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Dragan Veselinović¹,
Miloš Jovanović²

¹Clinic of Ophthalmology, Niš
²Clinic of Ophthalmology
"Đorđe Nešić", Belgrade

DIABETES MELLITUS AND OPTIC NERVE DISEASES

SUMMARY

In addition to diabetic retinopathy, optic nerve diseases of diabetic origin also occupy a significant place in routine ophthalmologic practice and they are one of the most important complications of diabetes. The paper deals with the systematization and classification of optic nerve diabetes – induced diseases into various clinical forms.

The patients with congenital bilateral optic nerve atrophy and juvenile insulin-dependent diabetes, diabetic papillopathy, anterior ischemic optic neuropathy, posterior ischemic optic neuropathy, and retrobulbar neuritis are described as the most common clinical forms of optic nerve diabetes-induced diseases. Possible etiopathogenetic mechanisms are analyzed, the most important of which are hereditary, toxic, metabolic, ischemic and transudative ones.

In order to assess the signs of optic nerve disease we analyzed 600 diabetic patients. The presence of optic nerve disease was established in 24 cases. Compared to controls, statistical significance was demonstrated regarding the number of patients with optic nerve disease in the group of examinees ($p < 0.01$).

One of the essential characteristics of optic nerve diabetes-induced disease is that the optic nerve involvement was not always associated with evident signs of diabetic retinopathy and that in several cases optic nerve disease even preceded the occurrence of retinopathy.

Key words: optic nerve diseases, diabetes mellitus

INTRODUCTION

When we talk about changes on fundus oculi caused by diabetes, we usually think about the existence of diabetic retinopathy. In extensive ophthalmologic literature, there is a great number of papers dealing with the problem of diabetic retinopathy (1-3). The occurrence of optic nerve diseases caused by diabetes mellitus is not so often described, in spite of the fact that these diseases have a significant place among diabetes-caused complication in

the eye. There were several attempts to systematize and classify the optic nerve diabetes-induced diseases and the most appropriate, in our opinion, is the one presented by Forofonova et al.(4). Based on this classification, optic nerve diseases can be divided into several groups.

Patients with congenital bilateral optic nerve atrophy and juvenile insulin dependent diabetes where progressive deterioration of eyesight begins from the 9-11th month of life are usually discovered in 4-5 years of age, when it becomes obvious to the

parents that the child has poorer eyesight (5–7). Diabetic papillopathy, which is a rarely described disease, occurs in younger diabetes patients with minimal or completely absent visual disturbances (8–10).

Anterior and posterior ischemic optic neuropathy occurs after ischemic lesions of anterior or posterior part of the optic nerve in the area of diabetic micro- and macroangiopathy (11–14). Retrobulbar neuritis associated with diabetes is the subject of many controversies, because many authors consider that in these patients this is the case of posterior ischemic neuropathy. The purpose of our research is to establish the incidence of optic nerve diseases in patients with diabetes in our population, based on the classification proposed by a group of authors led by Forofonova (4).

MATERIAL AND METHODS

We analyzed ophthalmological results of 600 diabetes patients sent to our daily hospital by endocrinologists, as a part of one-day research. We performed detailed ophthalmologic examination of the fundus oculi, and those patients in whom pathological changes were detected were subjected to even more detailed examination, in order to make a diagnosis (visual acuity, perimetry, fluorescein angiography). Along with these results we analyzed the results of ophthalmologic examination of the fundus oculi of 600 patients examined in outpatient Ophthalmology Clinic in Niš, who came there in order to receive appropriate glasses, being without symptoms of optic nerve disease. These patients were of approximately similar age and sex compared to the patients with diabetes mellitus.

RESULTS

Out of 600 patients with diabetes, 314 were male and 286 female, with average age structure of 61.2 years. 467 patients were on oral anti-diabetic therapy, while 133 were on insulin therapy. Out of this number, there were 14 patients (2.4%) with optic nerve disease. In six cases we detected anterior ischemic neuropathy, in three posterior ischemic neuropathy, and in one case with juvenile diabetes the symptoms consistent with diabetic papillopathy were described. In four patients we described unilateral decoloration of optic nerve papilla, without being able to establish the exact etiology. In our research group of patients with diabetes we did not detect a single case of retrobulbar neuritis and hereditary atrophy associated with juvenile diabetes (table 1).

Table 1. Optic nerve diseases and diabetes

Disease	Diabetics		Controls		X2 test
	N	%	N	%	
Diabetic papillopathy	1	0.17	-	-	
Anterior ischemic neuropathy	6	1.0	1	0.17	
Posterior ischemic neuropathy	3	0.5	1	0.17	
Retrobulbar neuritis	-	-	1	0.17	
Papillar decoloration	4	0.7	-	-	
Total	14	2.37	3	0.51	

In the control group of subjects we detected three cases with optic nerve disease of various genesis. We proved the significance of the number of patients with optic nerve disease in the diabetes group (p<0.01) compared to the control group of subjects. In table 2 we can see the changes at the eye bottom in patients with diabetes, where it is evident that the largest number of patients (72 subjects or 12%) had minimal, initial changes on blood vessels, described as micro and macro diabetic angiopathy. The second largest group was the group of patients with sings of mild diabetic retinopathy (63 or 10.5%), followed by 28 (4.7%) patients with marked non-proliferative diabetic retinopathy, and the smallest group of 12 patients (2%) with proliferative diabetic retinopathy as the most complex form of diabetic eye bottom disease.

Table 2. Changes in the fundus oculi in patients with diabetes mellitus

Changes in the fundus oculi	N	%
Micro-macro angiopathy	72	12.0
Mild diabetic retinopathy	63	10.5
Sevre diabetic retinopathy	28	4.7
Proliferative diabetic retinopathy	12	2.0

After detecting the patients with pathological changes on the optic nerve, we started with their analysis. The results can be seen in table 3.

Table 3. Changes in the fundus oculi in patients with optic nerve disease

Changes in the fundus oculi	N	%
Micro-macro angiopathy	4	28.6
Mild diabetic retinopathy	5	35.7
Severe diabetic retinopathy	3	21.4
Proliferative diabetic retinopathy	2	14.3
Total	14	100.0

In 4 cases, signs of micro- and macro-angiopathy were described, in 5 cases initial signs of non-proliferative diabetic retinopathy (spot-like retina bleeding) and in three patients we detected a more marked form of diabetic retinopathy (stain hemorrhage, hard and soft exudates). We registered two cases of proliferative neuropathy.

DISCUSSION

Diabetes mellitus presents an extremely significant etiological factor for development of various optic nerve diseases (1, 2). Taking into consideration the division proposed by Forofonova et al. (4) we classified them into five groups and analyzed their incidence.

The most common optic nerve diseases registered in our study were anterior and posterior ischemic optic neuropathies. We described one case with diabetic papillopathy, while in three cases with established decoloration of optic nerve it is most probably the case of descendent atrophy as a consequence of vascular disease. Considering that this was a retrograde study, there was no possibility of monitoring the patients with an acute form of disease.

When analyzing etio-pathogenetic mechanisms for development of these diseases, it became obvious that vascular complications were dominant as a consequence of ischemia in the area of posterior and anterior parts of the optic nerve, and in the terrain of micro and macro angiopathy (11).

According to Hayreh (15), diabetes is on the fourth place as etiological factor for development of anterior and posterior ischemic optic nerve neuropathy (12, 15). In spite of some authors' opinion that anterior and posterior ischemic neuropathy caused by diabetes are the consequence of toxic effects of prolonged glycemia, we know, nowadays, that pri-

mary factor for development of anterior ischemic neuropathy is vascular lesion in the area of anterior ciliary arteries, and that posterior ischemic neuropathy is caused by ischemia of posterior parts of the optic nerve (13-17). When describing diabetes-induced optic nerve diseases, other etio-pathogenetic mechanisms are also important, such as hereditary, toxic, metabolic and transudative.

Hereditary factor is important for younger patients with congenital atrophy of opticus and juvenile diabetes, who were not present in our study but who are described by some authors (1-3). Toxic-metabolic factor can be responsible for development of diabetic papillopathy, which presents a new and not adequately known and affirmed ophthalmologic syndrome. It is described as pathological condition occurring in younger patients with juvenile diabetes, with minimal or completely absent visual disturbances (8-10). They describe it as ophthalmologic presentation of bilateral edema of optic disc, with prominence, peri-papillary haemorrhagia and extensively dilated veins and capillary nexus on papilla, which is in a great measure similar to obstructive edema of the optic nerve. In fundus oculi you can usually see a clinical picture of non-proliferative diabetic retinopathy.

Domination of ischemic factor for development of complications on the optic nerve in diabetes, once again points to the significance of vascular disorders developed during this disease. It is characteristic that in three cases with the optic nerve disease, micro and macro-angiopathy were also present, without any signs of retinopathy, and that in five cases a mild form of diabetic retinopathy was detected. This indicates that vascular complications on the optic nerve occur in diabetes patients as one of the primary complications before the development of the marked form of diabetic retinopathy. It is considered that the primary involvement of the optic nerve vascularization is also the consequence of the specificity of sensitive vascular network which vascularizes opticus. The appearance of complications on the opticus indicates the progression of primary disease, especially after the involvement of the opticus when there is a progression of diabetic retinopathy.

For that reason the complications occurring on the optic nerve as a consequence of diabetes should be considered seriously and all the necessary therapeutic measures should be taken in order to prevent further complications and development of the disease on the other eye. The treatment of the combined vascular diseases such as hypertension, arteriosclerosis, cardiovascular diseases and others also has a great importance for the treatment of the affected eye and prevention of further complications.

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OBOLJENJA VIDNOG ŽIVCA PROUZROKOVANA DIJABETESOM

Dragan Veselinović, Miloš Jovanović,

Klinika za očne bolesti Niš, Klinika za očne bolesti "Đorđe Nešić" – Beograd

Pored dijabetične retinopatije i oboljenja vidnog živca dijabetične geneze imaju značajno mesto u svakodnevnoj oftalmološkoj praksi i predstavljaju jednu od značajnijih komplikacija dijabetesa. U radu se govori o sistematizaciji i podeli oboljenja vidnog živca prouzrokovanih dijabetesom. Bolesnici sa urođenom obostranom atrofijom vidnog živca i juvenilnim insulin zavisnim dijabetesom, dijabetična papilopatija, prednja ishemična neuropatija vidnog živca, zadnja ishemična neuropatija i retrobulbarni neuritis, opisani su kao najčešće forme oboljenja optikusa prouzrokovane dijabetesom.

Takođe se analiziraju mogući etiopatogenetski mehanizmi, među kojima je najznačajniji ishemični, toksični, metabolički i transudativni.

Analizirano je 600 bolesnika sa dijabetesom u cilju utvrđivanja znakova oboljenja vidnog živca. Prisustvo patoloških promena na vidnom živcu ustanovljeno je kod 12 pacijenata, pri čemu je kod 5 konstatovana prednja ishemična neuropatija, 3 sa zadnjom ishemičnom neuropatijom, 1 slučaj dijabetične papilopatije i tri slučaja dekolracije papile nejasne etiologije. U odnosu na kontrolnu grupu ispitanika pokazana je statistička signifikantnost broja pacijenata sa oboljenjem vidnog živca u grupi pacijenata sa dijabetesom ($p < 0,01$).

Jedna od bitnih karakteristika oboljenja vidnog živca je ta, da nisu bila praćena izraženim znacima dijabetične retinopatije i da je čak, u nekoliko slučajeva, oboljenje optikusa prethodilo pojavi retinopatije.

Ključne reči: oboljenja vidnog živca, šećerna bolest