

The Relationship Between O and Non-O Blood Groups with Retinal Vein Occlusion

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ABSTRACT

Purpose: The aim of this study is to investigate the relationship between retinal vein occlusions (RVO) and blood groups.

Materials and Methods: Detailed ophthalmological examinations, systemic diseases and blood groups of patients who applied to Balıkesir University Faculty of Medicine, Ophthalmology Outpatient Clinic between February 2019 and May 2020 with retinal vein occlusion were retrospectively analyzed. The blood groups of the patients were divided into 2 groups as O and non-O. The results were compared with a normal group matched in terms of age and gender. Regression analysis was performed to determine the relationship between blood group types and vein occlusions.

Results: A total of 78 people were included in the study. The mean age of 38 patients with vein occlusion was 61.8±11.3, while the mean age of 40 patients without vein occlusion was 64.0±10.3 (p=0.320). In the RVO patients group, 14 (36.8%) were female, 30 (78.9%) had non-O blood group, 20 (52.6%) had hypertension (HT), 19 (50%) had diabetes mellitus (DM). According to the results of logistic regression analysis, HT have statistically significant effect on RVO formation (OR 2.92 95% CI 1.14-7.51, p=0.025). The number of patients with non-O blood group was 30 (78.9%) in the RVO group and 25 (62.5%) patients in the control group had non-O blood group (p=0.140).

Conclusion: HT is the major risk factor for RVO. Although non-O blood group is found at a higher rate in RVO patients, it does not show a significant difference.

Keywords: ABO blood groups, Retinal vascular occlusion, Vein occlusion, Venous occlusion.

INTRODUCTION

Retinal vascular occlusion is a serious condition with severe vision loss in adults. Retinal vein occlusions (RVO) are the most common condition among retinal vascular occlusions.^{1,2} In addition, RVO is the most common retinal vascular disease after diabetic retinopathy.³ Annual prevalence of RVO was found between 0.52% and 1.1% in large-scale studies.^{4,5} As a result of studies on factors that predispose to RVO, advanced age, diabetes mellitus (DM), hypertension (HT), thrombophilia (Protein C and S deficiencies, antithrombin factor V Leiden mutation, hyperhomocysteinemia and anticardiolipin antibodies) were identified. Glaucoma is the most common eye disease predisposing to RVO.⁶⁻¹¹

ABO blood group system was first described by Karl Landsteiner in 1901.¹² These antigens are expressed on the surface of red blood cells and some other tissues

like platelets, vascular endothelium. People may have 4 different blood group phenotypes on the ABO blood type scale. Moreover, another blood group system with great clinical importance is the rhesus blood group system. People are called Rh-positive or Rh-negative according to the synthesis of rhesus proteins.¹³

Lots of researches proved blood groups differences have implications on diseases. Coagulopathy is one of the conditions which is associated with ABO groups.^{14,15} Especially the relation of cardiovascular diseases with blood groups has been discussed in many studies. It has been reported that patients with blood groups A and B mostly have coronary artery disease, ischemic heart disease and myocardial infarction. The cause of this situation is attributed to the effect of ABO blood groups on the plasma levels of factor VIII (FVIII) and vonWillebrand factor (vWF).¹⁶⁻¹⁸ The mechanism of the blood groups antigens' effect on the levels of FVIII and vWF is unclear. Both

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FVIII and vWF glycoproteins are lower (approximately 25%) in plasma of O blood group. High levels of FVIII and vWF is associated with thromboembolic diseases.^{19,21}

There are few studies in the literature on the relationship between retinal vein occlusion and blood groups. Therefore, we planned to examine retinal vein occlusions in terms of possible risk factors and blood groups.

MATERIALS AND METHODS

Patients with retinal vein occlusion who were followed up between February 2019 and May 2020 at Balıkesir University Faculty of Medicine, Department of Ophthalmology were included in this retrospective study. Written permission was obtained from the local ethics committee and the study was adherent to the Declaration of Helsinki. Patients with deficient blood type, thrombophilia history and glaucoma were not included in the study. Patients' detailed ophthalmological examinations, systemic diseases, demographic characteristics and blood groups were recorded through the national health system database. The presence or absence of glaucoma was determined from the data recorded in the system according to the use of antiglaucomatous drugs and the presence of glaucoma changes in the optic disc and visual field, if any. We determined the blood group records based on the tests performed in the biochemistry laboratory of our hospital. Blood groups were divided into 2 groups as O and non-O. A, B and AB blood groups were defined as non-O. The control group was randomly selected from the patients

who applied to the outpatient clinic due to refractive error and whose records were complete with the characteristics specified in the study.

All values were reported as mean \pm standard deviation (SD). The normality of the data distribution was evaluated using the Shapiro-Wilk test. Chi-square test was used for categorical variables and an independent t test was used for continuous variables. In addition, logistic regression models were applied to evaluate independent relationships between blood groups and other possible factors and RVO. Odds ratio (OR) and 95 % confidence intervals (CI) are reported. A p value <0.05 was considered statistically significant. Analyses were carried out using SPSS software package version 20.0 (IBM, Armonk, NY).

RESULTS

A total of 78 patients were included in this study. There were 38 patients (with RVO) in the first group and 40 patients in the second group (without RVO). The mean age of the first group was 61.8 ± 11.3 years, and the mean age of the second group was 64.0 ± 10.3 years ($p=0.320$). 14 (36.8%) of the RVO patients and 21 (52.5%) of the control group were female. There was no significant difference between the groups in terms of age and gender ($p=0.320$, $p=0.180$). The demographic and clinical characteristics of the study groups are given in Table 1.

In the RVO group, non-O blood type was 78.9% of the total number; the same ratio was 62.5% for the non-RVO

Table 1: Demographic and clinical characteristics of the study groups.

	RVO group (n=38) (Mean \pm SD)	Control group (n=40) (Mean \pm SD)	p value
Age (year)	61.8 \pm 11.3	64.0 \pm 10.3	0.320
Gender (F/M)	14/24	21/19	0.180
Blood group n, (%)			
O	8 (21.1)	15 (37.5)	0.100
A	18 (47.4)	16 (40)	
B	8 (21.1)	9 (22.5)	
AB	4 (10.5)	0	
Rh positivity n, (%)	22 (57.8)	20 (50)	0.505
Hypertension n, (%)	20 (52.6)	11 (27.5)	0.037*
Diabetes Mellitus n, (%)	19 (50)	15 (37.5)	0.361
Anticoagulant drug use n, (%)	11 (28.9)	16 (40)	0.348
Non-O blood group n, (%)	30 (78.9)	25 (62.5)	0.140
RVO: Retinal vein occlusion			
*Bold value indicates statistically significant result.			

group ($p=0.140$). Rh positivity was similar for the two groups ($p=0.505$). The rate of hypertension in the RVO group was significantly higher than the control group ($p=0.037$). There was no difference between the groups for diabetes mellitus and anticoagulant drug use rates ($p=0.361$) ($p=0.348$) (Table 1).

According to the results of logistic regression analysis, only the presence of HT was found to be risk factors for RVO (OR 2.92, 95% CI 1.14-7.51, $p=0.025$) (Table 2).

DISCUSSION

According to the univariate logistic regression analysis results of our study, patients with HT show a predisposing effect in terms of retinal vein occlusion. Although non-O blood group was observed significantly more in RVO patients, it was not statistically significant.

There are 2 studies on the subject in the literature. In the study of White in 1978, no relationship was found between ABO blood groups and retinal vein occlusions. Interestingly, individuals with blood type A have been reported to have worse visual prognosis than other blood groups.²² Borella et al. stated that non-O blood group and thrombophilia were observed more in RVO patients.¹⁰ The difference of our study from this study is that some demographic and systemic features that may affect the development of RVO are evaluated by regression analysis.

The relationship between ABO blood group differences and vascular occlusions has been researched for many years and studies have been carried out by many different disciplines. When the published reviews on this subject are examined, it is seen that vascular occlusions of both arterial and venous system can be affected by the patient's blood type.^{14,22} A large-scale study with more than 1.5 million blood donors also showed that there was a significant difference between O type and non-O type blood groups in terms of both arterial and venous thromboembolic events, and those with non-O group were at higher risk for thromboembolic

events. When A, B and AB groups were evaluated among themselves in the same study, it was stated that the group that created the most susceptibility to vascular occlusions was the AB group and the tendencies of groups A and B to vascular occlusions were found to be similar.¹⁹ In a cross-sectional study conducted in 7800 patients, a relationship was found between venous thrombotic events and blood group A compared to O individually.²⁰ Although this relationship has been demonstrated in many studies, it can be said that the events related to venous vascular structures are affected more with ABO blood groups when the venous and arterial originated events are examined.²³

There are few studies in the literature investigating the relationship between Rh blood group and vascular occlusions. In an article published in 1973, no relationship was found between myocardial infarction and Rh blood group.²⁴ Similarly, in another previous study, no relationship was found between coronary artery disease and Rh positivity.²⁵ In our study, results consistent with the literature were obtained.

It is well known that advanced age, hypertension and diabetes mellitus are risk factors for vascular occlusions. This has also been shown for both retinal artery and vein occlusions. In the reviews published on retinal vascular occlusions, it was stated that advanced age and cardiovascular risk factors increase the risk of all retinal vascular occlusions.^{1,26} Similarly, in studies conducted specifically for retinal vein occlusions, advanced age, hypertension and diabetes mellitus were reported to be risk factors.^{8,9} In our study, it was determined that hypertension was a factor predicting retinal vein occlusions. However, diabetes mellitus was found to have no significant effect.

The most important limiting factor of our study is its retrospective design. Apart from this, the relatively low number of patients is another limiting factor. However, the incomplete records of the patients who were examined for thrombophilia caused many patients to be excluded from the study. Despite these limitations, our study is important,

Table 2: Results of logistic regression analysis of possible factors affecting retinal vein occlusion.

	OR	95% CI	p value
Age	0.97	0.93-1.02	0.316
Gender (Female)	0.52	0.21-1.30	0.166
Non-O group	2.25	0.82-6.17	0.115
Rh positivity	0.72	0.29-1.77	0.485
Hypertension	2.92	1.14-7.51	0.025
Diabetes Mellitus	1.66	0.67-4.10	0.267
Anticoagulant drug use	0.61	0.23-1.57	0.307

because it is the first study in which the effect of ABO blood groups on retinal venous occlusions was evaluated by regression analysis.

In conclusion, HT is a major risk factor predisposing to retinal vein occlusions. Non-O blood group is observed at a higher rate in RVO patients.

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