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CLINICAL FEATURES OF PATIENTS WITH DIABETIC POLYNEUROPATHY

Keywords: *diabetic poly neuropathy, diabetes.*

Abstract. *The authors have studied the clinical features and state of surface and deep types of sensitivity in patients with diabetic polyneuropathy. In patients having diabetic polyneuropathy peripheral nerves of the lower limbs get affected more compared to the upper ones, as evidenced by the ratio of values of vibration sensitivity on the hands to those of vibration sensitivity on the feet. It is increasing with the duration of diabetic polyneuropathy.*

Introduction

Diabetes mellitus (DM) is one of the most common diseases and remains one of the most complicated health and social problems. In Ukraine there are nearly 1 million of diabetic patients, and approximately the same number of people is believed to have undiagnosed diabetes, that is, the real number of cases is around 2-2.5 million people [1]. Over the past 10 years, the incidence of diabetes has increased by more than 1.5 times, and the mortality due to the disease has risen by twice [2]. The economic and social loss, caused by this disease is enormous due to its prevalence and resulting disabilities [3]. Diabetic polyneuropathy (DPN) is one of the most common complications of DM. DPN causes disability in patients of working age due to the development of diabetic foot syndrome [4]. DPN is known to cause an increased risk of amputation by 1,7 times, the risk of deformation of the foot by 12 times and the risk of foot ulcers by 39 times [3].

The aim of research

To explore clinical features and state of surface and deep types of sensitivity in patients with diabetic polyneuropathy.

Research objectives

To study the tactile sensitivity, we used a 10-gram monofilament ("Thio-Therm"), pain sensitivity was examined using a needle, temperature sensitivity - using tubes with cold (10-15 ° C) and warm water (40-50 ° C).

Materials and methods

We have used the material of comprehensive cli-

nic, instrumental and biochemical study of 126 patients suffering from diabetes mellitus type 2 combined with DPN who had been admitted to Chernivtsi regional clinical endocrinology hospital and to neurology department of Chernivtsi mental hospital as a base of our study. The study involved 66 women and 60 men aged from 35 to 65 years. Moderate diabetes was diagnosed in 102 patients, 24 patients were diagnosed with severe form of the disease. 8 patients were in a state of compensation of the disease, while 118 patients were in that of subcompensation.

The patients were divided into 3 groups:

Gr. I - patients with DM suffering for under a year (32 individuals);

Gr. II - patients with DM suffering for under 10 years (50 individuals);

Gr. III - patients with DM suffering for over 10 years (44 individuals).

While forming the control group virtually healthy persons were selected so that the average age of the group is not statistically significantly different from the average age of the patients and corresponded to them in the distribution by sex. The age of healthy individuals donors ranged from 35 to 65 (average 51.5) years, respectively.

The control group consisted of 20 virtually healthy individuals.

In order to assess the clinical status of patients objectively, we used a scale of diabetic neuropathies, where DPN severity was assessed by an analysis of the patients' feelings and of neurological symptoms (Table 1).

The points were added on one side of the body, and in if there were some disorders on only one side,

Table 1

Signs of disease	DPN scale		
	0	1	2
Pain	lacking	Moderate	severe
Causalgia	absent	Moderate	severe
Numbness	absent	Moderate	severe
Paresthesia	absent	Moderate	severe
Sensitivity			
pain	normal	Reduced	lacking
temperature	normal	Reduced	absent
tactile	normal	Reduced	absent
vibration	normal	Reduced	absent
Achilles (tendon) reflexes	normal	Reduced	absent
Heel walking	normal	hard	impossible

it was this point that had to be included in the number. The minimum number for DPN was 3 points. To assess the sensitivity of vibration, we applied 128 Hz tuning fork. For this purpose, the leg of the tuning fork was placed on symmetrical areas of the skin on the plane of bony prominences and the time of feeling vibration was measured. When the vibrations of the tuning fork became shorter along the limb and the feeling in symmetrical points was different, it was indicative of the objective sign of disturbed vibration sensitivity. The results were treated statistically using Student's reliability t-test

Discussion of results

The patients experienced common diabetic manifestations like periodic dry mouth, thirst and an increased urination volume.

DPN diagnosis was made based on the typical clinical manifestations of this diabetic complication, on the findings of neurological examination of the patient, and special tests.

96 (76.2%) patients complained of a dull diffuse pain in symmetric parts of the lower limbs, in 40 (31.7%) patients it was so intense that kept them from sleeping properly; paresthesia, which manifested itself by goose pimples sensation in 88 (69.8%) patients, tingling in 82 (65.1%) patients, numbness in 92 (73.1%) patients. 20 (6.3%) patients felt painful tonic spasms in the calf muscles of the foot, heaviness in the lower extremities was reported in 22 (17.5%) patients. 24 (19.0%) patients did not complain of their nervous system. Objectively, there were disorders in pain sensitivity in 104 (82.5%) patients and temperature sensitivity in 106 (84%) patients with polyneuritic type. Motor changes, presented with weakness in the distal parts of the legs, especially in the extensors of the foot were recorded in 28 (22.2%) patients. Reducing Achilles (tendon) reflexes on the feet was observed in 72 (57.0%) patients, lack of them in 16 (12.7%) patients. Vege-

tative-trophic disorders in the form of thinning and peeling were observed in 76 (60.3%) patients, impaired growth of hair on the legs in 46 (36.5%) patients, disorders of the nail trophic in 50 (39.7%) patients.

According to the results of neurological examination and duration of the underlying disease, the following clinical forms of DPN have been identified:

When diabetes lasted not more than a year, distal symmetrical sensory polyneuropathy was the most common. While studying the neurological status we defined sensitive reflex disorders of varying severity. Disorders of sensitivity were polymorphic. The patients complained of numbness, pain, cold feeling in the lower extremities. The intensity of pain in the legs grew at rest and at night to indicate its neurogenic nature and is characteristic differential-diagnostic feature of this particular diabetic complication, as in most vascular complications the pain syndrome occurs at exertion during the day. However, there was no weakness in the distal and proximal muscle groups of the lower limbs found while studying the neurological status or with functional loads.

When diabetes with DPN lasted under 10 years, the patients experienced predominantly distal symmetric sensorimotor polyneuropathy. Typical complaints of these patients were an increased fatigue when walking, weight loss in the muscles of the legs. In all cases there was a polyneuritic type of sensitivity disorders. The patients complained of feeling heat or "icy" cold in their soles, "shooting" and "stabbing" pain and paresthesia in the legs, cramps in the shin muscles and those of the toes. 8 patients experienced breach joint and muscular sensations in the toes. 2 patients had disorders of the sensitivity by the type of hyperesthesia with some elements of hyperpathia on the feet and legs along the front surface of the shins up to the knees. Knee-jerks in 7 patients were more vivid, in 5 of them they were weakened, in other 2 they did not respond. Achilles reflexes we-

re lacking in all the patients of this group. Besides sensitive reflex disorders all the patients were revealed weakness in peroneal muscle groups, which was found in 6 patients at the rear flexion of the foot, and in 8 of them only in case of functional load (walking on heels). We also observed moderate hypotrophy of muscles of legs and feet.

In patients, suffering from diabetes for more than 10 years we observed sensorimotor polyneuropathy and that with lesions of distal and proximal segments of the feet. All the patients had difficulty rising from a seated position and climbing a ladder, which evolved gradually (from a few weeks to 1.5-2 years) and was not accompanied by pain. While studying the neurological status, we diagnosed two patients with paresis of the quadriceps muscle of thigh up to 3 points and in one up to 4 points. In 3 cases the weakness was only determined in functional activities. In all cases the weakness was observed in peroneal muscle groups: in 3 patients up to 3 points, in 4 individuals up to 4 points, in other 2 people only

with a functional load. Reducing muscle strength was accompanied by hypotonia and hypotrophy of the thigh muscles, 5 patients also experienced hypotrophy in the muscles of legs and feet. All patients were lacking Achilles reflexes, the knee ones were reduced in 3 patients and 4 of them were lacking Achilles reflexes. In all cases we observed surface sensitivity disorders with polyneuritic type like "gloves" and "socks", reducing vibration sensitivity in the feet. There were no sensitivity disorders in the area of the thighs.

State of surface and deep types of sensitivity in patients with diabetic polyneuropathy.

The most common clinical manifestation of DPN is a disorder of sensitivity, ranging from mild numbness in the toes to deep anesthesia with neuropathic ulcers and arthropathy.

State of surface and deep sensitivity in patients with DPN is shown in Table 2.

Table 2 shows that patients, suffering from DPN with diabetes duration for under a year have mainly

Table 2

State of surface and deep sensitivity in patients with diabetic polyneuropathy

Types of sensitivity	Group I (n=32)	Group II (n=50)	Group III (n=44)
hypalgesia	14 (43,7%)	45 (90%)	37 (84,1%)
hyperalgesia	17 (53,1%)	3 (6%)	-
analgesia	-	2 (4%)	7 (15,9%)
thermohypesthesia	14 (43,7%)	46 (92%)	37 (84,1%)
thermanesthesia	-	2 (4%)	7 (15,9%)
thermohyperesthesia	17 (53,1%)	3 (6%)	-
vof the tactile sensitivity	19 (59,4%)	32 (64%)	36 (81,8%)
hyperesthesia	18 (56,3%)	3 (6%)	-
hyperpathia	5 (15,6%)	10 (20%)	9 (20,5%)
allodynia	4 (12,5%)	-	-
vof the vibration sensitivity	20 (62,5%)	46 (92%)	44 (100%)
batyhypesthesia	4 (12,5%)	8 (16%)	9 (20,4%)

irritation of nerve fibers and clinical signs of hypersensitivity of distal sections of upper and lower extremities as well as allodynia. With longer duration of diabetes symptoms of loss of nerve fiber function occur, as evidenced by a decrease in surface and deep sensitivity.

Thus, patients with DPN experience an increase in the threshold of superficial and deep sensitivity, which in turn explains the insensitivity of these patients to different micro traumas and a high risk of diabetic neuropathic ulcers of the feet.

Among the deep sensitivity types in DPN it is the vibration sensitivity that gets impaired first. We studied it using 128 Hz tuning fork, which was placed on the symmetric areas in the projection of bony eminences and the time of feeling vibrations was

measured in seconds [90, 99]. As an objective sign of vibration sensitivity disorder, we took a drastic reduction of duration of feeling tuning fork vibration on the distal segments of the feet compared to those of the hands and took into account the dynamics of the time growth of feeling under the influence of treatment. The parameters of the vibration sensitivity on the feet in patients with DPN before and after the treatment are shown in Table 3.

As table 3 shows, while examining the patients of group I, we found out, that the time of feeling the vibration on the feet decreased by 45,8% compared to the control group.

The patients in group II, suffering from diabetes for under 10 years, showed a decreased time of feeling vibrations on the feet by 55.1% compared to

Table 3

Indices of vibration sensitivity on the feet and distal parts of the hands in patients with diabetic polyneuropathy (in seconds) (M±m)

Groups of patients	Control group	I	II	III
On the feet	13,48 ± 0,56 (n=20)	7,30 ± 0,51 (p<0,001) (n=32)	6,05 ± 0,33 (p<0,001) (n=50)	5,25 ± 0,41 (p<0,001) (n=44)
On the distal parts of the hands	14,56 ± 0,98 (n=20)	11,8 ± 0,40 (p<0,05) (n=32)	10,89 ± 0,38 (p<0,01) (n=50)	10,20 ± 0,41 (p<0,01) (n=44)

Note: p – reliability compared to the control group

the control group.

The patients in group III suffering from third diabetes for more than 10 years showed a decreased time of feeling vibrations on the feet by 61% compared to the control group. Indices of the vibration sensitivity in the distal parts of the hands are shown in table. 3.

When measuring the time of feeling vibrations in the distal parts of the hands in the patients of group I, we found out, that it was reduced by 18.9% compared to the control group. The time of feeling vibrations in the distal parts of the hands in the patients of group was by 25.2% lower than that in the control group. In the patients of group III the time of feeling the vibration in the distal parts of the hands was reduced by 29.9% compared to the control group.

Due to the fact that in DPN peripheral nerves of the lower limbs get affected more, compared to the upper ones, we calculated the ratio of vibration sensitivity on the distal parts of the hands to that of vibration sensitivity on the feet.

In the patients of group I the ratio of vibration sensitivity on the hands to those on the feet was 1.60. Among the patients of group II the ratio of vibration sensitivity on the distal parts of the hands to that of vibration sensitivity on the distal parts of the feet was 1.80. The ratio of vibration sensitivity on the distal parts of the hands to that of vibration sensitivity on the feet in patients of group III was 1.94.

Therefore, in patients having DPN peripheral nerves of the lower limbs get affected more compared to the upper ones, as evidenced by the ratio of values of vibration sensitivity on the hands to those of vibration sensitivity on the feet. It is increasing with the duration of DM with DPN.

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КЛІНІЧНІ ОСОБЛИВОСТІ ХВОРИХ З ДІАБЕТИЧНОЮ ПОЛІНЕЙРОПАТІЄЮ

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Резюме. Вивчені клінічні особливості перебігу та стан вібраційної чутливості у хворих з діабетичною полінейропатією залежно від тривалості цукрового діабету. При діабетичній полінейропатії більше страждають периферичні нерви нижніх кінцівок порівняно з верхніми, про що свідчить індекс співвідношення показників вібраційної чутливості кистей до показників вібраційної чутливості на стопах, який збільшується по мірі тривалості цукрового діабету.

Ключові слова: діабетична полінейропатія, цукровий діабет.

КЛИНИЧЕСКИЕ ОСОБЕННОСТИ ПАЦИЕНТОВ С ДИАБЕТИЧЕСКОЙ ПОЛІНЕЙРОПАТИЕЙ

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Резюме. Изучены клинические особенности и вибрационная чувствительность у пациентов с диабетической полинейропатией в зависимости от длительности сахарного диабета. При диабетической полинейропатии больше страдают периферические нервы нижних конечностей по сравнению с верхними, о чем свидетельствует индекс соотношения показателей вибрационной чувствительности на руках к показателям вибрационной чувствительности на стопах.

Ключевые слова: диабетическая полинейропатия, сахарный диабет.

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