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The Correlation of Blood Lipid Profile and its Ratio, Cystatin C and Homocysteine of Thyroid Dysfunction

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Abstract: This thesis aims to discuss the correlation of blood lipid and its ratio, Cystatin C(CysC) and Homocysteine (Hcy) of thyroid dysfunction patients, who are hyperthyroidism, subclinical hyperthyroidism, hypothyroidism and subclinical hypothyroidism. The authors choose each 60 patients of four groups of thyroid dysfunction and the control group to measure the serum TH, blood lipid, CysC and Hcy and calculate and analyze blood lipid ratio. As a result, on the one hand, TC, TG, LDL-C of hyperthyroidism and subclinical hyperthyroidism group are obviously lower than the control group, TC/HDL-C and TG/HDL-C, LDL-C/HDL-C, LCI and non-HDL-C of hyperthyroidism are significantly lower than the hyperthyroidism and the control group. LDL-C/HDL-C, and TC/HDL-C and TG/HDL-C of subclinical hyperthyroidism significantly reduce, and especially LCI is significant. The followings are LDL-C/HDL-C, nevertheless TC/HDL-C, TG/HDL-C are higher than the control group. On the other hand, TC, TG, LDL-C, TG/HDL-C, LDL-C/ HDL-C, LCI and non-HDL-C of hypothyroidism are prominently higher than the subclinical hypothyroidism and the control group. TC, TG and LDL-C, LDL-C/HDL-C and non-HDL-C of the subclinical hypothyroidism are higher than the control group. HDL-C is lower than the control group. TC has the highest relevance in various kinds of TH and the followings are respectively: non-HDL-C, LDL-C and LCI. CysC of hyperthyroidism and subclinical hyperthyroidism group obviously increases, whereas Hcy decreases. CysC of hypothyroidism and subclinical hypothyroidism group obviously decreases, whereas Hcy increases. According to the results, the authors come to the conclusion that the change of blood lipid ratio of subclinical thyroid dysfunction is more obvious than the index of single blood lipid and the CysC and Hcy also corresponding change. Dynamic monitoring TSH, blood lipid ratio, CysC and Hcy has an important value of transforming from subclinical thyroid dysfunction to clinical dysfunction and prediction of concurrent CVD. Joint detection is expected to become the ideal optimization combination of project.

Keywords: Thyroid Dysfunction, Thyroid Hormones, Blood Lipid Profile, Blood Lipid Ratio, Cystatin C, Homocysteine

1. Introduction

Thyroid disease is a general term, which is a group of diseases of thyroid in changing of function, size or structure. The change of thyroid function of the disease mainly includes hyperthyroidism (hyperthyroidism), hypothyroidism (hypothyroidism, hypothyroidism) and thyroiditis [1]. Hyperthyroidism is an endocrine disease caused by a variety of abnormal increasing of thyroid hormone thyroid hormone (TH) [2]. The mainly clinical manifestation of hyperthyroidism is highly metabolic syndrome. It not only involves the thyroid, but also spreads to the body. As known as the cardiovascular and nervous system, the incidence rate of hyperthyroidism is increasing year by year and presenting trend of younger. In 2010, thyroid disease epidemiological survey in the top ten cities finds that the prevalence of

hyperthyroidism is about 1.1% [3], mostly young women [4]. Hypothyroidism is a common endocrine system disease, which is a group of syndromes caused by synthesis of TH, decrease of secretion and lack of biological effects. Subclinical hypothyroidism (SCH) refers to the increase of serum of thyroid stimulating hormone (TSH), free thyroid hormone normal [5] and no clinical symptoms or mild symptoms, which must be based on confirmation of serological examination. The prevalence rate of SCH could reach 5% to 15% in the crowd with the gradually growth of age and women, over the age of 60, can be as high as 20% [6]. It is estimated that about 2% to 5% of SCH transforms into clinical hypothyroidism each year. The TSH of SCH patients increases, which results in the incidence of cardiovascular disease (cardiovascular disease, CVD) increased [7]. TH, one of the hormones, is essential to maintain normal metabolism of blood lipids. TH participates in the decomposition of lipids, synthesis and mobilization through many ways regulating lipid metabolism. The increasing of hyperthyroidism's TH secretion promotes intestinal absorption of fat, synthesis and accelerates its transformation and excretion, which often leads to disorder of lipid metabolism. Cystatin C (CysC) and homocysteine (Hcy) can reflect the severity of coronary artery disease to a certain extent and develop closely with the development of atherosclerosis (AS). Hypothyroidism with high Hcy predicts a higher prevalence of CVD, especially with closely related to AS [8], [9]. By detecting thyroid dysfunction and serum TH, blood lipid and Hcy levels of the control group and analyzing and calculating the lipid ratio, the authors can provide the basis for the prevention and cure of thyroid and related diseases, now report as follows.

2. Materials and Methods

2.1. General Information

Selected 240 cases thyroid dysfunction patients who came to our hospital to take health examination and endocrine treatment from April 2015 to December 2016, Including hyperthyroidism in 60 cases: 26 males and 34 females; age from 18 to 77 years, average mean (49.58±12.96) years old;60 cases of subclinical hyperthyroidism group: 21 males and 39 females; age from22 to 80 years, average mean (46.91±13.14) years; 60 cases of hypothyroidism: 21 males and 39 females, age from 20 to 73 years, average mean (49.31±15.28) years; 60 cases of subclinical hypothyroidism group: 17 males and 43 females, age from 25 to 78 years, average mean (49.16±15.36) years; 60 healthy subjects were selected as the control group: 30 males and 30 females; age from 19 to 81 years, average mean (46.38±12.94) years old. There was no significant difference in gender and age between the five groups ($\chi2$=2.892, P=0.591 VS $\chi2$=0.826, P=0.574), excluding the history of liver, kidney disease, hypertension and coronary atherosclerotic heart disease (CHD) and other causes of dyslipidemia, and nearly three months did not take the impact of thyroid function and blood lipid drugs.

2.2. Methods

2.2.1. Detection Method

All subjects were fasted for more than 12 hours, in the morning 7:30~9:30 to take venous blood 6 ml dispensing 2 copies, and centrifuged serum at 4000r/min, with the German Roche Cobas E 601 immunochemical luminescence instrument, testing serum thyroid stimulating hormone (Thyroid stimulating hormone, TSH), total amount of triiodothyronine (TT3), Thyroxine Total (TT4), free triiodothyronine (FT3), free thyroxine (FT4). Reagents are original Roche reagents. Using HITACHI-020 automatic biochemical analyzer test Three acyl glycerol (TG), total cholesterol (TC), High density lipoprotein cholesterol (HDL-C), Low density lipoprotein cholesterol

(LDL-C), TC/HDL-C,TG/HDL-C,LDL-C/HDL-C, Lipid comprehensive index (LCI=T×TG×LDL-C/HDL-C), non-HDL-C= TC-HDL-C. CysC and Hcy were measured by AXSYM automated rapid immunoassay.

2.2.2. Normal Reference Interval and Diagnostic Criteria

Due to regional differences, as well as instruments, reagents and other factors, the hospital reference value range is different. TH normal reference range is as follows: TSH 0.27~4.2 mIU/L, FT3 2.8~7.1 pmol/L, FT4 12~22 pmol/L, T3 1.3~3.10 nmol/L, T4 66~181 nmol/L; Normal lipid reference range: TG 0.56~1.71 mmol/L, TC 3.1~5.17 mmol/L, HDL-C 1.09~2.28 mmol/L, LDL-C<3.36 mmol/L, CysC 0~1.7 mg/L, Hcy 4~15.4 ìmol/L. The diagnostic criteria are as follows: Hyperthyroidism has corresponding symptoms or signs and TSH<0.27 mIU/L,FT4>22 pmol/L and/or FT3>7.1 pmol/L; Subclinical hyperthyroidism has no corresponding symptoms or signs and TSH <0.27 mIU/L, FT3 and FT4 are normal; Hypothyroidism has corresponding symptom or sign and TSH>4.20 mIU/L, FT4<12 pmol/L and/or FT3<3.10 pmol/L; Subclinical hypothyroidism has no corresponding symptoms or signs and TSH>4.20 mIU/L, FT3 and FT4 are normal.

2.3. Statistical Processing

Data processing uses SPSS 18.0 statistical software. The measurement data is expressed as mean ± standard deviation ($\bar{x} \pm s$). Comparison of single factor analysis of variance. The correlation between TH and blood lipid profile, blood lipid ratio, CysC and Hcy is analyzed by linear correlation analysis and P<0.05 is statistically significant.

3. Results

3.1. The Comparison of Thyroid Hormone Levels among Groups

The TSH of hyperthyroidism and subclinical hyperthyroidism group is significantly lower than that of control group (P<0.01), and there is significant difference between the two groups (P<0.01). The levels of FT3, FT4,

T3 and T4 in hyperthyroidism group are significantly higher than those in control group (P<0.01). FT3, T3 and T4 are also higher than those in control group (P<0.05). The TSH of hypothyroidism is significantly higher than that of subclinical hypothyroidism group and control group (P<0.01). FT3, FT4 and T4 are lower than those of subclinical hypothyroidism and control group, while FT3, FT4 and control group have not statistically significant (P>0.05). T3, T4 of hypothyroidism and subclinical hypothyroidism group are lower than the control group but there is no significant difference (P>0.05). See Table 1

Table 1. *The Comparison of Thyroid Hormone Levels among groups ($\bar{x} \pm s$).*

Groups	N	TSH (mIU/L)	FT3 (pmol/L)	FT4 (pmol/L)	T3 (pmol/L)	T4 (pmol/L)
Hyperthyroidism	60	0.125±0.0242**	19.27±11.21**	50.432±24.80**	5.261±2.269**	208.3±59.9**
Subclinical Hyperthyroidism	60	0.17±0.073**	5.541±1.124*	18.239±4.792	2.118±0.387*	119.3±32.6*
Hypothyroidism	60	32.7±12.58**	3.57±1.11*	8.175±3.210*	1.65±0.53*	96.82±25.1*
Subclinical Hypothyroidism	60	8.681±2.579*	4.62±1.09	16.62±12.16	1.71±0.59	99.34±19.12
Controls	60	2.308±1.023	4.85±0.65	18.59±7.04	1.88±0.34	105.31±19.84

Note: Compared with the normal control group,*P<0.05,** P<0.01.

3.2. The Comparison of Blood Lipid Spectrum, CysC and Hcy among Groups

TC, TG, HDL-Cand LDL-C of hyperthyroidism group are significantly lower than those in control group (P <0.01). TC, TG and LDL-C of subclinical hyperthyroidism are lower than those in control group (P<0.05) and there is no significant difference between HDL-C and control group. TC, TG and LDL-C of hypothyroidism group are significantly higher than those in the control group (P<0.05). TC, TG and LDL-C, LDL-C/HDL-C and non-HDL-C of subclinical hypothyroidism group are higher than those in the control group and HDL-C is lower than the control group. The CysC of hyperthyroidism and subclinical hyperthyroidism group is obviously higher, and the difference between the two groups has statistical significance. However, Hcy is lower than the control group(P<0.05), but there is no difference in the statistical significance between two groups. The CysC of hypothyroidism and subclinical hypothyroidism group is obviously lower, but there is no difference in the statistical significance between two groups. However, Hcy is higher than the control group *(*P<0.05), and the difference between the two groups has statistical significance. The CysC of hyperthyroidism and subclinical hyperthyroidism group obviously increase and Hcy decrease. See table 2.

Table 2. *The Comparison of blood lipid spectrum, CysC and Hcy among groups ($\bar{x} \pm s$).*

Groups	N	TC(mmol/L)	TG(mmol/L)	HDL-C(mmol/L)	LDL-C(mmol/L)	CysC(mg/L)	Hcy(μmol/L)
Hyperthyroidism	60	3.61±0.76**	1.089±0.593**	1.13±0.256**	1.892±0.589**	1.48±0.39**	12.529±8.540
Subclinical Hyperthyroidism	60	4.46±0.93*	1.491±1.140*	1.381±0.293	2.581±0.792*	1.16±0.14**	12.108±8.607
Hypothyroidism	60	5.424±1.61*	1.966±1.576*	1.159±0.418	3.903±1.135*	0.781±0.22	17.98±37.1**
Subclinical Hypothyroidism	60	5.214±1.11*	1.662±1.141*	1.149±0.337*	3.419±0.923*	0.772±0.17	15.79±6.21*
Controls	60	4.967±0.961	1.577±1.200	1.365±0.326	3.129±0.380	0.879±0.18	13.272±7.75

Note: Compared with the normal control group,*P<0.05,** P<0.01.

3.3. The Comparison of Blood Lipid Ratio and Non-HDL-C among Groups

TC/HDL-C, TG/HDL-C, LDL-C/HDL-C, LCI, and non-HDL-C of hyperthyroidism are significantly lower than subclinical hyperthyroidism and control group. LDL-C/HDL-C, LCI and non-HDL-C decrease and LCI is the most significant, followed by LDL-C/HDL-C, while TC/HDL-C and TG/HDL-C are higher than those in control group. TG/ HDL-C, LDL-C/HDL-C, LCI and non-HDL-C of hypothyroidism are higher than those of subclinical hypothyroidism and control group (P<0.05). LDL-C/HDL-C and non-HDL-C are higher than the control group (P<0.05), but there is no significant difference between TC/ HDL-C and control group (P>0.05). The results are shown in Table 3.

Table 3. *The Comparison of blood lipid ratio and non-HDL-C among groups ($\bar{x} \pm s$).*

Groups	n	TC/HDL-C	TG/HDL-C	LDL-C/HDL-C	LCI	non-HDL-C
Hyperthyroidism	60	3.57±0.774*	1.08±0.596*	1.23±0.25*	1.93±0.58*	2.32±0.789*
Subclinical Hyperthyroidism	60	4.458±0.94*	1.485±1.13*	1.39±0.28*	2.58±0.79*	3.09±0.88*
Hypothyroidism	60	3.89±1.169*	1.529±1.41*	2.90±0.93*	33.9±47.2*	4.00±1.396*
Subclinical Hypothyroidism	60	3.868±1.051	1.387±1.26*	2.63±0.87*	24.4±28.1	3.87±1.08*
Controls	60	3.816±1.023	1.320±1.314	2.412±0.824	23.43±29.41	3.600±0.935

Note: Compared with the normal control group,*P<0.05.

3.4. The Analysis of the Correlation of Thyroid Hormone and Blood Lipid Profile and Ratio, Non-HDL-C, Hcy and CysC among Groups

TSH and TC, TG, LDL-C, HDL-C, TC/HDL-C and TG/HDL-C, LDL-C/HDL-C, LCI, non-HDL-C, Hcy are positive correlation, in addition to the TG P = 0.007, the remaining P< 0.001. FT3, FT4, T3, T4 and TC, TG, HDL-C, LDL-C, TC/HDL-C, TG/HDL-C, LDL-C/HDL-C, LCI, non-HDL-C, CysC and Hcy are negative correlation, except for T3 and T4 TG/HDL-C P=0.03 and P=0.007, the remaining P<0.001. Comprehensive analysis of the results, the correlation of all kinds of thyroid hormones and blood lipid ratio and non-HDL-C, Tc is the highest respectively followed by non-HDL-C,LDL-C and LCI. See the Table 4.

Table 4. *The Analysis of Correlation of Thyroid Hormone and Blood Lipid Profile and Ratio, Hcy and CysC.*

	TSH		FT3		FT4		T3		T4	
	r	***P***	***r***	***P***	***r***	***P***	***r***	***P***	***r***	***P***
TC	0.462	<0.001	-0.539	<0.001	-0.485	<0.001	-0.499	<0.001	-0.483	<0.001
TG	0.250	=0.007	-0.238	<0.001	-0.267	<0.001	-0.205	<0.001	-0.230	<0.001
HDL-D	0.108	<0.001	-0.247	<0.001	-0.168	<0.001	-0.233	<0.001	-0.220	<0.001
LDL-D	0.422	<0.001	-0.492	<0.001	-0.453	<0.001	-0.458	<0.001	-0.450	<0.001
TC/HDL-C	0.342	<0.001	-0.290	<0.001	-0.303	<0.001	-0.280	<0.001	-0.267	<0.001
TG/HDL-C	0.176	<0.001	-0.114	<0.001	-0.163	<0.001	-0.094	=0.03	-0.117	=0.007
LDL-C/HDL-C	0.349	<0.001	-0.307	<0.001	-0.318	<0.001	-0.301	<0.001	-0.294	<0.001
LCI	0.378	<0.001	-0.375	<0.001	-0.381	<0.001	-0.347	<0.001	-0.356	<0.001
non-HDL-C	0.464	<0.001	-0.509	<0.001	-0.472	<0.001	-0.470	<0.001	-0.454	<0.001
Hcy	0.098	=0.010	-0.057	=0.053	-0.079	=0.035	-0.094	=0.024	-0.101	=0.016
CysC	-0.383	<0.001	0.426	<0.001	0.439	<0.001	0.407	<0.001	0.393	<0.001

4. Discussions

TH can accelerate the mobilization and decomposition of blood lipids and promote cholesterol degradation and discharge, leading to lower total cholesterol levels [10], but the change of blood lipid spectrum of patients with hyperthyroidism report is not the same. Selim et al [11] reported that the decrease of hyperthyroidism's TC and LDL-C and a significant negative correlation between FT3, FT4 and TC, LDL-C and HDL-C, and positive correlation of TG. Wang yan et al [12] who carried on studying of 216 patients with hyperthyroidism lipid, found that TG, TC, HDL-C, LDL-C were significantly lower than the control group and LDL-C, T3, T4, FT3, FT4, TG-Ab, TPO-Ab were higher than the control group. Chorin et al [13] reported that TC, TG, HDL-C, LDL-C of hyperthyroidism group was significantly lower than the control group. After curing, FT3, FT4 significantly decreased and TSH and TC, TG, HDL-C, LDL-C were obviously higher than prior treatment. Sun jh et al [14] found that the higher the FT3 and FT4 of hyperthyroidism patients, the significantly lower of TC, TG, LDL-C, ApoE. FT3 had negative correlation with TC, HDL-C, LDL-C and FT4 had negative correlation with TC, TG, HDL-C, LDL-C, ApoA1. FT4 had the highest correlation with TC(r=0.498, P=0.498). Gu Qing et al [15] reported that TC, TG, HDL-C, LDL-C, ApoB, LP (a) of hyperthyroidism group were lower than the control group and TG, TC, LDL-C, ApoB subclinical hyperthyroidism group decreased. The results of this study showed that TC, TG, HDL-C and LDL-C of hyperthyroid group were significantly lower than those in control group (P<0.01). TC, TG and LDL-C of subclinical hyperthyroidism were lower than those in control group (P<0.05) and HDL-C was slightly higher than the control group, which were basically the same as the above results. The reduction of TC, TG and LDL-C in patients of hyperthyroidism may be related to the following factors: (1) TH accelerates LDL-C conversion, increases the number and activity of LDL receptors in the liver, and promotes LDL-C clearance and decrease of LDL-C; (2) TH promotes peripheral tissue to the use of cholesterol, accelerates liver bile acid synthesis and the excretion of bile, and decrease of blood TC; (3) TH enhances lipoprotein lipase activity, accelerates the use of TC in peripheral tissues, and increases of the clearance rate of TG, the clearance of TC and the serum TC [16]; (4) TH promotes the reverse transport of cholesterol, accelerates the conversion of cholesterol ester from HDL to LDL, directly or indirectly reduces TC,TG, HDL-C,LDL-C levels. But there are also reports that TG, LDL-C of hyperthyroidism's patients are higher [17]. Therefore, the changes of blood lipid spectrum of hyperthyroidism's patients and its mechanism require a further study.

For the first time since 1930, Mason et al [18] in the NEJM reported "Blood Cholesterol Values in Hyperthyroidism and Hypothyroidism Their Significance". the research of relationship between hypothyroidism and lipid metabolism has received more attention. Garduno et al [19] found that normal higher TSH and lower TH were associated with blood lipids and were positively correlated with TC, LDL-C and TG, and negatively correlated with HDL-C [20]. Li fang [21] found that TG, TC, and LDL-C of hypothyroidism patients was significantly higher than the control group and the SCH was given priority to the increase of LDL-C and TC. Song Qingzhang et al [22] reported that TG, TC, LDL-C of hypothyroidism's patients significantly increased, while HDL-C significantly decreased. Toruner and other found [23], SCH patients regardless of TSH≥l0mIU/mL, or<10mIU/mL, TC, TG and LDL-C significantly increased. López Rubio et al [24] analyzed the correlation of TH and

lipid correlation through 326 cases of SCH patients, found that SCH was associated with the high of TG. Van Tienhoven-wind et al [25], [26] reported that TC, TG and LDL-C of SCH patients significantly increased. Laway [27] found that TC, TG of SCH patients significantly increased. In this study, the levels of TC, TG, LDL-C of hypothyroidism's patients were significantly higher than those in SCH group and control group (P<0.05), while HDL-C decreased. The changes of TC, TG, HDL-C and LDL-C of SCH group were similar with hypothyroidism group, but there was no statistically significant difference (P>0.05) and there was no significant difference between TC, TG, LDL-C, HDL-C and normal thyroid function in SCH patients [28]. As a result, the relationship between the SCH patients and dyslipidemia needed for further research.

Blood lipid measurement is a clinical evaluation of the risk of CHD and prognosis of the commonly used indicators, but not all CHD patients have significant changes in the indicators. TC/HDL-C,LDL-C/HDL-C are more valuable than CHD for the diagnosis of CHD [29]. TC/HDL-C and LDL-C/HDL-C can accurately reflect the comprehensive level of lipid metabolism and the risk of CHD in vivo. LDL-C/HDL-C predicts carotid atherosclerotic plaque ratio TC/HDL-C is more valuable [30]. Xie Yingjun [31] reported that LCI in the CHD group were significantly higher than those in the control group and the LCI in the unstable angina pectoris (UAP) and acute myocardial infarction (AMI) group was higher than that in the stable angina pectoris group (SAP), while the LCI of UAP and AMI group had no statistical difference. He recognized that the LCI was a good indicator of the risk of CHD. Non-HDL-C represented the total amount of atherosclerotic cholesterol that could accurately reflect the cholesterol levels of atherosclerotic lipoprotein particles, and the predictive and prognostic evaluation of CHD was superior to LDL-C [32]. Chen XJ etc [33] found that non-HDL-C can be used as a supplement to LDL-C, which was to assess the severity of coronary artery disease, recurrent cardiovascular risk and cardiovascular residual risk of new indicators. The results showed that TC/HDL-C, TG/HDL-C, LDL-C/HDL-C, LCI, and non-HDL-C of hyperthyroidism group were significantly lower than those in the control group (P<0.001). The TC/HDL-C and TG/HDL-C of subclinical hyperthyroidism group were higher than that of control group, while LDL-C/HDL-C, LCI and non-HDL-C significantly decreased. The decrease of LCI was the most obvious, followed by LDL-C/HDL-C. TG/HDL-C, LDL-C/HDL-C, LCI and non-HDL-C were significantly higher in SCH group than in SCH group and control group (P<0.05), HDL-C was higher than that of the control group, but there was no significant difference between TC/HDL-C and control group (P>0.05). The correlation between TH and lipid ratio was the highest with TC, followed by non-HDL-C, LDL-D and LCI, respectively. Suggesting that changes in blood lipid ratio in the abnormal thyroid function than the single indicator was more obvious. TG/HDL-C, LCI and non-HDL-C were calculated to be convenient and not affected by diet and sex, which was to open up new ideas for predicting the occurrence of thyroid dysfunction.

Ye et al [34] suggested that changes of TH can cause a change in CysC. Xu Yanqing [35] reported that CysC of hyperthyroidism patients is higher than the control group. Through analyzing 520 patients with serum CysC and thyroid function of the Meta-analysis, Yu Weiguo [36] found that patients with hyperthyroidism CysC significantly increased and hypothyroidism significantly decreased. The results of this study showed that CysC in hyperthyroidism and subclinical hyperthyroidism were significantly higher than that in control group and there was significant difference between the two groups (P<0.05). Hypothyroidism in patients with CysC significantly decreased, which consistent with the results of the above studies confirming that CysC and thyroid function closely related. However, the mechanism of elevated CysC in patients with hyperthyroidism is unclear. The studies in vitro have shown that TH can stimulate Cys C secretion [37]. Recent studies have shown that TH may have an effect on CysC [38]. Hyperthyroidism patients with strong metabolism, cell regeneration rate/metabolic rate to accelerate the formation of nuclear cells and secretion of CysC faster, may be the direct cause of CysC increased [39]. However, the degree of influence of CysC and TH on all nucleated cells in patients with hyperthyroidism is required to be further studied. The majority of scholars believe that CysC is positively correlated with the severity of coronary artery disease [40]. Jiang Xiaojing et al [41] found that the higher the serum CysC, the higher the risk of plaque instability of coronary atherosclerosis degree of multiple vascular disease. Guan Shikui et al [42] 977 patients with CysC and CHD relationship between the meta-analysis found that CHD patients with CysC was significantly higher than the control group and high levels of CysC and CHD closely related. Dynamic monitoring of CysC may provide an important basis for the transformation from subclinical hyperthyroidism to hyperthyroidism and the prediction of hyperthyroidism complicated with CHD.

Data shows that, each increasing of Hcy 4μmol/L can increase the risk of CHD 4% and increasing of Hcy 5 μmol/L and TC 0.5mmol/L can increase the incidence of CHD equally [43]. Song Qingzhang et al [22] found that Hcy of hypothyroidism patients was significantly negatively correlated with FT3, FT4, was significantly positively correlated with TC, and was not correlation with TC, HDL-C, LDL-C. He also recognized that the increasing of serum Hcy was important risk factors of hypothyroidism concurrent CHD. Jihong et al [14] found that FT3 of hypothyroidism negatively related to TC, LDL-C and FT4 negatively related to TC, HDL-C, LDL-C. Yu et al [44] reported that TG, TC, LDL-C and Hcy of hypothyroidism and SCH significantly increased and positively correlated with TSH and decreased HDL-C. Zhou et al [9] found that Hcy positively correlated with TSH during SCH transmission to Hypothyroidism. Hcy of patients of hypothyroidism elevated indicating a higher incidence of CVD, so combing detection of TSH with Hcy is of great value on the diagnosis and treatment of hypothyroidism. Xiong lu [45] found that slightly increasing

of TSH<10mIU/L had little effect on TG, LDL-C, but can increase the Hcy and TSH≥10 mIU/L. It also could make TG, LDL-C, Hcy significantly increased. A meta-analysis showed that Hcy was associated with a severity of hypothyroidism and the treatment with L-T4 can reduce Hcy [46]. This study found that Hcy of hypothyroidism and TSH patients was significantly higher than the control group and the difference between the two groups was statistically significant, which consistent with the above findings. And TSH positively correlated with TC, TG, LDL-C, TC/HDL-C, TG/HDL-C, LDL-C/HDL-C, LCI, non-HDL-C and Hcy.

5. Conclusion

All in all, the change of thyroid dysfunction in patients with TH has obvious influence on blood lipid, CysC and Hcy. The changes in blood lipid ratio are more pronounced than those of single index. After treatment, with thyroid function improving, blood lipid profile, blood lipid ratio and Hcy can return to normal. Changes in blood lipid ratio and increasing of CysC and Hcy are risk factors for CHD. Therefore, the dynamic monitoring of thyroid dysfunction in patients with lipid ratio and CysC, Hcy contributes to transmission subclinical thyroid dysfunction to thyroid dysfunction and prediction of thyroid dysfunction recurrent CHD. Joint detection may open up new ways for the prevention and treatment of thyroid dysfunction combined with CVD.

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Biography

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