A novel diagnostic procedure of asymptomatic coronary artery disease in diabetic patients using carotid wall intima-media thickness(IMT) as a surrogate marker and coronary computed tomography angiography(CCTA)

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Diabetes is associated with a marked increase in the risk of coronary artery disease (CAD). Also, diabetic patients without previous myocardial infarction have as high a risk of myocardial infarction as non-diabetic patients with previous myocardial infarction. It is well known that patients with diabetes have often asymptomatic CAD. Carotid-wall intima-media thickness (IMT) is a surrogate marker of atherosclerosis associated with cardiovascular risk factors and with cardiovascular outcomes. The present study was performed in order to establish a diagnostic procedure for asymptomatic CAD in diabetic patients using the maximum IMT (maxIMT) of carotid artery as a surrogate marker followed by coronary computed tomography angiography (CCTA), a new noninvasive diagnostic test for CAD. In the present investigation, 357 diabetic patients and 244 non-diabetic patients with lifestyle-related diseases (hypertension, dyslipidemia) without any episode of chest pain and having maxIMT over 1.5mm were studied. CCTA using a 256 channel MDCT scanner was performed for all of them. Then coronary angiography (CAG) was performed for the patients with positive findings in CCTA. In the present study, 52.3% of diabetic patients and 25.4% of nondiabetic patients have coronary lesions with stenosis more than 25% in the CAG (p <0.0001). Also, 37.0% of diabetic patients and 16.0% of non-diabetic patients have coronary lesions with stenosis more than 75% in the CAG (p <0.0001). False-positive rate of CCTA was 10.1% in diabetic patients, 19.7% in non-diabetic patients (p <0.0001), respectively. Among various parameters, age, HDL-C, eGFR, max IMT and uric acid have correlation with the degree of coronary lesion. Thus, maxIMT of carotid artery over 1.5mm is a useful surrogate marker of asymptomatic CAD in diabetic patients. The present diagnostic procedure requires further studies of subsequent outcomes.

【Introduction】

Diabetes is associated with a marked increase in the risk of coronary artery disease (CAD). Also, diabetic patients without previous myocardial infarction have as high a risk of myocardial infarction as non-diabetic patients with previous myocardial infarction. It is well known that patients with diabetes have often asymptomatic CAD. Carotid-wall intima-media thickness (IMT) is a surrogate marker of atherosclerosis associated with cardiovascular risk factors and with cardiovascular outcomes[1]. The present study was performed in order to establish a diagnostic procedure for asymptomatic CAD in diabetic patients using the maximum IMT (max IMT) of carotid artery as a surrogate marker followed by coronary computed tomography angiography (CCTA), a new noninvasive diagnostic test for CAD[2].

【Materials and Methods】

1. Subjects:

In the present investigation, 357 diabetic patients and 244 non-diabetic patients with lifestyle-related diseases (hypertension, dyslipidemia) without any episode of chest pain and having max IMT over 1.5mm were studied. CCTA using a 256 channel MDCT scanner was performed for all of them. Then coronary angiography (CAG) was performed for the all patients with positive findings in CCTA.

2. Statistical analysis

Statistical analysis was performed using the JMP® 9 software (SAS Institute Inc., Cary, NC, USA). All values are expressed as the means ± SEM. Values of p<0.05 were considered to indicate statistically significant differences.

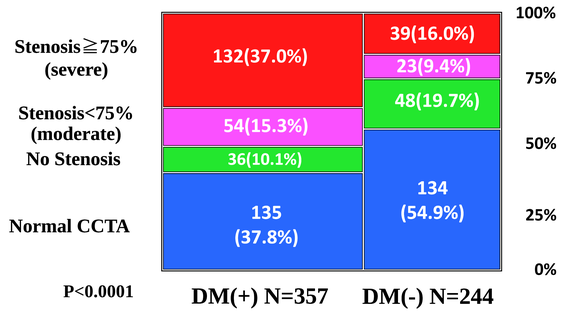
【Results】

Baseline Characteristics of the 601 Participants without Evidence of Coronary artery Disease (CAD)

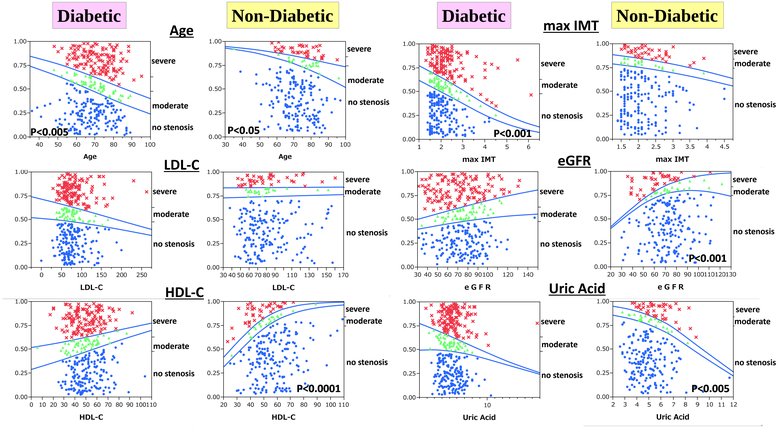
	DM(male)	DM(female)	nonDM(male)	nonDM(female)
Number	230	127	107	137
Age (yr)	68.5 ± 10.3	70.8±9.3	72.1±10.4	72.4±9.8
Smoking (%)	27.4	9.5	12.1	6.6
Hypertension (%)	65.7	65.3	51.4	38.0
Hyperlipidemia (%)	71.7	78.0	66.4	72.8
Insulin (%)	38.7	42.5		
HbA1c (%)	7.0 ± 1.5	7.3 ± 1.7		
LDL-C (mg/dl)	79.4 ± 31.0	83.5 ± 33.5	78.8 ± 25.5	83.6 ± 25.8
HDL-C (mg/dl)	47.5 ± 0.9	55.3 ± 1.1	50.6 ± 1.2	59.3 ± 1.1
eGFR	72.5 ± 23.9	72.9 ± 27.8	68.3 ± 20.9	72.2 ± 16.9
Max IMT (mm)	2.23 ± 0.71	2.09 ± 0.05	2.36 ± 0.68	1.99 ± 0.42

Mean ± SE

Effect of diabetes on the incidence of coronary atherosclerotic lesion in the patients without evidence of coronary artery disease (CAD)



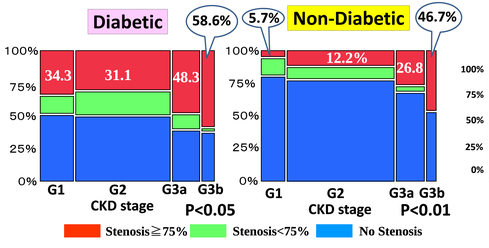
Logistic analysis of Age, LDL-C, HDL-C, max IMT, eGFR and Uric Acid with Coronary Artery Lesion



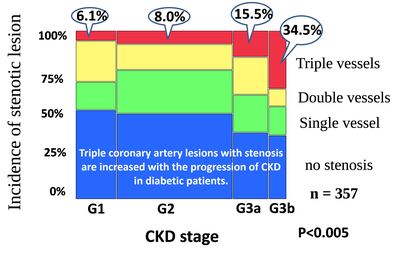
Summary of logistic analysis

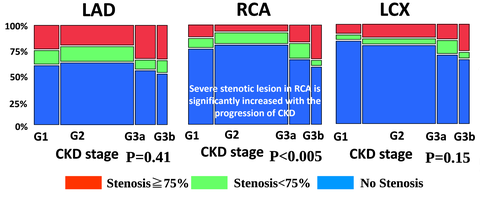
	Age	LDL-C	HDL-C	max IMT	eGFR	UA
DM(+) (n=357)	P<0.005	P=0.49	P=0.10	P<0.001	P=0.10	P=0.60
DM(-) (n=244)	P<0.05	P=0.96	P<0.0001	P=0.31	P<0.001	P<0.005

Effect of CKD stage on coronary artery stenotic lesion



Effect of CKD stage on the number of coronary vessels having stenotic lesion in diabetic patients





1. In the present study, 52.3% of diabetic patients and 25.4% of non-diabetic patients have coronary lesions with stenosis more than 25% in the CAG (p <0.0001). Also, 37.0% of diabetic patients and 16.0% of nondiabetic patients have coronary lesions with stenosis more than 75% in the CAG (p <0.0001).
2. False-positive rate of CCTA was 10.1% in diabetic patients, 19.7% in non-diabetic patients (p <0.0001), respectively.
3. Among various parameters, age, HDL-C, eGFR, max IMT and uric acid have correlation with the degree of coronary stenotic lesion.
4. CKD stage is closely correlated with the incidence of severe stenotic lesions (≧75%) both in diabetic and non-diabetic patients.
5. Triple coronary vessel lesions with stenosis are increased with the progression of CKD in diabetic patients due to a significant increase in RCA vessel lesions in G3a and G3b stage.

【Conclusion】

Max IMT of carotid artery over 1.5mm is a useful surrogate marker of asymptomatic CAD in diabetic patients in Japan. The present diagnostic procedure requires further studies of subsequent outcomes.

【Acknowlegments】

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【References】

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