ASSOCIATION OF DYSLIPIDEMIA, CHRONIC KIDNEY DISEASE AND HYPERTENSION WITH CAROTID ATHEROSCLEROSIS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

V. Vasilkova[1,3], T. Mokhort[2], E. Naumenko[3], M. Zshmailik[3]
[1]*Gomel State Medical University, Gomel, Belarus*
[2]*Belarusian State Medical University, Minsk, Belarus*
[3]*The Republican Research Centre for Radiation Medicine and Human Ecology, Gomel, Belarus*

OBJECTIVES

Atherosclerotic complications are the leading causes of morbidity and mortality among patients with DT2.

Aim was to investigate the possible role of dyslipidemia, hypertension and chronic kidney disease (CKD) on the characteristics of carotid atherosclerosis (presence of plaque, carotid IMT and total plaque area) in patients with DT2.

METHODS

- Patients aged 60–75 years with DT2 were included in this study.
- Control group included 24 healthy subjects the same age.
- Other atherosclerosis risk factors of subjects, including smoking, hypertension, dyslipidemia, and CKD, were identified with a questionnaire and a blood test.
- The IMT was measured using automated edge detection software as the distance between the lumen-intima interface and the media-adventitia interface.
- Atherosclerotic plaque was defined as a focal structure encroaching into the arterial lumen of 0.5 mm or 50% of the surrounding IMT value or IMT of >1.5 mm.
- Total plaque area (TPA) was calculated as the sum of all plaque areas.

DEMOGRAPHIC AND ULTRASONOGRAPHIC CHARACTERISTICS IN PATIENTS WITH DT2 AND CONTROL WITH DIFFERENT NUMBERS OF ATHEROSCLEROSIS RISK FACTORS (1)

Parameters	Groups with different number of atherosclerosis risk factor			
	Group 1 (0) n=24	Group 2 (1) n=25	Group 3 (≥2) n=43	p
Age, years	65.13 ± 3.48	65.54 ± 4.37	66.38 ± 4.53	-
Gender (female/male), n	11/13	14/16	17/21	-
Presence of plaque, n	2	8	20	0.016*
Hypertension, n	-	10	37	-
Dyslipidemia, n	-	8	17	-
CKD, n	-	0	5	-
Coronary heart disease, n	0	6	29	-
Stroke, n	0	1	3	-
Глюкоза крови, ммоль/л	4.65±2.12*	8.83±4.27	8.28±2.09	0.01
Hemoglobin A1c, %	4.38±1.15*	6.49±1.85	6,78±2.13	0.04
Total cholesterol, mmol/L	5.01±1.11	5.05±1.09	5.24±1.44	0.08
Triglyceride, mmol/L	1.53±0.78	1.54±0.81	1.89±1.10	0.203
High-density lipoprotein cholesterol, mmol/L	2.84±0.89	2.95±0.95	3.25±1.00	0.124
Low-density lipoprotein cholesterol, mmol/L	1.24±0.31	1.37±0.36	1.16±0.32	0.814
eGFR, mL/min per 1.73 m^2	97.15±24.12*	84.68±36.60	79.40±23.74	0.02
IMT, mm	0.73±0.02	0.78±0.01	0.81±0.02	0.441
TPA, mm^2	11.31±0.12	12.36±0.23	13.18±0.15	0.213

CKD: Chronic kidney disease; IMT: intima-media thickness; TPA: total area plaque; eGFR: estimated glomerular filtration rate; ∗p value indicates significant difference

RESULTS

In the 68 patients with DT2, the mean blood glucose and HbA1c level were 8.52 ± 3.10 mmol/L and 6.59 ± 1.88%, respectively. We divided all patients (DT2 and control) into 3 groups: Group 1 (n=24) – patients did not have any additional atherosclerosis risk factor, Group 2 (n=25) – patients had one additional atherosclerosis risk factor, and Group 3 (n=43) – patients had two or three additional atherosclerosis risk factors. There were significant differences of blood glucose and HbA1c level between Group1 and Group 2, 3 (Table 1; $p<0.05$).

Using multiple linear regression analysis adjusted for confounding factors, IMT and TPA were significantly correlated with age >60 years ($\beta=0.359$, $p<0.0001$; $\beta=0.263$, $p<0.0001$), hypertension ($\beta=0.041$, $p=0.003$; $\beta=0.126$, $p<0.0001$), dyslipidemia ($\beta=0.066$, $p=0.0001$; $\beta=0.125$, $p<0.0001$) and CKD ($\beta=0.054$, $p=0.003$; $\beta=0.165$, $p<0.0001$), respectively. However, gender (men) was not significantly correlated with IMT ($p=0.171$) and TPA ($p=0.112$) (Table 2).

The results of the study suggested that the left carotid artery in patients with DT2 was more vulnerable to atherosclerosis when compared with the right carotid artery. So, we found a significant difference in carotid IMT between left and right carotid artery (0.70 ± 0.16 mm versus 0.66 ± 0.13mm, $p<0,001$, respectively). There were no significant difference in carotid IMT between patients with plague and without plague ($p=0.171$).

MULTIVARIATE LINEAR REGRESSION ANALYSIS FOR PUTATIVE PREDICTORS OF IMT AND TPA IN ELDERLY DT2 PATIENTS (2)

Parameters	IMT			TPA		
	β†	r^2	p	β†	r^2	p
Gender (men)	0.177	0.039	0.171	0.136	0.020	0.112
Age >60 years	0.359	0.145	<0.0001	0.263	0.099	<0.0001
Hypertension	0.041	0.001	0.003	0.126	0.014	<0.0001
Dyslipidemia	0.066	0.004	0.0001	0.125	0.019	<0.0001
CKD	0.054	0.003	0.002	0.165	0.026	<0.0001

All variants are adjusted for the analysis. b: standardized regression coefficient; CKD: Chronic kidney disease; IMT: intima-media thickness; TPA: total area plaque

MULTIVARIATE LINEAR REGRESSION ANALYSIS FOR PUTATIVE PREDICTORS OF IMT AND TPA IN ELDERLY DT2 PATIENTS

Parameter	DT2					
	The patients with plaque n=40	The patients without plaque n=28	p	The left carotid artery n=68	The right carotid artery n=68	p
IMT, mm	0.71 ± 0.11	0.67 ± 0.13	0.171	0.70 ± 0.16	0.66 ± 0.13	<0.001

CONCLUSIONS

We showed the role of additional atherosclerosis risk factors to carotid atherosclerosis in elderly patients with DT2. In these patients, the presence of dyslipidemia, hypertension, and different CKD status were predictors of carotid plaque. Thus, early diagnosis and treatments of hypertension, dyslipidemia, and CKD are necessary for diabetic patients to prevent adverse cardiovascular and cerebrovascular outcomes and reduce cardiovascular and cerebrovascular morbidity and mortality in aged patients with diabetes.

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