

# O blood group as an indicator for abdominal aortic aneurysm

N. FATIĆ<sup>1</sup>, H. LUKAĆ<sup>1</sup>, N. RADOJEVIĆ<sup>1</sup>, I. SIMANIĆ<sup>1,2</sup>, I. BANZIĆ<sup>3</sup>, B. PAJOVIĆ<sup>1</sup>

<sup>1</sup>Clinical Centre of Montenegro, Medical Faculty, University of Montenegro, Podgorica, Montenegro

<sup>2</sup>Special Hospital for Rehabilitation and Orthopedic Prosthetics, Belgrade, Serbia

<sup>3</sup>Clinic for Vascular end Endovascular Surgery, Clinical Center of Serbia, Belgrade, Serbia

**Abstract. – OBJECTIVE:** An aortic aneurysm is a general term for an enlargement (dilation) of the aorta to greater than 1.5 times normal size. Abdominal aortic aneurysm (AAA) primarily affects the population older than 50 years, with a prevalence of approximately 5%. There are a few theories about AAA etiology.

Interest in the relationship between blood type and vascular disease has been established. The aim of our study is to evaluate distribution of blood-groups among the patients with abdominal aortic aneurysm (AAA) as well as to identify any kind of relationship between blood type and AAA.

**MATERIALS AND METHODS:** The design of our research is combination of retrospective and prospective case-control study in a sample of population of Montenegro. Statistical analysis was performed in SPSS v 20.0, using the chi-square test for independent samples, with the probability level at  $p < 0.05$  as significant, and  $p < 0.01$  as highly significant.

**RESULTS:** O blood group was the most frequent among the examination group (53.11 %), and A blood group was the most frequent among group without AAA (43.22 %). Presence of AAA in individuals with O blood type was 1.46 higher than for the other blood types.

**CONCLUSIONS:** This finding leads us to suspect that O blood type can be indicator for AAA.

*Key Words:*

ABO blood groups, Abdominal aortic aneurysm, Risk factors.

## Introduction

An aortic aneurysm is a general term for an enlargement (dilation) of the aorta to greater than 1.5 times normal size. Abdominal aortic aneurysm (AAA) primarily affects the population older than 50 years, with a prevalence of around 5%<sup>1-3</sup>. There are a few theories about AAA etiol-

ogy<sup>4</sup>. Several studies have established male gender, age, smoking, and a positive family history of AAA as independent risk factors for abdominal aortic aneurysm development<sup>2</sup>. Interest in the relationship between blood type and vascular disease has been established<sup>5-10</sup>. These conclusions lead us to suspect, if there is any kind of relationship between blood type and AAA.

## Materials and Methods

The design of our study is a combination of retrospective and prospective case-control study in a sample of population of Montenegro. The study group consisted of 209 patients, who were diagnosed with AAA using ultrasound and multi-scan computed tomography (MSCT), between January 2011 and December 2013. The control group consisted of 273 randomly-selected routine blood donors from general population, 40-80 years old without AAA (based on an ultrasound examination that excluded AAA) in the same period. ABO blood group with RhD typing was performed for each patient in both groups as a routine laboratory examination.

## Statistical Analysis

Statistical analysis was performed in SPSS v 20.0 (SPSS Inc., Chicago, IL, USA), using the chi-square test for independent samples, with the probability level at  $p < 0.05$  as significant, and  $p < 0.01$  as highly significant. The study protocol was in accordance with the Declaration of Helsinki and subsequent amendments.

## Results

The groups were homogenous in gender and age. The analysis of the subjects by gender con-

cluded that both groups, the study and the control group, had the majority of male subjects (91.2: 8.8 for the study group and 87.1: 12.9 for the controls). Based on the application of the chi-square test, there wasn't gender structure difference between groups ( $p = 0.095$ ). Application of the  $t$ -test to the age distribution, didn't find difference between groups ( $p = 0.095$ ).

Comparing the blood types distribution, among the groups (Table I), O blood group was the most frequent in the study group (53.11 %), and A blood group was the most frequent among controls (43.22%). The chi-square test demonstrated the significant difference between blood types distribution among the groups ( $p = 0.007$ ). RhD positive – RhD negative ratio in the study group was 83.3: 16.7. RhD positive – RhD negative ratio in the control group was 87.9: 12.1, and the chi-square test didn't demonstrate significant difference ( $p = 0.145$ ).

Descriptive analysis showed that the O blood type was the most common in patients with AAA. The odd ratio reveals a probability that part of the sample population with AAA has 1.81 times more individuals with the O blood type. Therefore, the relative risk for AAA in individuals with O blood type was 1.46 higher than for the other blood types.

## Discussion

Despite advances in the management of aortic aneurysm, morbidity and mortality remain considerable<sup>11</sup>. Therefore, effective screening and preventive action plans for AAA are necessary, but they could be achieved only with comprehensive exploration and understanding of all risk factors within the patient. Although risk factors for AAA rupture have been well-described<sup>11-17</sup>, determining additional factors that can initiate the AAA, increases the probability of identifying those patients who are in need for preventive care.

Association of blood groups with vascular disease has been proposed for a long time<sup>18-20</sup>. ABO blood groups and AAA have also been related in some studies. Viklander et al<sup>21</sup> investigated 504 patients operated because of AAA. They haven't found difference in the distribution of the ABO blood types in the operated patients and the common population based control group. Furthermore, there was no significant difference in distribution of ABO blood group between patients

operated for ruptured AAA (n=174) and non-ruptured AAA (n=330). In conclusion, this study failed to demonstrate an association between ABO blood groups and AAA.

Frequencies of blood groups (ABO, RhD, MNSs, P, Kell, Lewis and Duffy) and HLA antigens were studied in a series of patients from northern Sweden with AAA. Significant differences from the controls were found: a decreased frequency of the Rh-negative blood group and increased frequencies of the Kell-positive and MN blood groups<sup>22-24</sup>.

Our study showed that the distribution of ABO blood types among examination and control group wasn't similar. We found the significant difference in favor of O blood type among the patients with AAA. Some previous study showed existence of *Chlamydia pneumoniae*-specific antigen in the walls of abdominal aortic aneurysms<sup>6</sup>. In additionally other studies demonstrated connection between O blood group and some infectious agents. Having this result in mind, we hypothesize that there could be some connection between O blood group and *Chlamydia pneumoniae*<sup>7</sup>. However, this theory has to be verified by further experimental and clinical work. This observation leads us to think that O blood group can be indicator for AAA.

## Conclusions

The research, presented in this paper, demonstrated that AAA was most frequent among patients with O blood type. The relative risk for AAA in individuals with O blood type was 1.46 higher than for the other blood types. This finding leads us to suspect that O blood type can be indicator for AAA.

## Conflict of Interest

The Authors declare that they have no conflict of interests.

## References

- 1) PEARCE WH, SLAUGHTER MS, LEMAIRE S, SALLYPONGSE AN, FEINGLASS J, MCCARTHY WJ, YAO JS. Aortic diameter as a function of age, gender, and body surface area. *Surgery* 1993; 114: 691-697.
- 2) SAKALIHASAN N, LIMET R, DEFAYE OD. Abdominal aortic aneurysm. *Lancet* 2005; 365: 1577-1589.

**Table I.** Distribution by Rh D and ABO blood types for both groups.

				Boold types				Total
				O	A	B	AB	
Study group	Rh factor	Rh D negative	Count	21	9	4	1	35
			%	60.00	25.71	11.43	2.86	16.75
		Rh D positive	Count	90	63	13	8	174
			%	51.72	36.21	7.47	4.60	83.25
	Total		Count	111	72	17	9	209
			%	100.0	100.0	100.0	100.0	100.0
Study group	Rh factor	Rh D negative	Count	14	11	7	1	33
			%	42.42	33.33	21.21	3.03	12.09
		Rh D positive	Count	91	107	32	10	240
			%	37.92	44.58	13.33	4.17	87.91
	Total		Count	105	118	39	11	273
			%	100.0	100.0	100.0	100.0	100.0

- 3) CHOKE E, COCKERILL G, WILSON WRW, SAYED S, DAWSON J, LOFTUS I, THOMPSON MM. A review of biological factors implicated in abdominal aortic aneurysm rupture. *Eur J Vasc Endovasc Surg* 2005; 30: 227-244.
- 4) TILSON MD. Aortic aneurysms and atherosclerosis. *Circulation* 1992; 85: 378-379.
- 5) HAIDER M, RIZVI M, MALIK A, AZAM M, RABBANI MU. Acute and chronic Chlamydia pneumoniae infection and inflammatory markers in coronary artery disease patients. *J Infect Dev Ctries* 2012; 5: 580-586.
- 6) XIONG F, ZHAO JC. Quantification and location of Chlamydia pneumoniae-specific antigen in the walls of abdominal aortic aneurysms. *Ann Vasc Surg* 2011; 25: 256-263.
- 7) ANSTEE DJ. The relationship between blood groups and disease. *Blood* 2010; 115: 4635-4643.
- 8) OHIRA T, CUSHMAN M, TSAI MY, ZHANG Y, HECKBERT SR, ZAKAI NA, ROSAMOND WD, FOLSOM AR. ABO blood group, other risk factors and incidence of venous thromboembolism: the Longitudinal Investigation of Thromboembolism Etiology (LITE). *J Thromb Haemost* 2007; 5: 1455-1461.
- 9) SARI I, OZER O, DAVUTOGLU V, GORGULA S, EREN M, AKSOY M. ABO blood group distribution and major cardiovascular risk factors in patients with acute myocardial infarction. *Blood Coagul Fibrinolysis* 2008; 19: 231-234.
- 10) WU O, BAYOUMI N, VICKERS MA, CLARK P. ABO(H) blood group and vascular disease: a systematic review and meta-analysis. *J Thromb Haemost* 2008; 6: 62-69.
- 11) LAVALL D, SCHÄFERS H, BÖHM M, LAUFS U. Aneurysms of the ascending aorta. *Dtsch Arztebl Int* 2012; 109: 227-233.
- 12) HELLER JA, WEINBERG A, ARONS R, KRISHNASASTRY KV, LYON RT, DEITCH JS, SCHULICK AH, BUSH HL JR, KENT KC. Two decades of abdominal aortic aneurysm repair: Have we made any progress? *J Vasc Surg* 2000; 32: 1091-1100.
- 13) WAINESS RM, DIMICK JB, COWAN JR JA, HENKE PK, STANLEY JC, UPCHURCH JR GR. Epidemiology of surgically treated abdominal aortic aneurysms in the United States, 1988 to 2000. *Vascular* 2004; 12: 218-224.
- 14) WANHAINEN A, BYLUND N, BJÖRCK M. Outcome after abdominal aortic aneurysm repair in Sweden 1994-2005. *Br J Surg* 2008; 95: 564-570.
- 15) FORSDAHL S, SINGH K, SOLBERG S, JACOBSEN B. Risk factors for abdominal aortic aneurysms: A 7-year prospective study: The Tromso Study, 1994-2001. *Circulation* 2009; 119: 2202-2208.
- 16) MAHMOODI B, NIJSTEN M, WIJSMAN J, MATTHEWS A, VAN DER LAAN L. ABO-blood groups and risk of abdominal aortic aneurysm and peripheral obstructive artery disease: Two sides of the same coin. *Thromb Res* 2012; 129: 89-90.
- 17) BLANKENSTEIJN J, DE JONG S, PRINSSSEN M, VAN DER HAMA, BUTH J, VAN STERKENBURG S, VERHAGEN HJ, BUSKENS E, GROBBEE DE; Dutch Randomized Endovascular Aneurysm Management (DREAM) Trial Group. Two-year outcomes after conventional or endovascular repair of abdominal aortic aneurysms. *N Engl J Med* 2005; 352: 2398-2405.
- 18) GARRISON R, HAVLIK R, HARRIS R, FEINLEIB M, KANNEL W, PADGETT S. ABO blood group and cardiovascular disease: The Framingham study. *Atherosclerosis* 1976; 25: 311-318.
- 19) WU O, BAYOUMI N, VICKERS M, CLARK P. ABO(H) blood groups and vascular disease: A systematic

- review and meta-analysis. *J Thromb Haemost* 2008; 6: 62-69.
- 20) CLARK P, WU O. ABO blood groups and thrombosis: a causal association, but is there value in screening? *Future Cardiol* 2011; 7: 191-201.
- 21) VIKLANDER G, WALLINDER J, HENRIKSSON AE. ABO blood groups and abdominal aortic aneurysm. *Transfus Apher Sci* 2012; 47: 351-353.
- 22) KINGSBURY KJ. Relation of ABO blood-groups to atherosclerosis. *Lancet* 1971; 1: 199-203.
- 23) MORRIS T, BOUHOUTSOS J. ABO blood groups in occlusive and ectatic arterial disease. *Br J Surg* 1973; 60: 892-893.
- 24) NORRGÅRD Ö, CEDERGREN B, ÄNGQUIST KA, BECKMAN L. Blood groups and HLA antigens in patients with abdominal aortic aneurysms. *Hum Hered* 1984; 34: 9-13.