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# Olmesartan for the treatment of primary hypertension patients and its influence on inflammatory factors

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***Abstract*: This paper aims to study the expression of inflammatory cytokines in plasma of patients with essential hypertension and antihypertensive effect of olmesartan patients with essential hypertension and the effect on plasma inflammatory factors. Will be in accordance with the guidelines of hypertension prevention and control standard collection of 100 cases of primary hypertension patients,randomly and evenly divided for 2 groups into the experimental group and the control group, and given a dose of olmesartan and valsartan treatment for 10 weeks. Before and after treatment were measured with sitting or lying right brachial artery blood pressure and fasting 12 hours of venous blood, were observed and compared before and after treatment patients with blood pressure and serum inflammatory factors changes. Treated with oral medication after 10 weeks experimental group and control group, the blood pressure decreased significantly, the difference was statistically significant (P <0.01) compared with that before treatment,and the blood pressure of the olmesartan group decrease slightly greater than in the valsartan group, but the difference between the two groups was no significant (P> 0.05); compared with before treatment, hs-CRP, TNF-α levels were significantly decreased, NO levels were increased, compared to before treatment the two groups were statistically significant (P <0.01), And olmesartan plasma levels of inflammatory factors decline slightly larger than valsartan group, hs-CRP changes between the two groups showed no significant difference (P> 0.05), while TNF-α and NO levels between the two groups the difference was statistically significant (P <0.01). Olmesartan smoothly and effectively lower blood pressure, and can be more effective in reducing the degree of abnormality of plasma levels of inflammatory factors expression.**

***Keywords:*** Hypertension; Olmesartan; Hs-CRP; TNF-α ; NO

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## 1. Introduction

Vascular disease is more common worldwide, one of the higher mortality rate of the disease, epidemiological studies have been confirmed to have a very close relationship between hypertension and vascular disease, awareness of hypertension patients, hypertension treatment and control rate of the disease is low, there are many issues, such as lack of understanding of the large number of patients with hypertension or misunderstanding of its existence, the lack of systematic disease health education and so on, at present clear pathogenesis of hypertension improve hypertension treatment and control rate is our common goal. Large number of clinical studies has shown that there is a certain degree of correlation between the abnormal expression of essential hypertension and inflammatory factors. Plasma levels of inflammatory cytokine of the present study was to investigate plasma of patients with essential hypertension abnormal expression of inflammatory cytokines, the antihypertensive effect of olmesartan for patients with essential hypertension and in blood pressure at the same time, can improve exception .

## 2. Materials and Methods

### *2.1. General Information*

Cardiology in our hospital inpatient or outpatient treatment in between October 2014 to September 2015 in patients with essential hypertension (according to the 2010 Chinese Hypertension Prevention Guide diagnostic criteria included) 100 cases, including the initial treatment of patients with hypertension and antihypertensive treatment ongoing system, and patients with poor blood pressure control, all patients with physical examination and laboratory tests to exclude: 1) suffering from rapidly progressive, patients with secondary or malignant hypertension; 2) patients with severe cardiovascular and cerebrovascular diseases; 3) liver and kidney function in patients with significant abnormalities; 4) those in poor glycemic control in diabetic patients; 5) pregnancy, breast-feeding patients; 6) to valsartan or olmesartan allergy medicines.

### *2.2. Experimental Methods*

#### *2.2.1. Administration Method*

100 patients with essential hypertension were randomly divided into two groups, the experimental group received olmesartan 20mg, once a day, the control group received valsartan 80mg, once a day, if blood pressure control is not satisfactory, the dose was doubled, were treated for 10 weeks. For the initial treatment of patients with hypertension, directly given appropriate medication, has other oral antihypertensive drug efficacy and patient dissatisfaction, instruct stop

taking the drug after the original five half-lives administering a therapeutic amount of valsartan or olmesartan. Before and after plasma inflammatory factors and changes in blood pressure treatment observed in patients during treatment.

#### *2.2.2. Blood pressure measurement*

Prior to manometry quiet rest 15min, sitting or lying on the right brachial artery, continuous measurement three times and averaged and recorded.

#### *2.2.3. Inflammatory cytokines measured*

Before treatment and treatment of 10 weeks, all patients were drawn 12 hours of fasting venous blood, placed in a test tube containing the same concentration sodium citrate solution in order to 3000r/min centrifugal 10min later, the supernatant, set -70℃ refrigerator spare. High-sensitivity C-reactive protein (hs-CRP), double-antibody sandwich enzyme-linked immunosorbent assay (ELISA) determination of tumor necrosis factor-α (TNF-α), measured nitrate reductase nephelometry nitric oxide (NO) content by immunohistochemistry the kit used strictly according to instructions by hand.

### *2.3. Statistical Methods*

All data using SPSS 19.0 statistical software for statistical analysis, measurement data were presented as mean ± standard deviation (x±s) that the paired t test for comparison within the group, between groups using a t-test. Correlation test using Person correlation. P <0.05 was considered significant.

**Table 1 Before and after treatment of blood pressure changes in the two groups (x±s).**

| group | index | before treatment | after treatment |
|---|---|---|---|
| Olmesartan group | SBP | 177.40±12.5 | 129.18±11.6* |
| Valsartan group | （mmHg） | 175.56±16.2 | 131.32±15.2* |
| Olmesartan group | DBP | 96.66±9.6 | 65.10±5.6* |
| Valsartan group | （mmHg） | 96.12±14.6 | 68.98±8.9* |

Note: Compared with before treatment, * P <0.01

## 3. Results

In the experimental group and the control group after 10 weeks of drug therapy, all patients systolic and diastolic pressures significantly lower than before treatment, basically reached the standard of care, in contrast to the two groups before treatment differences were statistically significant (P<0.01), and the olmesartan group, the decrease in blood pressure, in contrast to the decline in the valsartan group to be bigger, but the difference between the two groups was not statistically significant (P> 0.05). (See Table 1).

Plasma levels of inflammatory cytokine experimental and control groups, respectively, after 10 weeks of drug therapy, hs-CRP, TNF-α were significantly decreased, NO levels were significantly increased, compared with before treatment groups were statistically significant (P<0.01), and the variation width olmesartan plasma levels of inflammatory cytokine greater than valsartan group, hs-CRP changes between the two groups showed no significant difference (P>0.05), while TNF-α and no level changes in the experimental group and control group, the difference between the two groups was statistically significant (P <0.01). (See Table 2)

**Table 2 Groups of patients before and after 2 Inflammatory treatment (x±s).**

| group | hs-CRP(mg/L) | TNF-α(ng/L) | NO(μmol/L) |
|---|---|---|---|
| Olmesartan group | | | |
| Before treatment | 1.94±1. | 3.12±0.9 | 41.28±6.9 |
| After treatment | 0.72±0.7 | 2.02±0.9* | 63.34±7.6* |
| Valsartan group | | | |
| Before treatment | 1.95±1 | 2.32±1. | 41.18±12.3 |
| After treatment | 0.88±0.8* | 1.91±1.1* | 55.07±12.6* |

Note: Compared with before treatment, * P <0.01

## 4. Discussion

Essential hypertension is a very dangerous global common cardiovascular disease, its incidence, complications, if the effect of poor blood pressure control, can easily lead to cerebral vascular accident, heart failure, kidney disease, pop epidemiological survey [1], the higher the degree of blood pressure in patients whose stroke and coronary events the greater the risk, not only for patients with high blood pressure disease caused physical damage, while giving the patient's psychological and economic increasing the burden on a lot of research for the early clinical diagnosis of hypertension and the safe and effective control of blood pressure. In recent years, studies have shown that high blood pressure is a low degree of inflammation diseases, inflammation produce a great impact on the occurrence of hypertension, high blood

pressure and the development of complications [2].

Olmesartan is commonly used in our clinic a non-peptide selective angiotensin Ⅱ receptor (type AT1) antagonist that can selectively block the binding and effective in vivo angiotensin Ⅱ AT1 receptor, thereby antagonistic vasoconstrictor angiotensin ii function, thereby relieving symptoms, lower blood pressure. Through this research and analysis, in patients after oral administration of olmesartan treatment, 10 weeks after treatment were significantly decreased blood pressure, blood pressure differences in contrast to the patients before treatment was statistically significant (P<0.01), and olmesartan group blood pressure decreased more than valsartan group.

Antihypertensive effect of olmesartan slightly better than valsartan reasons: the efficacy of olmesartan medoxomil, pharmacokinetic properties has its own unique character. Olmesartan medoxomil in patients with oral tablets, its completely in the small intestine to the esterification, after conversion to an active metabolite olmesartan, unlike other ARB class of drugs to go through hepatic cytochrome CYP450 metabolic enzyme, therefore olmesartan in with the other drugs may reduce the interaction between applications simultaneously; its half-life in the blood for up to 13 hours, when the plasma trough levels is still 50% of the AT1 receptor inhibitory concentration of 5 to 6 times; oral not affect food absorption, 35% to 50% of the absorbed dose is excreted in the urine, the rest of parenteral excretion, showed a more balanced dual-path excretion. These features ensure that the olmesartan medoxomil orally once a day with a powerful, stable blood pressure, liver and kidney dysfunction can be taken and so on.

Recent epidemiological studies have confirmed [3], the presence of essential hypertension in patients with blood vessel wall inflammation, inflammation involved in the pathophysiology of the disease, and hypertension itself increased vascular endothelial dysfunction, eventually leading to a vicious circle. Among the many plasma inflammatory factors, hs-CRP studied at most, most, there may be several ways to consider the impact of the research hs-CRP on blood pressure: 1) CRP on endothelial cells injury, so that NO and the release of prostaglandins in endothelial cells is reduced, leading to vasodilation, loss of antithrombotic properties; 2) high concentrations of CRP can promote the proliferation and migration of vascular endothelial cells, such intimal thickening, promote atherosclerosis, eventually leading to vascular resistance increased blood pressure [4]. 3) high concentrations of CRP may also directly participate in local or systemic inflammation, which damage blood vessels, vascular endothelium-dependent vasodilator reactivity reduction, increased vascular resistance [5], resulting in high blood pressure.

Considering TNF-α on blood pressure Influence: secretion of essential hypertension in patients with vascular endothelial inflammation can induce TNF-α and platelet-derived growth factor (PDGF) is a substantial increase, inducing fibroblasts and monocytes leukocytes interleukin-6 (IL-6); while IL-6 also makes the smooth muscle cells and fibroblasts, which produce large amounts of PDGF, causing vascular resistance increases, causing high blood pressure [6].

As described above, many of the factors and mechanisms involved in the occurrence and development of essential hypertension, of which the balance of NO and endothelin -1 (ET-1) is also among important [7]. Under normal conditions, the local vessel wall, endothelial cells secrete NO and ET-1 to maintain homeostasis, NO vascular endothelium dependent relaxation factor, which may be involved in self-regulation of vascular tone, to make sympathetic tone weakened, inhibition of platelet adhesion, etc. to regulate blood pressure, and eT-1 is a shrinkage factor of vascular endothelium-dependent, when endothelial cells are damaged, so NO secretion decreased, the relative increase in eT-1 levels, causing increased vascular tone, eventually lead to high blood pressure.

Through this study found that patients with essential hypertension after taking olmesartan treatment 10 weeks, plasma hs-CRP, TNF-α levels than before treatment reduced, NO levels before higher than that described in the buck olmesartan while improving the endothelial function in patients with respect to valsartan, olmesartan has better anti-inflammatory effect.

In summary, patients with essential hypertension hs-CRP, TNF-α levels than normal blood pressure increase, decrease NO levels, long-term stable olmesartan can effectively lower blood pressure, and may be more effective to reduce plasma abnormal levels of inflammatory cytokine expression level.

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