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Clinicl Value of Combined Detection of Glycosylated Hemoglobin and Various Biochemical Indicators of Blood lipid, Blood glucose and Renal Function

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ABSTRACT

Objective: To explore the clinical values of detection results of glycosylated hemoglobin, blood lipid, blood glucose and renal functions and their correlation in diabetic microangiopathy and incidence of cardiovascular and cerebrovascular diseases. **Methods:** The determinations of glycosylated hemoglobin (HbA1c), fasting plasma glucose (FPG), Urea, creatinine (Cr), total cholesterol (TC), triglycerides (TG), and low-density lipoprotein cholesterol (LDL-C) were carried out in 96 cases of diabetic patients (divided into non-lesion group (50 cases) and non -lesion group (46 cases) according to microangiopathy status) and 116 non-diabetic patients with cardiovascular and cerebrovascular diseases (60 cases of coronary artery diseases and 56 cases of hypertension) and the correlation of HbA1c with various biochemical indicators. **Results:** in patients with diabetes, the HbA1c with various biochemical indicators of the lesion group saw different levels of increases compared with the non-lesion group and there is statistically significant difference ($P<0.05$); the HbA1c and FPG, Urea, TC,TG and LDL-C of the group of non-diabetic cardiovascular and cerebrovascular diseases show a positive correlation ($P<0.05$). **Conclusion:** The joint detection of HbA1c and various biochemical indicators is of great significance to the diagnosis and treatment of diabetic microangiopathy and cardiovascular and cerebrovascular diseases.

Introduction

Diabetes is a clinically common cardiovascular disease and a common chronic disease that currently affects the safety of human life. At present, many results of clinical studies demonstrate that diabetes is a risk factor for several other cardiovascular and cerebrovascular diseases. For diabetic patients, the poor control of blood glucose very easily leads to microangiopathy, causing many chronic complications and incidence of cardiovascular and cerebrovascular diseases, with higher mortality rates and higher disability rates. Now some research results show that glycosylated hemoglobin also plays a certain influential role in the process of incidence and development of other non-diabetic cardiovascular diseases.

1 Materials and methods

1.1 General materials

212 cases of patients diagnosed in hospital were chosen, with 96. Among them, there are 96 cases of DM patients between 43 and 81 years of age, which are divided into lesion group (50 cases) and non-lesion group (46 cases) according to microangiopathy status; there are 60 cases of patients with coronary artery diseases between 55 and 91 years of age in the group of non-DM cardiovascular and cerebrovascular diseases; and there are 56 cases of hypertensive patients aged 51-89 years. The diagnosis of DM complied with the 1997 American Diabetes Association (ADA) criteria for the diagnosis of diabetes; the diagnosis of coronary artery diseases was accordance with the 1985 World Health Organization (WHO) criteria for the diagnosis of ischemic heart disease; the diagnostic criteria for hypertension reference the diagnostic criteria contained in the 2004 Chinese Guidelines on Prevention and Treatment of Hypertension (practical edition). Patients have not controlled diet and taken drugs that affect glucose metabolism before exam and they maintained normal diet before being examined.

1.2 Methods

1.2.1 Sample collection

From all the subjects, 5mL of fasting venous blood is collected for the detection of biochemical indicators, and 2mL of fasting venous blood is collected and put into to a test tube containing EDTA-K2 anticoagulant for the detection of HbA1c.

1.2.2 Determination of HbA1c

TOSOHHLC-723G8 full-automatic glycosylated hemoglobin analyzer and supporting agents

1.2.3 Detection of various biochemical indicators

OlympusAU2700 full-automatic biochemical analyzer is used, FPG, TC, TG, LDL-C, Cr reagents are provided by BioSino Bio-Technology & Science Inc. and Urea reagents by Shanghai Fosun Long March Medical Science Co., Ltd. The specific methods for detection are as follows: Hexokinase methods for FPG; Enzyme Kinetics for Urea; Jaffe assay for Cr; cholesterol oxidase method (CHOD-PAP method) for TC; enzymatic GPO-POD method for TG; and elimination method for LDL-C. The determination of in-door quality control is carried out daily and after the control, the specimens of patients are detected.

1.3 Statistical disposal

The statistical software SPSS18.0 is utilized to conduct data analysis, metering materials are expressed as $\bar{X}\pm s$, T-tests are used in the inter-group comparison, and the correlation of HbA1c with various biochemical indicators is analyzed using Pearson double-variable analysis method. $P<0.05$ means the differences are statistically significant.

2 Results

2.1 Comparison of detection results of HbA1c and various biochemical indicators in DM group. HbA1c and various biochemical indicators in the lesion group saw different levels of increases compared with the non-lesion group, with the differences having statistical significance ($P < 0.05$). See Table 1.

Table 1 Comparison of Detection Results of HbA1c and Various Biochemical Indicators in DM Group ($\bar{X}\pm s$)

group	n	HbAlc(%)	FPG (mmol/L)	Urea (mmol/L)	Cr (mmol/L)	TC (mmol/L)	TG (mmol/L)	LDL-C (mmol/L)
non-lesion group	46	7.80±1.13	8.98±1.79	4.23±1.37	74.83±16.13	4.07±0.69	1.59±0.75	2.24±0.48
lesion group	50	10.59±1.94	13.49±3.33	7.46±4.49	176.20±161.49	5.75±1.27	2.49±1.90	3.28±0.63

2.2 Comparison of detection results of HbA1c and various biochemical indicators of patients with coronary artery diseases and hypertensive patients in the group of non-DM cardiovascular and cerebrovascular diseases at HbA1c≥6.5%, various biochemical indicators see different levels of increased with the difference having statistical significance ($P<0.05$). See Table 2.

Table 2 Comparison of Detection Results of HbA1c and Various Biochemical Indicators of Patients with Coronary Artery Diseases and Hypertensive Patients in the Group of Non-DM Cardiovascular and Cerebrovascular Diseases ($\bar{X}\pm s$)

Indicator	HbA1c≥6.5%		HbA1c＜6.5%	
	coronary artery diseases	hypertensive	coronary artery diseases	hypertensive
HbA1c (%)	7.06±0.44	6.90±0.49	5.88±0.33	5.93±0.36
FPG (mmol/L)	7.68±0.55	8.22±1.76	5.82±0.39	6.25±0.81
Urea (mmol/L)	6.08±3.00	6.27±2.25	4.83±1.26	4.47±1.27
Cr (mmol/L)	94.59±29.47	106.21±42.08	78.15±20.24	71.64±10.47
TC (mmol/L)	4.68±1.03	5.50±0.92	3.76±0.73	4.11±0.81
TG (mmol/L)	1.64±0.56	2.71±0.89	1.03±0.50	1.43±0.36
LDL-C (mmol/L)	2.63±0.79	3.29±0.78	1.98±0.60	2.39±0.82

2.3 Correlation of HbA1c with various biochemical indicators in the group of non-DM cardiovascular and cerebrovascular diseases

HbA1c and FPG, Urea, TC, TG, LDL-C in the group of non-DM cardiovascular and cerebrovascular diseases show a positive correlation ($P<0.05$). See Table 3.

3 Discussion

Diabetes is a set of metabolic diseases characterized by high blood glucoses. With the current aggravation of population ageing and constant growth in our material standard of living, the clinical incidence of diabetes shows an increasing trend and related statistical results indicate that the clinical incidence of diabetes among people at a younger age gradually increases. Current clinical research results have demonstrated that diabetes is a risk factor for multiple cardiovascular and cerebrovascular diseases. For diabetic patients, poor glucose control easily causes microangiopathy, and thus leads to vascular injury and full-body multiple organ function damage, resulting in incidence of many complications and threatening the safety of life of patients. The focus of current clinical treatment of diabetes is to enhance early treatment of diabetes in patients, proactively control the blood glucose of patients and prevent the incidence of complication of cardiovascular complications and related complications in patients. FPG is a common indicator for monitoring the diabetic blood glucose status clinically and currently, but the detection results of FPG has instantaneity and offers an understanding of instant control condition of blood glucose in patients. However, FPG is susceptible to patients' own body status, emotional changes, living environment and diet conditions and other factors and is hard to serve as a specific indicator for the diagnosis of diabetic patients and to distinguish the increase status of non-diabetic blood glucose, easy to result in misdiagnosis[1]. Glycosylated hemoglobin is an important indicator for clinically reflecting the 6-8-week blood glucose level of the body and a gold standard for conducting the diagnosis of diabetes currently and clinically. Glycosylated hemoglobin is a combined product of hemoglobin in red blood cells and blood glucoses. The level of glycosylated hemoglobin is correlated to the level of the blood glucose level of the body. The higher the blood glucose level is, the more glycosylated hemoglobin is generated; the generating process of glycosylated hemoglobin levels is relatively slow, and the levels are immune to enormous factors like patients' own factors, diet conditions, emotional status, environmental elements; and the glycosylated hemoglobin generated shows high stability and is hard to be decomposed, therefore, the level of glycosylated hemoglobin can reflect blood glucose control conditions of patients in 6-8 weeks[2]. Hence, the monitoring of glycosylated hemoglobin levels can offer an effective understanding of the blood glucose effects of patients in a period of time and effectively assist in the determination of diagnosis and treatment programs, with a wide clinical application.

Table 3 Correlation of HbA1c with Various Biochemical Indicators in the Group of Non-DM Cardiovascular and Cerebrovascular Diseases

Indicator	coronary artery diseases		hypertensive	
	r	P	r	P
FPG	0.823	<0.01	0.853	<0.01
Urea	0.4	<0.01	0.6	<0.01
Cr	0.238	>0.05	0.703	<0.01
TC	0.528	<0.01	0.603	<0.01
TG	0.41	<0.05	0.397	<0.05
LDL-C	0.5	<0.01	0.528	<0.01

In this paper, the glycosylated hemoglobin, blood lipid, blood glucose and renal functions of patients with diabetic microangiopathy, patients without diabetic microangiopathy and people receiving health examination are analyzed, and the results show that various indicators of patients with diabetic microangiopathy are the highest and comply with the results of Fileena's study, illustrating that the implementation of the conjunction of glycosylated hemoglobin with blood liquid, blood glucose, renal function indicators can effectively assist in the diagnosis of diabetes and offer an understanding of the microangiopathy status of patients. Microangiopathy is a risk factor for many cardiovascular and cerebrovascular diseases such as coronary artery disease and hypertension , and clinical studies for glycosylated hemoglobin levels and the status of lesions in cardiovascular and cerebrovascular diseases remain unclear. To further understand the relationship between glycosylated hemoglobin and cardiovascular and cer[3]ebrovascular diseases, the glycosylated hemoglobin levels, blood liquid, blood glucose and renal function indicators of patients with non-diabetic cardiovascular and cerebrovascular diseases are detected in this paper, and the results show that, as the glycosylated hemoglobin levels increase, blood liquid, blood glucose and renal function indicators rise, which means glycosylated hemoglobin levels also can assist in diagnosing the condition of cardiovascular and cerebrovascular diseases and the higher the glycosylated hemoglobin levels are, the worse the condition of patients with cardiovascular and cerebrovascular diseases. But the implementation of the monitoring of glycosylated hemoglobin levels only can offer an understanding of blood glucose control effects of patients and is unable to offer an understanding of the status of related complications resulting from microangiopathy in patients. Therefore, when cardiovascular and cerebrovascular diseases are clinically diagnosed, it is necessary to combine the monitoring results of glycosylated hemoglobin with biochemical indicators like blood liquid, blood glucoses and renal functions, further define actual types and status of cardiovascular and cerebrovascular lesions in patients, and assist in the formulation of treatment programs for patients based on the detection results to improve the pertinence and effectiveness of treatment for patients.

From Table 1, it can be seen that, compared with the non-lesion group, HbA1c and various biochemical indicators in the lesion group see different levels of increases and the differences are statistically significant ($P < 0.05$). As the body of DM patients is in the state of high blood glucoses on a long-term basis, the vascular endothelial cells are damaged, the deformability of white blood cells and red blood cells is reduced, and improved adhesiveness and aggregation are caused, resulting in clogged and slow blood flow in the microcirculation, microthrombus formation and increased thickness of capillary basement membranes, leading to complications like microangiopathy, thus bringing out full-body multiple organ function damage. Therefore, regular detection of HbA1c and various biochemical indicators on patients with DM microangiopathic lesions is of very has critical significance to the assessment and monitoring of conditions of patients.

In short, the combined detection of glycosylated hemoglobin and various biochemical indicators of blood lipid, blood glucose and renal functions can effectively assist in diagnosing the conditions of patients with diabetic cardiovascular and cerebrovascular diseases and patients with non-diabetic cardiovascular and cerebrovascular diseases, with high clinical application value.

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