

## The Effect of Telmisartan and Amlodipine on Hypertension Carotid Artery Atherosclerosis

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**Abstract: Objective:** To study the effect of amlodipine and telmisartan on serum high-sensitivity C-reactive protein (hs-CRP) and carotid artery intima-media thickness with hypertension. **Methods:** 78 patients with essential hypertension were randomly divided into (n=40) amlodipine and telmisartan group (n=38). Amlodipine group was treated with amlodipine tablets 5 mg/d~10 mg/d and telmisartan group was treated with telmisartan tablets 40~80mg/d. Both groups were treated continuously for 12 months. Before and after treatment measured the blood pressure, plasma hs-CRP and cervical vessels ultrasonography among all subjects. **Results:** Blood pressure, hs-CRP, IMT was significantly decreased in two groups after 12 months treatment ( $P<0.05$ ). There was no statistical significance difference between amlodipine and telmisartan groups ( $P>0.05$ ). **Conclusion:** Amlodipine and telmisartan had similar effect on anti-hypertensive and anti-atherosclerosis.

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**Key words:** Hypertension; Carotid Artery Atherosclerosis; Amlodipine; Telmisartan

### Introduction

Atherosclerosis (AS) is a systemic disease. Intimamedia thickness (IMT) is an index to reflect the sensitivity and specificity about y atherosclerosis. IMT can test cardiovascular and cerebrovascular diseases independently [1]. Long-term hypertension make Carotid Artery smooth muscle proliferation, hypertrophy and collagen proliferation, the symptom is carotid artery IMT increasing, encroaching some lumen and vascular structural remodeling. Therefore we discuss the development of antihypertensive can drugs antihypertensive effectively meanwhile delaying atherogenesis having important clinical significance.

This paper comparatively Study the effect of amlodipine and telmisartan on serum high-sensitivity C-reactive protein (hs-CRP) and carotid artery intima-media thickness with hypertension.

### 1. Materials and Methods

#### 1.1 Case Selection

Select 78 cases about 1 and 2 level hypertension patients from cardiovascular internal medicine outpatient and hospitalization department in our hospital during Oct.2008 ~ Aug. 2010, which accord with *Commentary on the China Guideline for the Prevention and Treatment of Hypertension* definition and diagnosis standard in 2004 revised edition: which take 3 times blood pressure monitoring in different days, systolic pressure (LVSP) $\geq 140$ mmHg and (or) diastolic blood pressure $\geq 90$ mmHg means hypertension. All cases eliminate tumor, gout,

diabetes mellitus and hepatic and kidney function obstacle, various acute-chronic inflammation, immune system disease and secondary hypertension (SH). Selected patients in 2 randomized groups, while telmisartan group has 38 cases, among them have 20 male cases and 16female cases, age: 45~79, average age 61.8 $\pm$ 8.2 ; amlodipine group has 40 cases, among them have 22 male cases and 18female cases, age: 46~79, average age 60.3 $\pm$ 8.5. The study was approved by the institution review board at Beijing Military General Hospital, and all of the subjects gave informed consent.

#### 1.2 Method

##### 1.2.1 Administration Method

All selected patients don't taking dihydropyridine calcium entry blocking agents, angiotensin converting enzyme inhibitor (ACEI) and angiotensin receptor antagonist (ARB), telmisartan group takes telmisartan (Trade name: Telmisartan Capsule (Micardis), Blinger Yinggehan Co.Ltd), each time 80mg, 1 time /d; amlodipine group takes amlodipine (Trade name: Norvasc, Hui Rui Pharmaceutical Co.Ltd), each time 5mg, 1 time /d. If the blood pressure doesn't reach the standard after 2 weeks treatment then increase dose or increase hydrochlorothiazide conditionally. If the blood pressure doesn't reach the standard after 4 weeks then reject them.

### 1.2.2 Determination of Carotid Artery IMT

Selected patients should test Carotid Artery IMT half of the year before treatment and half of the year after treatment. Use VIVID-7 Dimension color Doppler imaging (CDI), transducer frequency 10.0MHz, sample volume 4.0mm. The testing includes bilateral common carotid arteries (BCCA), common carotid artery bifurcation and internal and external carotid artery. Record the IMT data and normal value is 0.8mm~1.0mm, take IMT>1mm as the standard to diagnose early atherosclerosis. IMT local incassation>1.2mm diagnosed as Plaque.

### 1.2.3 Blood Biochemical Criterion

All patients should measure the serum total cholesterol (TC), triglyceride (TG) before treatment; patients should test hs-CRP before the treatment and 1 year after the treatment.

### 1.4 Statistical Method

We use software package taking statistical treatment. Measurement data coincidence the normal distribution, indicate as average  $\pm$  Standard Deviation ( $\bar{x}\pm s$ ). Two sets of measurement data are compared by t test. Count data is compared by Chi-s quare test ( $\chi^2$ ).  $P<0.05$  means there is statistical significant differences.

### 2. Result

**2.1** The common clinical date of amlodipine group and telmisartan group patients. The data between two groups have no obvious difference, see table 1.

Table 1. The common clinical date about two groups ( $\bar{x}\pm s$ )

Subject	Telmisartan Group (n=38)	Amlodipine Group (n=40)
Male(%)	52.6	55.0 $\Delta$
Age(year)	61.8 $\pm$ 8.2	60.3 $\pm$ 8.5 $\Delta$
BMI(kg/m <sup>2</sup> )	25.8 $\pm$ 4.7	26.5 $\pm$ 6.6 $\Delta$
Total Cholesterol (mmol/l)	5.4 $\pm$ 1.3	5.7 $\pm$ 1.2 $\Delta$
Triglyceride (mmol/l)	1.37	1.40 $\Delta$
Somking(%)	22	26 $\Delta$
Heart Rate (次/分)	74.7 $\pm$ 4.9	75.3 $\pm$ 5.4 $\Delta$
Systolic Pressure (mmHg)	109.2 $\pm$ 5.3	156.3 $\pm$ 8.7 $\Delta$
Diastolic blood pressure (mmHg)	108.9 $\pm$ 5.5	155.8 $\pm$ 9.8 $\Delta$
Carotid intima-media thickness (mm)	1.22 $\pm$ 0.15	1.23 $\pm$ 0.14 $\Delta$

compare with telmisartan group  $\Delta P > 0.05$

**2.2** The amlodipine group and telmisartan group's changes before and after treatment in blood pressure, carotid artery IMT and serum hs-CRP.

The systolic pressure and diastolic blood pressure in two groups are in good control comparing before the treatment having obvious decreasing (average  $P<0.01$ ), the comparison between two groups has no obvious

difference ( $P>0.05$ ). One year after the treatment, the carotid artery IMT had obvious decreasing compared to before the treatment ( $P<0.01$ ,  $P<0.05$ ), the comparison between amlodipine group and telmisartan group have no statistical significant, see table 2.

Table 2. Before and after treatment the changes in blood pressure, carotid artery IMT and serum hs-CRP. ( $\bar{x}\pm s$ )

Group	Cases	Systolic Pressure		Diastolic blood pressure	
		Before	After 1 year	Before	After 1 year
Telmisartan group	38	155.8 $\pm$ 9.8	132.4 $\pm$ 6.1 <sup>#</sup>	108.9 $\pm$ 5.5	83.3 $\pm$ 4.2 <sup>#</sup>
Amlodipine group	40	156.3 $\pm$ 8.7	125.5 $\pm$ 5.2 <sup>#<math>\Delta</math></sup>	109.2 $\pm$ 5.3	76.4 $\pm$ 3.8 <sup>#<math>\Delta</math></sup>
Group	Cases	IMT(mm)		hs-CRP(m g/L)	
		Before	After 1 year	Before	After 1 year
Telmisartan group	38	1.22 $\pm$ 0.15	1.13 $\pm$ 0.14 <sup>#</sup>	4.71 $\pm$ 0.67	3.23 $\pm$ 0.78 <sup>#</sup>
Amlodipine group	40	1.23 $\pm$ 0.14	1.14 $\pm$ 0.13 <sup>#<math>\Delta</math></sup>	4.56 $\pm$ 0.78	3.18 $\pm$ 0.58 <sup>#<math>\Delta</math></sup>

Compared to before the treatment

#  $P<0.05$ ; compared to telmisartan group:  $\Delta P > 0.05$

### 3. Discussion

Atherosclerosis (AS) is a systemic disease which is vascular reflection about excessive inflammation and fibroplasia towards multiple injuries. Intima-media thickness (IMT) is an important index to diagnose early atherosclerosis changes<sup>[2]</sup>. Confirmed by domestic and international research there is correlation between carotid artery lesion and coronary artery disease which the two condition can coexistence<sup>[3]</sup>; IMT thickening (>1mm) is a predictor of cardio-cerebro vascular complications.

Inflammation exists in every AS disease process, from the beginning to throughout the development and finally cause the atherosclerosis plaque rupture and thrombus. Hs-CRP is an important inflammatory response marker to AS which is an independent predictor to cardio-cerebro vascular complications [4, 5].

Hypertension is a danger but important element to atherosclerosis. Recently with the further study to hypertension, new anti-hypertension medicine comes out constantly. It is a new trend in hypertension treatment that research how to decrease blood pressure effectively, control inflammation reaction and slowdown or reverse arteriosclerosis.

Telmisartan is a new Angiotensin II Receptor Antagonist (ARB), which has strong lipophilia and has the highest capacity in ARB distribution in vivo. Due to this study we find that amlodipine and telmisartan have same effect to decreasing blood pressure and to decrease the carotid artery IMT and hs-CRP level. One conclusion is that amlodipine and telmisartan have clear effect on decreasing blood pressure; what's more they can anti inflammatory and reverse arteriosclerosis.

Amlodipine is one of the new types of long-term calcium ionic channel blocker. Based on the study that amlodipine can take effect on anti-atherosclerosis by this means: ① inhibit vascular smooth muscle cell proliferation and migration ②antioxygen free radical ③ inhibit vascular endothelial cells apoptosis ④ inhibit the cytokine and the chemokine receptor expression. The research results are as the following: amlodipine can decrease blood pressure effectively. After 1 year continuous therapy, hypertension patients' carotid artery IMT and hs-CRP level decrease obviously compared to before the treatment. Further confirmed that amlodipine not only can anti-hypertension but also to anti-atherosclerosis independently [6, 7].

Angiotensin II inhibits NF-κB making phosphorylation, which can promote the secretion of

inflammatory cytokines. In the animal experiment, angiotensin II can increase the ratio of arterial intima / media [8], therefore angiotensin II plays an important role in anti-atherosclerosis. At present ARB medicines considered as to anti-atherosclerosis and anti inflammatory in two ways: first is to block angiotensin system then take effect as anti-oxidative stress, anti-hypertension, preventing cell propagation and anti cells inflammatory; second is to improve insulin sensitivity intervening atherosclerosis formation. Through this study telmisartan's anti-atherosclerosis efficacy relates to decreasing hs-CRP.

In a word, through this research we come to a conclusion that amlodipine and telmisartan can decrease blood pressure effectively, control inflammation reaction and slowdown or reverse arteriosclerosis. Amlodipine and telmisartan are the first choice that antihypertensive treatment of hypertension carotid artery atherosclerosis.

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