

ORIGINAL ARTICLE

Relationship between ABO blood groups and head and neck cancer among Greek patients

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Summary

Purpose: We examined the association of ABO blood groups with the different types of head and neck cancers. **Methods:** 195 diagnosed cases and 801 controls were selected from a Greek tertiary cancer center. Information regarding type of head and neck cancer and ABO blood group was collected and registered.

Results: The O blood group was found to be most prevalent followed by A, B and AB among the controls, whereas blood group A followed by O, B and AB was most prevalent among cancer patients. The difference among the distribu-

tion between the cases and controls was statistically significant in blood group A ($p < 0.05$), whereas blood group A had 1.52-fold higher risk of developing head and neck cancer compared to people of other blood groups.

Conclusions: Blood group A was found to be a potential risk factor for the development of head and neck cancers.

Key words: blood groups, head and neck cancer, laryngeal cancer, oral cancer

Introduction

Cancer, is a wide group of diseases involving accelerated cell growth, formation of malignant tumors, invasion in nearby parts of the body and distant metastases. If the cancer has progressed beyond the stage that it can be successfully removed, it may even result in death of the individual.

Head and neck cancer comprise 3-5% of the total cancer cases [1,2]. The rising number of cancer-related morbidity and mortality has been related to its multifactorial etiology, particularly lifestyle factors such as use of tobacco and alcohol, as well as genetics and heredity.

The ABO blood group is one of such genetic factors that has been related in the etiology of various chronic diseases [3]. A and B antigens are saccharide groups of glycoproteins present

on red blood cell membrane. These antigens are not shared by all the members of the particular species and are called "iso-antigens". The alleles which determine the presence or absence of these antigens are called as "iso-alleles", are located on chromosome 9 and are inherited according to simple Mendelian principles. Subjects are categorized to belong to the blood groups A, B, AB or O according to the presence of these blood group antigens.

Documented association between blood groups and head and neck cancer has been limited in Greece, hence, the present study aimed to assess the relative risk of head and neck cancers among different blood groups of patients attending the Otolaryngology Department of a tertiary cancer center ("Metaxa" Cancer Hospital) in Pirae-

us, Greece.

Methods

This study was conducted at the Outpatient and Inpatient Departments of the Otolaryngology Department over a period of 4 years (2010-2014). The study was approved by the Scientific Committee of the hospital.

A total of 996 patients were included in the study. We enrolled 195 (153 males and 42 females) head and neck cancer patients (cases) and 801 controls (631 males and 170 females). Inclusion criterion was the histopathological diagnosis for head and neck cancer and in the control group were included all the patients who had a negative histopathological diagnosis for head and neck carcinoma.

Statistics

Data were analyzed using SPSS statistical software 22 (SPSS Inc – IBM Corporation, New York, USA). Chi-square test and odds ratios were used to assess the relationship between ABO blood groups and oral cancer. Differences with *p* values less than 0.05 were considered significant.

Results

A total of 195 patients were diagnosed with head and neck carcinoma. In particular, 103 (52%) patients were diagnosed with laryngeal cancer, 32 (10%) with tongue cancer, 15 (7%) with oral cancer, 20 (10%) with salivary gland cancer, 7 (3%) with nose or sinus cancer, 4 (2%) with jaw cancer and 4 (2%) with cancer in different sites of the head or neck. The mean age for the patients was 63.5±12 years and for the controls it was 62.9±13.1 years irrespective of the blood groups (*p*>0.05). The analysis of the blood group distribution among the patients and controls is shown in Table 1, where the difference between the cases and controls was statistically significant in blood group A (*p*<0.05). The strength of the association between ABO blood groups and head and neck cancers was assessed by odds ratio.

Discussion

The blood group is a genetic factor that has recognized association with multiple cancers. Blood group O was found to be maximum among the whole study population followed by blood group A, B and AB, whereas among cancer patients the highest frequency of distribution was for blood group A. In a recent study in 2010 the blood group with the highest frequency of appearance in Greece was A, followed by a slightly lower frequency for blood group O, while third, with a considerably lower frequency of appearance in the population, was blood group B, and finally blood group AB showed the lowest frequency of all [4]. An older study in 1958 conducted in Greek population showed that the highest frequency of distribution was for blood group O [5].

In our study it was shown that patients with blood group A had highest potential of developing head and neck cancer. Association between ABO blood groups with benign or malignant diseases, such as gastric and pancreatic cancers, has been observed in other studies [6,7]. Several authors have reported an association between blood group and risk for head and neck cancer many years ago [8-10]. Hypermethylation of ABO gene promoter and modification of ABO blood group antigen expression on cancer cells are related to the invasiveness or metastatic potential of tumor [11].

In previous studies, blood group A or AB were related to a higher risk of nasopharyngeal carcinoma compared with subjects with blood type O [12]. Esophageal cancer was also found more frequently in patients with blood group A [13]. Moreover, people of blood group A are at higher risk to develop oral cancer than people with other blood groups [14]. A possible explanation is that in people belonging to A and B blood groups, the precursor H antigen is converted to A and B antigen increasing the risk for the development of oral cancer since H antigen has been found to be a protective factor for cancer. In O blood group individuals, it remains in original form and thus, people with blood group O have highest amount of

Table 1. Blood group distribution between cases and controls

Blood group	A N (%)	B N (%)	AB N (%)	O N (%)
Total	398 (39.9)	125 (12.5)	44 (0.4)	429 (42.7)
Cases	94 (48.2)	21 (10.7)	6 (3)	74 (38.1)
Controls	304 (37.9)	104 (12.9)	38 (4.9)	355 (44.3)
<i>p</i> value	<0.05	>0.05	>0.05	>0.05
Odds ratio	1.52	0.80	0.63	0.76

H antigen which contributes to protection against oral cancer [15].

Thus, this study highlights the susceptibility of different blood groups specifically for head and neck cancers. It is essential to suggest early and regular cancer screening for patients of susceptible blood groups if any sign or symptom of head and neck cancer is suspected, especially if coupled with some etiologic factors like tobacco smoking or alcohol abuse. It is also important to spread awareness for self-examination and early referral to cancer screening [16]. Systematic health education can be reinforced as a preventive measure.

Individuals with susceptible blood groups can be counseled and regular cancer screening can be suggested to them while oncologists and

dentists could detect early a cancer with regular examination. Lifestyle modification, such as tobacco smoking and alcohol avoidance is also important. Therefore, a comprehensive team effort is necessary to utilize the chances for prevention of the occurrence of cancer in high risk blood groups

This study demonstrates that different blood groups are associated with different risk for head and neck cancer and people with blood group A are at higher risk to develop head and neck cancer, followed by those with blood group B, AB and O.

Conflict of interests

The authors declare no conflict of interests.

References

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. *CA Cancer J Clin* 2011;2:69-90.
2. Chaturvedi AK, Anderson WF, Lortet-Tieulent J et al. Worldwide trends in incidence rates for oral cavity and oropharyngeal cancers. *J Clin Oncol* 2013;36:4550-4559.
3. Anderson DE, Haas C. Blood type A and familial breast cancer. *Cancer* 1984;9:1845-1849.
4. Lialiaris T, Digkas E, Kareli D et al. Distribution of ABO and Rh blood groups in Greece: an update. *Int J Immunogenet* 2011;1:1-5.
5. Constantoulis NC, Paidoussis M. The distribution of ABO, MNS and Rh blood groups in Greece. *Vox Sang* 1958;3:145-154.
6. Wolpin BM, Chan AT, Hartge P et al. ABO blood group and the risk of pancreatic cancer. *J Natl Cancer Inst* 2009;6:424-431.
7. Wang Z, Liu L, Ji J et al. ABO blood group system and gastric cancer: a case-control study and meta-analysis. *Int J Mol Sci* 2012;10:13308-13321.
8. Tyagi SP, Pradhan S, Agarwal SS. Blood groups in malignant diseases. *J Indian Med Assoc* 1965;12:645-650.
9. Nayak SK. ABO blood groups in different diseases. *J Indian Med Assoc* 1971;12:449-452.
10. Baruah BD, Gogoi BC. Blood groups in cancer in Assam. *Indian J Cancer* 1977;1:6-9.
11. Gao S, Worm J, Guldberg P et al. Genetic and epigenetic alterations of the blood group ABO gene in oral squamous cell carcinoma. *Int J Cancer* 2004;2:230-237.
12. Sheng L, Sun X, Zhang L, Su D. ABO blood group and nasopharyngeal carcinoma risk in a population of Southeast China. *Int J Cancer* 2013;4:893-897.
13. Nozoe T, Ezaki T, Baba H, Kakeji Y, Maehara Y. Correlation of ABO blood group with clinicopathologic characteristics of patients with esophageal squamous cell carcinoma. *Dis Esophagus* 2004;2:146-149.
14. Jaleel BF, Nagarajappa R. Relationship between ABO blood groups and oral cancer. *Indian J Dent Res* 2012;1:7-10.
15. Singh K, Kote S, Patthi B et al. Relative Risk of Various Head and Neck Cancers among Different Blood Groups: An Analytical Study. *J Clin Diagn Res* 2014;4:ZC25-28.
16. Jornet PL, Garcia FJ, Berdugo ML, Perez FP, Lopez AP. Mouth self-examination in a population at risk of oral cancer. *Aust Dent J* 2015;1:59-64.