MEDICAL UNIVERSITY OF VIENNA

The age-specific prognostic impact of the platelet-to-lymphocyte ratio on long-term outcome after acute coronary syndrome

Kazem N, Hofer F, Koller L, Hammer A, Hofbauer TM, Hengstenberg C, Niessner A, Sulzgruber P

Division of Cardiology, Department of Internal Medicine II, Medical University of Vienna, Austria

Background

Personalized risk stratification within the ageing society after ACS remains scarce, but in urgent need. Increased platelet activity together with inflammatory activation play a key role during ACS. We aimed to evaluate the age-specific prognostic potential of the platelet to lymphocyte ratio (PLR) on long-term cardiovascular mortality after ACS.

Patients and Methods

Patients presenting with ACS admitted to the Vienna General Hospital between 12/1996 and 01/2010 were recruited within a clinical registry including assessment of peripheral blood samples. The impact of the PLR on survival was assessed by Cox-regression hazard analysis.

Results

We included a total of 681 patients with a median age of 64 years (IQR:45-84). 200 (29.4%) individuals died during the median follow-up time of 8.5 years. A strong and independent association of the PLR with cardiovascular mortality was found in the total study population (adjusted [adj.] hazard ratio [HR] per one standard deviation [1-SD] of 1.52 [95%CI:1.18-1.96]; p<0.001)

After stratification in individuals <65 years (n=339) and ≥65 years (n=342), a prognostic effect of the PLR on cardiovascular mortality was solely observed in elderly patients ≥ 65 years (adj. HR per 1-SD of 1.32 [95%CI: 1.01-1.74]; p=0.045), but not in their younger counterparts <65 years (adj. HR per 1-SD of 1.08 [95%CI: 0.60-1.93]; p=0.804).

	<65 years (n=339)	≥65 years (n=342)	p-value
Platelet-to-Lymphocyte Ratio (IQR)	118.2 (91.7-154.7)	150.2 (107.3-209.3)	**<0.001**
Platelet count (IQR)	247 (210-292)	219 (178-266)	**<0.001**
Lymphocyte count (IQR)	2.1 (1.6-2.7)	1.4 (1.1-2.0)	**<0.001**
Clinical Presentation			
Age, years (IQR)	45 (41-56)	84 (73-87)	**<0.001**
Gender (male), n (%)	186 (54.9)	143 (41.8)	**0.001**
Body mass index, kg/m² (IQR)	27.4 (24.7-31.1)	25.2 (23.4-27.8)	**<0.001**
Cardiogenic Shock, n (%)	35 (10.4)	18 (5.3)	**0.014**
STEMI, n (%)	180 (53.3)	275 (80.4)	**<0.001**
Coronary angiography, n (%)	293 (86.4)	229 (67.6)	**<0.001**
Stenting, n (%)	276 (81.4)	202 (59.1)	**<0.001**
Fibrinolysis, n (%)	54 (16.0)	18 (5.3)	**<0.001**
Comorbidities			
Hypertension, n (%)	216 (64.1)	269 (78.7)	**<0.001**
Diabetes mellitus, n (%)	53 (15.7)	90 (26.3)	**0.001**
Hypercholesterolemia, n (%)	237 (70.3)	218 (63.7)	0.068
Renal function failure, n (%)	8 (2.4)	44 (13.3)	**<0.001**
Chronic heart failure, n (%)	8 (2.4)	24 (7.3)	**0.002**
Current smoker, n (%)	262 (78.4)	98 (28.7)	**<0.001**
Family history of CVD, n (%)	146 (43.8)	114 (33.3)	**0.005**
Laboratory Analysis			
Total Leukocytes, G/L (IQR)	10.3 (8.1-13.3)	9.2 (7.0-11.5)	**<0.001**
C-reactive protein, mg/dl (IQR)	0.61 (0.32-1.24)	0.82 (0.40-2.51)	**0.001**
Troponin T (max), µg/l (IQR)	2.09 (0.78-4.95)	2.18 (0.75-4.54)	0.868
Creatine kinase (max), U/l (IQR)	910 (336-1942)	581 (226-1352)	<0.001
LDH (max), U/l (IQR)	430 (282-698)	419 (285-622)	0.345
Gamma-GT µkat/l (IQR)	32 (20-52)	28 (18-46)	0.088
Butyrylcholinesterase, U/l (IQR)	7.4 (5.9-9.0)	6.3 (5.5-7.6)	**<0.001**
Total Bilirubin, µmol/l (IQR)	0.48 (0.35-0.69)	0.64 (0.45-0.91)	**<0.001**
Creatinine, mg/dL (IQR)	0.98 (0.82-1.09)	1.10 (0.93-1.36)	**<0.001**
NT-proBNP, pg/ml (IQR)	582 (213-1427)	3172 (1163-7411)	**<0.001**
Cardiovascular Mortality	34 (10.0)	166 (48.5)	**<0.001**

Table 1: Baseline characteristics stratified by age groups. Categorical data are presented as counts and percentages and analyzed using Chi-square-test. Continuous data are presented as median and the respective interquartile range and analyzed using Mann Whitney U test. ST-elevation myocardial infarction (STEMI), coronary vessel disease (CVD), lactate dehydrogenase (LDH)

Conclusion

The present investigation highlights a strong and independent age-specific association of the PLR with cardiovascular mortality in patients with ACS. The PLR only allows to identify patients ≥ 65 years at high risk for fatal events after ACS – even from a long-term perspective.

	Crude HR (95%CI)	*p-value*	*Adjusted HR (95%CI)*	*p-value*
Total study population	1.83 (1.42-2.36)	**<0.001**	1.52 (1.18-1.96)	**0.001**
<65 years	0.90 (0.56-1.45)	0.673	1.08 (0.60-1.93)	0.804
≥65 years	1.39 (1.06-1.83)	**0.016**	1.32 (1.01-1.74)	**0.045**

Table 2: Unadjusted and adjusted effects of platelet-to-lymphocyte ratio on outcome within the total study population and stratified according age-groups. Cox proportional hazard model. *The multivariate model was adjusted for: age, gender, STEMI, hypertension, type-2 diabetes mellitus, hypercholesterolemia, smoking status, family history of CVD

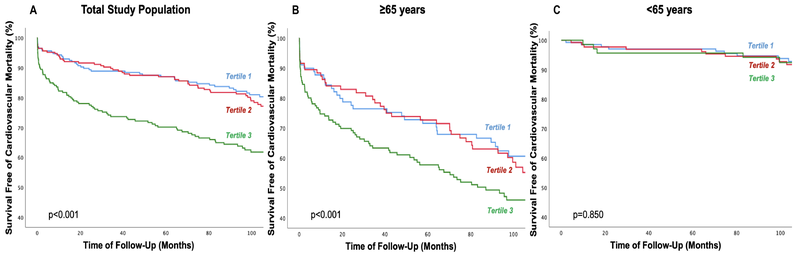

Figure 1: Effect of platelet-to-lymphocyte ratio on long-term cardiovascular mortality stratified by age. Kaplan-Meier curves for the impact of tertiles of neutrophil to lymphocyte ratio on cardiovascular mortality plotted in low (= Tertile 1), intermediate (= Tertile 2) and high (= Tertile 3) and compared using log-rank test – Total study population: p<0.001; <65years p=0.850; ≥65years: p<0.001

Conflict of Interest

Nothing to declare.

Correspondence: niema.kazem@meduniwien.ac.at