The Effects of Amlodipine on Cerebral Circulatory Values in Patients With Essential Hypertension

Ilgar G. Alizade, MD, Nigar T. Karayeva, MD
From the Department of Cardiology, Hospital of Ministry of Internal Affairs, *Baku, Azerbaijan*

Objective: This study assessed the effects of calcium chanelle blocker Amlodipine on the cerebral circulation in patientsz with essential hypertension.
Methods: Cerebral circulation in 37 patients with essential hypertension and 10 healthy subjects was assessed using rheoplethysmography. In patients with essential hypertension cerebral circulation values were also re-estimated after treatment with Amlopidine (5-10 mg daily).
Results: The cerebral circulatory parameters in hypertensive patients before treatment with Amlodipine were different from those in healthy persons. Amlodipine along with the reduction in systemic blood pressure caused attenuation of cerebrovascular abnormalities: decrease in spastic signs and incrase in cerebral blood supply in patients with essential hypertension.
Conclusion: Amlodipine causes reduction of cerebral vascular resistance and promotes improvement in arterial blood filling in patients with essential hypertension. These changes in cerebral circulation may be secondary to the increase of cardiac output-known effect of Amlodipine. *(Ana Kar Der, 2001; 1: 14-16)*
Key words: Essential hypertension, cerebral circulation, amlodipine.

İndroduction

Over recent period calcium channel blockers being marked arteriodilators (1-3) have had a widespread application in the treatment of essential hypertension (EH). This feature is used to eliminate and avoid coronary artery spasm in ischemic heart disease, promote pulmonary vascular dilatation in primary pulmonary artery hypertension, in the treatment of disturbed peripheral circulation as a result of atherosclerosis and vascular spasm. Calcium channel blockers have been reported to prevent cerebral circulatory disturbances and to discontinue migraine attacks (4,5).

It is well known that one of the main signs of EH is cerebral circulatory disturbance (6,7,). Accordingly, there are papers in literature describing the effects of antihypertensive drugs on cerebral hemodynamics (4,8,9). But there are no published papers devoted to the effects of amlodipine on cerebral circulation in the patients with EH.

Material and Methods

Thirty-seven patients with stage II EH (16 – males, 21 – females) aged 33-60 years and controls consisting of 22 comparable by age (36-59 years) and gender normal subjects were included into the investigation. The study was performed before and after treatment with amlodipine in doses of 5-10 mg/daily, chosen individually. BP was measured by Riva-Rocchi methods modified by Korotkoff. Records of rheoencephalograms (REG) were made using tetrapolar rheoplethysmograph (RPG-2-02 in frontooccipital lead with a patients win supine position. While analysing the rheograms, the following values had been assessed: A (in ohm) – reflecting blood supply to cerebral vascular basin dependent on cardiac output and tension of major cerebral arteriesp B (in sec) – index of tension of major cerebral arteries; C (in %) – index of small cerebral vessels (arterioles, capillaries, venules) tension and cerebral vascular resistance; D (in %) – index of venous blood flow from cranial cavity and cerebral venous tension (7).

Central hemodynamics was studied using tetrapolar rheography before and analysis of basic and differential rheograms was evaluated according to W.G. Kubicek, et al. (10) modified by Yu.T.Pushar, et al (11). The investigation was perormed using a 2-channel rheoplethysmograph RPG 2-02 and recorder "Elkar-6). Stroke volume, cardiac output, cardiac index and total peripheral resistance were evaluated based on the data obtained.

Yazışma Adresi: Professor I.G.Alizade MD, PhD – 9 Huseyn Javid st.apt.51, 370002 Baku, Azerbaijan Tel. (99412)-62787

Statistical evaluation of digital data was perormed using computer program Excel-5. Significant difference was assessed using U non-parametric criterion (Wilcoxon, Mann-Whitney).

Results

The initial blood pressure in all of patients was on average: systolic - 1820±4.6 mm Hg, diastolic – 108.4±2.8 mm Hg. The patients at baseline pre-treatment investigation sustained spastic signs in major arteries (B 0.18±0.03 sec, p<0.05) and small arteries (C 24.6±2.4%, p<0.005) resulting in insufficient arterial blood supply to cerebral vascular basin (A 0.09±0.003 ohm, p<0.001) as compared with controls (Table 1). Venous tension was reduced and venous blood flow was different (D 75.9±7.1, p<0.001) in patients with EH than in controls.

A drop in systolic blood pressure by 16.6%, diastolic-by 17.9% was observed after amlodipine treatment. In 28 (78%) patients treatment was found to be effective.

Furthermore, major artery tension reduced by 44.4% (p<0.01) in EH patients after treatment with amlodipine (Table 1). Tension of small vessels also significantly reduced (by 47.9%, p<0.001). Moreover, in the vast majority of patients these values reached normal range. Normalization of cerebral vascular resistance resulted in significant increase of is arterial blood fiiling (by 33.3%), (p<0.001). The increase of arterial blood filling is most likely related to the increase of stroke and minute blood volumes, characteristic hemodynamic effects of amlodipine.

While analyzing the values of cerebral vein tension, the reduction of venous tension (by 4.4%, p>0.5) was observed. However, its absolute values remained reduced as during the initial investigation.

The improvement of overall status was observed in 28 patients treated with amlodipine simultaneously with fall in BP. Headache, giddiness, chest pain and weakness were significantly reduced and eliminated. Eleven patients experienced continuous headache and 6 of them sustained significant intensification of pain despite a drop in BP. Flushing and pulsation in head and extremities, hyperemia of skin integuments developed in 9 patients.

Discussion

In conclusion, the effect of amlodipine on cerebral hemodynamics was mainly expressed by decreased arterial link tension o blood filling in case if it was increased in the initial state. In this circumstance, the reduction of cerebral vascular resistance was a driving factor contributing to the improvement of its arterial blood filling. The increase of cardiac output contributes to the enhancement of arterial blood filling under the effect of amlodipine. The capacity to increase cardiac output charasteristic for amlodipine promoted the improvement of regional as well as cerebral circulation. Side effects observed in some patients, most likely were related to inadequate and excessive arteriodilatation.

We failed to reveal statistically significant changes in cerebral venous tension after taking amlodipine. However, significant aggravation of venous blood flow concomitant with severe headache was traced in REG of some patients. We feel a certain role of disturbances in venous part of cerebral vascular basin in the arising of headache after amlodipine taking.

Thus, the obtained results demonstrate the suitability of amlodipine treatment in patients with EH and disturbed cerebral hemodynamics.

Table 1: The changes of cerebral hemodynamic values in the patients with EH under the effect of amlodipine (M±m)

Index (M±m)	Controls (22)	Before treatment with amlodipine	After treatment with amlodipine	P
A (ohm)	0.13±0.002	0.09±0.003	0.12±0.006	<0.001
B (sec)	0.12±0.02	0.18±0.03	0.10±0.01	<0.001
C (%)	15.0±1.7	24.6±2.4	12.8±1.1	<0.001
D (%)	62.5±3.5	75.9±7.1	72.5±3.4	>0.5

P- statistically significant difference as compared with the values before treatment

Acknowledgement: *We would like to extend our thanks to Mrs Gulya M.Akhundzade for her translational help in preparing the manuscript.*

References

1. Epstein M. Calcium antagonists should continue to be used for first line treatment of hypertension. Arch Intern Med 1995; 155: 2150-6.
2. Furberg C. Calcium antagonists not appropriate as first line antihypertensive agents. Am J Hypertens 1996; 9: 110-21.
3. Yusuf S. Calcium antagonists in coronary artery disease and hypertension. Time for reevaluation. Circulation 1995; 92: 1079-82.
4. Shchepotin BM, Miroshnik Nyu. The effect of corinfar on cerebral hemodynamic values in hypertonic patients. Kardiologia 1988; 3: 68-72 (in Ru).
5. Sidorenko GGI, Liventseva MM, Nechesova TA, Pavlova AI. The effect of acute pharmacologic test and treatment with nifedipine on the values of cerebral hemodynamics and effective information processing in hypertonic patients. Kardiologia 1988; 1: 14-7 (in Ru).
6. Karayeva NT, Alizade IG. The state of central hemodynamics and cerebral circulation in hypertonic patients. Zdorovie 1995; 1: 27-30 (in Ru).
7. Yarulin KhKh. Klinicheskaya Reoensefalografia. Moscow: Meditsinap 1983p (in Ru).
8. Sidorenko GI, Pavlova AI, Gaiduk VN, et al. The change of cerebral and central hemodynamics under the effect of antihypertensive therapy in hypertonic patients with different types of circulation. Ter Arkhiv 1986; 11: 18-21 (in Ru).
9. Alizade IG, Karayeva NT. The effect of antihypertensive therapy on the values of cerebral circulation in hypertensive patients. J Clin and Basic Cardiol 1999; 2: 283.
10. Kubicek WG, Karnegis JN, Peterson RP, et al. Development and evolution of impedance cardiac output system. Aerospace Med 1966; 37: 1208-12.
11. Pushkar YuT, Bolshov VM, Elizarova NA, et al. The determination of cardiac output via thoracic tetrapolar rheography and its methodical capacities. Kardiologia 1977; 7: 89-90 (in Ru).