# Comparative effects of 2.5mg levamlodipine and 5mg amlodipine on vascular endothelial function and atherosclerosis

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**Abstract**: This study was designed to compare the efficacy of two different racemic antihypertensive drugs on elderly patients with hypertension and their effects on vascular endothelial function and atherosclerosis. A total of 84 elderly hypertensive patients were randomly divided into control and treatment group with 42 patients in each group. The control group was treated with 2.5mg levamlodipine while the treatment group was given 5mg amlodipine. Total effective rate of the treatment group was 90.5%, higher than the control group, that was 71.4% ($P<0.05$). The time for recovery of related indicators like blood pressure, the total duration of medication were significantly ($P<0.05$) shorter in the treatment group. Only 1 case of adverse drug reaction was found in the treatment group while 6 cases in control group. Compared to the control group, the treatment group had massive improvement in fingertip pulse volume, flow-mediated dilation of the brachial arteries and endothelin-1 level, carotid intima-media thickness, plaque length & thickness, and blood pressure after the administration. The rate of satisfaction with the in treatment group was 95.3%, higher than that the control group, which was 78.6%. The study concluded that in elderly patients with hypertension, the treatment with 5mg amlodipine enhanced curative effect, fully improved endothelial function & arteriosclerosis and reduced adverse reactions thereby shortening treatment time.

**Keywords**: Hypertension, antihypertensive drugs, vascular endothelial function.

## INTRODUCTION

Hypertension has currently become a common disease in clinical practices in China and is more commonly seen in the elderly. It mainly refers to the clinical syndrome accompanied with dysfunction of heart, brain and kidney or organic lesion, mainly characterized by increasing of systolic or diastolic blood pressure (systolic blood pressure≥140mmHg, diastolic blood pressure ≥90mHg). Timely and correct treatment can save patient's lives and helps with the improvement of their life quality (Zhang and Zhang, 2015; Xu *et al*., 2015). In patients with hypertension, the organ injury is closely related to abnormal elevation of blood pressure, leading to damage the organs seriously. Therefore, it is necessary to make rational and appropriate choice of drugs to control the level of blood pressure effectively and realize more satisfactory prognosis in patients (Doneen and Bale, 2013; Thijssen *et al*., 2010; Grossman and Messerli, 2012). At present, timely effective prevention and control of hypertension has become an important topic in clinical and related researches and there is a close relationship between hypertension diseases with vascular endothelial dysfunction (Malesker and Hilleman, 2010). In recent years it has become a very important task in related research fields to figure out, how to fundamentally control the condition of hypertension disease through drug therapy, how to make vascular endothelial function more ideal and how to effectively control the pace of pathological change in arteriosclerosis. Because the patients with the disease need long-term medication and the majority of them are elder, it requires not only to improve pertinence and thoroughness of drug treatment, but also take into account the treatment safety. In this study, 84 elderly patients with hypertension were selected as the objects to compare the curative efficacy of two different antihypertensive drugs on the disease treatment and their effects on vascular endothelial function as well as atherosclerosis.

## MATERIALS AND METHODS

### *Study subjects*

Eighty four elderly hypertensive patients treated in selected "Jiangxi Provincial People's Hospital, China" over a period of time. They were randomly divided into control group and treatment group with 42 patients in each group. In the control group there were 25 male and 17 female, aged 63-86, with an average age of 70.5±4.3 years; 1-18 years in a history of hypertension, with an average duration of 5.1±1.4 years. Twenty eight cases of stage-II hypertension and 14 cases of stage-III hypertension. In the treatment group there were 23 male and 19 female, aged 60-82, with an average age of 70±4.7 years; 1-22 years in a history of hypertension, with an average duration of 5.4±1.8 years. Twenty nine cases of stage-II hypertension and 13 cases of stage-III hypertension.

### *Method*

Patients in the control group were given oral medication of lev-amlodipine with the dose of 2.5mg, once a day for a continuous month. Patients in the treatment group were

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given oral medication of amlodipine of 5mg, once a day for a continuous month (Yangke *et al*., 2014)

***Observation Index***

The observation indices included total effective rate, the time for recovery of related indicators like blood pressure, the total treatment duration, the number of adverse reactions, improvement in fingertip pulse volume, flow-mediated dilation of the brachial arteries, level of endothelin-1, carotid intima-media thickness, plaque length plus thickness, blood pressure before and after the administration and the rate of satisfaction with the antihypertensive treatment.

***Evaluation criteria for therapeutic effect***

*Significant effect*

After treatment, patient's diastolic blood pressure level decreased by 10mmHg or above and was within the normal range.

***Effectiveness***

After treatment, patient's diastolic blood pressure decreased by less than 10mmHg, but compared with the condition before treatment, it decreased 10~19mmHg or reached the normal range.

***Ineffectiveness***

Patient's diastolic blood pressure was not improved after treatment or the condition went worse (Tang *et al*., 2014).

***Evaluation criteria for satisfaction degree***

At the end of treatment, the patient's satisfaction with the program and effect was scored anonymously with a total score of 100. The score more than 80 suggested that they were satisfied; less than 80 suggested they were basically satisfied and lees than 60 suggested they were dissatisfied (Ruzyllo *et al*., 2007).

***Ethical approval***

The institutional ethical review board (IERB) of Jiangxi Provincial People's Hospital, Nanchang, PR China approved this study. The approval number was 233/IER/2015.

## STATISTICAL ANALYSIS

The data was processed by SPSS18.0 statistical software in which the measurement data was described as "$\bar{x} \pm s$" and checked by t test and the count data was checked by $X^2$ test, $P<0.05$ suggested that there was significant difference of statistical value.

## RESULTS

***Total effective rate of drug treatment in elderly hypertensive patients***

The total effective rate of the treatment group was 90.5%, higher than that of the control group that was 71.4% ($P<0.05$) (table 1).

***Recovery time of related indicators like blood pressure and the total duration of medication***

The recovery time of related indicators like blood pressure and the total medication duration in the treatment group were shorter than those in the control group ($P<0.05$) (table 2).

***The number of adverse drug reactions occurring during the medication period***

During the period of medication, only one patient of adverse drug reactions was found in the treatment group while in the control group there were 6 cases ($P<0.05$).

***Improvement of Fingertip Pulse Volume, Flow-Mediated Dilation of the Brachial Arteries and Endothelin -1 Level Before & after Administration***

Compared with the control group, the treatment group had higher improvement in fingertip pulse volume, flow-mediated dilation of the brachial arteries and endothelin -1 level ($P<0.05$) (table 3).

***Improvement of Carotid Intima-Media Thickness, Plaque Length and Thickness before & after Treatment***

The improvement of carotid intima-media thickness, plaque length and plaque thickness in the treatment group was greater than that in the control group ($P<0.05$) (table 4).

***Improvement in blood pressure levels before and after administration***

The degree of blood pressure improvement in the treatment group was larger than that in the control group with significant difference in between ($P<0.05$) (table 5).

***Degree of satisfaction with antihypertensive treatment program and effect***

In the treatment group, the satisfaction rate reached 95.3%, higher than that in the control group that was 78.6%, with significant difference in between ($P<0.05$) (table 6).

## DISCUSSION

Impairment of vascular endothelial function plays a significant role in the development of pathological changes in atherosclerosis and becomes an important sign for diagnosis of hypertensive diseases (Rinaldi *et al*., 1998). The increase in blood pressure can promote the formation of atherosclerosis, so it becomes a fundamental principle for hypertension control to improve patient's vascular endothelial function and lower the generation speed of atherosclerosis in current clinical trials (Osuch *et al*., 2012; Zhao *et al*., 2014). To protect the vascular endothelial function in patients has been all the way a focus of hypertension prevention and treatment. In

**Table 1**: Comparison of total effective rate of treatment [n (%)] (n=42)

| Group | Significant Effect | Effectiveness | Ineffectiveness | Total Effective Rate |
|---|---|---|---|---|
| Control Group | 12 (28.6) | 18 (42.8) | 12 (28.6) | 30 (71.4) |
| Treatment Group | 16 (38.1) | 22 (52.4) | 4 (9.5) | 38 (90.5)* |

Note: compared with the control group, *P<0.05

**Table 2**: Comparison of the recovery time of related indicators like blood pressure and the total duration of medication (d) (n=42)

| Group | Recovery Time of Related Indicators | Total Duration of Medication |
|---|---|---|
| Control Group | 14.73±2.50 | 23.67±2.58 |
| Treatment Group | 8.91±1.25 | 17.13±2.56 |
| P | <0.05 | <0.05 |

**Table 3**: Comparison of improvement among fingertip pulse volume, flow-mediated dilation of the brachial arteries and endothelin -1 level before & after administration

| Group | Time | Fingertip Pulse Volume | Flow-Mediated Dilation in Brachial Arteries (%) | Endothelin -1(ng/L) |
|---|---|---|---|---|
| Control | Before Administration | 0.94±0.32 | 5.21±0.76 | 236.17±27.59 |
| | After Administration | 1.13±0.47* | 6.83±1.20* | 194.28±13.52* |
| Treatment | Before Administration | 0.97±0.26 | 5.35±0.87 | 229.51±23.65 |
| | After Administration | 1.39±0.54*# | 8.11±1.34*# | 168.92±10.34*# |

Note: compared with this group before treatment, *P<0.05; compared with the control group after treatment, #P<0.05

**Table 4**: Comparison of improvement in carotid intima-media thickness, plaque length and plaque thickness before and after treatment (mm)

| Group | Time | Plaque Thickness | Plaque Length | Carotid Intima-Media Thickness |
|---|---|---|---|---|
| Control Group | Before Treatment | 2.03±0.58 | 6.91±1.27 | 1.08±0.34 |
| | After Treatment | 1.79±0.37* | 5.96±1.20* | 0.97±0.21* |
| Treatment Group | Before Treatment | 2.00±0.46 | 6.97±1.25 | 1.09±0.28 |
| | After Treatment | 1.51±0.32*# | 4.01±0.94*# | 0.80±0.23*# |

Note: compared with this group before treatment, *P<0.05, compared with the control group after treatment, #P<0.05

**Table 5**: Improvement of blood pressure level in two groups before and after medication (mmHg)

| Group | Time | Systolic Pressure | Diastolic Pressure |
|---|---|---|---|
| Control Group | Before Medication | 184.27±16.95 | 106.32±10.27 |
| | After Medication | 132.50±10.54* | 94.13±8.56* |
| Treatment Group | Before Medication | 186.35±17.22 | 105.58±9.47 |
| | After Medication | 116.34±8.21*# | 81.10±8.96*# |

Note: compared with this group before treatment, *P<0.05; compared with the control group after treatment, #P<0.05

**Table 6**: Comparison in degree of satisfaction with antihypertensive treatment program and effect [n (%)]

| Group | Case (n) | Satisfied | Basically Satisfied | Dissatisfied | Satisfaction Degree |
|---|---|---|---|---|---|
| Control Group | 42 | 13 (31.0) | 20 (47.6) | 9 (21.4) | 33 (78.6) |
| Treatment Group | 42 | 28 (66.7) | 12 (28.6) | 2 (4.7) | 40 (95.3)* |

Note: compared with the control group, *P<0.05

addition, endothelium-dependent vasodilation dysfunction is another important reason for hypertension disease, so the ideal antihypertensive drugs should not only have a good blood pressure-decreasing effect but should also effectively protect the patient's vascular endothelial function (Hayoz *et al*., 2012; Bannu *et al*., 2014). In the present work, total effective rate of the treatment group (with amlodipine) was 90.5%, higher than that of the

control group (with lev-amlodipine), that was 71.4%. The time for recovery of related indicators like blood pressure, the total duration of medication were significantly shorter in the treatment group (Soanker *et al*., 2012).

## CONCLUSION

Amlodipine can rapidly exert its ideal effect of pressure-decreasing after being taken to steadily reduce blood pressure and protect the vascular endothelial function. The rate of satisfaction with the antihypertensive treatment in the present study reached 95.3%, higher than that in the control group, which was 78.6% with significant difference between groups.

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