Short Communication

Platelet count as predictor of 30-day survival after intracerebral hemorrhage

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Intracerebral hemorrhage (ICH) is a major public health concern leading to high rate of mortality as well as disability [1]. Many risk factors for ICH have been described including old age, male sex, arterial hypertension, diabetes mellitus, and high alcohol intake [2, 3]. Moreover, anticoagulants and antiplatelets have also been documented to increase the risk for ICH [4].

The role of platelets in the pathophysiology of (ICH) has not been clarified yet. It has been demonstrated that platelet count (PLT) was significantly lower in hemorrhagic strokes when compared with controls [5]. Moreover, PLT has been proposed as an independent predictor of poor outcome at time of discharge in cerebellar hemorrhage [6]. Interestingly, the presence of thrombocytopenia (PLT < 150 x 10^3/μL) itself did not affect the functional outcome after ICH, regardless of antiplatelets administration [7]. However, whether PLT can be a prognosticator of survival after ICH remains obscure.

We have retrospectively enrolled 60 patients, aged 75.9 ± 12.0 years, who had been admitted to Xanthi General Hospital for ICH between January 2018 and May 2021. Demographics, medical record, vital signs, arterial blood gas test, complete blood count, blood biochemistry, and CT scan test were collected for each patient. PLT at admission (PLT_1) and 24 hours later (PLT_2) were evaluated as potential predictors of 30-day survival after ICH. Descriptive statistics are provided either as means along with their relevant standard deviations, or percentages, for scale and nominal variables respectively. Survival data are given as medians along with their 25th and 75th percentiles (Q1 and Q3, respectively). All patients were censored, either at the time of their death, or at the 31st day after admission. Kaplan Meier (KM) curves were used to depict survival data; the log-rank test was used to determine the univariate significance of the study variables. Cox proportional hazards regression analysis was performed to explore the potential correlations between independent variables and survival data. All reported p values are two-sided. The level of statistical significance was set to p=0.05. All numerical values are given with at least two significant digits. Statistical analysis was performed with the use of IBM SPSS Statistics software, version 26.0, for Windows. MedCalc software, version 20.218, was preferred for visualization of results. The study was approved by the Scientific Board of Xanthi General Hospital (Decision No. 103/May 17, 2021).

Thirty patients (50%) succumbed within the first 30 days. The median survival time during the first month after admission was 25 days (Q1: 11 days; Q3: 30 days).

PLT_1 values were 232,000 ± 86,000/μL and 211,000 ± 60,000/μL (P=0.251), while PLT_2 values were 240,000 ± 63,000/μL and 203,000 ± 60,000/μL (P=0.012), for survivors and non-

survivors, respectively; these results are schematically presented as boxplots. (*Figure 1*)

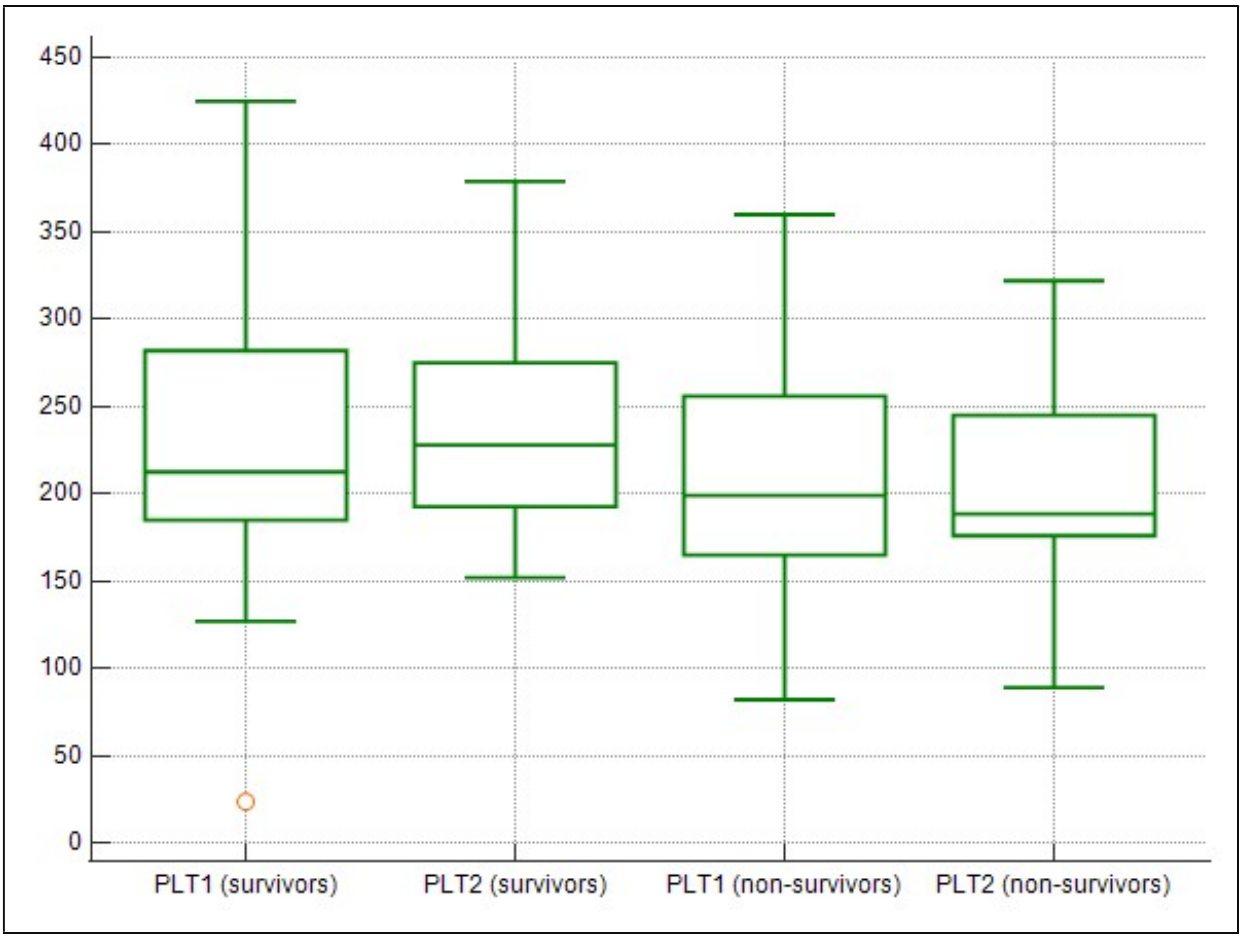

Figure 1. *Boxplots presenting PLT_1 and PLT_2 values in survivors and non-survivors; PLT values (y-axis) are given in $10^3/\mu L$.*

Using Cox proportional hazards regression univariate analysis, it has been shown that 30-day survival after ICH was positively correlated with PLT_2 (P=0.012), hemoglobin levels at admission (P=0.020), and oxygen saturation at admission (P=0.015). Moreover, 30-day survival was negatively correlated with age (P=0.001), blood glucose levels at admission (P=0.043), medical history of diabetes mellitus (P=0.014), and medical history of arterial hypertension (P=0.036). Of note, PLT_1 was comparable between survivors and non-survivors (P=0.251).

The use of a Cox-regression proportional hazards multivariate analysis model demonstrated that increased PLT_2 was independently correlated with 30-day survival after ICH, considering all other parameters as potential confounders (HR: 0.986 per unit $10^3/\mu L$; 95% CI: 0.978-0.994, P<0.001). All necessary details are provided in *Table 1.*

Table 1. *Patients' characteristics as well as Cox regression univariate and multivariate analysis based on 30-day survival status.*

Parameters	Mean±SD; N(%)†	Survived (n=30)	Succumbed (n=30)	P‡	HR; ±95%CI§	P§
Gender						
Men	28 (46.7)	14 (46.7)	14 (46.7)			
Women	32 (53.3)	16 (53.3)	16 (53.3)	0.834		
Age (years)						
Mean ± SD	75.9 ± 12.0	70.8 ± 11.2	81.0 ± 10.5	0.001	1.035; 0.992-1.080	0.115
Diabetes						
Yes	10 (16.7)	1 (3.3)	9 (30.0)		1.000	
No	50 (83.3)	29 (96.7)	21 (70.0)	0.014	0.651; 0.216-1.960	0.445
Hypertension						
Yes	42 (70.0)	17 (56.7)	25 (83.3)		1.000	
No	18 (30.0)	13 (43.3)	5 (16.7)	0.036	0.183; 0.055-0.614	0.006
Antiplatelets						
Yes	14 (23.3)	7 (23.3)	7 (23.3)			
No	46 (76.7)	23 (76.7)	23 (76.7)	0.949		
Anticoagulants						
Yes	7 (11.7)	3 (10.0)	4 (13.3)			
No	53 (88.3)	27 (90.0)	26 (86.7)	0.995		
Temperature (^{o}C)						
Mean ± SD	36.2 ± 0.4	36.1 ± 0.3	36.2 ± 0.5	0.186		
Pulse rate (min^{-1})						
Mean ± SD	86.8 ± 16.5	84.8 ± 17.2	88.7 ± 15.9	0.451		
SBP (mmHg)						
Mean ± SD	170 ± 29	173 ± 31	168 ± 28	0.565		
DBP (mmHg)						
Mean ± SD	94.2 ± 14.3	94.7 ± 15.4	93.7 ± 13.4	0.611		
Hemoglobin (g/dL)						
Mean ± SD	13.3 ± 1.4	13.7 ± 1.1	12.9 ± 1.5	0.020	0.554; 0.401-0.766	<0.001
Glucose (mg/dL)						
Mean ± SD	124 ± 46	111 ± 25	138 ± 57	0.043	1.000; 0.989-1.011	0.994
Creatinine (mg/dL)						
Mean ± SD	0.97 ± 0.91	1.03 ± 1.15	0.90 ± 0.60	0.667		
CRP (mg/dL)						
Mean ± SD	1.45 ± 1.53	1.13 ± 1.53	1.77 ± 1.49	0.206		
pH						
Mean ± SD	7.40 ± 0.07	7.41 ± 0.06	7.40 ± 0.08	0.717		
sPO_2 (%)						
Mean ± SD	95.0 ± 2.9	95.8 ± 1.5	94.2 ± 3.6	0.015	0.854; 0.750-0.973	0.018
PLT_1 ($10^3/\mu L$)						
Mean ± SD	222 ± 74	232 ± 86	211 ± 60	0.251		
PLT_2 ($10^3/\mu L$)						
Mean ± SD	223 ± 64	240 ± 63	203 ± 60	0.012	0.986; 0.978-0.994	<0.001

SD: Standard Deviation, † For scale and nominal variables, respectively,
‡ P-value based on univariate Cox regression analysis,
§ HR along with ±95% CI and P-value based on multivariate Cox regression analysis

To further assess an easy and clinically useful tool for using PLT_2 as a predictor of 30-day survival, we used 225,000/μL, being the mean of the PLT_2 covariate, as derived from the Cox proportional hazards regression univariate analysis. Patients with PLT_2 ≥225,000/μL had a hazard ratio (HR) of 0.991 (95% CI: 0.984-0.998) per unit (10^3/μL) to succumb within the first 30 days after admission for ICH (HR<1 favors 30-day survival). The result was statistically significant (P=0.048) using the Log-Rank test; the relevant Kaplan-Meier curve is provided as *Figure 2*.

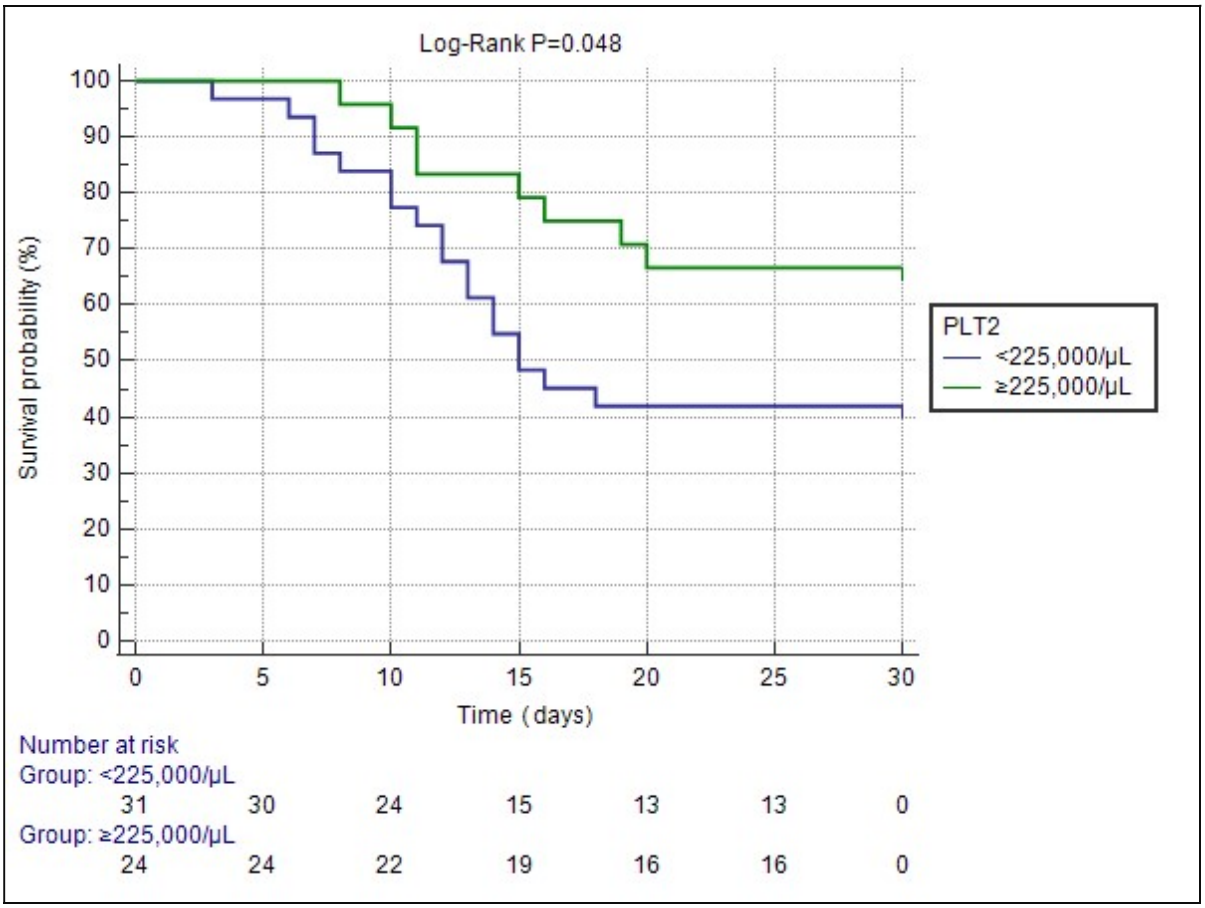

Figure 2. *Kaplan-Meier curve depicting survival function according to selected PLT_2 cutoff; ICH patients with PLT_2 ≥225,000/μL presented favorable 30-day survival when compared to patients with PLT_2 <225,000/μL (Log-Rank P=0.048).*

Based on our results, we propose that PLT_2 might be further investigated as an early predictor of 30-day survival after ICH. Moreover, in the light of absence of independent correlation between PLT_1 and 30-day survival, it is reasonable to hypothesize that the crucial parameter of platelet involvement in ICH might not be their initial number *per se*, but rather their alterations due to vascular damage and/or activation.

References

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