PRIMARY OPEN-ANGLE GLAUCOMA AND SERUM LIPIDS

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Abstract

The aim of this paper was to prove the relation between serum lipid values (cholesterol, triglyceride, low density cholesterol, high density cholesterol and primary open -angle glaucoma. The study includes two patient groups: 50 patients with primary open-angle glaucoma and 50 patients without this disease. However, all 100 patients were tested for serum lipid values. The research covered a period of six months (from May to December 2007.). Primary open-angle glaucoma was diagnosed with intraocular pressure values (between 20,1 and 25,6 mm Hg) measured with Schiotz tonometry. The visual field changes were confirmed with Goldmann perimetry. The gonioscopies were done for diagnosis confirmation. The serum lipid values were confirmed with enzymatic colorimetry *in vitro* method. U-test (Mann-Witney-Wilcox test) and t-test, as nonparametric tests, were used for statistical evaluations. The cholesterol mean value in the test group was 6,14 mol/dm^3 (3,20-8,10 mol/dm^3) whereas in the control group it was 5,96 mol/dm^3 (2,70-8,80 mol/dm^3). U-test was with negative ranks (z=-0,83 AS=0,678). The triglyceride mean value in the test group was 2,38 mol/dm^3 (0,84-11,73 mol/m^3) and in the control group it was 2,04 mol/dm^3 (0,63-5,89 mol/dm^3). U-test was with positive ranks (z=0,950 AS=0,342). High density cholesterol was average in the test group with 1,45 mol/dm^3 (0,71-3,40 mol/dm^3) and in the control group 1,40 mol/m^3 (0,80-3,20 mol/dm^3). Low density cholesterol in the test group was 3,98 mol/m^3 (1,82-6,49 mol/m^3) and in the control group 4,08 mol/m^3 (2,69-5,69 mol/m^3). These results had positive ranks according to U-test. Serum lipid values could be one of predictable factors in primary open-angle glaucoma diagnosis. Due to the patient age, cholesterol values, as common factors in primary open-angle glaucoma and atherosclerosis genesis, could be concern in the same aetiology based on dyslipidaemia as well.

KEY WORDS: serum lipids, primary open-angle glaucoma, cholesterol, triglyceride

Introduction

Several mechanisms are considered as primary open-angle glaucoma (POAG) aetiology factors but metabolic disorders such as diabetes mellitus, hypercholesterolemia, hypertriglyceridemia, may have an important role in the appearance of this disease (1). Primary open-angle glaucoma (POAG) has been undiagnosed in 50% patients as the disease characterised with the following: high intraocular pressure, changes in optical nerve papilla, visual field changes and open anterior chamber angle. Patients over 50 years of age are usually with this diagnosis but they stay undiagnosed. Patients with a positive family history of the disease, black race, patients with middle or high myopia, patients with diabetes mellitus type 2, artery hypertension, hyperthyroidism, patients with night snoring are predetermined for this disease (2). The protocol for POAG diagnosis consists of the recommendation for patients over 60 years to be examined for ocular glaucoma once a year, and for patients over 60 years to be examined every three years. However, the patients from the risk group should be examined more frequently (3). Lipid metabolism disorders may result from inadequate lipids food income, bad lipids digestion in gastrointestinal organs or may be a result of cell lipid metabolism disorders. Cholesterol and triglycerides, as serum lipids, are the most important factors for atherosclerosis genesis. Serum lipid values are related to patients' age considering that cholesterol values, one year after birth, have to be 2,5 times greater than after birth. The second high pick for serum lipids in human life is in the thirties,ending in the fifties for males, but for women, these facts are slightly postponed (4). Hyperlipoproteinemias are results of metabolic disorders in genesis and lipoproteins decomposition. Total lipids come from three groups: cholesterol, triglycerides and phospholipids. Lipoproteins are a form of transported lipids in the blood and they are divided into: high density lipoproteins (HDL), low density lipoproteins (LDL) and very low density lipoproteins (VLDL). High density lipoproteins are cholesterol cleaners and are, therefore, marked as a protective factor in atherosclerosis genesis (5). It is confirmed that atherosclerosis with higher intraocular pressure has a bad influence on pulse volume level in glaucoma (6).

Patients and Methods

This prospective, comparative clinical study has been conducted with 100 patients with lipids serum status and patients were divided in two groups: 50 patients with POAG diagnosis and 50 patients without POAG but with some another ophthalmological diagnose. The study was conducted over a period of time from May to December 2007. All data concerning the diagnosed POAG were obtained from the patients' medical documentations in the Eye Policlinic of the Public Health Institution in Tuzla. The sex structure in the test group was as follows: 34% male and 66% female, and in the control group it was 42% male and 58% female. The age mean value in the test group was 58,8 years (40,0-72,0) and in the control group it was 59,4 years (38,0-81,0). Serum lipid values (cholesterol, triglycerides HDL, LDL, risk factor) were evaluated by means of the enzymatic, colorimetric method *in vitro* for diagnostic usage in the Diagnostic Department of the Public Health Institution Tuzla. Primary open-angle glaucoma diagnosis was determined with the following: intraocular pressure measurement with Sctziötz tonometer (as impression method expressed in mmHg, with 1% tetracain topical anaesthesia), eye fundus examination (direct ophthalmoscopes) with Helmholtz ophthalmoscope diagnosis, Goldmann perimeter for visual fields evaluation and gonioscopy (with Goldmann one mirror lens). Intraocular pressure was measured within the range from 20,1 to 25,6 mmHg. Visual field changes were registered as blind spot exclude from I1-I2 and I2-I3 isopterans and isopterans depression from upper or lower side, as well. Chamber angle was controlled as open angle with first or second degree pigmentation. Control group patients were without any changes suggested on POAG. For the statistical evaluation, Mann-Witney-Wilcox (U-test) and t-test, as non-parametric tests, were used considering that examples were used from the same population and therefore their distribution was the same because the examples were independent.

	Patients with POAG*	Patients without POAG	U-test
Cholesterol	6,14 (3,20-8,10)	5,96 (2,70-8,80)	Negative AS=0,678
Triglycerides	2,38 (0,84-11,73)	2,04 (0,63-5,89)	Positive AS=0,342
HDL[1]	1,45 (0,71-3,40)	1,40 (0,80-3,20)	Positive AS=0,320
LDL [2]	3,96 (1,82-6,46)	4,08 (2,96-5,69)	Positive AS=0,382
31-40	16	10,73	2,46
21-30	1	0,67	20,99
Total	149	100	66,05

*POAG=Primary Open Angle Glaucoma
[1] HDL- High Density Lipoproteins
[2] LDL- Low Density Lipoproteins Positive

TABLE 1. Serum lipids values in the group of patients with primary open-angle glaucoma and in the group of patients without glaucoma

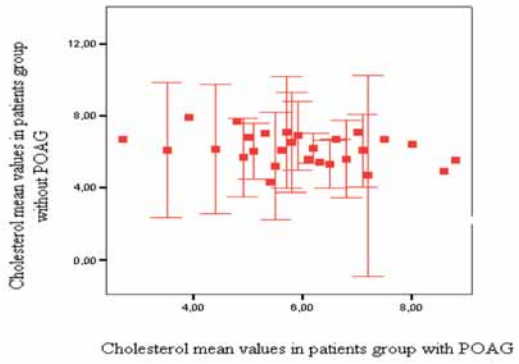

FIGURE 1. Cholesterol mean values in different patient groups: with and without primary open angle glaucoma

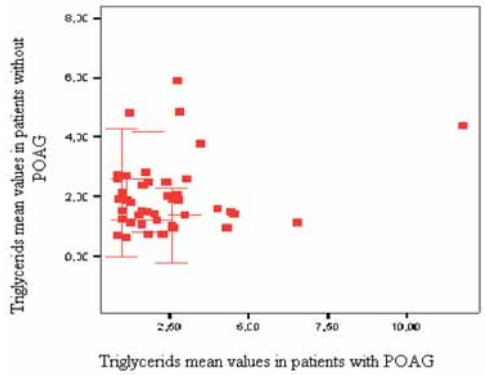

FIGURE 2. Triglyceride mean values in two different patient groups: with and without POAG

Results

Age and sex patient structures were not significantly different in these two groups. T-test for sex structure in both was insignificant, without difference in the two groups studied (t-test=0,622 df=48 P>0,05=0,537). For age structure t-test was insignificant, as well (t=0,667 df=49 P>0,05=0,063). Regular serum lipids values are: cholesterol 0,00-5,7 mol/dm^3, triglycerides 0,00-1,80 mol/dm^3, high density lipoproteins-HDL 0,90-1,55 mol/dm^3, low density lipoproteins-LDL 2,20-3,89 mol/dm^3.

Blood cholesterol mean values were with negative ranks comparing the test group and the control group. This means that blood cholesterol levels for patients in the test group were higher compared to those of the control group and could suggest that hypercholesterolaemia could be one of predictable factor in POAG diagnosis. Therefore, distribution values were with dispersive characteristics. Triglyceride mean values were with positive ranks which means that there is no significance in these two groups considering POAG diagnosis. Therefore, distribution values are with no dispersive characteristics.

Discussion

Metabolic abnormalities in patients with POAG have been the focus of various studies. Moses et al. (2) suggests that there are no significant differences in two patient groups with and without POAG in total cholesterol, HDL, LDL, triglycerides mean values. Likewise, there was no difference when it comes to hypercholesterolemia and hypertriglyceridemia in percent values. In our study, lipid status fraction values were the same in both groups for triglycerides, LDL, HDL values with no values differences but cholesterol values were different in both groups (Table 1.) and with dispersive characteristics (Figure 1.) which suggest cholesterol as one of predictable POAG diagnostic factor. Kovačević et al. (7) points out that in patients with higher values of total cholesterol, particularly atherogenic LDL fraction, may have certain influence in diagnosed glaucoma. In this study, serum lipid values were similar in both groups for triglycerides, HDL and LDL lipoproteins but cholesterol values were significantly higher in the POAG group. Egorow et al. (8) showed that lipid biochemical analysis in patients with glaucoma may find atherogenic hyperlipidaemia with lower antioxydative activity while lipid plasma analysis may determine the direction of the clinical disease. The statins in usage longer than 23 months may significantly reduce the risk of glaucoma (9). Therefore, the statins usage in hyperlipidaemia therapy could not change intraocular pressure values in patients with glaucoma but could reduce glaucoma risk appearance (P>0,04). Stewart et al. (10) suggests that ß-adrenergic blockers used in glaucoma therapy may have influence in serum lipids values.

Conclusion

Together for atherosclerosis disease risk and POAG is genetically predisposed and appearance in older life age (about 50 years and more). Higher cholesterol values are connected with POAG comparing with other lipid fractions (triglycerides, HDL, LDL) and with patients age, as well. Therefore, hypercholesterolaemia could be one of important predictable POAG diagnostic factor. Dyslipidemia, as an independent metabolic disorder, may have influence on the appearance of glaucoma but together with other risk factors such as: age, sex, positive family disease history and some other diseases(gall bladder stone or hyperthyreoidism)

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