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Original Article

The study of the difference between vascular and biological age among patients with arterial hypertension after optimal antihypertensive and hypolipidemic treatment

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Abstract

Aim: The purpose of this study was to assess the difference between Vascular (VA) and Biological age (BA) among pts with arterial hypertension (AH) after optimal antihypertensive and hypolipidemic treatment.

Material and Methods: The current non-interventional study began in February 2019 and 200 patients (pts) were included in the study. At Visit 1 the doctor collected information on age, sex, early family history of cardiovascular diseases (CVD), diabetes mellitus (DM) and other CV risk factors, smoking habits, obesity, BP values, lipid levels: low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TG), SCORE scale for non-interventional study. The information was collected on CV risk and VA as well. Pts have been prescribed treatment with rosuvastatin, valsartan (Val), or Val/hydrochlorothiazide (HCTZ), or amlodipine (Aml). At Visit 2 the doctor collected information on BP values, lipid levels: LDL-C, HDL-C, and TG.

Results: Total VA was initially 73.8 ± 2.2 y.o., after treatment 65.5 ± 1.8 y.o. ($p<0.001$), the difference between VA and BA was initially 13.7 ± 1.2 y., after treatment 5.6 ± 0.8 y.

Conclusion: The difference between VA and BA among pts with AH was reduced by almost 2.5 times as a result of optimal antihypertensive and hypolipidemic treatment ($p< 0.001$).

Keywords: Total cholesterol, Low-density lipoprotein cholesterol, High-density lipoprotein cholesterol, Triglycerides, Vascular age, Biological age

INTRODUCTION

Cardiovascular disease is leading cause (32%) of all deaths worldwide (1). Prevention of atherosclerotic CVD (ASCVD) both through lifestyle changes and medical treatment remains a major issue (2). Disorders of lipid metabolism in pts with AH play a crucial role in the development of CV complications (3). According to the statistics of 2020 age-adjusted average primary morbidity from systolic blood pressure (SBP)≥140 mm Hg and diastolic blood pressure (DBP) ≥ 90 mm Hg of AH pts in ESC member countries was 24.8% (IQR 19.8 – 28.5 %) (4).

The latest 2018 ESC/ESH guidelines on the management of AH give preference to the administration of two drugs combination: calcium channel blockers or diuretic with several combinations of ARBs and using a different dosage of combined components (single-pill combination - SPC) give preference and comfort to the treatment (5). Adding ARB reduces negative metabolic actions associated with diuretics, such as hypokalemia, hyperuricemia, and impaired glucose tolerance. Improving venous return to the heart ARB normalizes capillary hydrostatic pressure and thus, it negatively affects amlodipine in most people with edema (6).

More than 60% of hypertensive pts have hypercholesterolemia. Adherence to both drugs in pts starting antihypertensive and hypolipidemic therapy is considered to be higher (more than 34%) (7).

MATERIAL AND METHODS

This non-interventional study has been conducted for over 3 months. 200 pts were included in the study. Enrolment of pts started in February of 2019. The attending doctor made 2 visits during the follow-up period: Visit 1 - including the patient into the study (week 0 - starting); Visit 2 - control and the result after 3 months treatment.

At Visit 1 the doctor collected information for the non-interventional study on age, gender, early CVD family story, DM and other CVD risk factors, smoking habits, obesity, BP values, and lipid levels: LDL-C, HDL-C, and TG, about CV risk and VA. The pts were administered rosuvastatin, valsartan, or combined treatment with Val: HCTZ or Aml were prescribed. Initial dosage treatment with rosuvastatin was started based on LDL-C levels, ten-year CV risk, and possible adverse drug reaction risk assessment. Treatment with Val or Val/HCTZ or Aml was started according to initial values of BP and risk assessment of possible adverse events.

At Visit 2 the doctor collected information on BP values, lipid levels: LDL-C, HDL-C, and TG according to with method and schedule attached to the working protocol of continuous work on VA on primary prevention. The tolerability of the treatment was assessed by the adverse reactions occurring from the moment of application to the corresponding visit.

Dosage

Doses of statin: rosuvastatin - 10 mg, 20 mg and 40 mg. Doses of sartan: Val - 80 mg and 160 mg. Doses of sartan/HCTZ: Val 80 mg/HCTZ 12.5 mg, Val 160 mg/HCTZ 12.5 mg and Val 160 mg/HCTZ 25 mg. Doses of Aml/Val: Aml 5 mg/Val 80 mg; Aml 5 mg/ Val 160 mg and Aml 10 mg/Val 160 mg.

Criteria for the use of medicine

Pts of both genders with hyperlipidemia. Extensive information on the prevention of pregnancy in pts of reproductive age and the use of contraceptive measures have been provided.

Medical exception criteria

Treatment threatening the patient's health, severe and acute diseases, the patient's decision to withdraw from the study.

The following has been taken into account in evaluating the clinical efficacy: levels of BP and LDL-C. BP of all pts should be reduced to 140/90 mm Hg or lower, in well- tolerated pts to 130/80, but not lower than < 120 mm Hg. In pts with moderate CV risk, the target level of LDL-C should be <3.0 mmol/L. The target level of LDL-C in pts with CV risk should be < 2.6 mmol/L or if LDL-C initially varies between 2.6 and 5.2 mmol/L it should be either equal or lower by >50%. In pts with high CV risk, the target level of LDL-C is to be <1.8 mmol/L or with LDL-C initially varying between 1.8 and 3.5 mmol/L it should be equal or lower by > 50%.

The participants were divided into groups getting primary and secondary prevention. Pts without CVD in recent medical history, receiving hypolipidemic and antihypertensive treatment were included in primary prevention, but the group of secondary prevention included the pts with CVD in the recent medical history and getting hypolipidemic and antihypertensive treatment. The VA was defined by a special VA calculator according to the guidelines of the ESC.

Ethical principles and personal data

The patient's personality was kept secret and was only known to the doctor. All clinical data were collected according to the law on confidentiality of the country.

Statistic analysis

The efficiency parameters were considered to be random variable relative scales. Descriptive statistical data were presented for the analysis of variables: smaller and larger values, numerical average, standard inclination, standard error of the mean. The sample being big the asymptotic Z criterion was used to estimate differences between two variable measurements in the same population. The asymptotic 95% confidence interval was analogously used to differentiate the intervals. The statistic indicators presented for statistics are as follows: N-quantity of pts, %-percent, max- maximum value, min – minimum value, CI - 95% Confidence Interval.

RESULTS

The mean age of the pts included in the study was 60±10.6 years (min 26, max 90), 103 (51.5%) men and 97 (48.5%) women. BMI of the examined pts was 27.9±4.1 kg/ m^2 (min19.0, max 41.0).

At the beginning of the study 109 pts (54.5%) received hypolipidemic, 139 pts (69.5%) antihypertensive treatment, but 91 pts (45.5%) did not have hypolipidemic, and 61 pts (30.5%) antihypertensive treatment. The previous percentage in the next findings was calculated regarding all pts and the next one concerning those who are receiving treatment at present.

As a continuation of the hypolipidemic treatment Rosuvastatin 10 mg was administered to 59 pts (29.5%), 20 mg to 82 pts (41%), 40 mg to 26 pts (13.0%), in general it was re- administered to 167 (83.5%) pts, 10 mg to 68 (34%) pts, 20mg to 55 pts (27.5%), 40 mg to 8 (4.0%) pts, thus, it was totally continued in 131 pts (65.5%). As a continuation treatment Valsartan in a dose 80 mg was re- administered to 35 pts (17.5%), 160 mg to 18 pts (9.0%), Aml/Val 5/80 mg to 15 pts (7.5%), 5/60 mg to 44 pts (22.0%), 10/160 mg to 22 pts (11.0%), Val/HCTZ 80/12.5 mg to 19 pts (9.5%), 160/12.5 mg to 42 pts (21.0%), 160/25 mg to 5 pts (2.5%). 63 pts (31.5%) continued with 80 mg Val, 37 pts (18.5%) with 160 mg Val, 22 pts (11%) with Aml/Val 5/80 mg, 31 pts (15.5%) with 5/160 mg, 4 pts (2.0%) with 10/160 mg, 13 pts (6.5%) with Val/HCTZ 80/12.5 mg, 11 pts (5.5%) with 160/12.5 mg, 5 pts (2.5%) with 160/25 mg.

The Total Cholesterol level was initially 5.6±0.2 mmol/L (min

2.7, max 9.2) (95% CI 5.4-5.8), after treatment 4.8±0.1 mmol/L (min 2.0, max 7.9) (95% CI 4.7-5.0) (p <0.001) (Picture 1). LDL-C level was initially 3.5±0.2 mmol/L (min 1.1, max 6.6; 95% CI 3.4-3.7), after treatment 2.8±0.1 mmol/L (min 0.8, max 6.6; 95% CI 2.7-2.9) (p<0.001). The triglycerides level was initially 2.0±0.1 mmol/L (min 0.4, max 7.6; 95% CI 1.9-2.2), after treatment 1.6±0.1 mmol/L (min 1.5, max 1.7; 95% CI 1.5-1.7) (p<0.001) (Figure 1.)

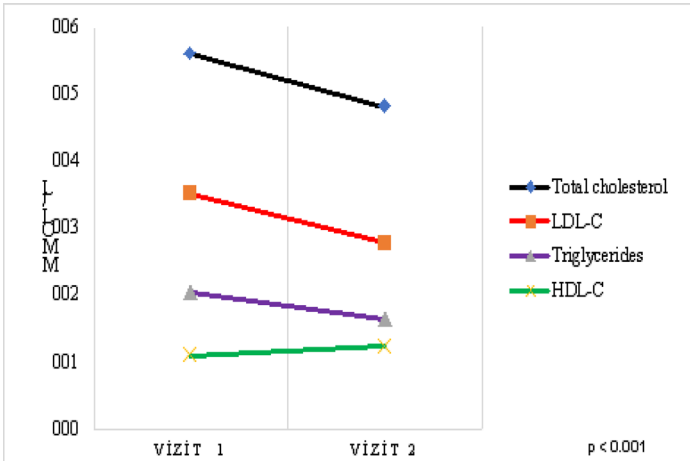

Figure 1. *Changes in the lipid components' mean values*

Initial SBP level was 160.6±2.0 mm Hg (min 120, max 200; 95% CI 158.6-162.7), after treatment 133.9±1.4 mm Hg (min 110, max 160; 95% CI 132.4-135.3) (p<0.001). Initial DBP level was 94.1±1.1 mm Hg (min 70, max 140; 95% CI 92.9-95.2), after treatment 83.0±1.1 mm Hg (min 70, max 100; 95% CI 81.8-84.1) (p<0.001) (Figure 2).

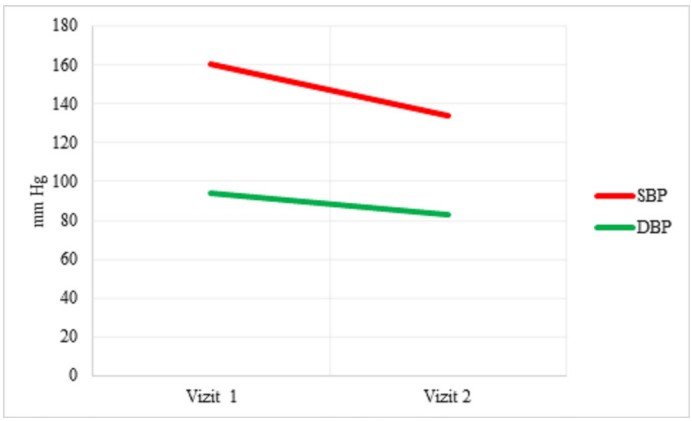

Figure 2. *Changes in average values of SBP and DBP*

Total VA was initially 73.8±2.2 (95% CI 71.66 - 75.97), after treatment 65.5±1.8 (95% CI 63.65 - 67.32) (p<0.001). Initially, the difference between VA and BA was 73.8±2.2 (95% CI 71.66 - 75.97), after treatment 5.6±0.8 (95% CI 4.78 - 6.38). The VA in pts receiving primary prevention was initially 69.4±3.8 (95% CI 65.56 - 73.20), after treatment 61.5±3.1 (95% CI 58.47 - 64.61), thus the difference between VA and BA was initially 11.4±2.0 (95% CI 9.39 - 13.40), after treatment 3.8±1.4 (95% CI 2.48 - 5.22). Initially VA of the pts aged 40-65 was 68.0±1.8 (95% CI 66.59 - 70.28), after treatment 61.0±1.5 (95% CI 59.39 - 62.42). The difference between VA and BA initially was 12.7±1.2 (95% CI 11.48 - 13.98), after treatment 5.4±0.9 (95% CI 4.45 - 6.33). The VA of pts getting primary prevention was initially 64.0±2.7 (95% CI 60.90 - 66.36, after treatment 57.0±2.5 (95% CI 54.92 - 59.85). Initially, the difference between VA and BA was 9.4±1.6 (95% CI 7.78 - 11.02), after treatment 3.3±1.5 (95% CI 1.77 - 4.80) (Table 1, Figure 3, 4).

Table 1. The difference between vascular and biological age

Findings	Visit 1	Visit 2
	Vascular age	
Total	73.8±2.2 (95% CI 71.66 - 75.97)	65.5±1.8 (95% CI 63.65 - 67.32)*
Primary prevention	69.4±3.8 (95% CI 65.56 - 73.20)	61.5±3.1 (95% CI 58.47 - 64.61)*
Age 40-65	68.0±1.8 (95% CI 66.59 - 70.28)	61.0±1.5 (95% CI 59.39 - 62.42)*
Age 40-65, primary prevention	64.0±2.7 (95% CI 60.90 - 66.36)	57.0±2.5 (95% CI 54.92 - 59.85)*
	The Difference between Vascular and Biological age	
Total	13.7±1.2 (95% CI 12.53 - 14.94)	5.6±0.8 (95% CI 4.78 - 6.38)*
Primary prevention	11.4±2.0 (95% CI 9.39 - 13.40)	3.8±1.4 (95% CI 2.48 - 5.22)*
Age 40-65	12.7±1.2 (95% CI 11.48 - 13.98)	5.4±0.9 (95% CI 4.45 - 6.33)*
Age 40-65, primary prevention	9.4±1.6 (95% CI 7.78 - 11.02)	3.3±1.5 (95% CI 1.77 - 4.80)*
*- p<0.001(asymptotic Z test)		

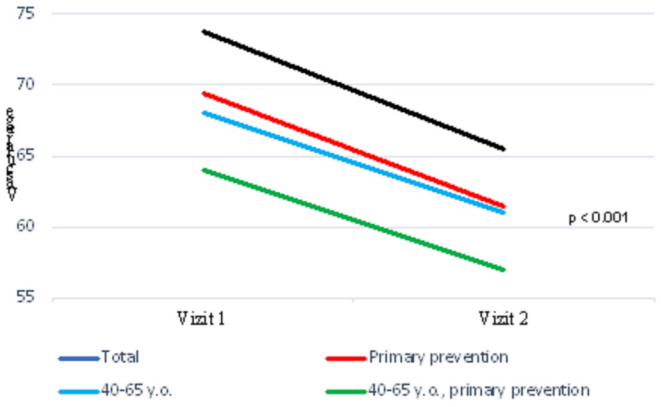

Figure 3. *Changes in average values of Vascular age*

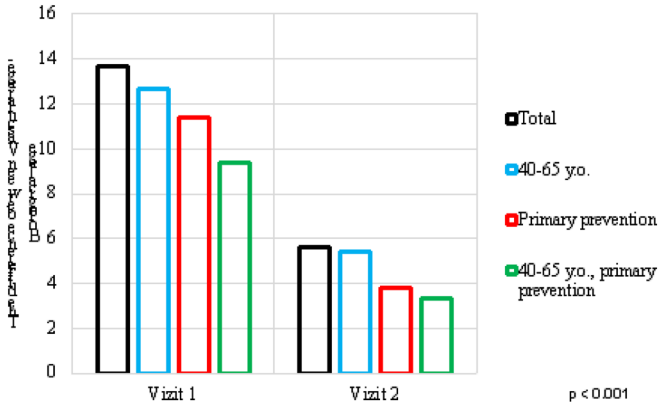

Figure 4. *The Difference between Vascular and Biological age*

DISCUSSION

It is significant that 139 pts (69.5%) initially involved in the study received antihypertensive treatment with Lisinopril, HCTZ, Amlodipine, Ramipril, Enal-april, and Indapamide. 30.5% of them were not given antihypertensive treatment at all. It is important to note that antihypertensive treatment was optimized to 100% in the course of treatment. 34% of the pts started to receive monotherapy with Val 80 and 160 mg and 66% of them were given combined therapy, includ-ing Aml/Val 5/80 mg, 5/160 mg, 10/160 mg, Val/HCTZ 80/12.5 mg, 160/12.5mg, 160/25 mg. The next antihypertensive treatment stage continued in 93% of the pts with repeated optimization of Val and its combina-tions with Aml, HCTZ. There have been increasing recommendations in the ESC Guidelines initial switching to combined treatment of definite pts with BP for quicker achieving and maintaining the target blood pressure recently. The ACE or ARB inhibitors, thiazide diuretics, and calcium channel blockers are included in the first-line drugs to start the antihypertensive treatment (5).

SPC treatment is clear to simplify the therapy and optimize long-term adherence. The combination of Val with Aml or HCTZ provides blood pressure control, re-duces undesirable reactions, as peripheral edema, and prevents hyperkale-mia (8).

Val and its combinations with Aml and HCTZ were administered to the pts newly diagnosed with AH both as main and long-term treatment with other antihypertensive drugs in our study. The results obtained show the initial treat-ment with SPC to have sufficient activity and contribute to the effective reduction of arterial pressure. A significant reduction of SBP and DBP as a result of treat-ment optimization mainly with SPC was observed in our study ($p<0.001$). There was an absolute change in SBP - 26.2 (-28.1, -24.3), relative change -15.9% (-17.0%, -14.9%), absolute change in DBP-10.7 (-12.0, -9.3), relative change 11.0% (-12.4%, -9.7%). The target level of BP was achieved in 64.5% of cases. Only 54.5% of the pts enrolled in the study received hypolipidemic treat-ment mainly with Atorvastatin and Rosuvastatin, but 45.5.% of them did not re-ceive hypolipidemic treatment. It should be noted that during the study treatment of hypolipidemia was optimized from Rosuvastatin 10mg, 20mg, 40 mg to 83.5.%. At the next stage, the hypolipidemic treatment continued with repeated optimization of other doses of Rosuvastatin in 65% of cases.

Absolute change of TC was -0.75 (-0.87, -0.64), relative change -11.9% (-13.8%, -9.8%), absolute change of LDL-C as a result of the treatment was 10, 20 and 40 mg (-0.82,-0.59) doses of rosuvastatin, relative change -16.9% (19.8%, -14.0%), absolute change of TG -0.38 (-0.52, -0.23), relative change -3.7% (-13.8%, 6.5%), absolute change of HDL-C 0.12 (0.09, 0.16), relative change -15.7% (11.4%, 20.1%). So, the dynamics of all lipid components was positive and the target level of LDL-C was achieved in 69 cases.

According to Mikhin V.P. just after 12 weeks of treatment with Rosuvastatin 10 mg, the TC level in the blood increased from 6.3±0.3mmol/L to 3.6±0.1 mmol/L, but the level of LDL-C from 4.2±0.2 mmol/L to 1.8±0.1 mmol/L, the level of TG from 2.2±0.1 mmol/L 1.7±0.1 mmol/L, but the level of HDL–C increased from 1.02±0.03 mmol/L to 1.12±0.04 mmol/L ($p<0.05$) (9).

Soureti A. compared the perception of risk by the participants and their readiness to change their lifestyle connected with CVD, the traditional format of the-10-year–risk percentage of CVD or VA in the same way. Vascular risk had a great emotional impact on people with high stroke risk and consequently, contributed to a healthy lifestyle (10).

We calculated the VA of the pts aged 40-65 receiving general primary prevention and those aged 40-65 having primary prevention in the current study. VA is an obvious measurement to be easily calculated and it defines the clinical course of the disease for the patient. Consequently, the effectiveness of antihypertensive and hypolipemic treatment can be easily assessed by this measurement. VA was determined among different categories of the participants in the study. As expected, the highest VA was observed in the subgroup of the general VA of all participants, but the lowest was in the pts aged 40-65 in the subgroup receiving primary prevention. The difference

between VA and BA lowest values was registered in the subgroup receiving primary prevention, i.e. VA in those having no CV complications and aged ≤ 65 is closer to the BA, but negative effects of risk factors, CV complications, and VA growth with the age are equivalent to increase of CV risk. The severity of the patient's condition and the effectiveness of the therapy on this measurement can be observed before initiation of treatment.

CONCLUSION

- As a result of the optimization of treatment with Valsartan and its combinations, as Amlodipine, HCTZ the relative change in SBP was -15.9%, in DBP - 11.0%. Thus, there was a significant reduction both in SBP and in DBP ($p<0.001$).
- The relative change in TC was –11.9%, LDL-C –16.9%, triglycerides–3.7%, HDL-C – 15.7%. So, there was a significant reduction in the dynamics of all lipid components ($p<0.001$).
- As a result of optimal antihypertensive and hypolipidemic treatment, the difference between Vascular and Biological age among pts with AH in registered encounters different medical institutions of Baku was almost decreased by 2.5 times ($p<0.001$).

Conflict of Interests: The author declares that there are no conflict of interests.

Financial Disclosure: There are no financial supports.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Study Association: This study is not associated with any thesis or dissertation work.

REFERENCES

1. World Health Organization. Cardiovascular diseases (CVDs) Fact sheet. http://www.who.int/mediacentre/factsheets/fs317/en/ accessed date 20 Nov 2017
2. Piepoli MF, Hoes AW, Agewall S, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J. 2016;37:2315–81.
3. Ochilova DA, Rakhmonkulova NG, Sobirov Sh.H. Features of the Course of Hypertension Disease in People with Dyslipidemia. Am J Med Med Sci. 2020;10:77-80.
4. Timmis A, Townsend N, Gale C, et al. The ESC Atlas of Cardiology is a compendium of cardiovascular statistics compiled by the European Heart Agency, a department of the European Society of Cardiology. Eur Heart J. 2020;41:12-85.
5. Williams B, Mancia G, Spiering W, et al. ESC Scientific Document Group. 2018 ESC/ESH guidelines for the management of arterial hypertension. Eur Heart J. 2018;39:3021–104.
6. Abraham HM, White CM, White WB. The comparative efficacy and safety of the angiotensin receptor blockers in the management of hypertension and other cardiovascular diseases. Drug Saf. 2015;38:33-54.
7. Egan B, Li J, Qanungo S, Wolfman T. Blood pressure and cholesterol control in hypertensive hypercholesterolemic patients national health and nutrition examination surveys 1988–2010. Circulation. 2013;128:29-41.
8. Destro M, Cagnoni F, D'Ospina A. Role of valsartan, amlodipine and hydrochlorothiazide fixed combination in blood pressure control: an update. Vascular Health and Risk Management. 2010;6:253–260.
9. Mikhin VP, Nebieridze DV, Akhmedzhanov NM, Zhilyaeva YuA. Effectiveness of rosuvastatin in very high risk cardiovascular patients in the actual outpatient practice.2015;14:18–28.
10. Soureti A, Hurling R, Murray P, et al. Evaluation of a cardiovascular disease risk assessment tool for the promotion of healthier lifestyles. Eur J Cardiovasc Prev Rehabil. 2010;17:519–23.