Turkish Archives of Otorhinolaryngology
Türk Otorinolarengoloji Arşivi

Turk Arch Otorhinolaryngol 2018; 56: 21-4

ABO and RhD Blood Groups in Nasal Polyposis

Nazal Polipoziste ABO ve RhD Kan Grupları

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Original Investigation
Özgün Araştırma

Abstract

Objective: The aim of this study was to determine ABO and RhD blood group distribution in nasal polyposis (NP) patients and whether there is a specific ABO or RhD blood phenotype associated with susceptibility to or protection with respect to development of NP.

Methods: The study group comprised 126 consecutive patients with chronic rhinosinusitis and bilateral NP. The control group comprised 126 healthy blood donors. All participants were from the same geographical region. Distribution of ABO and RhD phenotypes in all participants was studied.

Results: There were no significant differences between patients and controls in the distribution of the A (p=0.520), B (p=0.306), AB (p=0.673), O (p=0.894), and RhD (p=0.742) phenotypes.

Conclusion: According to the present results, the ABO and RhD blood group systems are not associated with development of NP.

Keywords: Chronic rhinosinusitis, nasal polyposis, blood group system, ABO, RhD

Öz

Amaç: Bu çalışmanın amacı, nazal polipozis (NP) hastalarındaki ABO ve RhD kan grubu dağılımını belirlemek ve NP gelişimine duyarlılık veya korunma ile ilişkili belirli bir ABO veya RhD kan fenotipi olup olmadığını saptamaktır.

Yöntemler: Çalışma grubu 126 ardışık kronik rinosinüzit ve bilateral NP hastasından, kontrol grubu ise 126 sağlıklı kan vericiden oluşuyordu. Tüm katılımcılar aynı coğrafi bölgeden idi ve tümünde ABO ve RhD fenotiplerinin dağılımı incelendi.

Bulgular: A (p=0.520), B (p=0.306), AB (p=0.673), O (p=0.894) ve RhD dağılımında hastalar ve kontroller arasında anlamlı bir fenotip farklılığı yoktu (p=0.742).

Sonuç: Mevcut bulgulara göre, ABO ve RhD kan grubu sistemlerinin NP gelişimiyle ilişkisi saptanmadı

Anahtar kelimeler: Kronik rinosinüzit, nazal polipozis, kan grubu sistemi, ABO, RhD

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Cite this article as: *Jelavic B, Marković J, Klarić S, Martinac M, Selak S, Baudoin T. ABO and RhD Blood Groups in Nasal Polyposis. Turk Arch Otorhinolaryngol 2018; 56: 21-4*

This study was presented at the 26th Congress of the European Rhinologic Society July 3-7, 2016, Stockholm, Sweden.

Bu çalışma, 26. Avrupa Rinoloji Derneği Kongresi'nde sunulmuştur, 3-7 Temmuz 2016, Stockholm, İsveç.

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Received Date/Geliş Tarihi: 17.11.2017
Accepted Date/Kabul Tarihi: 16.12.2017

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DOI: 10.5152/tao.2018.3048

Introduction

Nasal polyposis (NP) is a complex multifactorial disease with an arguable genetic association. Several members of a family may be affected with nasal polyposis, but there is weak evidence regarding the genetic association (1). ABO and RhD blood groups are genetically transmitted. The antigens of the ABO blood group system are complex carbohydrate molecules. Besides being expressed on the surface of red blood cells, ABO antigens are strongly expressed on the surface of a variety of human cells and tissues, including the epithelium, sensory neurons, platelets, and vascular endothelium (2). The oligosaccharide composition of the cell membrane and mucosal secretions is controlled in part by the ABO system and influences the adhesion of environmental factors to epithelial cells, thereby modulating viral and bacterial respiratory tract infections (3).

Specific ABO blood types are considered to be associated with increased or decreased susceptibility to particular diseases. There are studies that claim that there is a significant relationship between a specific blood group and susceptibility to asthma or allergic rhinitis (4-6). Studies on adults and children with bronchial asthma have shown that asthma is significantly related to the O/non-secre-

tor phenotype (4, 5). Compared with controls, a significantly higher incidence of the O phenotype in male patients with allergic rhinitis was reported (6). Chronic rhinosinusitis (CRS) with NP is a frequent condition associated with bronchial asthma and allergic rhinitis. Comorbid conditions may have common risk factors. It is possible that the factors causing susceptibility to bronchial asthma are also involved in susceptibility to NP.

The aim of this case-control study was to determine ABO and RhD blood group distribution in NP and whether there is a specific ABO or RhD blood phenotype associated with susceptibility to or protection against the development of NP. To the best of our knowledge, no study on this topic has previously been published.

Methods

The study group comprised 126 consecutive patients with CRS and bilateral nasal polyposis refractory to medical therapy. All patients met the CRS criteria endorsed by the European Rhinologic Society (7). All patients underwent endoscopic sinus surgery (from 2009 to 2016). The control group, representing ABO and RhD grouping in the population of our region, comprised 126 healthy blood donors. All participants were from the same geographical region. Written informed consent from each patient with NP and the institutional ethics committee approval (No. 01-1-12/16) were obtained.

The ABO and RhD phenotypes were determined by a standard hemagglutination test using microgel technique (ABO/D+Reverse Grouping, Bio-Rad Laboratories, Hercules, California, USA). Distribution of ABO and RhD phenotypes in all participants was studied. The study group and the control group were compared according to the frequency of the A, B, AB, O, and RhD phenotypes.

Statistical Analysis

Sample size calculations (significance level=0.05, power=80%) were performed with the G*Power 3.0.10 program and our pilot data. Normality of the distribution was tested by the Kolmogorov-Smirnov test. The chi-square (χ^2) test for significance was used to evaluate relationships between nominal variables. Comparison between two independent symmetric variables was drawn with Student's t-test. p values of <0.05 were regarded as statistically significant. All statistical analyses were performed with Statistical Package for the Social Sciences for Windows (version 13.0, SPSS Inc.; Chicago, IL, USA).

Results

The characteristics of the participants studied are shown in Table 1. Patients were significantly older than controls (Student's t-test=10.073; p<0.001). There was no significant difference in sex (χ^2 test=0.421; df=1; p=0.517). There were no significant differences between patients and controls in the distribution of the A (χ^2 test=0.414; df=1; p=0.520), B (χ^2 test=1.049; df=1; p=0.306), AB (χ^2 test=0.178; df=1; p=0.673), O (χ^2 test=0.018; df=1; p=0.894), and RhD (χ^2 test=0.108; df=1; p=0.742) phenotypes.

Discussion

A number of authors published papers suggesting an association of various diseases with particular blood groups (8). It seems that the clinical significance of blood group systems now extends beyond the traditional boundaries of transfusion medicine. However, according to our present results, the ABO and RhD blood group systems are not linked with development of nasal polyposis. To the best of our knowledge, no study on this topic was published. We are not aware of previous studies and results that can be discussed and compared with our study and results.

A study conducted in Germany reported the higher incidence of blood group antigens A and B in patients with atopic diseases (atopic dermatitis, hay fever, allergic rhinitis, bronchial asthma, and acute urticaria) in comparison with controls (individuals clinically free of allergic conditions and without allergy in the family history) (9). Several studies suggest that there is an as-

Table 1. Data of the study (patients with nasal polyposis) and control (blood donors) group

Demographics	The study group (n=126)	The control group (n=126)	The study group versus the control group
ABO and RhD phenotypes	Mean±SD† or number of patients (%)	Mean±SD† or number of patients (%)	p*
Age (years)	47.63±15.501	30.90±10.374	<0.001
Male/female	75/51	81/45	0.517
A	53 (42.1)	47 (37.3)	0.520
B	17 (13.5)	24 (19)	0.306
AB	14 (11.1)	11 (8.7)	0.673
O	42 (33.3)	44 (34.9)	0.894
RhD positive	105 (83.3)	102 (81)	0.742

*p<0.05 were regarded as statistically significant.
SD: standard deviation

sociation between specific ABO blood types and some medical conditions commonly associated with NP (4-6, 10). Comorbid conditions may have common risk factors. It is believed that the factors contributing to bronchial asthma or allergic rhinitis may be involved in susceptibility to NP.

In a study conducted in Italy, children with asthma and controls were compared according to the joint ABO/secretor phenotype (5). Some people have the ability to secrete ABO blood group substances in the saliva, and they are referred to as "secretors," whereas others do not have such an ability and are referred to as "non-secretors". The ability of secreting the blood group antigens plays a significant role in the natural resistance of the organism to infections. Secretor status of an individual is genetically determined. This Italian study showed an association between the O/non-secretor phenotype and childhood asthma. The difference was much more marked in males than in females (5). Another study determined the association between ABO, Lewis (Le), and secretor (Se) genetic complex and susceptibility to childhood asthma in Taiwan (10). Blood group O/secretors (Se/Se) and O/Le(a-b-) were associated with childhood asthma (10). In France, three blood systems (Le, salivary ABH secretor, and ABO) were investigated in coal miners. Significantly higher prevalences of adult asthma were observed in Le-negative or non-secretor subjects of blood group O (4). On the contrary, a lack of association between asthma and the ABO system was found in the study conducted in India (11). In Brazil, the patients with allergic rhinitis and controls were compared according to the frequencies of the ABO phenotypes. The O phenotype was significantly associated with allergic rhinitis in male but not in female patients (6).

An exact immunological background with respect to the aforementioned relationships is not known. Carpeggiani (3) speculated and offered the following explanation The respiratory organs express abundant ABO and Le antigens. ABO, Le, and secretor genes control the enzyme glycosyltransferase. Glycosyltransferases attach sugar molecules to disaccharide precursors and build oligosaccharide structures on the cell surface of red blood cells and vascular endothelium as well as in the exocrine secretion system, including the respiratory tract. Blood group antigens are also involved in the formation of mucopolysaccarides in epithelial and mucosal secretion that may play role in the adhesion of enviromental factors, such as microorganisms, and air toxic substances to epithelial cells. The A and B genes encode for glycosyltransferases. Modifications to the H antigen by glycosyltransferases lead to the synthesis of the A and B substances. Subjects with the O phenotype are not capable of encoding glycosyltransferases and modifying the H antigen (3).

The frequencies of the blood groups differ widely between different ethnic groups (12). Our country has very complex structure with three major ethnic groups. There are significant differences in ethnic structures among administrative units. There are no official data about frequencies of ABO and RhD groups for the whole country. Therefore, we analyzed a hospital database of 23,320 subjects who underwent ABO and RhD blood typing at our Center for Transfusion Medicine (from 2009 to 2016 inclusive). We found 37.37% subjects with the A, 19.61% with the B, 8.57% with the AB, 34.43% with the O phenotype and 81.41% RhD-positive subjects. This distribution was similar to the frequencies of the ABO and RhD phenotypes in our control group. Thus, we believe that the control group was representative of the population living in the region where our study was conducted with respect to the ABO and RhD blood group system.

Young adults are more often blood donors; nasal polyposis becomes more common with advancing age (7). In this study, patients were significantly older than controls. This age difference is of no relevance in this study. Because blood group is genetically determined and the ABO antigens remain constant throughout the life, this age difference does not interfere with the study objective or influence the final results.

Conclusion

In conclusion, our study showed a lack of association between nasal polyps and the ABO and RhD blood group systems. Because the frequencies of ABO and RhD blood groups vary from one population to another, it would be interesting to see the results of similar studies conducted in regions with different ABO and RhD grouping. Further studies should also include the assessment of participants' ABH secretor status.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Mostar University School of Medicine (Reg. No. 01-1-12/16) and the Mostar University Hospital (Reg. No. 712/17).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - B.J., J.M., S.K., M.M., S.S., T.B.; Design - B.J., J.M., S.K., M.M., S.S., T.B., ; Supervision - B.J., J.M., S.K., M.M., S.S., T.B.; Data Collection and/or Processing - J.M., S.K., M.M.; Analysis and/or Interpretation - B.J., J.M., S.K., M.M., S.S., T.B.; Literature Search - B.J., J.M., M.M., S.S., T.B.; Writing - B.J., T.B.; Critical Reviews B.J., J.M., S.K., M.M., S.S., T.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Etik Komite Onayı: Bu çalışma için etik komite onayı Mostar Üniversitesi Tıp Fakültesi (Reg. No. 01-1-12/16) ve Mostar Üniversitesi Hastanesi'nden (Reg. No. 712/17) alınmıştır.

Hasta Onamı: Yazılı hasta onamı bu çalışmaya katılan hastalardan alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - B.J., J.M., S.K., M.M., S.S., T.B.; Tasarım - B.J., J.M., S.K., M.M., S.S., T.B.; Denetleme - B.J., J.M., S.K., M.M., S.S.,

T.B.; Veri Toplanması ve/veya İşlemesi J.M., S.K., M.M.; Analiz ve/veya Yorum - B.J., J.M., S.K., M.M., S.S., T.B.; Literatür Taraması B.J., J.M., M.M., S.S., T.B.; Yazıyı Yazan - B.J., T.B.; Eleştirel İnceleme B.J., J.M., S.K., M.M., S.S., T.B.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

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