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Research Article

The relationship between ABO blood group and blood transfusion in upper gastrointestinal bleeding

Üst gastrointestinal kanamada ABO kan grubu ile kan transfüzyonu arasındaki ilişki

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Abstract

Introduction: ABO blood group (BG) antigens found in many cells and tissues, especially in erythrocytes, have been associated with many diseases including cardiovascular diseases, infections, and malignancies. The association of ABO BG with duodenal and gastric ulcers and upper gastrointestinal bleeding (UGB) has been investigated in few studies and the information on this subject is limited. The primary objective of our study is to examine whether there is an association between ABO BG and UGB, and the secondary objective is to examine whether there is an association between ABO BG and UGB in patients who received blood transfusions after bleeding.

Methods: The prevalence values of A, B, AB, 0 BG and Rh antigens, endoscopic procedure, and blood transfusion information of patients who were diagnosed with UGB by endoscopic examination and hospitalized were recorded. Healthy individuals without UGB in the same period were included as the control group (CG). Those who had UGB by endoscopic examination constituted the study group (SG) while those who received at least 2 units of blood transfusion formed the transfusion group (TG).

Results: SG consisted of 423 patients, TG included 383 patients, and CG had 1650 individuals. While the risk of bleeding was higher in SG patients with BG 0 (OR 1.33 1.07-1.66 P=0.009), the bleeding risk was lower in SG patients with BG B (OR 0.77 0.63-0.95 P=0.014). In addition, while the risk of bleeding was higher in TG patients with BG 0 (OR 1.35 1.08-1.70 P=0.009), the bleeding risk was lower in TG patients with BG B (OR 0.55 0.38-0.79 P=0.001). There was no statistically significant difference in SG, and TG in other BG A and AB and no significant difference in Rh.

Conclusion: While UGB is more common in individuals with BG 0, it is less common in individuals with BG B. The risk of need for blood transfusion during the follow-up period of these patients in the ward is higher in patients with BG 0 but lower in patients with BG B.

Keywords: Blood group, bleeding, transfusion

Öz

Giriş: Başta eritrositler olmak üzere birçok hücre ve dokuda bulunan ABO kan grubu (KG) antijenleri kardiyovasküler hastalıklar, enfeksiyonlar, maligniteler olmak üzere çok sayıda hastalıkla ilişkilendirilmiştir. ABO KG'nin duodenal ve gastrik ülserler, üst gastrointestinal kanaması (ÜGK) ile ilişkisi az sayıda çalışmada incelenmiş olup bu konudaki bilgiler kısıtlıdır. Çalışmamızın birincil amacı ABO KG ile ÜGK arasında bir ilişki olup olmadığını incelemek, ikincil amacıysa kanama sonrası kan transfüzyonu yapılan hastaların ABO KG ile ilişki olup olmadığını incelemektir.

Yöntem: Endoskopik inceleme ile ÜGK tanısı alan ve yatış yapılan hastaların A, B, AB, O KG ve Rh antijenlerinin prevalans değerleri, endoskopik işlem ve kan transfüzyon bilgileri kayıt altına alındı. Aynı dönemde ÜGK olmayan sağlıklı bireyler kontrol grubu (CG) olarak alındı. Endoskopik inceleme ile ÜGK olanlar çalışma grubunu (ÇG), en az 2 ünite kan transfüzyonu alanlar da transfüzyon grubunu (TG) oluşturdu.

Bulgular: ÇG 423 hasta, TG 383 hasta, CG 1650 hastadan oluştu. ÇG 0 KG olanlarda kanama riski daha yüksek tespit edilmiştir (OR 1.33 1.07-1.66 P=0.009). ÇG B KG olanlarda kanama riski daha düşük tespit edilmiştir (OR 0.77 0.63-0.95 P=0.014). TG O KG olanlarda kanama riski daha yüksek tespit edilmiştir (OR 1.35 1.08-1.70 P=0.009). TG B KG olanlarda kanama riski daha düşük tespit edilmiştir (OR 0.55 0.38-0.79 P=0.001). Diğer KG'ler A ve AB'de ÇG ve TG'de istatistiksel olarak anlamlı bir fark olmadığı gibi Rh'da da anlamlı bir fark tespit edilmemiştir.

Sonuç: 0 KG olan bireylerde ÜGK daha sık görülürken B KG olan bireylerde daha az rastlanmaktadır. Bu hastaların servis izlem sürelerinde kan transfüzyon ihtiyacı riski de 0 KG olanlarda daha fazla olurken B KG olanlarda daha az olmaktadır.

Anahtar Kelimeler: Kan grubu, kanama, transfüzyon

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Key Points

1. Upper gastrointestinal bleeding and getting blood transfusions are more common in individuals with blood group 0, while they are less common in individuals with blood group B.
2. There is no statistically significant difference in blood group A and AB, as well as Rh.

Introduction

In the early twentieth century, Shattock and Karl Landsteiner determined for the first time that some features in human blood varied from individual to individual, which established the basis of the ABO blood group (BG). ABO BG antigens were found in erythrocytes, platelets, vascular endothelium, epithelial cells, sensory neurons, and many cell and tissue surfaces [1]. Following these discoveries, the relationship between ABO BG and many diseases such as cardiovascular, infectious, and malignant diseases has been thoroughly investigated [2].

Acute upper gastrointestinal bleeding (UGB) is one of the most common reason for emergency hospital admission managed by gastroenterologists and has an annual incidence ranging from approximately 50 to 150 per 100,000 of the population [3]. Bleeding occurring in the upper part of the ligament of Treitz is defined as upper gastrointestinal bleeding (UGB). UGB may be observed due to ulcerative-erosive lesions, complications of portal hypertension, vascular lesions, malignancy, and traumatic or iatrogenic causes [4]. The cause of most bleeding is diagnosed by an endoscopy. For this reason, the endoscopic treatment is the main treatment option in many patients. Although the relationship between BG antigens and ulcer disease has been extensively investigated [5-7] and a fresh perspective for the etiology has been proposed, the data regarding UGB association is limited. In the study by Bayan et al. and the meta-analysis by Dentali et al. UGB was found to be higher in patients with BG 0 [8,9]. The relationship between the need for blood transfusion in patients with UGB and ABO BG has not been examined in any study to date.

In this study, our primary aim is to determine the prevalence of BGs in the normal population and in patients with gastrointestinal system bleeding and to examine whether there is a relationship between ABO BG antigens in patients with UGB. The secondary aim of our study is to examine whether there is a relationship between the need for blood transfusion in patients with UGB and ABO BG antigens.

Methods

The present study was a retrospective review of the files of patients admitted to the internal medicine and gastroenterology clinics of a university hospital with UGB. The study was performed after approval from the local ethics committee (University of Health Sciences, Kocaeli Derince Training and Research Hospital, Clinical Research Ethics Committee, decision no: 2019/102, decision date: 10.10.2019). Patients who were diagnosed with UGB by endoscopic examination and hospitalized in internal medicine or gastroenterology clinics were included in the study. Patients who were admitted to internal medicine and gastroenterology clinics in the same period without a diagnosis of UGB and whose BG was checked were included in the study as the control group (CG). The criterion for acceptance of UGB was endoscopic diagnosis of the bleeding. Patients with bleeding esophageal varices and patients using warfarin were excluded. In addition, patients with lower gastrointestinal tract bleeding without UGB and patients with positive fecal occult blood tests but not diagnosed as UGB on endoscopic examination were excluded. Rh and ABO BG of all individuals in the study were determined using gel centrifugation. Prevalence values, endoscopic procedure, and blood transfusion information were recorded on the basis of A, B, AB, O BG and Rh antigens of the patients in the study and control group.

Ethical approval

Local Ethics Committee Approval for this study was obtained from University of Health Sciences, Kocaeli Derince Training and Research Hospital, Clinical Research Ethics Committee (Decision no: 2019/102, decision date: 10.10.2019).

Statistical analysis

Statistical analysis was performed using the SPSS (Statistical Package for Social Sciences) Ver.20.0.0 software. Descriptive statistics were used for the demographic and baseline characteristics of the patients. The chi-square test was used for frequency comparison between groups. Risk assessment between groups was analyzed by the Odds ratio. $P<0.05$ was considered statistically significant.

Results

The study group (SG) consisted of 423 patients diagnosed with UGB by endoscopic examination while the control group (CG) consisted of 1650 individuals. The transfusion group (TG) consisted of 383 patients who received at least 2 units of blood transfusion to increase the hemoglobin that decreased due to bleeding during the follow-up period after endoscopic examination. The BG and Rh distributions of the CG, SG, and TG included in the study are shown in Table 1.

Table 1. ABO/Rh blood group distribution in UGB, transfusion and control groups.

Blood Group	Control Group	Study Group	Transfusion Group
0	563 (34.1)	173 (40.9)	158 (41.3)
A	681 (41.3)	173 (40.9)	160 (41.8)
B	274 (16.6)	49 (11.6)	38 (9.9)
AB	132 (8.0)	28 (6,6)	27 (7.0)
Rh+	1457 (88.3)	368 (87.0)	332 (86.7)
Rh-	193 (11.7)	55 (13.0)	51 (13.3)

ABO/Rh blood group distribution of the groups.

The risk of bleeding was higher in SG patients with BG 0 who were hospitalized in the clinic and diagnosed with UGB by endoscopic examination (OR 1.33 1.07-1.66 P=0.009), whereas the risk of bleeding was lower in SG patients with BG B (OR 0.77 0.63-0.95 P=0.014). The bleeding risk was found to be higher in TG patients with BG 0 who underwent an endoscopic procedure and received at least 2 units of blood transfusion due to hemoglobin decrease during follow-up (OR 1.35 1.08-1.70 P=0.009), while the risk of bleeding was lower in TG patients with BG B (OR 0.55 0.38-0.79 P=0.001). There was no statistically significant difference in EG, SG, and TG in other BGs A and AB, as well as Rh. Table 2 shows the Odds ratio levels between BG and Rh and between SG and TG groups.

Table 2. Odds ratio of ABO/Rh blood group in study and transfusion groups.

Blood Group	Group	Odds Ratio (95% CI)	P Value
0	Study Group	1.33 (1.07-1.66)	**0.009**
	Transfusion Group	1.35 (1.08-1.70)	**0.009**
B	Study Group	0.65 (0.47-0.91)	**0.011**
	Transfusion Group	0.55 (0.38-0.79)	**0.001**
A	Study Group	0.98 (0.79-1.22)	0.889
	Transfusion Group	1.02 (0.81-1.27)	0.857
AB	Study Group	0.78 (0.51-1.20)	0.266
	Transfusion Group	0.86 (0.56-1.33)	0.516
Rh	Study Group	0.88 (0.64-1.22)	0.460
	Transfusion Group	0.86 (0.61-1.20)	0.380

Chi-Square Test, Odds Ratio for groups, %95 confidence interval.

Discussion

Similar to the previous studies, our study supported that UGB was more frequent in patients with BG 0. On the other hand, according to our literature review, we found that UGB was less frequent in patients with BG B for the first time in our study. In previous studies, the need for blood transfusion in patients with UGB has never been examined. In our study, similar to the risk of UGB, we found that the need for transfusion was more frequent in patients with BG 0, while the need for transfusion was less in patients with BG B.

It was reported by the Turkish Kızılay Blood Services that 2,751,692 blood donations were made in 2021. Accordingly, the distribution of BG in our country is shown in Table 3 [10]. When the CG data in our study were compared with the Turkish Kızılay data, it was seen that the results were similar.

Table 3. ABO blood group distribution in Türkiye.

Blood Group	0	A	B	AB
Rh^+	%30	%37	%14	%7
Rh^-	%4	%5	%2	%1
Total	%34	%42	%16	%8

The ABO blood group distribution of Turkish Kızılay data in Türkiye.

To date, the most important study examining the relationship between UGB and ABO in detail is the study by Bayan et al. Similar to our study, Bayan et al. found that UGB was more frequent in those with BG 0 [8]. Additionally, in a study conducted in 1966 in a Greek population, the reason for the frequency of UGB in patients with BG 0 was thought to be the frequent occurrence of gastroduodenal ulcers in individuals with BG 0 [7]. Aird et al. found a 35% increased risk of peptic ulcer in individuals with BG 0 [10]. In the study by Horwich et al. BG 0 was found to be significantly higher in patients with bleeding duodenal ulcers [12]. In the study by Mentis et al., the BG distribution of patients with ulcers was examined and BG 0 was found to be higher in patients with ulcers [13]. Similarly, in a meta-analysis in which the relationship between ABO BGs and bleeding risk was investigated, a significant relationship between BG 0 and bleeding risk was reported [9].

Meian et al. asserted that BG ABO is essentially related to the risk of coronary heart disease. In comparison with other BGs, the risk of having CHD is slightly higher in individuals with BG 0 [14]. According to Garcia and Pruissen, BG 0 is related to lower von Willebrand factor levels. Various studies assert that it might be related to the hemorrhage development risk, particularly when other bleeding risk factors exist [15-16]. In light of these data, we can say that although thromboembolic events are less common in individuals with BG 0, the risk of bleeding is higher in these individuals. In our study, in addition to the increased risk of bleeding, we found that these patients require more blood transfusion in case of UGB development. We recommend that individuals with BG 0 should be prepared for transfusion in case of UGB development and that spare blood should be available for those with BG 0.

The most important feature that distinguishes our study from other studies is that we found that the risk of bleeding and the need for blood transfusion were significantly lower in individuals with B BG compared to the general population. There is very limited information on the difference in the association of BG B with bleeding or thromboembolism. Separham et al. discovered that a higher response is triggered with A or B BG antigens in individuals with acute myocardial infarction [17]. According to this finding, it can be inferred that individuals with A or B BG antigens are more likely to have thrombotic occlusion of coronary arteries.

Limitations

In our study, such a finding in BG B may be due to the fact that the number of patients diagnosed with UGB was 49 and the number of transfused patients was 38. A statistical difference may have been detected because the individuals with BG B included in the study did not adequately represent the patient group. Another limitation is that the study was conducted only in Turkish individuals and in a specific localization.

Conclusion

There is a relationship between UGB, which may have high morbidity and mortality, and ABO BG. While UGB is more common in individuals with BG 0, it is less common in individuals with BG B. The risk of need for blood transfusion during the follow-up period of these patients in the ward is higher in patients with BG 0 but lower in patients with BG B.

Conflict of interest: The authors declared no potential conflicts of interest regarding the research, authorship and/or publication of this article.

	Author Contributions	Author Contributions
SCD	Study Conception and Design	HK, ABT, BCB, SM
AD	Acquisition of Data	HK, ABT, BCB, SM, GD
AID	Analysis and Interpretation of Data	HK, ABT, BCB, SM, GD
DM	Drafting of Manuscript	HK, ABT, BCB, SM, GD
CR	Critical Revision	HK, ABT

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