Original Research Article

A clinical study to evaluate platelet count and serum albumin as independent prognostic factors in predicting the outcome in burn patients in a tertiary care hospital

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ABSTRACT

Background: Burns can affect the population of all age groups and regions. There has been a reduction in the mortality and morbidity of burn patients due to improvements in standards of medical care. Several laboratory values were proposed to indicate the prognosis of burns patients. Of these, the oldest is abbreviated burn severity index (ABSI), which includes variables such as sex, age, total burned body surface area (BSA), full-thickness injuries, and burns attributable to inhalation. Later the acute physiology and chronic health evaluation (APACHE) II and APACHE III scales which incorporates biochemical markers to improve predictive power evolved.
Methods: In this study, in a tertiary care government institution, we attempt to assess platelet count and serum albumin independently in the prognosis of burns patient, in a background of sepsis.
Results: For analysis, patients were divided into two groups- survivors and non-survivors as sepsis development and mortality was observed. There was a progressive decline in the platelet count in non-survivors, while the initial fall improved in those who survived. There was only a marginal difference between the two groups in serum albumin levels.
Conclusions: A serial fall in platelet count is a predictor of sepsis and mortality in burn patients. It is an indicator of bone marrow depression and correlation with leucocyte count needs to be evaluated. In those patients where the initial fall in platelet count improved, survival rates were high. As a biochemical marker, serum albumin was not a reliable marker in predicting sepsis and mortality.

Keywords: Albumin, Burns, Platelet count, Sepsis

INTRODUCTION

Burn is a wound that has tissues with coagulative necrosis. There are various classifications for cutaneous burns depending on the type of injury, depth, extent, and severity.[1] 'Mortality is roughly proportional to the size (% TBSA) and age of the patient. Mortality $\approx$ (% BSA+age)/100. Large burns >15% in adults (>10% in children) require intravenous resuscitation.[2,3]

Immediately following a burn injury, blood counts were increased and gradually the values come down. Pattern difference exists in WBC count, RBC count, and Platelet count. Reverse J curve was observed in the WBC count and V curve in platelet count. Patients with prolonged thrombocytopenia, monocytopenia, and lymphopenia have high mortality rates and they can be considered as independent risk factors.[4]

Proper management of burns patients requires evaluation of prognostic factors. Of these, the oldest is Abbreviated Burn Severity Index (ABSI), which includes variables such as sex, age, total burned body surface area (BSA), full-thickness injuries, and burns attributable to

inhalation.[5] Later the acute physiology and chronic health evaluation (APACHE) II and APACHE III scales which incorporates biochemical markers to improve predictive power evolved.[6]

In this study in a tertiary care government institution, we attempt to assess the relation of platelet count and serum albumin independently in the prognosis of a burn patient.

METHODS

This prospective observational study was conducted during the period from January 2007 to December 2007 in the general surgical wards of Medical College Hospital, Thiruvananthapuram. A preliminary selection of cases was done by a surgical resident and a senior faculty member on the date of admission of the patient in the ward. Ethical approval for the study was taken from the hospital ethical committee.

With a confidence level of 95% and a population of burns patient matching the inclusion and exclusion criteria as 61, with a margin of error of 6%, the sample size was calculated to be 50.

The following are the inclusion and exclusion criteria. Burns less than 20% and more than 70% were excluded from the study and so were the patients referred to us after Day 1 (day of incident). This study has a background of septicemia. Patients with <20% burns rarely have septicemia and patients with >70% burns have very high early mortality due to hypovolemia and die early before the days necessary for the study is completed. Referred patients beyond Day 1 lacked initial data for study and hence excluded.

Routine collection of blood samples for various parameters were done and samples sent for laboratory analysis on days 1, 3, 7, 14, 21, 29. These patients underwent regular management in surgical wards as per the general protocol with fluid resuscitation, systemic antibiotics, analgesics, and wound care with silver sulfadiazine and saline dressings.

The patients were monitored for complications like septicemia and appropriate treatment regimens instituted accordingly. For analysis, burns patients were divided into two groups: Survivors and Non-survivors. They were followed up till discharge or death.

RESULTS

Platelet count

The mean value of platelet count in surviving patients was 3.5 lakhs whereas it was only 2.6 lakhs in the group of patients who expired (Figure 1).

Figure 2 shows the comparison between the mean values over subsequent days in the two groups. There was a

progressive decline in the platelet count in those patients who expired while the initial fall improved in those who survived.
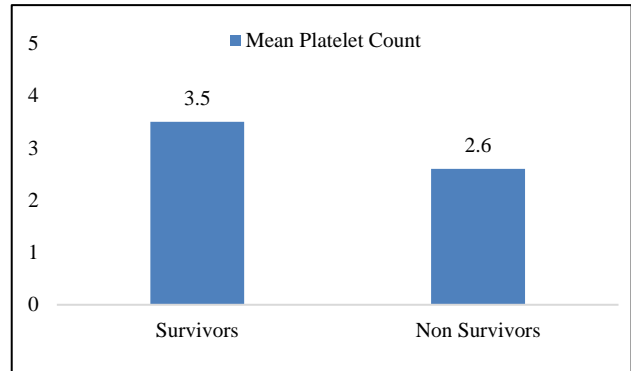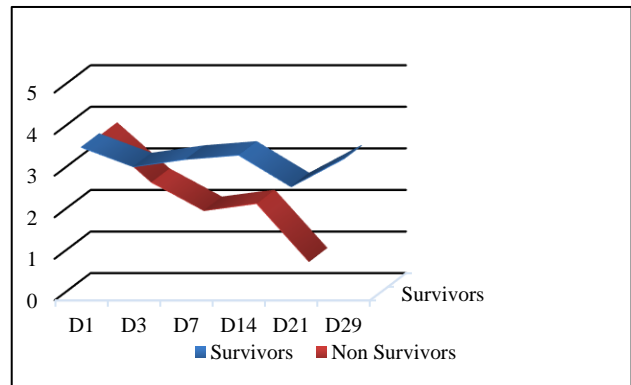

Figure 1: Mean platelet count.

Figure 2: Serial chart of platelet count.

Serum albumin

The mean value of serum albumin in the group of surviving patients was 3.2 g/dl while it was 3.0 g/dl in the group of patients who expired (Figure 3).
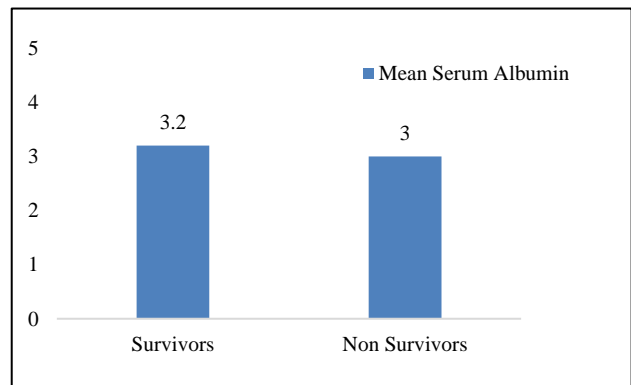

Figure 3: Mean serum albumin.

Figure 4 shows a comparison between the mean values of serum albumin over subsequent days in the two groups. There was a marginal difference between the two groups with regard to improvement in albumin values.
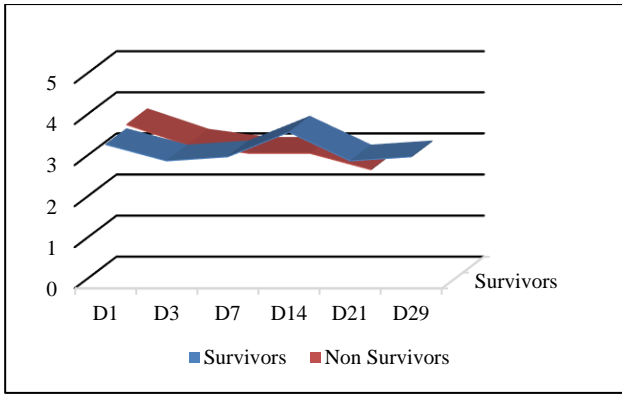
Figure 4: Serial chart of albumin values.

Sepsis

Of the 18 patients who expired, 11 had sepsis, indicating a 61% incidence whereas only 3 of the 32 survivors developed sepsis which amounted to an incidence of 9% (Figure 5).
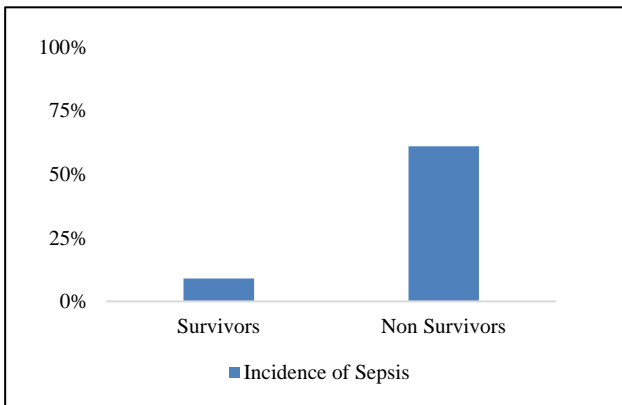

Figure 5: Incidence of sepsis.

Out of the 14 patients with sepsis, 11died, indicating 79% mortality while only 7 out of the remaining 36 died, showing a mortality rate of 19% (Figure 6).
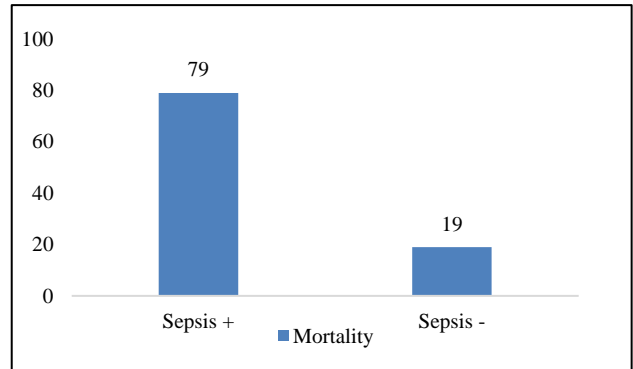

Figure 6: Mortality rates.

DISCUSSION

The patients were broadly divided into two groups- survivors and non-survivors for analysis. The statistical test used for analysis was the 'Independent samples t-test'. Since some of the patients were discharged before the 14th-day observations, the values taken on the 1st, 3rd, and 7th days only were included for analysis for the sake of statistical congruity.

Platelet count

From the chart, it is obvious that the difference in Platelet counts on the 3rd and 7th days were statistically significant in the group of survivors and non-survivors. It can be inferred that a significant fall in the platelet values on the 3rd and 7th days could predict that the patient may expire due to complications accrued from the burn injuries (Table 1 and 2).

Table 1: Platelet count statistical analysis chart 1.

		Levene's test for equali of variances		t-test for equality of means					95% CI of the diff.	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean diff.	Std. error diff.	Lower	Upper
D1P	Equal variances assumed	4.498	0.039	-2.312	48	0.025	-0.193	8.36E-02	-0.362	-0.02.52
	Equal variances not assumed			-2.15	28.52	0.04	-0.193	9.00E-02	-0.378	-0.009.27
D3P	Equal variances assumed	0.013	0.909	-4.96	48	0	-0.654	0.132	-0.919	-0.389
	Equal variances not assumed			-5.071	37.74	0	-0.654	0.129	-0.915	-0.393
D7P	Equal variances assumed	0.726	0.398	-8.82	48	0	-1.3	0.15	-1.59	-1
	Equal variances not assumed			-8.239	28.92	0	-1.3	0.16	-1.62	-0.98

Table 2: Platelet count statistical analysis chart 2.

	E/S	N	Mean	Std. deviation	Std. error mean
D1_P	0	18	3.572	0.33	0.07.79
	1	32	3.766	0.255	0.04.50
D3_P	0	18	2.606	0.425	0.1
	1	32	3.259	0.459	0.08.12
D7_P	0	18	1.86	0.58	0.14
	1	32	3.16	0.45	0.07.99

Mortality in burn patients through the pathway of sepsis has to be addressed. Such patients are salvageable only by early detection of sepsis with a very sensitive prognostic indicator. Usual studies classify their results based on the division of subjects as survivors and non-survivors. A study by Gajbhiye et al concludes that a serial decline in platelet count is an important prognostic factor in early detection of post-burn septicemia and corroborates with our study.[7] It is further supported by a 6-year retrospective study by Huang et al.[8]

Serum albumin

From the chart, it is seen that the difference in serum Albumin on the 7th day only was statistically significant in the group of survivors and non-survivors. It can be inferred that a significant fall in the albumin values on the 7th day could predict that the patient is succumbing to the complications of burns. This needs to be evaluated with bigger sample studies (Table 3 and 4).

Table 3: Albumin statistical analysis chart 1.

	E/S	N	Mean	Std. deviation	Std. error mean
D1_A	0	18	3.617	0.212	0.05.00
	1	32	3.634	0.201	0.03.55
D3_A	0	18	3.111	0.153	0.03.61
	1	32	3.181	0.173	0.03.06
D7_A	0	18	2.939	0.194	0.04.58
	1	32	3.106	0.218	0.03.86

Table 4: Albumin analysis statistical analysis chart 2.

		Levene's test for equality of variances		t-test for equality of means					95% CI of the diff.	
		F	Sig.	T	df	Sig. (2-tailed)	Mean diff.	Std. error diff.	Lower	Upper
D1A	Equal variances assumed	0.037	0.849	-0.29	48	0.771	-1.77E-02	6.04E-02	-0.139	0.104
	Equal variances not assumed			-0.29	33.8	0.775	-1.77E-02	6.13E-02	-0.142	0.107
D3A	Equal variances assumed	0.188	0.667	-1.43	48	0.159	-7.01E-02	4.90E-02	-0.169	0.02.83
	Equal variances not assumed			-1.48	39.2	0.146	-7.01E-02	4.73E-02	-0.166	0.02.5
D7A	Equal variances assumed	1.204	0.278	-2.7	48	0.01	-0.167	6.19E-02	-0.292	-0.04.28
	Equal variances not assumed			-2.79	38.9	0.008	-0.167	5.99E-02	-0.289	-0.04.61

There are many studies which predict that hypoalbuminemia is common in burn patients with >20% TBSA and albumin levels <20 g/l, <30 g/l is associated with an increase in sepsis and mortality rates.[6,9,10] Human albumin infusion as a part of resuscitative measures in the initial hours has also been tried in that study group.

A retrospective study by Kim et al including 147 burn patients (TBSA>30%) reported an association between day 1 serum albumin<25 g/l and mortality [adjusted OR=2.65; (CI 95% 1.06-6.64)] regardless of age, sex and burn size.[11]

In another prospective observational study with analysis by logistic regression model, hypoalbuminemia at 24 hours was independently associated with mortality [adjusted OR=0.06; (CI 95% 0.00-0.49); p=0.009] and ABSI.[12]

CONCLUSION

After completion of the study, the following conclusions were drawn. A serial fall in platelet count is a predictor of sepsis and mortality in burn patients. It is an indicator of bone marrow depression and correlation with leucocyte count needs to be evaluated. In those patients where the initial fall in platelet count improved, survival rates were high. Huang X et al had a retrospective 6-year study which presented the biphasic pattern of platelet count after admission similar to our findings. As a biochemical marker, serum albumin was not a reliable marker in predicting sepsis and mortality. However, as further studies suggested that Serum albumin <2 g/l is useful as a

marker of burn severity and indicator of mortality with >84% sensitivity and 83% specificity, further studies by increasing the sample size and follow up for a longer period of surviving patients may prove beneficial.

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