ORIGINAL ARTICLE

THE ROLE OF COMORBIDITY IN THE CLINICAL COURSE AND QUALITY OF LIFE OF PATIENTS WITH DIABETIC POLYNEUROPATHY

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ABSTRACT

The aim: To identify and substantiate the role of comorbidity in the clinical course and quality of life (QOL) of patients with diabetic polyneuropathy (DP).

Materials and methods: We examined 139 patients aged from 19 to 69 years with DP occured as a consequence from type I and II diabetes mellitus (DM). The examined persons were divided into two groups: DP due to type I and II DM with comorbidity (group A,n=93) and without comorbidity (group B,n=46). For the patients was done a comprehensive clinical and neurological examination, laboratory, instrumental methods of examination.

Results: We observe hypo- or areflexia much more in group A respect to reflexes on the upper and lower extremities than in group B, where the changes are more noticeable on the lower extremities. The level of QOL in group A is significantly lower than in group B. According to the McGill scale in group A, all indicators of pain characteristics are higher. Quite a high score in group A on the Pain Rating Index(PRI) – 32.17±1.57points. The lowest rates of the nerve conduction velocity (NCV) on the motor fibers were registered in group A, on the sensitive fibers of the upper extremities has got lower rates in groups A and B than in the control group, but in group A it is slightly higher.

Conclusions: Clinical manifestations of DP in group A are more pronounced than in the comparison group and a wide range of comorbidity was diagnosed, including cardiovascular, which aggravates the manifestations of DP.

KEY WORDS: diabetic polyneuropathy, comorbidity, quality of life, McGill Pain Questionnaire, electroneurography

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INTRODUCTION

Prolonged and poorly controlled diabetes mellitus (DM) leads to damage to all body systems. As a result of damage to the peripheral nerves of the lower extremities diabetic polyneuropathy (DP) is developing – the result of reduced or completely lost function of the somatosensory and autonomic vegetative nervous system [1].

Many large randomized researches have shown that early intensive glycemic control reduces the risk of developing complications of DM. However, there is other data that testifies to the long-term effect of early glycemic control on clinical results of disease, on the basis of which the concept of "hyperglycemic memory" or "metabolic memory" was put forward and proposed [2].

DP is one of the main complications of type I and II DM, significantly increases the risk of the development of ulcerative defects of the feet and amputations, and is associated with higher mortality and increasing costs of the health care system [3,4].

Amputation rates among the population with diagnosed DM are usually 10-20 times higher than among the population without DM, and in recent decades have ranged from 1.5 to 3.5 cases per 1,000 people per year among population diagnosed with DM [5].

More than 50% of patients with DP have got an asymptomatic course [6], the prevalence of DP is about 8% with newly diagnosed DM and more than 50% in patients with long-term of course [7].

Demyelinating and axonal damage to sensory and motor fibers is closely related to the age of patients, the duration of DM, but does not depend on the type of DM and has no gender characteristics. According to electroneurography (ENMG) data, the absolute majority of patients (92.6%) showed signs of DP, more than 1/2 (55.6%) of them had sensorymotor form of DP and 37% had a sensory form of DP [8].

A significant contribution to the progression and deterioration of the clinical course of DP does comorbidity, which often is in people with type II DM. The presence of DM in relatives complicates the course of DP in type I DM. The appearance of «diabetic foot» causes disability among people of working age, «plunges» the patient into depression, deprives him of motivation for further treatment and control of glycemia, as it occurs in the early stages of DP, and sometimes is a peculiar kind of «indicator» for testing of the presence of DM.

In type II DM, the frequency of development of cardiovascular pathology is 3-4 times higher than in patients who do not suffer from it. The risk of cardiovascular mortality in patients with type II DM without coronary heart disease (CHD) is identical to that in individuals who have suffered

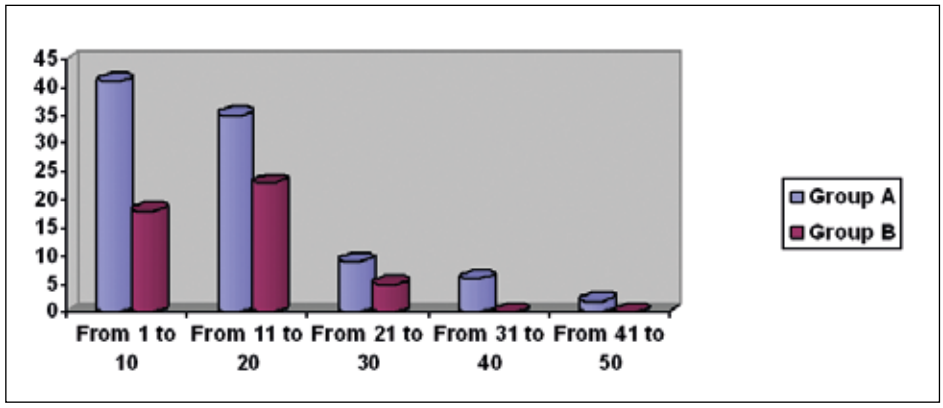

Fig. 1. Time interval of DM in the studied groups

a myocardial infarction but did not have carbohydrate metabolism disorders [9].

Polyneuritic disorders of sensitivity and autonomic-trophic disorders are more common in people with DP on the background of type I and II DM without thyroid pathology, they have a higher frequency of comorbidity and longer duration of DM. The influence of thyroid pathology on the manifestations of DP is reflected in the intensification of neuropathic pain syndrome [10].

The level of quality of life (QOL) in persons with DP on the background of type I and II DM with multimorbidity is generally low. Patients with DP due to type I DM, concomitant cardiovascular pathology (CVP) and gastrointestinal pathology have higher QOL rates than those with DP and type II DM with the same diseases, as they are persons that receive insulin therapy and, respectively, are less vulnerables to complications of DM and have a better course of nosology [11].

Neuroendocrinology in modern clinical practice attracts interest in physicians of various specialities because such patients have some concomitant nosologies. Actual focusing on the peculiar clinical features of DP in comorbidity, identifying specific areas of poor patient function will facilitate rapid diagnosis of DP and active involvement of psychotherapists who will help the family and the patient to modify the perception of the disease and to take care of their own health.

THE AIM

The aim of the research is to identify and substantiate the role of comorbidity in the clinical course and QOL of patients with DP.

MATERIALS AND METHODS

We examined 139 patients (67 women (48%), 72 men (52%) aged from 19 to 69 years with DP occured as a consequence from type I DM - 74 (53%) and type II - 65 (47%). The average age of patients is 48.87 ± 1.28 years. The examined persons were divided into two groups: DP due to type I and II DM with comorbidity (group A, n = 93) and DP due to type I and II DM without comorbidity (group B, n = 46).

For the patients was done a comprehensive clinical and neurological examination, laboratory (general analysis of blood, urine, biochemical analysis of blood, glycated hemoglobin - HbA1c), instrumental methods of examination (stimulation ENMG, performed by a computer multifunctional complex «Neuro-MVP-4»). QOL was determined using a non-specific questionnaire «SF-36 Health Status Survey» (The Short Form). The intensity of the pain syndrome was assessed by the Visual Analog Scale (VAS). The characteristics of pain were studied using the McGill Pain Questionnaire (MPQ), which demonstrates the quantitative component of the pain syndrome. Static data processing was done in Microsoft Office Excel 2003.

RESULTS

In group A, the average age of the examined persons was 53.47 ± 1.25 years, in group B – 39.56 ± 2.43 years. Women predominate in group A 48 (52%), men in group B – 27 (59%). Type I DM in group A was diagnosed in 38 (41%), in group B in 36 (78%), type II in group A – in 55 (59%), in group B – 10 (22%). According to the duration of DM (Fig. 1) in group A more patients have got DM for up to 10 years (41%), in group B from 11 to 20 years (23%). The average duration of DM in group A – 14.47 ± 1.04 years, in group B – 12.73 ± 0.97 years.

The average rate HbA1c in group A was 9.07 ± 0.18%, in group B – 9.06 ± 0.27%.

Trophic disorders were detected in both groups, in particular in group A was dominated hyperkeratosis – 51 (55%), changes of the nail plate – 49 (53%), foot fissure – 48 (52%), in group B – changes of the nail plate – 20 (43%), hyperkeratosis – 19 (41%), hypohidrosis – 19 (41%). White dermographism predominates in patients of groups A and B, which indicates the dominance of the sympathetic division of the vegetative nervous system with spasm of the arterial system on the periphery and disorder of blood flow. The prevalence of vegetative disorders indicates the presence of primarily neuropathy of small nervous fibers in DM.

Changes in the reflex system are given in Table I. We observe hypo- or areflexia much more in group A respect to reflexes on the upper and lower extremities than in group B, where the changes are more noticeable on the lower extremities. Movement disorders in the form of mild

peripheral paresis of the hands and feet were found in 2 (2%) patients of group A and 1 (2%) of group B. Significant damage to the distal extremities is due to the involvement in the process first of the longest distal axons (Yakhno NN, Shtulman DR, 2001). In fact, the comorbidity (group A) enhances the course of DP with the formation of a clear clinical picture.

Polyneuritic sensitivity disorders were detected in 85 (91%) persons of group A and 40 (87%) of group B with a predominance of hypoesthesia. The decrease in vibration sensitivity in group A on the upper extremities is 11.07 ± 0.40 s, on the lower extremities – 6.84 ± 0.29 s, in group B on the upper extremities – 13.15 ± 0.52 s, on the lower extremities - 7.69 ± 0.36 s.

"Diabetic foot" in group A was verified in 13 (14%) patients, of which 7 had amputations of the phalanges of the fingers. In group B in 1 (2%) patients had such a terrible complication of DM.

DP, as a variant of axonopathy leads to the inevitable permanent damage to peripheral nervous fibers, and in combination with comorbidity has a devastating effect on the vascular network of the body as a whole, in particular the lower extremities, which is reflected in a significant number of diagnosed cases of "diabetic foot" in group A.

For a clinical example, we observed a patient V., 78 years old, with type II DM (sick since 2010), who in 2019 sought medical care with complaints of headache, dizziness, difficulty reading, memory impairment, pain in the left leg from the level of the knee and down. It is known that in 2010 the patient suffered an ischemic stroke in the left middle cerebral artery and in 2017 an ischemic stroke in the vertebrobasilar basin. Manifestations of DP previously in the patient were not observed. In addition, he has got hypertension of the III grade and gastritis. Medically take aspirin 75 mg at night, metformin 500 mg twice, enalaprilum 10 mg in the morning. Examination of the neurological status revealed the following changes: easily smoothed nasolabial fold on the right. Dyslexia. Proboscis reflex (+). Muscle strength in the right extremities is 4 points. Tendom and periosteal reflexes from the upper extremities: d>s, medium liveliness; from the lower extremities: knee d>s, medium liveliness, Achilles d=s, torpid, plantar are not caused. Superficial sense is normal. Vibration sensation on the arms 16-17 s, on the legs – knee level 6-7 s, foot – 3-4 s. In the area of the plantar surface of the first toe of the left foot there is a rounded wound formation (the patient did not notice it), the skin of the left foot is slightly hot to the touch.

Clinical diagnosis: Dyscirculatory encephalopathy of the II gr. (ischemic stroke in the left middle cerebral artery in 2010 and in the vertebrobasilar basin 24.03.2017) with the presence of dyslexia, mild right-sided hemiparesis, right-sided cerebellar insufficiency, moderate vestibulo-atactic syndrome. Diabetic polyneuropathy with lesions of the lower extremities, mixed form, as the vibration sensitivity reduction, trophic defect of the left foot.

The level of HbA1c is 7.12%, fasting blood glucose is 9.22 mmol/l. Duplex scanning of the arteries of the lower extremities was performed (13.02.19): multiple atherosclerotic plaques of heterogeneous structure, radiography of the first toe of the left foot (15.02.19): deforming osteoarthritis of the first metatarsophalangeal joint, obsolete fracture of the nail phalanx I toe of the left foot was not excluded. The patient was consulted by a surgeon (15.02.19): type II DM. Diabetic angiopathy of the lower extremities. Trophic ulcer

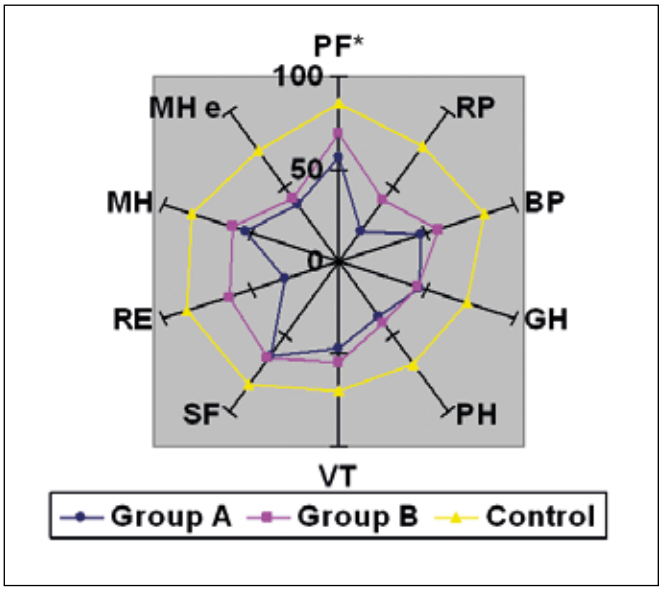

Fig. 2. Level of QOL on the SF-36 scale in groups (average data)
Note. PF* – Physical Functioning, RP – Role-Physical Functioning, BP – Bodily pain, GH – General Health, PH – Physical Health, VT – Vitality, SF – Social Functioning, RE – Role-Emotional, MH – Mental Health, MHe – Mental Health component.

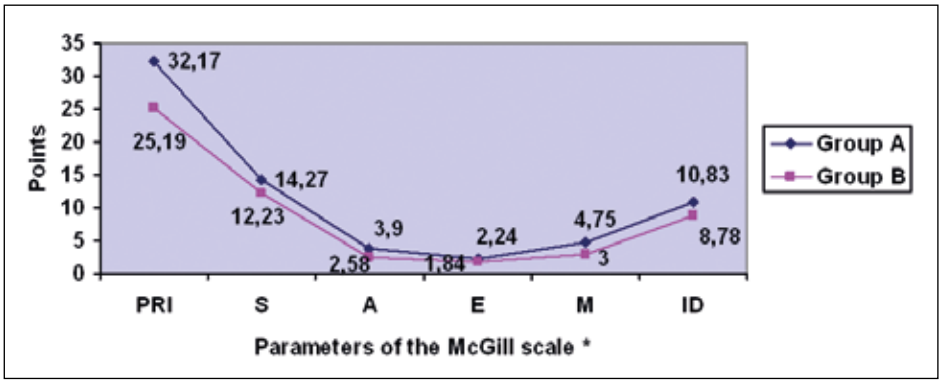

Fig. 3. Quantitative characteristics of pain on the McGill scale
* Note: affective (A), evaluative (E), miscellaneous (M) subscale.

Table I. Evaluation of the reflex sphere in the examined groups

Name of reflexes		Group A n=93	Group B n=46
Carpo radial	areflexia	25 (27%)	2 (4%)
	hyporeflexia	19 (20%)	11(24%)
Biceps	areflexia	15 (16%)	1 (2%)
	hyporeflexia	23 (25%)	6 (13%)
Triceps	areflexia	3 (3%)	0 (0%)
	hyporeflexia	18 (19%)	3 (7%)
Knee	areflexia	9 (10%)	2 (4%)
	hyporeflexia	59 (63%)	20 (43%)
Achilles	areflexia	43 (46%)	8 (17%)
	hyporeflexia	40 (43%)	25 (54%)
Plantar	areflexia	49 (53%)	19 (41%)
	hyporeflexia	35 (38%)	16 (35%)

Table II. Deviations on the ECG in both groups

Changes on the ECG	Group A n=93	Group B n=46
Lengthening of the QT interval	2 (2%)	0 (0%)
Shortening of the PQ interval	0 (0%)	3 (7%)
Blockade of the legs of the His bundle	19 (20%)	9 (20%)
Early repolarization syndrome	7 (8%)	4 (9%)
Sinus bradycardia	4 (4%)	2 (4%)
Sinus tachycardia	14 (15%)	4 (9%)
Myocardial scarring	5 (5%)	0 (0%)

of the first toe of the left foot. Recommended antibiotic therapy (after preliminary-sowing of the content of the wound on the sensitivity were allocated St. haemolyticus of the IV gr. and Ent.faecalis of the II gr.) with Clindamycin 150 mg 2 tab. twice a day for 7-10 days.

Thus, the onset of DP occurred in a patient with manifestations of "diabetic foot" without a previous history of the existence of DP, but with the presence of cardiovascular comorbidity, which is complicated by ischemic stroke. It is nessesary that patients with DM examine their feet and toes daily for the identification of trophic defects and seeking medical care to prevent secondary infection and limb amputations, which ultimately causes a material burden on the patient.

The examined persons of group A have got more disorders detected during electrocardiography (ECG) (Tab. II), in particular the blockade of the legs of the His bundle and sinus tachycardia, in addition, 5% of patients suffered a myocardial infarction. In our opinion, this is due to damage to the autonomic nervous system (parasympathetic division), as tachycardia is often the first manifestation of autonomic cardioneuropathy.

The level of functioning according to the scale QOL SF-36 (Fig. 2) in patients of groups A and B is low compared with the rates of healthy individuals (control). The level of QOL in group A is significantly lower than in group B, especially in the domain "Role-Physical Functioning (RP)" – 20.55 ± 3.53 points, "Role-Emotional (RE)" – 30.35 ± 4.0 points, "Physical Health (PH)" – 36.92 ± 0.91 points, "Mental Health component (MHe)" – 37.75 ± 0.98 points. QOL in group A in the domains "Physical Functioning (PF)" – 56.83 ± 2.57 points, "Social Functioning (SF)" – 63.19 ± 2.12 points and "Mental Health (MH)" – 52.71 ± 1.58 points, higher than other indicators.

In group B, the lowest rates of QOL in the domain "Physical health (PH)" 40.8 ± 1.31 points, "Role-Physical Functioning (RP)" 41.27±6.42 points, "General Health (GH)" – 45.39 ± 2.45 points," "Mental Health component (MHe)" 43.03 ± 1.33 points.

The intensity of pain in the studied groups on VAS was: 4.09 ± 0.18 points in group A and 3.30 ± 0.29 points in group B, which corresponds to the indicator "moderate pain".

According to the McGill scale (Fig.3) in group A, all indicators of pain characteristics are higher. Quite a high score in group A on the Pain Rating Index (PRI) - 32.17 ± 1.57 points. The variety of pain sensations (pulsating, cutting, expanding, etc.) was widely demonstrated in group A of Sensory Pain Rating (S) – 14.27 points, the Index of the number of selected descriptors (ID) in group A is – 10.83 ± 0.47.

Table III. ENMG rates in the examined (motor fibers)

ENMG rates on the motor fibers of the peripheral nerves		Healthy persons n=30	Group A n=93	Group B n=46
Abductor pollicis brevis, Medianus on the left	Amplitude of the M-response in the wrist area, mV	11,21±0,43	8,32±0,32	8,98±0,65
	Amplitude of the M-response of the elbow flexion, mV	10,22±0,50	6,49±0,36	7,04±0,70
	Residual latency, m/s	1,56±0,06	2,49±0,12	2,46±0,19
	NCV average according to the F-wave, m/s	59,91±1,02	53,62±0,64	53,92±1,14
	NCV, m/s	54,6±0,48	45,22±0,85	45,01±0,94
Abductor pollicis brevis, Medianus on the right	Amplitude of the M-response in the wrist area, mV	12,53±0,58	8,78±0,34	9,2±0,50
	Amplitude of the M-response of the elbow flexion, mV	10,11±0,70	6,35±0,37	7,47±0,56
	Residual latency, m/s	1,62±0,07	2,60±0,12	2,54±0,18
	NCV average according to the F-wave, m/s	58,46±1,09	50,50±1,14	50,76±0,97
	NCV, m/s	54,76±0,76	45,97±0,79	46,98±0,85
Abductor digiti minimi, Ulnaris on the left	Amplitude of the M-response in the wrist area, mV	10,40±0,22	8,38±0,35	8,65±0,43
	Amplitude of the M-response of the elbow flexion, mV	9,05±0,52	6,30±0,33	6,03±0,48
	Residual latency, m/s	1,22±0,06	3,41±0,98	1,53±0,13
	NCV average according to the F-wave, m/s	55,77±1,08	49,46±0,77	47,84±0,86
	NCV, m/s	58,50±0,83	49,0±0,96	48,06±1,02
Abductor digiti minimi, Ulnaris on the right	Amplitude of the M-response in the wrist area, mV	10,60±0,23	8,29±0,29	8,90±0,34
	Amplitude of the M-response of the elbow flexion, mV	9,38±0,38	6,84±0,34	7,24±0,38
	Residual latency, m/s	1,19±0,07	1,43±0,05	1,41±0,10
	NCV average according to the F-wave, m/s	55,31±0,99	50,40±0,75	47,85±0,68
	NCV, m/s	60,45±0,76	47,95±0,88	50,2±0,72
Abductor hallucis, Tibialis, on the left	Amplitude of the M-response in the medial bone area, mV	14,14±0,61	5,92±0,51	8,17±0,82
	Amplitude of the M-response in the fossa poplitea, mV	8,3±0,67	3,26±0,35	4,8±0,57
	Residual latency, m/s	1,87±0,11	2,32±0,10	2,24±0,11
	NCV average according to the F-wave, m/s	44,80±0,75	38,38±0,87	37,81±0,79
	NCV, m/s	47,68±1,00	38,98±0,57	40,36±0,89
Abductor hallucis, Tibialis, on the right	Amplitude of the M-response in the medial bone area, mV	14,01±0,66	6,05±0,55	8,57±0,94
	Amplitude of the M-response in the fossa poplitea, mV	7,40±0,80	3,17±0,33	5,47±0,64
	Residual latency, m/s	1,9±0,1	2,61±0,11	2,51±0,16
	NCV average according to the F-wave, m/s	45,34±1,03	38,29±0,61	37,98±1,07
	NCV, m/s	55,47±0,90	42,87±4,12	50,45±10,57

Extensor digitorum brevis, Peroneus, on the left	Amplitude of the M-response in the area of the metatarsus, mV	6,19±0,25	3,17±0,25	4,32±0,41
	Amplitude of the M-response in the area of the tibial plateau, mV	5,27±0,30	2,65±0,23	3,50±0,35
	Residual latency, m/s	1,90±0,11	2,65±0,23	2,44±0,16
	NCV, m/s	48,21±0,85	38,85±0,70	40,19±0,95
Extensor digitorum brevis, Peroneus, on the right	Amplitude of the M-response in the area of the metatarsus, mV	6,44±0,31	3,50±0,30	4,21±0,49
	Amplitude of the M-response in the area of the tibial plateau, mV	5,68±0,34	2,92±0,26	3,79±0,49
	Residual latency, m/s	1,9±0,1	2,82±0,13	2,57±0,20
	NCV, m/s	46,75±0,66	38,81±0,62	39,87±0,98

Table IV. ENMG rates in the examined (sensitive fibers)

ENMG rates on the sensitive fibers of the peripheral nerves		Healthy persons n=30	Group A n=93	Group B n=46
Peroneus superficialis on the left	Amplitude of the M-response in the middle third of the tibia, mV	4,14±0,42	2,68±0,36	2,65±0,61
	NCV, m/s	55,18±1,08	36,56±0,83	38,48±1,06
Peroneus superficialis on the right	Amplitude of the M-response in the middle third of the tibia, mV	4,62±0,62	2,31±0,24	1,84±0,27
	NCV, m/s	87,99±23,82	36,32±0,77	37,97±1,10
n.Suralis on the left	Amplitude of the M-response in the middle third of the tibia, mV	4,56±0,44	4,14±0,38	3,87±0,59
	NCV, m/s	52,06±0,66	37,31±0,60	39,13±0,75
n.Suralis on the right	Amplitude of the M-response in the middle third of the tibia, mV	6,61±0,65	3,92±0,40	3,97±0,52
	NCV, m/s	53,68±1,02	38,23±0,59	37,53±1,02
n. Medianus on the left	Amplitude of the M-response in the wrist area, mV	35,1±4,55	7,98±0,93	9,31±1,79
	NCV, m/s	58,60±0,86	42,57±0,63	41,73±1,19
n. Medianus on the right	Amplitude of the M-response in the wrist area, mV	32,84±5,18	6,77±0,61	7,08±0,91
	NCV, m/s	57,50±1,27	42,01±0,78	40,74±1,77
n. Ulnaris V dig. on the left	Amplitude of the M-response in the wrist area, mV	23,91±3,66	8,95±1,42	4,81±0,66
	NCV, m/s	57,45±0,62	42,03±0,70	40,17±1,35
n. Ulnaris V dig. on the right	Amplitude of the M-response in the wrist area, mV	21,66±3,06	7,15±0,78	6,13±0,80
	NCV, m/s	60,72±1,10	40,48±1,16	39,95±1,25

In group A there were different types of comorbidity in various combinations, in particular quite often and widely represented diseases of the cardiovascular system (hypertension 67(72%), CHD 29(31%), cardiosclerosis 11(12%), atrial fibrillation 4(4%), angina pectoris 4(4%), myocardial infarction in history 2(2%), patent foramen ovale 1(1%), varicose veins of the lower extremities 8(8%), suffered acute vascular thrombosis 1(1%), gastroenterological system (chronic cholecystitis 6(6%), gallstone disease 5(5%), chronic pancreatitis 5(5%), gastroduodenitis 5(5%), hepatitis 5(5%), gastritis 2(2%), biliary dyskinesia 1(1%), steatohepatosis 1(1%), duodenal ulcer 1(1%) and thyroid lesions (multinodular goiter 13(14%), hypothyroidism 6(6%), postoperative hypothyroidism 4(4%), autoimmune thyroiditis 4(4%), thyrotoxicosis 2(2%).

Diseases of the urinary system (urolithiasis 6(6%), chronic pyelonephritis 6(6%), respiratory (bronchial asthma 1(1%) were diagnosed with a lower frequency.

The presence of cardiovascular pathology in group A, in particular hypertension and CHD, explains the low QOL and reduced tolerance to pain, which is clinically demonstrated by changes in the McGill scale.

Diagnosed a large number of cases of «diabetic foot» indicates a combined vascular and neural lesion of the

lower extremities. According to ECG in 5 (5%) of examined group A were revealed scarring miocardial changes, in the anamnesis in 2 (2%) people - clinically suffered miocardial infarction, which allows us assume the presence of «mute» myocardial ischemia in the remaining 3 (3%) patients with DM.

Disorders of lipid metabolism in the form of obesity in group A were recorded in 13(14%) patients, in group B – in 2(4%).

ENMG rates show a significant decrease in all parameters in the examined groups, compared with the control group (almost healthy individuals). The lowest rates of the nerve conduction velocity (NCV) on the motor fibers (Tab. III) were registered in group A on Abductor pollicis brevis, Medianus on the right – 45.97 ± 0.79 m/s, for comparison in group B – 46.98 ± 0.85 m/s, according to Abductor digiti minimi, Ulnaris on the right in group A – 47.95 ± 0.88 m/s, Abductor hallucis, Tibialis, on the left 38.98 ± 0.57 m/s, on the right – 42.87 ± 4.12 m/s, Extensor digitorum brevis, Peroneus, on the left – 38.85 ± 0.70 m/s, on the right – 38.81 ± 0.62 m/s.

The amplitude of the M-response in the area of the medial bone on Abductor hallucis, Tibialis on the left in group A is very low – 5.92 ± 0.51 mV, on Abductor hallucis, Tibialis on the right – 6.05 ± 0.55 mV, the amplitude of the M-response in the fossa poplitea - 3.17 ± 0.33 mV.

Residual latency (RL) is quite prolonged on Abductor digiti minimi, Ulnaris on the left 3.41 ± 0.98 ms in group A.

Evaluation of ENMG characteristics of sensitive fibers (Tab. IV) of the lower extremities shows significantly lower rates of NCV in group A, in particular on Peroneus superficialis on the left 36.56 ± 0.83 m/s, on the right – 36.32 ± 0.77 m/s, n.Suralis on the left – 37.31 ± 0.60 m/s. The NCV of the sensitive fibers of the upper extremities has got lower rates in groups A and B than in the control group, but in group A it is slightly higher.

DISCUSSION

A number of clinical forms of peripheral nervous system lesions in DM have been described, ranging from cranial mononeuropathies, polyneuropathy, ending with lumbosacral radiculoplexopathies (so-called diabetic amyotrophy). We should not forget about the involvement in the pathological process of various parts of the vegetative nervous system, which threatens the appearance of vegetative neuropathy.

There are differences in the types of nervous fiber damage in DP (Takahashi O., 2020) actually, in mononeuropathy demyelination is observed, while in cases of DP there is a tendency to combine demyelination and axon damage.

The presence of DP sometimes leads to the appearance of «diabetic foot». Martínez Delgado M.M. (2018) described a clinical case of a 61-year-old patient diagnosed with type II DM who was diagnosed fourteen years ago [12]. The clinical case indicates that in the patient was developed DP quite quickly and, despite relatively compensated DM (HbA1c data), trophic disorders of the lower extremities were developed, which are closely related to vegetative disorders of DP.

An urgent problem of modern medicine is comorbidity. According to a study by Fahad A.S.Aleidan et al. (2020), hypertension was common in patients with DP ($p = 0.005$), as well as peripheral vascular disease ($p<0.001$), cerebrovascular accidents ($p = 0.027$), chronic kidney disease ($p<0.001$) and dyslipidemia ($p = 0.002$).

There is evidence of a negative effect of hypertension on the appearance of signs of «diabetic foot», especially due to the effect on the stiffness of the arterial walls (Magalhães et al, 2011). Sharp fluctuations in blood pressure may lead to the need for amputation (Gardner and Afaq, 2008; Lambert and Belch, 2013). Thus, in our study, this is confirmed by the appearance of «diabetic foot» in 13 (14%) people in group A.

In the journal Neurology (2015) E. Matthew Hoffman, Nathan P. Staff, in their study indicate that DP is an independent factor in a variety of functional disorders, namely: difficulty walking, tendency to fall, amputation of the lower extremities.

DP without (21.16 [21.31 - 21.01]) and with existing neuropathic pain (NP) (20.85 [21.04 - 20.67]) is independently associated with low QOL and higher indicators of depression levels (DP without: 4.18 [3.53-4.84] and with NP: 3.35 [2.51-4.18]), unsatisfactory sleep (DP without: 4.65 [4.04-5.27] and with NP: 2.22 [1.44-3.00]) and anxiety (DP without: 3.97 [3.31-4.64] and with NP: 2.73 [1.89- 3,58]) after monitoring the age, sex, duration of DM [13].

ENMG reflects the primary damage with a greater extent of motor and sensory fibers of the lower extremities, especially in group A. In group B of the NCV is within the norm for Abductor digiti minimi, Ulnaris on the right is 50.2 ± 0.72 m/s and Abductor hallucis, Tibialis on the right is 50.45 ± 10.57 m/s.

Data from current studies (2019) indicate satisfactory motor function of the median and ulnar nerves in 18.6% of patients with DP, tibial in 2.33% and peroneus nerves in 2.33% of patients [14].

CONCLUSIONS

Clinical manifestations of DP in group A are more pronounced than in the comparison group, because the average age of the examined persons is higher, dominated by type II DM and a longer course of DM. With a higher frequency in group A, scarring miocardial changes were detected as a consequence of a heart attack, and a wide range of comorbidity was diagnosed, including cardiovascular, which aggravates the manifestations of DP.

In general, the rates «Physical Health (PH)» and «Mental Health component (MHe)» in patients of group A are low (36.92 ± 0.91 points and 37.75 ± 0.98 points), combined with high results on the parameters of the McGill scale in this sample.

ENMG data indicate impaired conduction along motor and sensory fibers to a large extent in the lower extremities in both groups, but with an advantage in group A, where

there is a significant number of patients (14%) with «diabetic foot».

DP – the «cornerstone» of further vascular and ischemic disorders, increased pain, increased incidence of disability and catastrophically low QOL in all areas of functioning. This is a problem not only for neurologists, but also for doctors of related specialities, because a patient with DP has got an extremely large number of complications of DM and comorbidity. It is necessary to determine such patients with a certain frequency of QOL, to assess their level of pain, to pay attention to the initial, minimal sensitivity disorders in the onset of DP to prevent the future occurrence of a number of disabling consequences for the patient.

REFERENCES

1. Boulton A.J.M. The diabetic foot. Medicine. 2006; 34: 87–90.
2. Ihnat M.A., Thorpe J.E., Ceriello A. The «metabolic memory», the new challenge of diabetes. Diabetic Medicine. 2007; 24: 582–586.
3. Dedov I.I., Kalashnikova M.F., Belousov D.Y. et al. Cost-of-Illness Analysis of Type 2 Diabetes Mellitus in the Russian Federation: Results from Russian multicenter observational pharmacoepidemiologic study of diabetes care for patients with type 2 diabetes mellitus (FORSIGHT-T2DM). Sakharni Diabet = Diabetes Mellitus. 2017;20(6):403–419.
4. Malik R.A. Which test for diagnosing early diabetic neuropathy? Diabetes. 2014;63(7):2206–2208.
5. Moxey P.W., Gogalniceanu P., Hinchliffe R.J. et al. Lower extremity amputations – a review of global variability in incidence. Diabetic Medicine. 2011;28:(10)1144–1153.
6. Tesfaye S. Recent advances in the management of diabetic distal symmetrical polyneuropathy. Journal of Diabetes Investigation. 2011; 2 (1): 33–42.
7. Boulton A.J., Vinik A.I., Arezzo J.C. et al. Diabetic neuropathies: a statement by the American Diabetes Association. Diabetes Care. 2005; 28 (4): 956–962.
8. Batrak H.A., Metelkina N.F., Brodovska A.N. et al. Osobennosti diabeticheskoy polineyropatii u bolnykh sakharnym diabetom po rezultatam elektroneyromiografii [Features of diabetic polyneuropathy in patients with diabetes mellitus according to the results of electroneuromyography]. Consilium medicum. 2020; 22 (2): 45-49. (In Russian).
9. Suntsov Yu.I., Dedov I.I. Gosudarstvennyy registr bolnykh sakharnym diabetom — osnovnaya informatsionnaya sistema dlya rascheta ekonomicheskikh zatrat gosudarstva na sakharnyy diabet i ikh prognozirovaniye [The state register of patients with diabetes mellitus is the main information system for calculating of the economic costs of the state for diabetes mellitus and their forecasting] Sakharnyy diabet. [Diabetes mellitus]. 2005; 2: 2–5. (In Russian).
10. Chupryna G., Dubynetska V. Thyroid lesion as a manifestation of comorbidity in patients with diabetic polyneuropathy. Family Medicine. 2020; 5(91): 36-40.
11. Svyrydova N.K., Chupryna G.M., Dubynetska V.M., Tyzhuk Z.L. Fizychne ta psykhichne funktsionuvannya osib z diabetychnoyu polineyropatiyeyu na foni multymorbidnosti [Physical and mental functioning of people with diabetic polyneuropathy on the background of multimorbidity] Skhidnoyevropeyskyy zhurnal khvoroby Parkinsona ta rukhovykh rozladiv [East European Journal of Parkinson's Disease and Movement Disorders]. 2020; 6 (4): 8-19. (In Ukrainian).
12. Martínez Delgado M.M Clinical case complicated diabetic foot ulcer. Rev Esp Sanid Penit. 2018; 20(3): 121–124.
13. Gylfadottir S.S., Christensen D.H., Nicolaisen S.K. et al. Diabetic polyneuropathy and pain, prevalence, and patient characteristics: a cross-sectional questionnaire study of 5,514 patients with recently diagnosed type 2 diabetes. Research Paper Pain. 2020; 161 (3): 574–583.
14. Nurlaela S., Kurniawan S.N., Husna M. Electroneuromyography examination of diabetic polyneuropathy patients. Malang Neurology Journal. 2019; 5 (1): 1-4.

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