma gelsolin level was inversely associated with the occurrence of sepsis [OR 0.873 (95%CI 0.693–0.993)] and survival after sepsis [OR 0.939 (95%CI 0.859–0.992)].

Discussion: Plasma gelsolin levels decrease after burn. The level is significantly lower among those with large burns and those with combined sepsis. Plasma gelsolin levels can be used to predict the prognosis of burn patients.

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1. Introduction

The pathological role of actin released from injured cells is well documented in patients with severe trauma [1]. Gelsolin (GSN) is an important actin-binding protein that severs actin filaments, caps their barbed end, and promotes actin nucleation [2]. Plasma gelsolin, as part of the ‘actin-scavenging’ system, serves to clear harmful actin molecules leaked from injured tissues [2]. It has been suggested that this ‘actin-

scavenging’ system is often significantly depleted in critically ill patients [3], leading to a major reduction in plasma gelsolin levels [4]. However, few studies have monitored the change in plasma gelsolin concentration among burn patients as their conditions progress. It is unclear how severe burn might influence patients’ plasma gelsolin levels over time, and subsequently change the prognosis of the patients. This prospective study aims to observe the change in plasma gelsolin levels among burn patients, and explore its relation to the prognosis of these patients.

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<http://dx.doi.org/10.1016/j.burns.2014.02.020>

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2. Methods

2.1. Participants

Participants were 98 burn patients with burns $\geq 30\%$ TBSA, who were admitted to our institution between January 2010 and June 2013. Inclusion criteria: age ≥ 18 years old; Burns caused by hydrothermal or flame, with a burn area of $\geq 30\%$ TBSA; admitted within 48 h after injury. Exclusion criteria: heart, lung, kidney, liver dysfunction, and hematopoietic system diseases, infectious diseases or any other diseases that may cause abnormal levels of gelsolin.

Patients were grouped according to their burn sizes: 37 patients with small burns (30–49%TBSA), 32 with medium burns (50–69%TBSA) and 29 with large burns ($\geq 70\%$ TBSA); Based on guideline for the diagnosis of sepsis [5], participants were divided into those with and without sepsis; The diagnosis of sepsis was further categorized into sepsis, severe sepsis and septic shock; Finally, patients with sepsis were split according to their survival from the sepsis: survivors and non-survivors.

2.2. Measures

Blood samples (10 mL) were collected from all participants on the day of admission, and on day 3, 7, 14 and 21 after injury. Plasma gelsolin concentrations were measured with a commercial enzyme-linked immunosorbent assay (ELISA) diagnostic kit (Xinle, Shanghai, China) in accordance with the manufacturer's instructions. The absorbance value was measured using Bio-Rad Model 3550 Microplate Reader, and the sample concentration was calculated.

2.3. Statistical analysis

Demographic characteristics were compared by Pearson's chi-square test, and repeated measure ANOVA was used to compare the plasma gelsolin concentrations among different groups and at different time points. The associations between plasma gelsolin concentrations and the development of sepsis

and survival from sepsis were explored by logistic regression. Logistic regression models were built with patients' prognosis being the dependent variables (occurrence of sepsis; survival from sepsis) and the mean measure of plasma gelsolin concentrations being the independent variable. Covariates were chosen using a forward: LR approach (inclusion: $\alpha = 0.05$; exclusion: $\alpha = 0.1$). All statistical tests were two-sided. Analyses were implemented in SPSS 16.0.

3. Results

3.1. Baseline characteristics

Among the 98 burn patients, 41 were diagnosed with sepsis within 1–24 days after injury, including 21 sepsis, 11 severe sepsis and 9 septic shock cases. 12 of these sepsis cases died subsequently, leaving 29 survivors. All sepsis cases were caused by gram-positive bacteria. Table 1 shows the baseline characteristics among groups of different burn sizes, and according to occurrence of sepsis and sepsis prognosis. There was no significant age or gender differences among different groups ($P > 0.05$), indicating that these groups were demographically comparable.

3.2. Plasma gelsolin concentrations according to burn sizes

Results from repeated measure ANOVA on plasma gelsolin concentrations and burn sizes are shown in Table 2. This suggested a significant interaction between burn size and time effect ($F = 138.35$, $P < 0.001$), and that the plasma gelsolin concentrations among those with different burn sizes were significantly different ($F = 1487.13$, $P < 0.001$). Multiple comparison tests showed that plasma gelsolin concentrations decreased with increasing burn sizes, and the difference between any two groups were significantly different ($P < 0.001$). There was a significant time effect ($F = 6154.12$, $P < 0.001$), with the lowest gelsolin concentration observed on day 7 after the injury ($P < 0.001$).

Table 1 – Age and gender distribution of different groups.

Group	Number	Age (mean $\pm$ SD)	Gender [N (%)]	
			Men	Women
Burn sizes		$P = 0.09$	$P = 0.31$	
Small	37	32.17 ± 5.61	25 (67.6)	12 (32.4)
Medium	32	28.42 ± 5.21	22 (68.6)	10 (31.3)
Large	29	33.95 ± 6.17	15 (51.7)	14 (48.3)
Sepsis		$P = 0.27$	$P = 0.65$	
Yes	41	33.32 ± 5.34	27 (65.9)	14 (34.1)
No	57	31.28 ± 4.17	35 (61.4)	22 (38.6)
Severity of sepsis		$P = 0.54$	$P = 0.69$	
Sepsis	21	32.97 ± 7.91	15 (71.4)	6 (28.6)
Severe sepsis	11	33.24 ± 6.01	7 (63.6)	4 (36.4)
Septic shock	9	35.85 ± 2.36	5 (55.6)	4 (44.4)
Survival from sepsis		$P = 0.18$	$P = 0.43$	
Yes	29	32.43 ± 6.41	18 (62.1)	11 (37.9)
No	12	35.01 ± 8.16	9 (75.0)	3 (25.0)

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