

Aspirin resistance in patients with impaired renal functions

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Abstract

Background: Cardiovascular diseases (CVD) are the leading cause of death in patients with chronic kidney diseases (CKD). Aspirin resistance (AR) worsens prognosis in CVD.

Aim: The aim of this study was to detect AR prevalence in this patient group.

Methods: The 203 patients (mean age 61.84 ± 11.51 years, 128 [63.1%] male) with stable coronary artery disease included in the study were grouped into four study groups according to their estimated glomerular filtration rate (eGFR) values. Multiplate test was used to determine AR. Platelet aggregation results were presented as aggregation unit (AU) \times min and values over 300 AU \times min were accepted as AR.

Results: 61 (30.04%) patients in the whole study population were found to have AR. Differences were detected between AR ratios and multiplate values of the patient groups ($p = 0.006$ and $p = 0.002$). AR ratio was highest in patient group 4 (eGFR < 30 mL/min/1.73 m²) and/or on chronic haemodialysis therapy, whereas there was little difference among the other three groups. In multivariate analysis, while AR status was independently related to female sex (OR = 2.31, CI 1.14–4.65, $p = 0.019$) and mean platelet volume (MPV) (OR = 1.68, CI 1.21–2.33, $p = 0.002$), multiplate test results were independently related to MPV ($\beta = 0.265$, $p < 0.0001$) and eGFR ($\beta = -0.165$, $p = 0.025$).

Conclusions: The AR ratio was found to be high in severe CKD patients, especially haemodialysis patients, but not in mild and moderate CKD patients. This increased AR ratio in severe CKD patients may affect the prognosis in patients who already have an increased risk for cardiovascular complications.

Key words: aspirin resistance, coronary artery disease, chronic kidney disease

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INTRODUCTION

Aspirin is the most widely used antiplatelet agent. It irreversibly inhibits platelet cyclooxygenase-1 enzyme, thus preventing thromboxane A₂ production [1, 2]. Aspirin is the cornerstone of therapy in atherosclerosis, effectively reducing thromboembolic complications. A meta-analysis provided evidence that antiplatelet therapy, mainly aspirin, reduces approximately 25% of the risk of nonfatal myocardial infarction and stroke or vascular death in high-risk patients [3]. However, some patients have recurrent vascular events despite aspirin therapy, and some exhibit variable responses to *in vitro* tests

for platelet aggregation. This has led to the concept of aspirin resistance (AR).

Because of the variability in diagnostic tests and the absence of controlled randomised trials, there is no uniform definition of AR, and its importance for prognosis in all patient groups is unknown. Data on the frequency of AR varies widely, predominantly because various laboratory tests are used, an exact definition is undefined, and the investigations include a broad range of disease states [4–9]. AR affects the risk of cardiovascular, cerebrovascular, and vascular-related events [7, 10, 11], but there is still no

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standardised diagnostic method or effective treatment for this clinical situation.

AR is a multifactorial phenomenon. Possible causes of resistance include genetic polymorphism, factors related to compliance and absorption of aspirin, inadequate dose, up-regulation of alternative pathways for thromboxane synthesis, reduced bioavailability, increased platelet turnover, and drug interactions [12, 13].

Cardiovascular diseases (CVD) are the leading cause of death in patients with chronic kidney disease (CKD). Aspirin is widely used in this patient group for both primary and secondary prevention of atherothrombotic events and also for the prevention of access graft thrombosis in haemodialysis (HD) patients. Aspirin treatment after myocardial infarction in CKD patients could save one life for every five patients treated [14]. A high AR ratio has been reported in CKD patients in some studies [15, 16], and Kilickesmez et al. [17] demonstrated a greater risk of long-term major adverse events in aspirin-resistant end-stage kidney disease patients compared to aspirin-sensitive patients.

The aim of our study was to evaluate the prevalence of AR in CKD patients.

METHODS

This study was approved by the local ethics committee, and all participants gave written informed consent before participating.

We included 184 patients followed by our outpatient clinic; all patients had stable coronary artery disease (CAD) and a history of CKD. Estimated glomerular filtration rate (eGFR) of each patient was calculated by using the Modification of Diet in Renal Disease Study Formula [18], and 14 of these patients whose eGFR values were above 90 mL/min/1.73 m² were excluded. Thirty-three patients with stable CAD without any history of impaired renal function and whose eGFR values were above 90 mL/min/1.73 m² were included as the control group. We classified the 203 patients into four study groups according to their eGFR values. Group 1 was the control group with an eGFR \geq 90 mL/min/1.73 m² without renal disease history; group 2 patients had an eGFR between 60 and 89 mL/min/1.73 m² (stage 2 CKD); group 3 patients had an eGFR between 30 and 59 mL/min/1.73 m² (stage 3 CKD); and group 4 patients had an eGFR < 30 mL/min/1.73 m² or undergoing chronic HD (stage 4–5 CKD). All patients were on regular 100 mg acetylsalicylic acid (ASA) therapy for at least seven days. Compliance on aspirin therapy was determined by patient interviews at the time of inclusion.

Patients taking an antiplatelet therapy other than ASA (ticlopidine, clopidogrel, dipyridamole, nonsteroidal anti-inflammatory drugs, pentoxifyllin, cilostazol), previous treatment with glycoprotein IIb/IIIa inhibitors within ten days, diagnosis of acute coronary syndrome in the last six months, active malignancy, haemorrhagic diathesis, thrombolytic treatment within the last month, liver disease and platelet

counts < 100,000/mL, and noncompliant with medical therapy were not included in the study.

All patients on chronic HD were dialysed three times a week, for 4 h every session and by cannulation of arteriovenous fistula. Patients were dialysed with polysulfone low-flux dialysers using sterile bicarbonate concentrate, heparin, and reverse osmosis water. Dialysate and blood flow rates were 500 and 350–400 mL/min, respectively. Anticoagulation was performed with an intravenous bolus of 2,000 U of heparin followed by a 1,000 U/h infusion for 3 h.

Information on diabetes, hypertension, hyperlipidaemia, smoking, and medication history of the patients was recorded. Fasting blood samples were obtained to determine creatinine, blood urea nitrogen (BUN), uric acid, blood glucose, lipid profile, haemoglobin, mean platelet volume (MPV), leucocyte, and platelet count. We used the multiplate test (Dynabyte Medical, Munich, Germany) to determine aspirin responsiveness.

Assessment of ASA resistance

Whole blood aggregation was performed with the multiplate analyser, an impedance aggregometer that is based on the principle that activated platelets expose receptors on their surface that allow them to attach to artificial surfaces. After 1 h of aspirin ingestion, whole blood samples were collected in test tubes containing hirudin (25 μ g/mL) as anticoagulant. Blood samples were collected 1 to 2 h before the HD session after 1 h of aspirin ingestion in HD patients. Arachidonic acid was used as the aggregation agonist, and all samples were analysed within 2 h of collection. The aggregation measured with this device is quantified as area under the curve, aggregation degree, and aggregation velocity. Platelet aggregation results were presented as aggregation unit (AU) \times min, and values over 300 AU \times min were accepted as AR [19].

Statistical analysis

Continuous variables were presented as mean \pm standard deviation. Categorical variables were presented as frequencies and percentages. Analysis of variance with the posthoc Tukey test or the unpaired Student's *t*-test for continuous variables and χ^2 test or χ^2 -test for categorical variables was performed to compare the study groups in relation to GFR levels and patient groups with and without AR. Correlations between the multiplate test results and AR status with other parameters were analysed using Spearman's or Pearson's correlation analysis. Multivariate associations of the multiplate test results were determined by using multiple stepwise linear regression analysis with parameters having significant correlations in the univariate analysis. For the determination of the influential factors on AR, multivariate logistic regression analysis was also performed on variables with a *p* value of < 0.05 derived from the univariate analysis. The receiver-operating characteristics (ROC) curve was used to test the predictive accuracy of GFR with respect to the presence of AR based on multiplate test

Table 1. Demographic characteristics and laboratory values of the study groups

	Group 1 (n = 33)	Group 2 (n = 47)	Group 3 (n = 67)	Group 4 (n = 56)	P
Age [years]	53.42 ± 10.32	62.02 ± 10.41 ^a	68.90 ± 7.86 ^{a,b}	58.69 ± 12.38 ^c	0.002
Male	20 (60.6%)	31 (66.0%)	43 (64.2%)	34 (60.7%)	0.935
Smoking	13 (39.4%)	19 (40.4%)	25 (37.3%)	9 (16.1%)	0.022
Hypertension	20 (60.6%)	35 (74.5%)	59 (88.1%)	40 (71.4%)	0.016
Diabetes mellitus	11 (33.3%)	13 (27.7%)	30 (44.8%)	20 (35.7%)	0.293
Hypercholesterolaemia	22 (66.7%)	32 (68.1%)	49 (73.1%)	35 (62.5%)	0.656
Body mass index [kg/m ²]	29.13 ± 4.39	29.02 ± 5.73	28.01 ± 4.20	29.42 ± 3.22	0.765
Medication:					
β-blockers	21 (63.6%)	36 (76.6%)	56 (83.6%)	27 (48.2%)	< 0.0001
RAS blockers	18 (54.5%)	31 (66.0%)	54 (80.6%)	20 (35.7%)	< 0.0001
Calcium antagonists	4 (12.1%)	7 (14.9%)	15 (22.4%)	13 (23.2%)	0.449
Statins	19 (57.6%)	23 (48.9%)	38 (56.7%)	8 (14.3%)	< 0.0001
Diuretics	6 (18.2%)	20 (42.6%)	26 (38.8%)	20 (35.7%)	0.129
Laboratory values:					
Creatinine [mg/dL]	0.71 ± 0.13	0.97 ± 0.16	1.48 ± 0.27 ^a	7.52 ± 2.79 ^{a,b,c}	< 0.0001
Blood urea nitrogen [mg/dL]	12.60 ± 3.33	19.57 ± 8.14	29.74 ± 12.55 ^{a,b}	67.66 ± 13.37 ^{a,b,c}	< 0.0001
Glucose [mg/dL]	124.93 ± 41.45	121.87 ± 43.89	140.14 ± 75.69	121.46 ± 53.26	0.249
Uric acid [mg/dL]	4.81 ± 1.80	6.31 ± 2.22 ^a	7.19 ± 1.77 ^a	6.98 ± 1.89 ^a	< 0.0001
Total cholesterol [mg/dL]	190.15 ± 44.65	186.91 ± 39.96	176.01 ± 41.83	189.03 ± 52.02	0.327
LDL [mg/dL]	120.60 ± 34.59	117.06 ± 34.61	108.41 ± 34.62	129.27 ± 41.87 ^c	0.058
HDL [mg/dL]	44.57 ± 13.45	44.19 ± 13.48	40.14 ± 9.64	43.28 ± 12.82	0.210
Triglyceride [mg/dL]	179.09 ± 120.32	148.73 ± 77.73	163.77 ± 64.91	173.51 ± 92.70	0.414
White blood cell [× 10 ³ /μL]	8.02 ± 2.43	7.31 ± 1.38	7.75 ± 1.92	7.74 ± 2.62	0.513
Haemoglobin [g/dL]	13.87 ± 1.42	12.99 ± 1.72	12.13 ± 1.77 ^{a,b}	11.22 ± 1.61 ^{a,b,c}	< 0.0001
Platelet count [× 10 ³ /μL]	269.06 ± 82.33	234.61 ± 60.84	238.72 ± 55.17	190.49 ± 69.67 ^{a,b,c}	< 0.0001
Mean platelet volume [fL]	8.73 ± 0.75	8.60 ± 0.81	8.19 ± 0.92 ^a	9.73 ± 1.37 ^{a,b,c}	< 0.0001
Aspirin resistance:					
Multiplate [AU × min]	229.36 ± 191.13	220.38 ± 151.39	243.64 ± 189.03	351.39 ± 228.39 ^{a,b,c}	0.002

^aSignificantly different from group 1 (p < 0.05); ^bsignificantly different from group 2 (p < 0.05); ^csignificantly different from group 3 (p < 0.05); RAS — renin-angiotensin system; LDL — low-density lipoprotein; HDL — high-density lipoprotein; AU — aggregation unit

results. Significant prediction was accepted when the area under the ROC curve was significantly different from 0.5; p < 0.05 was accepted as statistically significant. All analyses were performed using SPSS 15.0 statistical software.

RESULTS

The 203 patients (mean age 61.84 ± 11.51 years; 128 [63.1%] male) included in the study were grouped into four study groups as follows: group 1 — 33 patients; group 2 — 47 patients; group 3 — 67 patients; and group 4 — 56 patients. Demographic and clinical features of these four groups are listed in Table 1.

Specific diagnoses of the patients with GFR < 30 were as follows: 35.4% of patients had hypertensive nephropathy, 31.3% of patients had diabetic nephropathy, and the other

33.3% had nephropathy due to other causes such as polycystic renal disease, glomerulonephritis, and obstructive nephropathy.

Sixty-one (30.04%) patients of the study population were found to have AR (aggregation > 300 AU × min). Multiplate test results and AR status of the study groups are also shown in Table 1 and Figure 1.

Forty-eight of the 56 patients in group 4 were on chronic HD. The mean dialysis vintage was 3.52 ± 2.61 (range 1–9) years; 50% of these HD patients had AR.

The mean value of the multiplate test results was 511.75 ± 189.51 (range 301–1,045) AU × min in the 61 patients with AR and 160.19 ± 64.58 (range 14–295) AU × min in the 142 patients without AR. Demographic and clinical features of AR and aspirin sensitive patients are presented in Table 2.

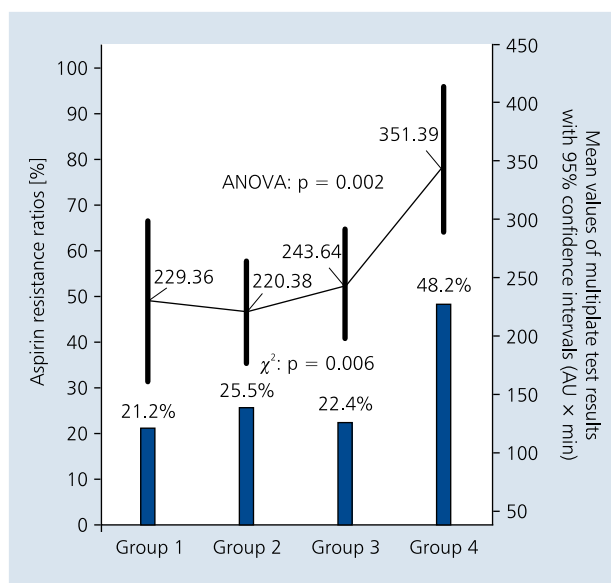


Figure 1. Multiplate test results and aspirin resistance ratios in the study groups

AR status was weakly correlated with sex ($r = -0.211$, $p = 0.003$), MPV ($r = 0.231$, $p = 0.001$), HD ($r = 0.242$, $p < 0.0001$), BUN ($r = 0.211$, $p = 0.003$), creatinine ($r = 0.191$, $p = 0.007$), and GFR ($r = -0.227$, $p = 0.001$). When these parameters which had significant correlation with AR status were included in the multivariate analysis, AR status was independently related to female sex (odds ratio [OR] = 2.31, confidence interval [CI] 1.14–4.65, $p = 0.019$) and MPV (OR = 1.68, CI 1.21–2.33, $p = 0.002$). Multiplate test results were also weakly correlated with MPV ($r = 0.299$, $p < 0.0001$), creatinine ($r = 0.280$, $p < 0.0001$), BUN ($r = 0.246$, $p < 0.0001$), GFR ($r = -0.264$, $p < 0.0001$), and HD ($r = 0.290$, $p < 0.0001$). When these parameters which had significant correlation with multiplate test results were included in the multivariate analysis, multiplate test results were independently related to MPV ($\beta = 0.265$, $p < 0.0001$) and GFR ($\beta = -0.165$, $p = 0.025$).

Diabetes mellitus ratio was not different in the study groups and also in AR and aspirin sensitive groups (Tables 1, 2). The presence of diabetes mellitus was not correlated with either AR ($r = 0.050$, $p = 0.479$) or multiplate test results ($r = 0.026$, $p = 0.709$). Also, diabetes mellitus ratio was not different between AR and aspirin sensitive patient groups in HD patients (29.2% vs. 45.8%, $p = 0.233$).

GFR were weakly correlated with AR status ($r = -0.227$, $p = 0.001$) and showed significant but poor discriminatory capacity between AR and aspirin sensitive patients, having an area under the ROC curve of 0.643 (CI 0.556–0.730), $p = 0.001$ (Fig. 2). With cut-point of GFR 47.5 mL/min/1.73 m², the sensitivity and specificity of GFR to detect AR were 58.3% and 62.4%, respectively.

DISCUSSION

AR is a multifactorial phenomenon that has been studied with different methods in different patient groups. AR patients are at an increased risk of future cardiovascular death, myocardial infarction, or stroke [20]. AR has also been studied in patients with CKD, and its incidence has been found to be higher, especially in HD groups [16]. There is a high prevalence of CVD in CKD patients, and mortality due to CVD is reported to be 10–30 times higher in HD patients [21]. A high AR ratio in CKD patients, especially in HD patients, may contribute to these increased mortality rates. Kilickesmez et al. [17] demonstrated that end-stage renal disease (ESRD) patients with AR were at greater risk of long-term major adverse events than aspirin sensitive ESRD patients. However, in another study [6], the presence of renal disease caused no difference in aspirin responsiveness in patients with CVD, and an increased AR ratio in CKD patients did not include patients from all stages of CKD.

In our study, we detected differences between the AR ratios of the four patient groups ($p = 0.006$). The AR ratio was highest in patient group 4, whereas the AR ratios of the other groups were approximately the same. Although the multiplate test results of group 4 were significantly higher than the other groups, there was little difference among the other three groups (Table 1, Fig. 1). Among the study population, there were differences in sex, β -blocker usage ratio, creatinine, BUN, urea, eGFR, HD, and MPV between patients with and without AR. AR presence was independently related to MPV and sex, and the multiplate test results were independently related to MPV and GFR.

Tanrikulu et al. [16] studied AR with the VerifyNow method in stage 3–4 CKD and HD patients, approximately one-third of whom had CAD. They detected AR in 46.1% of HD patients, 24.6% of stage 3–4 CKD patients, and 16.9% of the control group. Our study group was different from theirs, and CKD patients with a GFR between 60 and 90 mL/min/1.73 m² were not included in their study. The frequency of AR was significantly higher in CKD patients and especially in HD patients in Tanrikulu et al. [16], which agrees with our results.

Blann et al. [22] used light transmission aggregometry to study aspirin responsiveness in CAD patients. They detected 21.4% AR in patients with stage 1 CKD, 28.1% in stage 2, 42.9% in stage 3a, and 50% in stage 3b CKD patients. They did not evaluate aspirin responsiveness in stage 4 and HD patients. The AR ratios in their study, especially in stage 3 patients, were higher than those of our study. This could be because of the method they used, study group differences, or the use of lower dose aspirin (75 mg). However, the AR ratio increased with increasing severity of CKD, in agreement with the results of our study.

Kilickesmez et al. [17] used the multiplate method and reported an AR ratio of 43.58% in HD patients. This ratio is

Table 2. Characteristics and laboratory values of aspirin sensitive and aspirin resistant patients

	Aspirin sensitive group (n = 142)	Aspirin resistant group (n = 61)	P
Age [years]	62.33 ± 10.60	60.72 ± 13.43	0.363
Male	99 (69.7%)	29 (47.5%)	0.003
Smoking	49 (34.5%)	17 (27.9%)	0.355
Hypertension	105 (73.9%)	49 (80.3%)	0.215
Diabetes mellitus	54 (38.0%)	20 (32.8%)	0.477
Hypercholesterolaemia	95 (66.9%)	43 (70.5%)	0.615
Body mass index [kg/m ²]	28.72 ± 4.83	28.23 ± 4.22	0.649
Chronic renal failure	81 (57.0%)	42 (68.9%)	0.114
Haemodialysis	24 (16.9%)	24 (39.3%)	0.001
GFR [mL/min/1.73 m ²]	58.63 ± 34.50	41.29 ± 34.56	0.001
Medication:			
β-blockers	104 (73.2%)	36 (59.0%)	0.045
RAS blockers	90 (63.4%)	33 (54.1%)	0.215
Calcium antagonists	29 (20.4%)	10 (16.4%)	0.504
Statins	66 (46.5%)	22 (36.1%)	0.170
Diuretics	48 (33.8%)	24 (39.3%)	0.449
Laboratory values:			
Creatinine [mg/dL]	2.37 ± 2.80	4.01 ± 3.73	0.001
Blood urea nitrogen [mg/dL]	31.36 ± 22.28	42.70 ± 26.80	0.002
Glucose [mg/dL]	133.04 ± 63.09	117.53 ± 45.23	0.086
Uric acid [mg/dL]	6.55 ± 1.98	6.56 ± 2.11	0.976
Total cholesterol [mg/dL]	183.46 ± 43.01	184.43 ± 46.42	0.897
LDL [mg/dL]	116.31 ± 36.58	117.05 ± 36.32	0.905
HDL [mg/dL]	41.95 ± 11.48	44.22 ± 13.54	0.268
Triglyceride [mg/dL]	161.45 ± 83.05	172.14 ± 91.00	0.463
White blood cell [× 10 ³ /μL]	7.56 ± 1.98	7.99 ± 2.54	0.194
Haemoglobin [g/dL]	12.48 ± 1.88	12.10 ± 1.91	0.189
Platelet count [× 10 ³ /μL]	231.17 ± 69.85	225.81 ± 71.86	0.621
Mean platelet volume [fL]	8.50 ± 1.02	9.13 ± 1.16	< 0.0001

GFR — glomerular filtration rate; RAS — renin-angiotensin system; LDL — low-density lipoprotein; HDL — high-density lipoprotein

lower than our HD group, but most of the patients in their study did not have CAD. Geara et al. [15] used the VerifyNow method and reported an AR ratio of 34.8% in chronic HD patients, which is lower than our findings for HD patients. This difference may be due to the study method and differences in the study population. Our HD patients had CAD and possibly had more reactive platelets. However, the AR ratio of HD patients in their study was also higher than the general population.

In our study, the AR ratio and multiplate test results had a weak correlation with GFR ($r = -0.227$, $p = 0.001$ and $r = -0.264$, $p < 0.0001$). Tanrikulu et al. [16] also detected a weak correlation between the VerifyNow test results and GFR in their study ($r = -0.337$, $p < 0.001$) and found

a relation between the AR ratio and GFR (an increase of 1 mL/min/1.73 m² in GFR showed a reduction of 1.1% in the OR of AR). Blann et al. [22] also detected a weak correlation between 3-, 5-, and 7-min aggregation values studied with light transmission aggregometry and GFR ($r = -0.19$, $p = 0.011$; $r = -0.20$, $p = 0.008$; $r = -0.20$, $p = 0.009$). Würtz et al. [23], in their evaluation of the influence of renal function and platelet turnover on the antiplatelet effect of aspirin, found no significant relation between GFR and the results of multiplate and VerifyNow tests.

The exact cause of increased AR in CKD patients is unknown. There is a complex platelet dysfunction in uraemic patients, and HD and uraemic patients are prone to both haemorrhagic and thrombotic complications. Increased oxida-

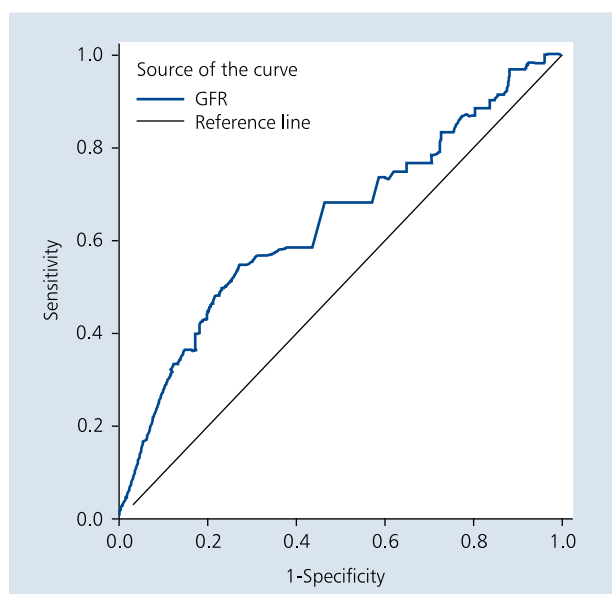


Figure 2. Receiver-operating characteristics (ROC) curve of the glomerular filtration rate (GFR) for detecting aspirin resistance (the area under the ROC curve of 0.643 [confidence interval 0.556–0.730], $p = 0.001$)

tive stress and inflammation have been shown in CKD and HD patients [24], and alteration of arachidonic acid metabolism has been described in uraemic platelet dysfunction [25]. An increase in thromboxane A2 production as an end product of arachidonic acid metabolism may account for the high incidence of AR in these patients.

The female percentage was significantly higher in AR patients in our study. There was also an independent relation between AR and female gender. This result is compatible with the results of other studies [6, 16].

There was a weak correlation between MPV and AR ratios and multiplate test results. Increased MPV in aspirin-resistant patients and the effect of this on prognosis has been demonstrated previously [26, 27]. Würtz et al. [25] also found a relation between multiplate test results and immature platelet count, which would be expected to have high MPV values. A possible explanation for this is that platelets with increased MPV values are more reactive and more resistant to the antiplatelet effect of aspirin.

In our study, the presence of diabetes mellitus was not correlated with either AR ($r = 0.050$, $p = 0.479$) or multiplate test results ($r = 0.026$, $p = 0.709$). Also diabetes mellitus ratio was not different between AR and aspirin sensitive patient groups in HD patients (29.2% vs. 45.8%, $p = 0.233$). Baber et al. [28] studied platelet functions in patients undergoing percutaneous coronary intervention to determine if increased thrombotic events in diabetic and CKD patients could be attributed to changes in platelet reactivity among this patient population. They assessed platelet

reactivity as clopidogrel resistance by VerifyNow method. They found that the presence of both diabetes mellitus and CKD confers a synergistic effect on platelet reactivity. This result is not compatible with our results, but this could be explained by differences of study populations and used methods for assessing platelet reactivity.

A weak correlation between AR and eGFR and a not significantly higher AR ratio of CKD patients, except severe CKD patients most of whom were under chronic HD, may suggest that mild or moderate renal impairment has no, or very little, effect on aspirin responsiveness and HD and that severe renal impairment has a significant effect on AR.

New studies are needed to evaluate the effect of CKD on AR and the underlying mechanism of increased AR status in this patient group. The management of patients with AR and their prognosis should also be evaluated.

Limitations of the study

It is difficult to compare results of other studies with our results because of the absence of an exact description of AR and the different methods for evaluating aspirin responsiveness in different patient groups with different aspirin doses. The observational nature of our study did not include examining factors that contribute to increased AR in CKD patients. Aspirin compliance was based on face-to-face interviews with patients and with the person responsible for the patient's primary care; salicylate levels were not measured.

CONCLUSIONS

The AR ratio was found to be high in severe CKD patients, especially HD patients, but not in mild and moderate CKD patients. This increased AR ratio in severe CKD patients may affect the prognosis in patients who already have an increased risk for cardiovascular complications.

Conflict of interest: none declared

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Aspirynooporność u chorych z niewydolnością nerek

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Streszczenie

Wstęp: Choroby układu sercowo-naczyniowego są główną przyczyną zgonów u pacjentów z przewlekłą chorobą nerek (CKD). Aspirynooporność (AR) pogarsza rokowanie w chorobie układu sercowo-naczyniowego.

Cel: Badanie przeprowadzono w celu ustalenia częstości występowania AR w tej grupie chorych.

Metody: Dwustu trzech chorych (średnia wieku $61,84 \pm 11,51$ roku; 128 [63,1%] mężczyzn) ze stabilną chorobą wieńcową, włączonych do badania, podzielono na 4 grupy w zależności od oszacowanej filtracji kłębuszkowej (eGFR). W celu określenia AR zastosowano metodę testów wielokrotnych. Wyniki oceny agregacji płytek przedstawiono w jednostkach agregacji (AU) \times min, a wartości większe niż 300 AU \times min uznano za wskazujące na obecność AR.

Wyniki: U 61 (30,04%) chorych z całej badanej grupy wykryto AR. Stwierdzono różnice w częstości występowania AR i wyników testów wielokrotnych między poszczególnymi grupami pacjentów ($p = 0,006$ i $p = 0,002$). Częstość występowania AR była największa u osób z grupy 4 (eGFR < 30 ml/min/1,73 m²) i/lub stosujących długotrwale hemodializę, natomiast różnice między pozostałymi trzema grupami były niewielkie. W analizie wieloczynnikowej częstość występowania AR była niezależnie związana z płcią żeńską (OR = 2,31; CI 1,14–4,65; $p = 0,019$) i średnią objętością krwinek (MPV) (OR = 1,68; CI 1,21–2,33; $p = 0,002$), natomiast wyniki testów wielokrotnych były niezależnie związane z MPV ($\beta = 0,265$; $p < 0,0001$) i eGFR ($\beta = -0,165$; $p = 0,025$).

Wnioski: Częstość występowania AR była większa w grupie pacjentów z CKD, zwłaszcza u osób hemodializowanych, natomiast nie była zwiększona u pacjentów z łagodną lub umiarkowaną CKD. Zwiększenie częstości AR u chorych z ciężką CKD może wpływać na rokowanie u osób, u których ryzyko powikłań sercowo-naczyniowych było już wcześniej zwiększone.

Słowa kluczowe: aspirynooporność, choroba wieńcowa, przewlekła choroba nerek

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