

The Dynamics of Central Aortic Pressure Indicators in Hypertensive Patients with Hypothyroidism after One Year of Therapy with Different Fixed Combinations of Antihypertensive Drugs

Vira Y Tseluyko¹, Iurii I Karachentsev^{1,2} and Daria A Korchagina^{1,2*}

¹Kharkiv Medical Academy of Postgraduate Education, Kharkiv, Ukraine

²State Institution "V. Danilevsky Institute for Endocrine Pathology Problems of the NAMS of Ukraine", Kharkiv, Ukraine

***Corresponding Author:** Daria A Korchagina, Postgraduate Student of the Department of Cardiology and Functional Diagnostics, Kharkiv Medical Academy of Postgraduate Education, Kharkiv, Ukraine.

Received: April 26, 2020; **Published:** May 29, 2020

Abstract

Introduction: The comorbid course of hypertension and hypothyroidism (HT), a recognized risk factor for cardiovascular diseases (CVDs), is characterized by a more severe hypertension and prognosis. Measurement of CAP is required for stratification of CVD risk in hypertensive patients with concurrent HT. At the same time, the possibilities and features of the effect of fixed antihypertensive combinations on the CAP indicators in patients with hypertension and hypothyroidism have not been studied.

Aim of the Study: The aim of our study was to assess the efficacy of various fixed double combinations of antihypertensive drugs and to evaluate their effects on central and peripheral BP in hypertensive patients with concurrent hypothyroidism.

Methods and Results: Patients enrolled in the study (n = 41) were divided into 2 groups using the sealed envelope method. At enrollment, the groups were statistically matched by age, body mass index, duration of hormone replacement therapy (HRT), duration of hypertension, level of office systolic blood pressure, SBP, and DBP. Patients of the first group (n = 21) received a fixed double combination of perindopril with indapamide, patients of the second group (n = 20) received a fixed double combination of perindopril with amlodipine. Based on the obtained regression model, the independent factors associated with the reduction in CAP are BMI, duration of hypertension, TSH level, systolic BP mean in the daytime and diastolic BP mean at night.

Conclusion: Based on the results of both ambulatory blood pressure monitoring and measurement of central aortic pressure, it has been found that the studied fixed combinations of antihypertensive drugs, namely perindopril with indapamide and perindopril with amlodipine, reduce blood pressure ($p < 0.05$) and central aortic pressure ($p < 0.05$) in hypertensive patients with concurrent hypothyroidism. Although the fixed combination of perindopril with indapamide led to a more significant reduction in blood pressure, the combination of perindopril with amlodipine showed a greater reduction in central aortic pressure ($p < 0.05$) in hypertensive patients with concurrent hypothyroidism.

Keywords: Central Aortic Pressure; Ambulatory Blood Pressure Monitoring; Arterial Hypertension; Hypothyroidism; Fixed Antihypertensive Combinations

Introduction

The comorbid course of hypertension and hypothyroidism (HT), a recognized risk factor for cardiovascular diseases (CVDs), is characterized by a more severe hypertension and prognosis [1]. The predictor of CVDs in hypertensive patients with concurrent HT is the level of

central aortic pressure (CAP) [2]. Increased ambulatory blood pressure monitoring (ABPM) indicators are associated with elevated CAP and increased vascular stiffness greater than those of the office blood pressure (BP) [3].

The main goal of the treatment of hypertension should be not only the reduction in office BP, but also control of blood pressure during the day and effective reduction in CAP to improve the prognosis [2,4]. Measurement of CAP is required for stratification of CVD risk in hypertensive patients with concurrent HT [5]. The possibilities and features of the effect of fixed combinations of antihypertensive drugs (AHD) on the CAP indicators and arterial rigidity in individuals with hypertension and HT remain unknown. Analysis of numerous studies of free AHD combinations suggests that the most beneficial dual combinations of AHDs in hypertensive patients may be a combination of an angiotensin-converting enzyme (ACE) inhibitor with a calcium antagonist (Aca) or ACE inhibitor with diuretin (D) [6,7]. At the same time, the possibilities and features of the effect of fixed antihypertensive combinations on the CAP indicators in patients with hypertension and hypothyroidism have not been studied.

Aim of the Study

The aim of our study was to assess the efficacy of various fixed double combinations of antihypertensive drugs and to evaluate their effects on central and peripheral BP in hypertensive patients with concurrent hypothyroidism.

Materials and Methods

Patients enrolled in the study (n = 41) were divided into 2 groups using the sealed envelope method. At enrollment, the groups were statistically matched by age, body mass index, duration of hormone replacement therapy (HRT), duration of hypertension, level of office systolic blood pressure, SBP and DBP.

Patients of the first group (n = 21) received a fixed double combination of perindopril with indapamide, patients of the second group (n = 20) received a fixed double combination of perindopril with amlodipine. For all patients, initial combination included perindopril at a dose of 5 mg. If the target blood pressure was not achieved within 3 months, the dose of perindopril was increased to the maximum.

The range of examinations, in addition to general clinical and anthropometric methods, included measurements of office BP and ambulatory BP monitoring, which were performed in accordance with the European Guidelines on hypertension [2]. ABPM was performed on the ABPM-04 apparatus (Meditech, Hungary). Data were processed using the software of the apparatus with the analysis of the following measures: average daily values of SBP, DBP and SBP and DBP means in the daytime and at night. CAP was measured on a SphygmoCor apparatus (Australia), the piezoelectric sensor was placed on the radial artery under visual (on-screen) and automatic quality monitoring determined by the device.

Throughout the study, the delta of indicators was evaluated as follows: the difference between the baseline values and those obtained after 12 months of treatment was estimated.

The data obtained were statistically processed using Statistica 13.0 software package. To estimate the significance of the rate difference, the Pearson's test was used.

Results and Discussion

After 12 months, the indicators describing daily profile of SBP (24 SBP, average daily SBP day, average daily SBP night) and DBP (daily average DBP day, daily average DBP night) were significantly lower in both groups versus baseline ($p < 0.05$), indicating the efficacy of both AHT combinations. In hypertensive patients with HT of both groups, improvements were also seen in terms of vascular stiffness (CAP, AIX75) ($p < 0.05$). When comparing the efficacy of AHDs, the analysis of the ABPM indicator dynamics (Δ) in hypertensive patients with hypothyroidism showed that Δ of average daily SBP was higher in patients on the combination of perindopril with indapamide ($p = 0.01$). However, Δ CAP was higher in patients on the fixed combination of perindopril with amlodipine (Table 1).

Indicator	Group 1 Perindopril + indapamide, (n = 21)		Group 2 Perindopril + amlodipine, (n = 20)		P _Δ
		Δ ₁	mmHg	Δ ₂	
24 SBP, mmHg	142.6 ± 6.80 135.8 ± 4.56*	9.77 ± 2.24	145.37 ± 6.71 137.45 ± 4.45*	7.92 ± 2.26	p = 0.01
24 DBP, mmHg	83.00 ± 4.78 80.44 ± 4.11*	2.56 ± 0.67	85.22 ± 5.30 82.11 ± 5.13*	3.11 ± 0.17	p = 0.01
Average daily SBP day, mmHg	145.05 ± 6.81 139.30 ± 4.50*	5.75 ± 2.31	147.26 ± 5.871 41.34 ± 4.19*	5.92 ± 1.68	p = 0.75
Average daily DBP day, mmHg	89.80 ± 5.52 86.30 ± 5.12*	3.5 ± 0.4	91.06 ± 4.41 86.96 ± 4.30*	4.1 ± 0.11	p < 0.05
Average daily SBP night, mmHg	135.86 ± 5.63 128.02 ± 4.89*	7.84 ± 0.74	137.16 ± 7.551 29.69 ± 6.14*	7.47 ± 1.41	p = 0.296
Average daily DBP night, mmHg	83.49 ± 3.90 80.52 ± 3.84*	2.97 ± 0.06	84.51 ± 4.22 81.05 ± 3.52*	3.46 ± 0.7	p < 0.05
s24HR, bpm	67.96 ± 8.81 65.49 ± 6.14	2.47 ± 2.67	64.64 ± 5.52 63.49 ± 4.49	1.15 ± 1.03	p = 0.61
CAP, mmHg	134.29 ± 6.05 126.76 ± 6.03*	7.53 ± 0.02	139.53 ± 8.86 130.84 ± 7.90*	8.69 ± 0.96	p < 0.05
PPa	34.05 ± 9.24 30.24 ± 5.98	3.81 ± 3.26	39.11 ± 7.22 36.16 ± 7.13	2.95 ± 0.09	p = 0.24
Ap	9.90 ± 2.32 8.29 ± 2.05*	1.61 ± 0.27	11.63 ± 2.43 9.89 ± 2.01*	1.74 ± 0.42	p = 0.24
AIX75, %	33.05 ± 6.67 29.81 ± 5.25#	3.24 ± 1.52	29.16 ± 4.57 26.74 ± 4.34#	2.42 ± 1.23	p = 0.07

Table 1: The dynamics of the ambulatory blood pressure monitoring indicators (Δ), central aortic pressure in hypertensive patients with concurrent hypothyroidism at baseline and after 12 months of treatment.

Notes: 1. * p < 0.05: Significance of the difference in indicators during treatment; #: Significant difference in indicators during treatment; 2. Δ: Difference of the indicator versus baseline.

Given that the level of CAP is a more important factor associated with the development of cardiovascular complications than the ABPM indicators, we conducted a regression analysis in the group of hypertensive patients with HT, who received a fixed combination of perindopril with amlodipine (Table 2). Based on the obtained regression model, the independent factors associated with the reduction in CAP are BMI, duration of hypertension, thyroid-stimulating hormone (TSH) level, systolic BP mean in the daytime and diastolic BP mean at night.

Indicator	Beta	B	p-level
BMI, kg/m ²	-0.52	-0.52	0.01
Duration of hypertension, years	-0.45	-0.41	0.08
TSH, mUI/l	-0.73	-0.19	0.01
Average daily SBP day, mmHg	1.94	2.09	0.004
Average daily DBP night, mm Hg	-1.83	-2.75	0.002

Table 2: Relationship between clinical and historical data, ABPM indicators and Δ CAP in hypertensive patients with hypothyroidism under fixed combination of ACEi + ACa (regression analysis).

To determine the informativeness of the obtained regression model by means of analysis of variance, the significance assessment of the determination coefficient was carried out ($R^2 = 0.977$). F-test was 25.11, $p < 0.0001$.

Based on the previous publications of C Yildiz., *et al.* (2019), TSH level correlated with CAP, however according to E Laugesen., *et al.* (2016), duration of HRT due to HT did not affect arterial stiffness and central hemodynamics [8,9]. Considering this, it can be assumed that adequate therapy with fixed double combination of perindopril and amlodipine in hypertensive patients with HT and HRT-compensated thyroid status will effectively reduce CAP and improve cardiovascular prognosis.

Conclusion

Based on the results of both ambulatory blood pressure monitoring and measurement of central aortic pressure, it has been found that the studied fixed combinations of antihypertensive drugs, namely perindopril with indapamide and perindopril with amlodipine, reduce blood pressure ($p < 0.05$) and central aortic pressure ($p < 0.05$) in hypertensive patients with concurrent hypothyroidism. Although the fixed combination of perindopril with indapamide led to a more significant reduction in blood pressure, the combination of perindopril with amlodipine showed a greater reduction in central aortic pressure ($p < 0.05$) in hypertensive patients with concurrent hypothyroidism.

Bibliography

1. Berta Eszter., *et al.* "Hypertension in thyroid disorders". *Frontiers in Endocrinology* 10 (2019): 482.
2. Williams Bryan., *et al.* "2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH)". *European Heart Journal* 39.33 (2018): 3021-3104.
3. Fouad Doaa A., *et al.* "Comparison between central and ambulatory blood pressure measurements in early detection of end organ damage: a single-center prospective non-randomized controlled trial". *The Egyptian Heart Journal* 71.1 (2019): 14.
4. Zuo Junli., *et al.* "Central aortic pressure improves prediction of cardiovascular events compared to peripheral blood pressure in short-term follow-up of a hypertensive cohort". *Clinical and Experimental Hypertension* 42.1 (2020): 16-23.
5. Andreeva Lyaisan., *et al.* "PS 05-75 Central aortic pressure and arterial stiffness assessment using 24-hour ambulatory monitoring in hypertensive subjects with metabolic syndrome and hypothyroidism". *Journal of Hypertension* 34 (2016): e161-e162.
6. Safar Michel E. "Effect of angiotensin II blockade on central blood pressure and arterial stiffness in subjects with hypertension". *International Journal of Nephrology and Renovascular Disease* 3 (2010): 167-173.

7. Williams Bryan., *et al.* "Differential impact of blood pressure-lowering drugs on central aortic pressure and clinical outcomes: principal results of the Conduit Artery Function Evaluation (CAFE) study". *Circulation* 113.9 (2006): 1213-1225.
8. Yildiz Canan., *et al.* "Arterial stiffness in hyperthyroid patients is deteriorated due to thyroid hormones". *Archives of Endocrinology and Metabolism* 63.3 (2019): 258-264.
9. Laugesen Esben., *et al.* "Arterial stiffness and central hemodynamics in thyroidectomized patients on long-term substitution therapy with levothyroxine". *Thyroid* 26.6 (2016): 779-784.

Volume 7 Issue 6 June 2020

©All rights reserved by Daria A Korchagina., *et al.*