Int J Clin Exp Pathol 2015;8(11):15280-15284
www.ijcep.com /ISSN:1936-2625/IJCEP0016864

Original Article

Characterization of the abnormal lipid profile in Chinese patients with psoriasis

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Received September 25, 2015; Accepted October 27, 2015; Epub November 1, 2015; Published November 15, 2015

Abstract: Psoriasis is a chronic inflammatory skin disease that has been associated with abnormal lipid metabolism. To characterize the lipid profile in Chinese, 86 patients with psoriasis and 84 healthy control subjects were assessed. Compared with healthy controls, the fasting serum values of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C) and apolipoprotein A-I (ApoA-I) were lower in the patient group. Compared with vulgaris psoriasis, special types of psoriasis had even lower levels of HDL-C and ApoA-I. Considering the severity of psoriasis, the level of ApoA-I and HDL-C were also the only two serum lipid parameters decreased in the mild group compared to those in controls. In the moderate and the severe group, the values of TC, LDL-C, HDL-C and ApoA-I were all decreased compared to healthy control group. Further analysis indicated that the values of HDL-C and ApoA-I were significantly lower in the severe group compared to the moderate group. Correlation analysis indicated that the levels of HDL-C but not ApoA-I was negatively associated with the severity of the disease. Interestingly, when psoriasis was improved by treatment, the serum levels of TG, TC, HDL-C and ApoA-I were increased from the pre-treatment values. We conclude that abnormalities in serum lipid metabolism may play an important role in the pathogenesis of Chinese patients with psoriasis.

Keywords: Chronic inflammatory skin disease, psoriasis, lipid metabolism, lipid profile

Introduction

Psoriasis is a common chronic skin disease with unknown cause. Both genetic polymorphisms and environmental factors are contributing to the development of the disease. The risk to develop occlusive vascular diseases such as atherosclerosis is increased in patients with psoriasis, and the abnormal lipid metabolism is proposed as one of the reasons [1, 2]. However, it is still controversial whether the changes in lipid metabolism are primary events or secondary to psoriasis or perhaps due to medications such as retinoids, cyclosporine, systemic glucocorticoids [3-5].

In this present study, we determined the serum lipid profile in 86 Chinese patients with psoriasis who had not received any treatments that could elevate serum lipids (such as beta blockers, retinoids, methotrexate, cyclosporine, systemic glucocorticoids, et al) for at least 6 months. We found that abnormal lipid metabolism in serum may play a critical role in the development of psoriasis in Chinese patients.

Subjects and methods

Subjects

All the patients and controls were from Air Force General Hospital (PLA), Beijing, China. This study was approved by the Institutional Review Board of Ethics Committee of Air Force General Hospital, PLA. All patients gave oral consent before the clinical study and the study was performed in accordance with the Helsinki II declaration. The women subjects with pregnancy and breastfeeding were excluded. Eighty-six patients with psoriasis who had not received any treatments that could elevate serum lipids such as beta blockers, retinoids, methotrexate, cyclosporine, systemic glucocorticoids for at least 6 months before hospitalization were

Table 1. Baseline characteristics of patients in psoriasis and control groups

Characteristic	Psoriasis group n=86	Control group n=84	*P*
Gender			0.1549
Male	64 (74.42)	70 (83.33)	
Female	22 (25.58)	14 (16.67)	
Age (year)	38.53±15.65	41.33±14.79	0.242
Min	13	10	
Max	85	90	
BMI (kg/m^2)	24.82±3.54	23.87±2.5	0.186
Min	16.23	18.73	
Max	18.20	30.00	
Onset age (year)	26.85±12.21	-	
Min	7		
Max	68		
Skin lesion history (year)	11.69±11.45	-	-
Min	0.08		
Max	50		
Psoriasis type		-	-
Vulgaris	62 (72.1)		
Erythrodermic	14 (16.3)		
Pustular	3 (3.5)		
Arthritis	1 (1.3)		
Combined	6 (7.0)		
Special psoriasis type history (year)	0.96±1.43	-	-
Min	0.01		
Max	12		
Family history		-	-
No	71 (82.6)		
Yes	15 (17.4)		

Table 2. Comparison on lipid parameters of patients in psoriasis group and control group

Parameters	Psoriasis group (n=86)	Control group (n=84)	*P*
TG (mmol/l)	1.34±0.68	1.14±0.37	0.085
TC (mmol/l)	4.2±0.93	4.57±0.53	0.001
LDL-C (mmol/l)	2.69±0.75	2.98±0.52	0.002
HDL-C (mmol/l)	1.12±0.24	1.32±0.24	<0.001
ApoA-I (g/l)	1.06±0.19	1.29±0.16	<0.001
$ApoB_{100}$ (g/l)	0.81±0.25	0.81±0.13	0.846

included in the study. The diagnosis of psoriasis was clinically and/or histologically confirmed. After hospitalization, based on the patients' conditions, 23 inpatients received medications that could elevate serum lipids, and the remaining 63 patients received only therapeutic agents that could not elevate serum lipids such as rehmannia root, kakuda figwort root, dan-shen root, angelica, asparagus cochinchinensis, creeping liriope, white herba hedyotis diffusae, liquorice root, antihistamines, folic acid and vitamin E. The severity and extensiveness of the disease was assessed by Psoriasis Area and Severity Index (PASI) score. PASI <12 was defined as mild; PASI ≥12 and <30 was considered as moderate; PASI ≥30 was defined as severe.

Eighty-four healthy subjects without systemic diseases (including coronary heart disease, diabetes mellitus, hypertension, hyperlipidemia, hyperuricemia, nephrotic syndrome, chronic renal insufficiency, obstructive liver disease, connective tissue disease and endocrine diseases) were considered as healthy control group. The values of their health examinations (fasting serum glucose, lipids, liver and renal functions) were all normal.

Methods

Venous blood was obtained from all subjects before and 2-4 weeks after treatment. On each occasion, samples were taken after 12 hours of fasting. Serum TG, TC, HDL-C, LDL-C, ApoA-I, $ApoB_{100}$ were determined by Hitachi 7600 automatic biochemistry analyzer (Hitachi Co. Ibaraki, Japan). The levels of TG and TC were determined by a glycerol-3-phosphatase oxidase-peraminophenazone assay, HDL-C and LDL-C were determined by a hydrogen peroxidase clearing method. ApoA-I and $ApoB_{100}$ were determined with immuno-nephelometry. The inter-assay and intra-assay coefficients of variance (CVs) were less than 8% and 5% respectively.

Table 3. Comparison on lipid parameters of patients grouped by psoriasis type

Parameters	Control group n=84	Psoriasis group, n=86				$P^{\#}$
		Vulgaris n=62	P^{*}	Specia n=24	P^{*}	
TG (mmol/l)	1.14±0.37	1.35±0.69	0.145	1.31±0.66	0.171	0.684
TC (mmol/l)	4.57±0.53	4.24±0.95	0.008	4.12±0.89	0.002	0.368
LDL-C (mmol/l)	2.98±0.52	2.68±0.75	0.005	2.72±0.77	<0.001	0.699
HDL-C (mmol/l)	1.32±0.24	1.15±0.24	<0.001	1.02±0.21	<0.001	0.047
ApoA-I (g/l)	1.29±0.16	1.09±0.18	<0.001	0.97±0.17	<0.001	0.009
$ApoB_{100}$ (g/l)	0.81±0.13	0.79±0.26	0.567	0.86±0.2	0.171	0.519

Notation: *Compared with control group, #comparison between psoriasis vulgaris and special type.

Table 4. Comparison on lipid parameters of patients grouped by PASI score grade

Parameters	Control group n=84	Psoriasis group, n=86						$P^{\#}$
		Mild n=11	P^{*}	Moderate n=54	P^{*}	Severe n=21	P^{*}	
TG (mmol/l)	1.14±0.37	1.18±0.61	0.904	1.40±0.70	0.052	1.24±0.67	0.602	0.393
TC (mmol/l)	4.57±0.53	4.21±0.92	0.065	4.31±0.96	0.034	3.92±0.84	<0.001	0.092
LDL-C (mmol/l)	2.98±0.52	2.65±0.92	0.088	2.75±0.73	0.021	2.56±0.72	0.002	0.218
HDL-C (mmol/l)	1.32±0.24	1.15±0.21	0.040	1.16±0.24	0.001	0.99±0.22[a]	<0.001	0.031
ApoA-I (g/l)	1.29±0.16	1.06±0.21	<0.001	1.10±0.16	<0.001	0.97±0.22[a]	<0.001	0.037
$ApoB_{100}$ (g/l)	0.81±0.13	0.73±0.25	0.131	0.81±0.28	0.821	0.85±0.19	0.331	0.681

Notation: *Compared with control group, #comparison among psoriasis patients with mild, moderate and severe PASI score; a, compared with moderate group $P<0.05$. Mild, PASI <12; Moderate, PASI ≥12 and <30; Severe, PASI ≥30.

Statistical analysis

Data of categorical variables were expressed as frequency (percentage); data of continuous variables were expressed as means ± SD. SAS 9.2 was used for statistical analysis. Analysis of covariance models with age and BMI as covariate were used for comparison on lipid parameters of patients in each group. Paired t-test was used for comparison on PASI score and lipid parameters of psoriatic patients between pre- and post-treatment. The comparison among groups in **Tables 2**-**4** were adjusted with age, sex and BMI. P<0.05 was considered as statistical significant.

Results

Serum lipid profile in patients with psoriasis

The baseline characteristics of patients and healthy controls are listed in **Table 1**. There were no significant difference of gender, age and body mass index (BMI) between the patient group and control group. The fasting serum values of TC, HDL-C, LDL-C and ApoA-I of patient group were all significantly lower than those in healthy controls (**Table 2**). The levels of fasting serum triglyceride (TG) and $ApoB_{100}$ did not show any significant difference between the patient group and healthy controls. When the patients were further divided into two pathological groups: vulgaris psoriasis group and special types of psoriasis group, decreased levels of TC, HDL-C, LDL-C and ApoA-I were still observed in both groups, compared to the healthy control group (**Table 3**). However, special types of psoriasis had even lower levels of HDL-C and ApoA-I compared with vulgaris psoriasis.

Relation between serum lipid profiles and severity of psoriatic condition

To further investigate the relationship between lipid profiles and the severity of psoriasis, 86 patients with psoriasis were divided into three groups based on the score of PASI: mild (PASI <12, n=11), moderate (PASI ≥12, and <30, n=54) and severe (PASI ≥30, n=21) group. In mild group, the levels of ApoA-I and HDL-C were decreased compared to healthy control group (**Table 4**). In the moderate and the severe

Table 5. Correlation of PASI score with lipid parameters of psoriatic patients

Parameters	PASI	
	r	*P*
TG	0.002	0.998
TC	-0.109	0.318
LDL-C	-0.075	0.509
HDL-C	-0.229	0.041
ApoA-I	-0.217	0.065
$ApoB_{100}$	0.180	0.127

Spearman's correlation coefficient.

group, the values of TC, LDL-C, HDL-C and ApoA-I were all decreased compared to healthy control group. The levels of TG and $ApoB_{100}$ were not changed with disease status or compared to healthy control group. When comparing among different groups of psoriasis patients, the levels of HDL-C and ApoA-I were significant different. Specifically, the values of HDL-C and ApoA-I were significantly lower in the severe group compared to the moderate group. Further analysis indicated that the levels of HDL-C but not ApoA-I was negatively correlated with the severity of the disease (**Table 5**).

Changes of serum lipid profiles after relief of psoriatic condition

After hospitalization, 23 inpatients received medications that could elevate serum lipids, and the remaining 63 inpatients received only medications that could not elevate serum lipids for treatment of psoriasis. After 2-4 weeks of treatment, the mean PASI score improved from 22.59±12.36 before treatment to 5.98±5.53 ($P<0.001$) (**Table 6**). The serum levels of TG, TC, HDL-C and ApoA-I were increased from the pretreatment values. There were no significant changes in the values of LDL-C and $ApoB_{100}$ by treatment.

Discussion

The association between dyslipidemia and psoriasis is controversial. Previous studies have reported that serum TG levels maybe normal [6] or increased [7], and the levels of serum TC maybe increased [8], normal [9], or decreased [10] in the patients with psoriasis. The data on serum concentrations of HDL-C, LDL-C, ApoA-I, ApoB and ApoC are also various [5, 7, 8, 11]. These different results may be ascribed to the different race, life styles, food habits, the medications and the severity of psoriasis. In our present study, all patients and healthy controls are Chinese Han people, their main diets are cereals. In order to rule out the effects of medication, we excluded patients received drugs that could elevate serum lipids for within 6 months. We did not exclude patients complicated with diabetes mellitus, coronary heart disease, hypertension, nephropathy, obstructive liver disease, and connective tissue disease. Because these diseases maybe either the cause or effect of the dyslipidemia, they may just be the subsistent clinical characteristics in the psoriatic patients with dyslipidemia.

The reasons for the changes in lipid metabolism in psoriasis patients have not been satisfactorily explained in the literature. In our study, the serum TG level was tended to be higher in patients with psoriasis than in healthy control subjects. After receiving medications that could not elevate serum lipids, in spite of a significant improvement of the psoriasis condition, the serum TG levels were significantly increased. Whether the serum TG can be regarded as a protection factor in psoriasis or not? The role of serum TG in the development of psoriasis needs to be further investigated.

The significant decrease in HDL-C and ApoA-I observed in this study is in agreement with previous studies [1, 12]. The levels of HDL-C but not ApoA-I was reversely correlated with the severity of the disease, In mild group of psoriasis patient, the levels of HDL-C and ApoA-I were already decreased, while the values of the other serum lipid parameters did not change. Then after improvement of the disease, the serum TG, TC, HDL-C and ApoA-I concentration was increased from that at baseline. There is a possibility that genetic alterations in the HDL-C and/or ApoA-I genes may be linked with psoriasis. In transgenic mice, when TG metabolism is altered by immunologic blockage of lipoprotein lipase activity, the genetic deficiency of enzyme, or overexpression of ApoC-III, TG level increases and HDL-C level consistently decreases [5]. Conversely, when HDL-C level is primarily depressed in ApoA-I deficiency or increased by overexpression of ApoA-I, TG level does not necessarily show a reciprocal change [5].

High TG, low HDL-C and ApoA-I are reported to be the features of abnormal lipid metabolism in atherosclerosis and they are also the major changes of the lipid metabolism in psoriasis in

Table 6. Change of PASI score and lipid parameters of psoriatic patient's pre- and post-treatment

Parameters	Psoriatic patients, n=63			*P*
	Pre-treatment	Post-treatment	Change	
PASI score	22.59±12.36	5.98±5.53	-16.61	<0.001
TG (mmol/l)	1.25±0.68	1.79±1.49	0.54	<0.001
TC (mmol/l)	4.12±0.91	4.35±0.86	0.23	0.029
LDL-C (mmol/l)	2.67±0.75	2.68±0.72	0.01	0.078
HDL-C (mmol/l)	1.13±0.23	1.19±0.26	0.06	0.028
ApoA-I (g/l)	1.05±0.17	1.14±0.21	0.09	0.001
$ApoB_{100}$ (g/l)	0.80±0.26	0.79±0.21	-0.01	0.911

our study. Further studies to investigate whether these changes contribute to the fact that psoriasis patients have higher risk of atherosclerosis are warranted. In our study, the serum TC and LDL-C levels were also gradually decreased with the exacerbation of psoriatic condition, while in atherosclerosis serum TC and LDL-C are the major risk factors. Thus, whether the serum TC and LDL-C are also risk factors or are playing other roles in psoriasis is to be determined.

In conclusion, the present study supports the notion that lipid abnormalities may play an important role in the development of psoriasis including Chinese patients.

Acknowledgements

This research did not receive any specific grant from any funding agency in the public, commercial or not-for-profit sector.

Disclosure of conflict of interest

None.

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