



Original Article

Correlated analysis and pathological study on insulin resistance and cardiovascular endocrine hormone in elderly hypertension patients

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ABSTRACT

Aims: The correlated analysis and pathological study on insulin resistance and cardiovascular endocrine hormone in elderly hypertension patients was investigated by clinical observation and physical experiments in my hospital.

Materials and methods: Randomly enrolled 300 subjects seen at hospital from January 2011 to January 2013, which included 150 hypertension patients and 150 non-hypertension of healthy people, while 150 cases of hypertension patients as the experimental group, 150 cases of healthy people without hypertension acts as the control group. The t-PA of serum (plasma), activity of PAI, ANP, IS, ET were determined in this 300 subjects, and it studied on the correlation and pathological effect between insulin resistance and cardiovascular endocrine hormone in elderly hypertension patients.

Results: The levels of PAI, ANP, ET are apparently higher in hypertension patients than in healthy control group ($p < 0.05$), while the t-PA, IS are obviously lower in hypertensive patients than in healthy control group ($p > 0.05$).

Conclusion: This study has shown that there is a significant correlation and pathological effect between insulin resistance and cardiovascular endocrine hormone in hypertensive patients, and which plays an important role in genesis and development of hypertension in elderly people.

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1. Introduction

Under the gradual development of social economy, people's living conditions have a great improvement. Recent years, the number of hypertensive patients is increasing. Of which is the main patients group of middle-aged and elderly people, and also it is a kind of common disease [1–5].

Domestic and foreign research showed that insulin resistance (IR) [3–8], tissue Plasminogen Activator (t-PA), Plasminogen Activator Inhibitor activity (PAI) was closely related to hypertension, coronary heart disease. However, the research of relationship between IR and Atrial Natriuretic Peptide (ANP), Endothelin (ET), Angiotensin I (AI) was rarely reported in the pathogenesis of hypertension disease.

It is a critical study of how to effective treat and explore the pathogenesis of elderly hypertension disease. Therefore, it is further to understand the etiology and pathogenesis, in order to

find better treatments. Therefore, the aim of this paper is that we selected from January 2011 to January 2011 in our hospital for treatment of 150 cases of hypertension patients and 150 patients without hypertension health people, and it analyzed the inspection data of these two groups.

2. Materials and methods

2.1. Clinical data

Three hundred subjects were selected from January 2011 to January 2011 in our hospital for treatment, including 150 cases of hypertension patients and 150 patients without hypertension health people, and analyze the inspection data of these two groups, the former acts as experimental group, the latter acts as control group.

Among the 150 cases of hypertension patients, the male is 90, female is 60, the age is from 55 to 80, average is 65 ± 7 , body mass index (BMI) is 22.19 ± 3.8 , blood pressure (SBP/DBP) is $156 \pm 19/94 \pm 11$ mmHg. The 150 patients without hypertension control group, the male is 95, female is 55, and the age is from 53 to 82, average is 66 ± 5 , body mass index (BMI) [7,9] is 21.47 ± 2.9 , blood

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Table 1Comparison of cardiovascular endocrine hormone between experimental and control group ($\bar{y} \pm s$, $n = 300$).

Groups	n	BMI	G (mmol/L)	t-PA (IU/ml)	PAI (IU/L)	ANP (pg/ml)	IS (mU/L)	ISI	ET (pg/ml)	AI (ng/ml/h)
Experimental group	150	22.19 \pm 3.80	6.12 \pm 1.30 [*]	1.68 \pm 0.32 [*]	11.81 \pm 2.3 [*]	62.37 \pm 35.4 ^{**}	14.72 \pm 7.37 [*]	-6.61 \pm 0.07 [*]	79.36 \pm 20.6 [*]	0.72 \pm 0.31
Control group	150	21.47 \pm 2.90	4.33 \pm 1.70	2.04 \pm 0.33	9.91 \pm 2.5	39.17 \pm 15.2	12.31 \pm 2.90	-7.01 \pm 0.08	52.31 \pm 22.9	0.76 \pm 0.35

^{*} $p < 0.05$.^{**} $p < 0.01$.

BMI, body mass index; G, glycemic index; t-PA, tissue plasminogen activator; PAI, plasminogen activator inhibitor activity; ANP, atrial natriuretic peptide; IS, insulin; ISI, insulin sensitivity index; ET, endothelin; AI, angiotensin I.

pressure (SBP/DBP) is 156 \pm 21/92 \pm 11 mmHg (shown in Table 1). All the cardiac function is normal, and the two groups are comparable.

2.2. Method

Elderly hypertension group had the medical history, physical examination and laboratory tests, with the exception of diabetes and endocrine diseases, liver, kidney, recent not taking drugs which affect blood pressure, blood glucose, blood lipids and platelet function. Healthy comparison group is also checked by the medical history, physical examination [10–13], electrocardiogram, chest X line, blood biochemical examination [14], and no organic disease. Specimen collection: empty stomach venous blood extraction and determination of plasma (serum) t-PA, PAI, glycemic index (G), insulin (IS), insulin sensitivity index (ISI) and the level of ANP, AI.

2.3. Statistical analysis

Statistical Package for Social Sciences (SPSS 18.0 Package Facility, SPSS Inc., IL, USA) was used for data support and analysis, *t*-tests [3–15], analysis of variance (ANOVA), and chi-square analyses were used to assess potential differences in demographic and clinical variables between groups. Data is showed mean \pm standard ($\bar{y} \pm s$). The *t*-tests is used to comparison of data difference, $p < 0.05$ is significant.

3. Results

3.1. Cardiovascular endocrine hormone

Comparison results of cardiovascular endocrine hormone between experimental and control group are shown in Table 1. The element of BMI in experimental group is 22.19 \pm 3.80 while the control group is 21.47 \pm 2.90, and the glycemic index is 6.12 \pm 1.30 mmol/L obviously higher than control group (4.33 \pm 1.70 mmol/L). As the test result of t-PA is 1.68 \pm 0.32 IU/ml in experimental group, while the control group is 2.04 \pm 0.33 IU/ml obviously higher than experimental group ($p < 0.05$ is significant). And the level of PAI in experimental group (11.81 \pm 2.3 IU/L) is significantly higher than control group (9.91 \pm 2.5 IU/L), the index of ANP level is 62.37 \pm 35.4 pg/ml in experimental group obviously higher than control group (39.17 \pm 15.2 pg/ml), $p < 0.01$ is significant in statistical analysis [11,13]. With the level of IS in experimental group is 14.72 \pm 7.37 mU/L, the control group is 12.31 \pm 2.90 mU/L.

The ET level is 79.36 \pm 20.6 pg/ml in experimental group, and control group is 52.31 \pm 22.9 pg/ml, and angiotensin I (AI) is 0.72 \pm 0.31 ng/ml/h in experimental group, while the control group is 0.76 \pm 0.35 ng/ml/h. Among these influence index of t-PA, PAI, glycemic index (G), insulin (IS), insulin sensitivity index (ISI) and the level of ANP, AI, it is helpful to find the key factor [15] which affect insulin resistance and cardiovascular endocrine hormone in elderly hypertension patients. And the detailed blood lipid level is shown in Table 2.

3.2. Blood lipid level

A recent published study [12–16] provided evidence suggesting that C-reactive protein better predicts cardiovascular events than LDL-C alone, whereas using both LDL-C and C-reactive protein values allows an even more accurate measure of cardiovascular risk. Although endothelial cell dysfunction occurs with individual components of the insulin resistance syndrome (i.e., hypertension, low levels of HDL-C, etc.), it also occurs with only modest alterations in these risk factors in the presence of insulin resistance.

Data in comparison of blood lipid between experimental group and control group is shown in Table 2. The results show that TG, TC, LDL-C in experimental group is obviously higher than control group, the $p < 0.05$ is significant difference. The detailed result of TG in experimental group is 2.28 \pm 0.27 mmol/L, while the level of TG is 1.63 \pm 0.31 mmol/L in control group. And the total cholesterol (TC) is 4.85 \pm 0.81 mmol/L in experimental group, the level of TC is 4.13 \pm 0.56 mmol/L in control group. However, the level of HDL-C in experimental group is similar with control group, it is not significant difference.

The level of insulin in hypertension patients are significantly higher than healthy people, its lipid metabolism is not normal accompanied with hyperinsulinemia. This may be related to the body and which is not sensitive to insulin, leading to resistance to lipolysis function abate [17], glucose utilization obstacle, the decomposition of lipid increasing. Therefore, the free fatty acid increased and lipid metabolism disorders can also promote the hypertension formation.

3.3. C-peptide and insulin releasing

The level of C peptide is a good indicator to reflect the insulin B cell in hypertension patients. However, the detailed result of comparison of C peptide and insulin releasing is shown in Table 3.

Table 2Comparison of blood lipid between experimental group and control group ($\bar{y} \pm s$, $n = 300$).

Groups	n	TG (mmol/L)	TC (mmol/L)	LDL-C (mmol/L)	HDL-C (mmol/L)
Experimental group	150	2.28 \pm 0.27 [*]	4.85 \pm 0.81 [*]	2.37 \pm 0.73 [*]	1.33 \pm 0.28
Control group	150	1.63 \pm 0.31	4.13 \pm 0.56	1.86 \pm 0.81	1.24 \pm 0.31

^{*} $p < 0.05$.

TG, triglycerides; TC, total cholesterol; LDL-C, low density lipoprotein cholesterol; HDL-C, high density lipoprotein cholesterol.

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