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Optimization of treatment of patients with type 2 diabetes mellitus with diabetic Polyneuropathy and arterial hypertension

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Abstract

The combination of diabetes mellitus and arterial hypertension is an aggravating circumstance which greatly impairs the effectiveness of the treatment of these patients, thus justifying the search for new therapies.

The research objective: optimization of complex treatment of patients with diabetic polyneuropathy and arterial hypertension by incorporating polarizing light into the standard treatment.

87 patients with type 2 diabetes complicated with diabetic polyneuropathy and arterial hypertension were examined. All patients received standard (protocol) antihypertensive therapy. In addition, the patients of the 1st group received standard treatment for diabetic polyneuropathy, whereas those of the 2nd group additionally underwent a course of polarizing light therapy procedures. The oscillometric monitoring method was applied daily to control dynamics of blood pressure indicators.

Patients who received additional light therapy procedures, showed a significant decrease in their daily blood pressure monitoring rates in comparison with those undergoing standard antihypertensive therapy and diabetic polyneuropathy treatment. 84.5% of them also achieved the target blood pressure level versus 61.9% in control group.

Keywords: Diabetes mellitus, arterial hypertension, daily monitoring of blood pressure, polarizing light

Introduction

Diabetes mellitus ranks first among the socially significant diseases of the internal organs [1]. About 80% of type 2 diabetes patients suffer from arterial hypertension (AH) [2-5] which is treated according to certain appropriate protocols [6, 7], still almost 27% of cases fail to achieve the desired antihypertensive effect (target blood pressure level) in patients with diabetes mellitus complicated with diabetic polyneuropathy [7-15].

One of the reasons for the relatively low effectiveness of medication antihypertensive therapy is the activity of the autonomic nervous system. According to literary sources [16], polarizing light normalizes the autonomic nervous system functionality, which helps to better control blood pressure.

The above facts became the basis for this study.

The research objective: to optimize the complex treatment of patients with diabetic polyneuropathy and arterial hypertension by incorporating polarizing light into standard patient care.

Materials and methods of research

87 patients with type 2 diabetes and diabetic polyneuropathy were examined. The age of the examined persons ranged from 45 to 65 years (average age $58,2 \pm 5,6$ years). Duration of diabetes mellitus was 5 to 19 years (average duration $10,9 \pm 3,8$ years), DPN (diabetic polyneuropathy) duration was 1-12 years (average duration $6,2 \pm 2,9$ years). Duration of arterial hypertension was 5 to 17 years (average duration $10,9 \pm 3,9$).

All patients received standard treatment of hypertension according to "Arterial Hypertension" unified clinical protocol of primary and secondary (specialized) medical care (dated May 24, 2012, No. 384) [6], and were divided into 2 groups. 1st group consisted of 42 patients, who received a standard treatment for diabetic polyneuropathy which was prescribed in accordance with the unified clinical protocol for primary and secondary (specialized) medical care (No. 1118 dated December 21, 2012) [17]. 45 patients in 2nd group additionally received 12 treatments with polarizing light. Groups were matched according to age, duration of diabetes,

duration of hypertension and severity of clinical manifestations of hypertension. To obtain reliable results of the dynamics of blood pressure parameters during the day, an ABPM50 (NEACO, London) oscillometric method-based daily blood pressure monitor was used, with the metrics recorded every 15 minutes during the day (06:00 - 22:00) and every 30 minutes at night (22:00 - 06:00). Analysis of the blood pressure data received was carried out with the help of the device software application. DBPM (daily blood pressure monitoring) results were taken into account only after obtaining at least 70% of successful measurements during the day.

Statistical processing of the results of the study was conducted using the Microsoft Office Excel 2007 and "Statistica 10.0" software applications. Normally distributed data is presented in the form of an average (mean) value and standard deviation $M \pm s$, where M is the mean value, m is the

standard deviation. The probability of the difference between the groups in quantitative terms was estimated using Student's t-criterion. The comparison of absolute values was carried out using the Pearson χ^2 criterion. The index difference was considered reliable at $P < 0.05$.

Results and their consideration

Prior to treatment, the patients had complaints of arterial hypertension: headache in 71 (55%) patients, sleep disorders in 62 (48%) of respondents, dizziness in 67 (52%), dyspnoea in 62 (48%), palpitation in 76 (58%), general weakness in 67 (52%), heart pain in 52 (40%) patients. Frequencies of complaints were comparable between groups.

Before the treatment in the patients under investigation, there was an increase in DBPM indices, which differed insignificantly between groups (Table 1).

Table 1: Indicators of DBPM in groups of patients with arterial hypertension before treatment

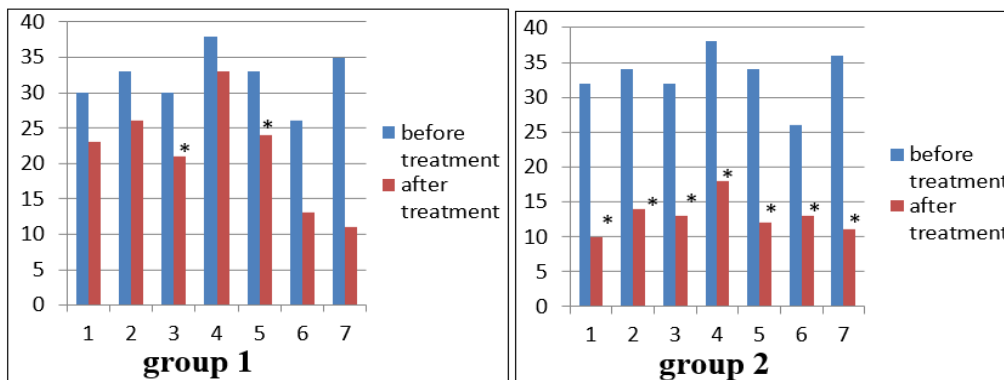
	Group 1 n=42	Group 2 n=45	P
SBP d, mm Hg.	158,8±5,13	157,5±5,61	p>0,05
DBP d, mm Hg.	100±5,54	100,5±4,44	p>0,05
SBP n, mm Hg.	150,6±7,87	151,5±7,85	p>0,05
DBP n, mm Hg.	90,8±6,63	94,4±5,95	p>0,05
CCF, beat/min.	87,7±6,25	89,2±5,62	p>0,05
SBP dnl, mm Hg.	155,2±4,35	157,5±5,1	p>0,05
DBP dnl, mm Hg.	95,5±5,66	97,2±4,32	p>0,05
PBP d, mm Hg.	57,1±1,84	58,7±2,61	p>0,05
PBP n, mm Hg.	57,2±2,39	59,8±2,54	p>0,05
PBP dnl, mm Hg.	57,2±2,36	59,5±2,78	p>0,05
TI SBP%	66,4±10,65	63,42±11,2	p>0,05
TI DBP%	60,89±3,73	61,96±6,28	p>0,05

Notes: 1. DBP - diastolic blood pressure; DBP d - diastolic blood pressure at daytime; DBP n - diastolic blood pressure at night; DI - daily index; TI - time index; PBP - pulse blood pressure; PBP d - pulse blood pressure at daytime; PBP dnl - diurnal pulse blood pressure; PBP n - pulse blood pressure at night; SBP d - systolic blood pressure at daytime; SBP dnl - diurnal systolic blood pressure; SBP n - systolic blood pressure at night; CCF - cardiac contraction frequency (heart rate). 2. $p < 0,05$ index difference reliability before treatment; After the course of standard (protocol) treatment, a significant improvement in the general state of health in patients was observed. At the same time, headache was diagnosed in 38 (29%) patients, sleep disorders in 33 people (25%), dizziness in 40 (31%), dyspnea in 34 (26%), palpitation in 51 (39%), general weakness in 36 (28%), and pain in the heart disturbed

38 (29%) patients.

At the same time, it should be noted that under the influence of standard antihypertensive therapy only 61.9% of patients in this group managed to reach the target levels of SBP and DBP (Table 2).

Hypertension subjective symptoms dynamics analysis in the groups of patients surveyed showed that the standard treatment results are consistent with those of other researchers [18-20] and contribute to a moderate reduction of complaints. Significantly better therapeutic effect was achieved in patients of experimental (2nd group), who additionally to standard treatment received a course of light therapy. The frequency of complaints that are typical for hypertension was significantly reduced among the patients in this group (Fig. 1).



Note: * - $p < 0.05$ index difference reliability before and after treatment in groups; 1- Sleep disorders; 2 – dizziness; 3 – dyspnea; 4 – palpitation; 5 – general weakness; 6 – pain in the heart; 7 – headache

Fig 1: Dynamics of complaints in groups of patients with type 2 diabetes and hypertension under the influence of treatment

It should be noted that there is a significant difference in the frequency of arterial hypertension clinical signs between the group after the standard treatment and the one after the proposed treatment with the inclusion of light therapy.

At the same time, it should be noted that the analysis of the DBPM indices in the examined patients in the 2nd group who received additional light therapy procedures showed a more significant decrease in the mean diurnal SBP (by 24.3% - up to 119.3 ± 7.68 mm Hg), with a decrease in mean daytime SBP by 21.3% ($p < 0.001$) and mean nighttime SBP for 24.4% ($p < 0.001$); DBP - by 29.3% (up to 68.7 ± 6.15 mm Hg) with a decrease in daytime DBP by 27.3% ($p < 0.001$) and nighttime

DBP by 31.8% ($p < 0.001$) (Table 2).

In group 1, SBP decreased by 21.4% ($p < 0.001$), DBP - by 25.4% ($p < 0.001$). The 2nd group of patients showed more significant decrease in mean daytime SBP (by 24.3%, $p < 0.001$) and DBP (by 29.3%, $p < 0.001$).

It is important to emphasize that light therapy procedures combined with antihypertensive therapy caused a corrective effect on the diurnal blood pressure profile, thus significantly lowering the "load pressure" parameters by 70% ($p < 0.001$). It is due to this factor that patients of this group significantly reduced the risk of hypertension complications.

Table 2: Dynamics of daily blood pressure monitoring indicators in the groups of patients under the influence of the proposed treatment programs (M \pm m)

	Group 1, n=42			Group 2, n=45		
	before treatment	after treatment	Δ (%)	before treatment	after treatment	Δ (%)
SBP d, mm Hg.	158,8 \pm 5,13	126,8 \pm 6,35**	20,3	157,5 \pm 5,61	124,3 \pm 7,07**	21,3
DBP d, mm Hg.	100 \pm 5,54	76,2 \pm 5,66**	23,9	100,5 \pm 4,44	73,2 \pm 7,06**	27,3
SBP n, mm Hg.	150,6 \pm 7,87	117,7 \pm 7,48**	21,9	151,5 \pm 7,85	114,7 \pm 8,2**	24,4
DBP n, mm Hg.	90,8 \pm 6,63	66,6 \pm 5,54*	26,9	94,4 \pm 5,95	64,5 \pm 6,52**	31,8
CCF beat/min.	87,7 \pm 6,25	60,7 \pm 3,49*	31,2	89,2 \pm 5,62	62,5 \pm 7,69**	29,9
SBP dnl, mm Hg.	155,2 \pm 4,35	122,2 \pm 6,70**	21,4	157,5 \pm 5,1	119,3 \pm 7,68*	24,3
DBP dnl, mm Hg.	95,5 \pm 5,66	71,3 \pm 6,69*	25,4	97,2 \pm 4,32	68,7 \pm 6,15**	29,3
PBP d, mm Hg.	57,1 \pm 1,84	51,2 \pm 2,13#	10,8	58,7 \pm 2,61	50,7 \pm 2,88 #	13,5
PBP n, mm Hg.	57,2 \pm 2,39	50,1 \pm 2,08#	12,0	59,8 \pm 2,54	51,0 \pm 3,13 #	14,6
BPB dnl, mm Hg.	57,2 \pm 2,36	50,8 \pm 2,24#	11,6	59,5 \pm 2,78	50,8 \pm 2,45 #	14,3
TI SBP, %	66,4 \pm 10,65	19,42 \pm 4,46**	70,7	63,42 \pm 11,2	13,59 \pm 3,49**	82,4
TI DBP, %	60,89 \pm 3,73	17,53 \pm 3,2**	71,3	61,96 \pm 6,28	12,2 \pm 3,85**	82,5

Notes: 1. DBP d - daytime diastolic blood pressure; DBP dnl - diurnal diastolic blood pressure; DAT n - nighttime diastolic blood pressure; DI - diurnal index; TI - time index; PBP - pulse blood pressure; PBP d - daytime pulse blood pressure; PBP dnl - diurnal pulse blood pressure; PBP n - nighttime pulse blood pressure; SBP d - daytime systolic blood pressure; SBP dnl - diurnal systolic blood pressure; SBP n - nighttime systolic blood pressure; CCF - heart rate (cardiac contraction frequency); 2. # - $p < 0,05$; * - $p < 0,01$; ** - $p < 0,001$ - index difference reliability in the process of treatment; 3. Δ - index change percentage compared with the results before treatment.

In general, it was found that inclusion of light therapy in the standard treatment contributed to the achievement of the target blood pressure level in patients in group 2 in 38 (84.5%) persons, whereas only 26 (61.9%) patients in group 1 (without light therapy) achieved target blood pressure levels ($\chi^2 = 5.7$; $p < 0.05$).

Improvement of antihypertensive therapy results in patients of the 2nd group was achieved due to modifying influence of light therapy on the autonomic nervous system [16]. No patient of the studied groups was diagnosed any side effects or complications of the proposed treatment methods.

Conclusions

The use of standard (protocol) antihypertensive therapy in patients with type 2 diabetes mellitus complicated with arterial hypertension can achieve the target blood pressure level only in 61.9% of patients. 2. Additional inclusion of polarizing light therapy in standard treatment of patients with diabetes mellitus with diabetic polyneuropathy and arterial hypertension produced a substantially better clinical effect and made it possible to reach target blood pressure levels in 84.5% of patients.

References

1. Bletskan MM, Fatula MI, Rishko OA, Svishtak VV, Rosul MM. Arterial Hypertension and Its Pathological Links in Patients with Diabetes Mellitus of Second Type. Scientific herald of Uzhgorod University, series Medicine. 2008; 33:79-82.
2. Arterial Hypertension and Adapted Clinical Installation Based On the Proofs of. Nov. Med. and Pharmacy. 2012: 12(422):12-58.
3. Kovalenko VM, Kornatsky VM. Circulatory System Diseases as Medical, Social and Socio-Political Problems, 2014, 278.
4. Kovalenko VM, Svischenko EP. Arterial hypertension in special categories of patients. MORION, 2009, 374.
5. Mankovsky BN. Metabolic Syndrome and Arterial Hypertension: Pathogenesis Dictates Therapeutic Tactics. Health Ukraine. 2006; 23-24:156-157.
6. The direction and clinical protocol for the provision of medical assistance Arterial hypertension. Order of the Ministry of Health of Ukraine No. 384 dated May 24, 2012. - Kyiv, 2012, 107.
7. Clinical guidelines for arterial hypertension of the European Society for Hypertension (ESH) and the European Society of Cardiology (ESC). Yu.M. Sirenko (scientific editor of translation). Arterial hypertension. 2013; 4(30):92-109.
8. Kovalenko VN, Svischenko EP. Arterial Hypertension in Special Categories of Patients Morion, 2009, 374.
9. Adler AI, Stratton IM, Neil HA *et al.* Association of Systolic Blood Pressure with Macrovascular and Microvascular Complications of Type 2 Diabetes (UKPDS36): prospective observational study. BMJ. 2000; 321:412-419.
10. Retnakaran R, Cull CA, Thorne KI, *et al.* UKPDS Study Group. Risk Factors for Renal Dysfunction in Type 2

- Diabetes: UK Prospective Diabetes Study 74. *Diabetes*. 2006; 55:1832-1839.
11. Standards for diabetes care in the American Association of Diabetes. Yu.M. Sirenko (Scientific editor of translation). *Arterial hypertension*. 2015; 4(42):92-110.
 12. Mankovsky BN. Protecting Target Organs with the Help of an Inhibitor and Angioprotective Enzyme in Diabetes Mellitus. *Ukrainian Cardiology Magazine*. 2012; 6:47-49.
 13. Dzyak GV, Khanyukov AA, Pisarevskaya OV, Lyulka YuP. Topical Issues of Antihypertensive Therapy. Rational choice of drugs: ACE inhibitors, diuretics, combined drugs. *Ukrainian Medical Magazine*. 2009; 1:17-25.
 14. Chazova IE. Treatment of Arterial Hypertension: Modern Views. *Therapeutic archive*. 2007; 9:5-8.
 15. Ilyash MG, Bazika OE, Dovganich NV, Yarinkina OA, Headache OS. Arterial Hypertension and Diabetes Mellitus: Modern Aspects of the Treatment. *Practitioner*. 2016; 5(2):5-9.
 16. Degtyareva LV, Slaikovskaya LE. Application of A Polarized Light Instrument in a Cardiology Device. *Journal Medicine and Health*. 2010; 12:56.
 17. Order of the Ministry of Health of Ukraine dated December 21, 2012 №1118 On Approval of Medical-Technological Documents with Standardization of Medical Assistance in Type 2 Diabetes Order of the Ministry of Health of Ukraine. - Retrieved from: http://old.moz.gov.ua/ua/portal / dn_20090805_574.html.
 18. Martynyuk LP, Shved MI, Makarchuk NR, Chernetsky VI. Ways to improve the quality of life of patients with diabetic polyneuropathy. *East European Scientific Journal*. 2018; 1(29):39-43.
 19. Sirenko Yu M. Target Blood Pressure Level in Type 2 Diabetes Patients: An Assessment of Scientific Evidence. *Ukrainian Cardiology Magazine*. 2012; 6:27-32.
 20. Koval SM, Pershina KS, Starchenko TG. Combination therapy of patients with hypertension in combination with type 2 diabetes. *Ukr. therapeutic magazine*. 2013; 1:24-27.