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EFFECT OF WEARING AN OCULAR PROSTHESIS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS ON THE LEVEL OF ACID-BASE BALANCE OF THE CONJUNCTIVAL CAVITY

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ABSTRACT — The aim of the study was to study the effect of wearing an eye prosthesis by patients with type 2 diabetes on the level of acid-base balance of the conjunctival cavity.
Materials and methods. Biomicroscopy of the conjunctival cavity, the pH of the discharge from the conjunctival cavity and HbA1c in the blood were determined.
Conclusions. The constant presence of an ocular prosthesis in the conjunctival cavity leads to a shift in the acid-base balance to the alkaline side, and the patient's history of diabetes also leads to the same result. The shift in the pH of the conjunctival cavity directly depends on the level of glycated hemoglobin, and the combination of these factors leads to a more aggressive shift of the pH to the alkaline side.

KEYWORDS — ocular prosthetics, anophthalmia, diabetes mellitus.

INTRODUCTION

The prevalence of anophthalmos in Russia reaches 24.47 per 10 thousand population [1, 2] and the only method of medical and social rehabilitation of such patients, today, remains eye prosthetics [3, 4, 5].

There is an increase in the number of patients with diabetes mellitus (DM) in the world. According to the forecasts of WHO experts, by 2025 the number of cases will reach 350 million [6, 7].

In patients with anophthalmos complicated by diabetes mellitus, there is a chronic sluggish inflammatory process, which negatively affects the cosmetic effect of ocular prosthetics and the comfort of wearing an ocular prosthesis [8, 9].

A shift in the acid-base balance (pH) of the conjunctival cavity to the alkaline side leads to chronic inflammatory processes, which lead to permanent secretions in the conjunctival cavity, in which the prosthesis is constantly located. Finding a prosthesis in such conditions increases the amount of deposits on its surface. It becomes rough and wears out faster. All this, in turn, leads to a shift in the period of planned replacement of an eye prosthesis for a shorter one [8, 9].

The aim of the study was to study the effect of wearing an eye prosthesis in patients with type 2 diabetes on the level of acid-base balance of the conjunctival cavity.

MATERIALS AND METHODS

The studies were carried out in the period from September 2018 to January 2020 at the Department of Eye Diseases of the RUDN University and at the Center for Eye Prosthetics in Moscow.

The study included 176 people, men and women, aged 19 to 80, with an average age of 58.4 ± 15.2 years. The patients were divided into five groups: 1st group — 36 people who do not use eye prostheses and do not suffer from DM; 2nd group — 33 patients using eye prostheses and not suffering from DM; 3rd/a group — 35 patients who do not use eye prostheses and suffer from type 2 DM with glycated hemoglobin in the blood less than 8%; group 3rd/b — 34 patients who do not use eye prostheses and suffer from type 2 DM with glycated hemoglobin more than 8%; 4th group — 38 patients using eye prostheses and suffering from DM.

All patients underwent the following studies: biomicroscopy of the conjunctival cavity, the pH of the discharge from the conjunctival cavity and HbA1c in the blood were determined.

THE RESULTS OF THE STUDY

The results of the study of the acid-base balance of the conjunctival cavity in both eyes in patients without diabetes mellitus and not using eye prostheses (1st group) showed a normal level of pH of the conjunctival cavity from 6.30 to 7.23 in 97.23% of cases (Table 1).

The results of the study of the acid-base balance of the conjunctival cavity of patients using an ocular prosthesis and not suffering from diabetes mellitus

Table 1. pH Measurement of the conjunctival cavity of 1st group

1st group, n = 36	pH			
	6–6,5	7–7,5	8–8,5	> 8,5
OD	11 (30,56%)	24 (66,67%)	1(2,77%)	-
OS	13 (36,12%)	22 (61,11%)	1(2,77%)	-

(2nd group) showed in 84.85% of cases a shift in the pH of the conjunctival cavity, in which the prosthesis is located, to the alkaline side, while the pH of the conjunctival the healthy eye cavity was within normal limits (Table 2).

Table 2. pH Measurement of the conjunctival cavity of 2nd group

2nd group, n = 33	PH				
	6–6,5	7–7,5	8–8,5	9–9,5	> 9,5
Non-prosthetic eye	9 (27,27%)	22 (66,67%)	2 (6,06%)	-	-
Eye with ocular prosthesis	-	5 (15,15%)	21 (63,64%)	7 (21,21%)	-

The results of the study of the acid-base balance of the conjunctival cavity of both eyes in patients with diabetes mellitus and not using an ocular prosthesis (3rd/a and 3rd/b groups) showed a shift in the pH of the conjunctival cavity to the alkaline side in both groups, but in patients with glycated hemoglobin more than 8% (3rd/b group), the pH shift towards the alkaline side was more aggressive, which suggests that the level of glycated hemoglobin in the blood is directly related to the level of pH of the conjunctival cavity (Table 3; Table 4).

Table 3. pH Measurement of the conjunctival cavity of 3rd/a group

3rd/a group, HbA1c <8% n = 35	PH				
	< 7	7–7,5	8–8,5	9–9,5	> 9,5
OD	-	9 (25,71%)	22(62,86%)	4 (11,43%)	-
OS	-	8 (22,86%)	23 (65,71%)	4 (11,43%)	-
Total	-	24,28%	64,29%	11,43%	-

Table 4. pH Measurement of the conjunctival cavity of 3rd/b group

3rd/b group, HbA1c >8% n = 34	PH			
	< 8	8–8,5	9–9,5	> 9,5
OD	-	16 (47,06%)	18 (52,94%)	-
OS	-	15 (44,12%)	19 (55,88%)	-

The results of the study of the acid-base balance of the conjunctival cavity of patients using an eye prosthesis and suffering from diabetes mellitus (4th group) showed a shift in the pH of the conjunctival cavity to a more aggressive alkaline side than in all our previous groups. This suggests that a combination of factors of the presence of an ocular prosthesis in the conjunctival cavity and a history of diabetes mellitus lead to a change in the pH of the environment in which the prosthesis is constantly located, and this, in turn, affects the effectiveness of ocular prosthetics and comfort when wearing the prosthesis (Table 5).

Table 5. pH Measurement of the conjunctival cavity of 4th group

4th group, n = 38	PH			
	7–7,5	8–8,5	9–9,5	10–11
Non-prosthetic eye	3 (7,89%)	17 (44,74%)	18 (47,37%)	-
Eye with ocular prosthesis	-	5 (13,16%)	19 (50%)	14 (36,84%)

CONCLUSIONS

1. The constant presence of an ocular prosthesis in the conjunctival cavity leads to a shift in the acid-base balance to the alkaline side.
2. Hyperglycemia in a patient with diabetes mellitus leads to a shift in the acid-base balance of the conjunctival cavity to the alkaline side, thus, the shift in the acid-base balance directly depends on the level of glycated hemoglobin in these patients.
3. A history of diabetes mellitus in patients using ocular prostheses increases the shift of the acid-base balance to the alkaline side to more aggressive levels, which negatively affects the effectiveness of ocular prosthetics and the comfort of wearing the ocular prosthesis.
4. Supervision of patients using ocular prostheses and suffering from diabetes mellitus should be carried out in conjunction with endocrinologists to achieve the best cosmetic effect from ocular prosthetics and maximum comfort of wearing the prosthesis.

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