Mean Platelet Volume and Immature Granulocyte Count in ICU Sepsis Patients and Disposition at 30 days

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Abstract

INTRODUCTION

The mean platelet volume (MPV) and immature granulocyte count (IGC) were reported to be higher in patients in whom local infection progressed to septicemia or death. Both measures have also been postulated to be early markers of outcome in ICU patients with sepsis. Since MPV and IGC are easily accessible laboratory results, associations between them and patient progression could prove useful in directing patient care, and could possibly result in improved patient outcomes.

HYPOTHESIS

MPV and/or IGC in ICU sepsis patient will be significantly different in patients who were dead versus alive, 30 days post-admission.

METHODS

Charts of patients admitted to the ICU with sepsis between June 2, 2011 and October 2, 2012 (inclusive) were selected for retrospective review. All statistical analyses were performed using SPSS® software (SPSS Inc., Chicago, IL) using a level of significance of 95% ($p<0.05$) for 2-tailed tests.

RESULTS

N=641 patients were recruited; 350 (54.6%) were male and 291(45.4%) were female. At 30 days post-admission, 229 (35.7%) were dead and 412 (64.3%) were alive. Data are presented as (mean ±SD; 95% CI) in those dead versus alive at 30 days. The MPV (in fL) was significantly increased (10.9±1.0; 10.8-11.0 vs 10.7±1.1; 10.6-10.8), but no differences were found in the IGC ($x10^9$/L) (0.11±0.15; 0.08-0.14 vs 0.12±0.18; 0.1-0.14). Age (in years) was significantly increased (69.7±15.6; 67.8-71.6 vs 61.1±15.2; 59.6-62.6) but no gender differences were found. Furthermore, no interactions were found between MPV or IGC and gender or age.

CONCLUSIONS

Significantly increased MPV levels were found in ICU septic patients who were dead at 30 days post-admission. Increased MPV may prove to be a useful marker in identifying septic patients in the ICU at increased risk of dying.

Background

MEAN PLATELET VOLUME

Increased MPV values were found in adult patients with blood culture-proven septicemia (1, 2) as compared to those with only localized infection. This parameter has also was found to be increased in sepsis patients who died within 30 days of admission (3). Similar findings were reported in neonatal and very-low-birth-weight sepsis patients (4, 5).

IMMATURE GRANULOCYTE COUNT

Similarly, increased IGC results were found in neonatal patients with blood culture-proven sepsis (6, 7). However, a recent study in adults found that IGC was a good biomarker to discrimminate between infected and non-infected patients (8, 9, 10), but not as a predictor for mortality (9).

To our knowledge, this is the first study to investigate both MPV and ICG parameters in the adult sepsis population.

1. Demographics

Total sample	ICU SEPSIS PATIENTS	
Sample size (n)	641	
Age (years)	64.2±15.5 (63.0-65.4)	
Gender (M/F)	350/291 (54.6/45.4%)	
Outcome at 30 days (Dead/ Alive)	229/412 (35.7/64.3%)	
By outcome at 30 days	Dead	Alive
Sample size (n)	229	412
Age (years)**	69.7±15.6** (67.8-71.6)	61.1±15.2** (59.6-62.6)
Gender (M/F)##	132/97## (57.6/42.4%)	218/194## (52.9/47.1%)

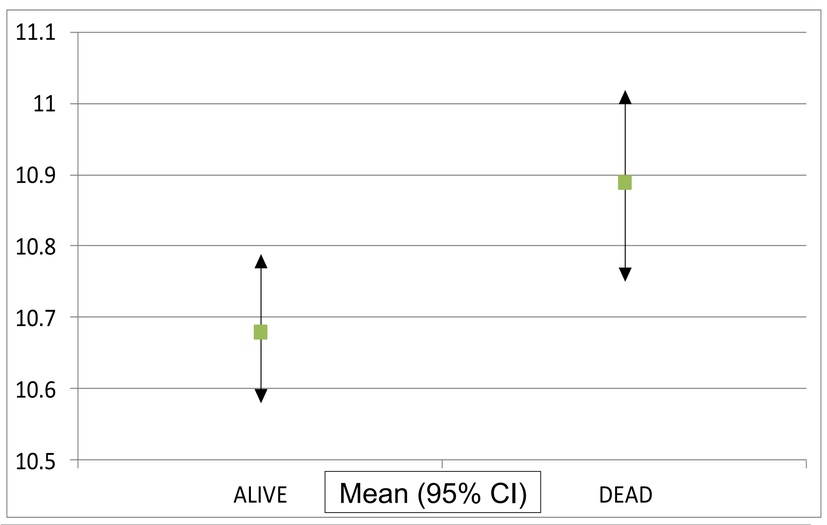
Numeric data presented as: mean±SD (95% CI)
Descriptive data presented as: number (%)
*p<0.05 or **p<0.001 ANOVA; # or ## p<0.001 Chi-squared

2. MPV and IGC

Total sample	ICU SEPSIS PATIENTS	
Sample size (n)	641	
MPV (fL)	10.76±1.08 (10.67-10.84)	
IGC ($x10^9$ /L)	0.116±0.172 (0.099-0.130)	
By outcome at 30 days	Dead	Alive
Sample size (n)	229	412
MPV (fL)*	10.88±1.00* (10.75-11.02)	10.67±1.10* (10.57-10.79)
IGC ($x10^9$ /L)	0.107±0.151 (0.085-0.129)	0.122±0.187 (0.098-0.147)

Numeric data presented as: mean±SD (95% CI)
Descriptive data presented as: number (%); *p<0.05 ANOVA

3. MPV and Disposition



Correlation between MPV and Dispositon at 30 days	
Pearson correlation (2-tailed)	p=0.023 ρ=0.091

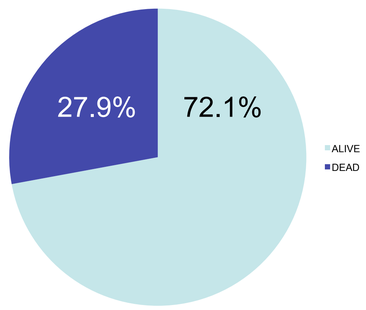
4. Effects of Age or Gender on MPV or IGC

Age	MPV	IGC
Pearson correlation (2-tailed)	p=0.063 ρ=0.074	p=0.064 ρ=0.188
Gender	MPV	IGC
Spearman correlation (2-tailed)	p=0.457 ρ= -0.030	p=0.817 ρ= -0.011

5. Effects of Age or Gender on Disposition

Age	Disposition at 30 day
Pearson correlation (2-tailed)	p<0.001 ρ=0.266
Gender	MPV
Spearman's correlation (2-tailed)	p=0.250 ρ= -0.046

6. Two-step Cluster Analysis



	DEAD	ALIVE
AGE (yr)	61.27	72.78
MPV (fL)	10.9	10.7
IGC ($x10^9$/L)	0.10	0.12

Discussion

MEAN PLATELET VOLUME

The results of this study indicate that in patients with sepsis who were dead 30 days after admission, MPV was significantly increased. However, these same patients were also significantly older than their colleagues who were still alive at 30 days post-admission. Indeed, after controlling for age, there difference in MPV was not statistically significant. However, given that the age-controlled MPV values were trending towards significance, it is possible that another factor or factors play a role in the increased MPV found in this study.

IMMATURE GRANULOCYTE COUNT

There were no significant differences found for IGC and disposition at 30 days. Interestingly, those alive had slightly higher IGC than those not, which is contrary to findings in some of the literature, and the opposite of what was expected in this study.

Importantly, when we analyzed both independent variables, with the covariate of age, we generated a good measure of cohesion and separation along these lines, as above.

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