Blood groups and acute aortic dissection type III

Nikola Fatic[1], Aleksandar Nikolic[1], Mihailo Vukmirovic[1], Nemanja Radojevic[1], Nenad Zornic[2], Igor Banzic[3], Nikola Ilic[3], Dusan Kostic[3], Bogdan Pajovic[1]

[1]Clinical Centre of Montenegro, Medical Faculty, University of Montenegro, Podgorica, Montenegro
[2]Clinical Centre of Kragujevac, Faculty of Medicine, University of Kragujevac, Kragujevac, Serbia
[3]Clinic for Vascular and Endovascular Surgery, Clinical Centre of Serbia, Faculty of Medicine, University of Belgrade, Belgrade, Serbia

Submitted: 11 February 2015
Accepted: 25 May 2015

Arch Med Sci 2017; 13, 3: 597–600
DOI: 10.5114/aoms.2015.52104

Corresponding author:
Nikola Fatic
Department
of Vascular Surgery
Clinical Centre
of Montenegro
Ljubljanska 1
20000 Podgorica,
Montenegro
Phone: +382 69 181 032
E-mail: nikolafatic@
hotmail.com

Abstract

Introduction: Acute aortic type III dissection is one of the most catastrophic events, with in-hospital mortality ranging between 10% and 12%. The majority of patients are treated medically, but complicated dissections, which represent 15% to 20% of cases, require surgical or thoracic endovascular aortic repair (TEVAR). For the best outcomes adequate blood transfusion support is required. 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 patients with acute aortic type III dissection and to identify any kind of relationship between blood type and patient's survival.
Material and methods: From January 2005 to December 2014, 115 patients with acute aortic type III dissection were enrolled at the Clinic of Vascular and Endovascular Surgery in Belgrade, Serbia and retrospectively analyzed. Patients were separated into two groups. The examination group consisted of patients with a lethal outcome, and the control group consisted of patients who survived.
Results: The analysis of the blood groups and RhD typing between groups did not reveal a statistically significant difference (p = 0.220).
Conclusions: Our results indicated no difference between different blood groups and RhD typing with respect to in-hospital mortality of patients with acute aortic dissection type III.

Key words: ABO blood groups, acute aortic dissection, risk factors.

Introduction

Acute aortic dissection is defined as the rapid development of a false, blood-filled channel within the tunica media of the aorta [1]. Approximately 2.9–3 out of 100,000 people per year are afflicted with acute aortic dissection [2, 3]. Aortic dissection type III accounts for 25% to 40% of all aortic dissections [4]. Acute aortic type III dissection (within 14 days of onset) is one of the most catastrophic events, with in-hospital mortality ranging between 10% and 12%. The majority of patients are treated medically, but complicated dissections, which represent 15% to 20% of cases, require surgical or thoracic endovascular aortic repair (TEVAR) [5]. For the best outcomes of these procedures, the surgical team requires adequate blood transfusion support. The IRAD study defined

some of the factors influencing in-hospital mortality: increasing age, hypotension/shock, peri-aortic hematoma, descending aortic diameter > 55 mm, acute renal failure, and limb ischemia [6]. In order to improve our results and to lower in-hospital mortality, more parameters beyond those of clinical symptomatology need to be investigated. Interest in the relationship between blood type and vascular disease has been established [7–10].

Therefore, the purpose of this study was to evaluate the distribution of blood groups among patients with acute aortic type III dissection and to identify any kind of relationship between blood type and patient survival.

Material and methods

The design of our study is a retrospective case-control study. From January 2005 to the end of December 2014, 115 patients with acute aortic type III dissection were enrolled at the Clinic of Vascular and Endovascular Surgery in Belgrade, Serbia. The diagnosis was established based on the findings of multi-slice computed tomography (MSCT). Patients were classified in two groups. The examination group consisted of the patients with a lethal outcome, and the control group consisted of the patients who survived. ABO blood group with RhD typing was performed for each patient in both groups as a routine laboratory examination. Complete statistical data analysis was performed in a statistical computer program (PASW Statistics version 18).

Statistical analysis

All attribute variables were presented in the form of the frequency of certain categories, and statistical significance between the individual categories was tested by the χ^2 test. All continuous variables are presented as mean values ± standard deviation. Student's *t*-test was used for differences in continuous variables for independent samples.

Results

The study population included 86 men and 29 women with an average age of 63.1 ±9.9 years (range: 45–72 years). The overall mortality rate was 20.9% (24 patients). The examination group consisted of 24 patients with a lethal outcome, and the control group consisted of 91 patients who survived. The analysis of the subjects by gender concluded that both groups consisted mostly of male subjects (91.7% for the examination group and 70.3% for the controls). Comparing the groups by gender, the χ^2 test did not reveal a significant difference (p = 0.054). The age distribution of the examination group was 55.65 ±9.75, and the age distribution of the control group was 60.26 ±11.81. The patients with a lethal outcome were slightly younger, but the Student *t*-test did not reveal a significant difference between groups (p = 0.123). Comparing the distribution of blood types among the groups (Table I), blood group A with positive RhD typing was the most frequent in

Table I. Demographic characteristics, blood groups and RhD typing distribution

Variable	Outcome		*P*-value
	Lethal	Survival	
Number of patients (%)	24 (20.9%)	91 (79.1%)	
Gender:			
Male	22 (91.7%)	64 (70.3%)	0.032*
Female	2 (8.3%)	27 (29.7%)	
Age, mean ± SD [years]	55.65 ±9.75	60.26 ±11.81	0.123**
Blood group:			
O–	3 (12.5%)	7 (7.7%)	0.220*
O+	7 (29.2%)	36 (39.5%)	
A–	–	5 (5.5%)	
A+	11 (45.8%)	22 (24.2%)	
B–	2 (8.3%)	4 (4.4%)	
B+	–	9 (9.9%)	
AB–	–	4 (4.4%)	
AB+	1 (4.2%)	4 (4.4%)	

the examination group (45.8%), while blood group O with positive RhD typing was the most frequent among the controls (39.5%). The χ^2 test did not reveal a significant difference between the distributions of blood types among the groups ($p = 0.220$).

Discussion

The purpose of this study was to evaluate the distribution of blood groups among the patients with acute aortic type III dissection, to identify any kind of relationship between blood type and patient survival, and to obtain information that can be useful for the transfusion department in case they encounter patients with acute aortic type III dissection. The association of blood groups with vascular disease has been proposed for a long time [11–13]. In the Serbian population, the most frequent blood group is A with 42% followed by blood group O with 38% [13]. Our study demonstrated that blood group O was the most frequent among the study population (46.07%). ABO blood groups and AAA have also been related in some studies. Viklander *et al.* [14] investigated 504 patients who required an operation because of AAA. They did not find any 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 groups between patients. The number of patients who required an operation for ruptured AAA was 174 and for non-ruptured AAA 330. 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 an increased frequency of the Kell-positive and MN blood groups [15–17]. Some previous examinations also demonstrated that blood type O can be an indicator for AAA [18]. Further study should determine whether blood type O is an indicator for acute aortic dissection type III. Despite advances in the management of acute aortic type III dissection, the in-hospital mortality rate remains considerable (about 13%) [5]. The overall mortality rate in our study was 20.9%. A definitive list of predictors for in-hospital mortality has not yet been established [6]. Acute aortic dissection almost never developed on the preserved aortic wall. The main reason for the destruction of the aortic wall is an atherosclerotic process in older patients. A previous study demonstrated that patients with non-O blood types are more likely to suffer from arteriosclerosis [19]. In order to improve our results and to lower in-hospital mortality, more parameters need to be investigated. Comparing the distribution of blood types among the groups (Table I), blood group A with positive RhD typing was the most frequent in the examination group (45.8%), while blood group O with positive RhD typing was the most frequent among the controls (39.5%). The χ^2 test did not demonstrate a significant difference between the distributions of blood types among the groups ($p = 0.208$). This led us to conclude that the blood group and the RhD typing cannot be an indicator for in-hospital mortality in patients with acute aortic dissection type III. Complicated dissections represent 10% to 20% of all cases [5, 20]. Since the risk factors for developing a complication are not currently well described, all of these patients should be considered as potentially complicated cases that can require surgical or TEVAR [5, 20]. In these cases transfusion support plays an important role. Previous studies primarily investigated the influence of bleeding complications and acute aortic dissection type I and II as the leading causes of death for these patients [20–24]. Furthermore, blood transfusion is associated with increased morbidity and mortality [25–30]. Our study demonstrated that blood groups O and A with positive RhD typing are the most frequent in the cohort population (Table I). This information showed that the existing strategy of preparing transfusion units and blood products for blood groups A and O with positive RhD typing for every patient accessing the ER is quite adequate even for these patients.

In conclusion, in the Serbian population, the most frequent blood group is A with 42% followed by blood group O with 38% [13]. Our study demonstrated that blood group O was the most frequent among the study population. Blood group A with positive RhD typing was the most frequent in the examination group (45.8%), while blood group O with positive RhD typing was the most frequent among the controls (39.5%). The χ^2 test did not demonstrate a significant difference between the distributions of blood types among the groups ($p = 0.208$). Our results indicated no difference between different blood groups and RhD typing with respect to in-hospital mortality of patients with acute aortic dissection type III.

Conflict of interest

The authors declare no conflict of interest.

References

1. Kumar V, Abbas S, Fausto R, Aster N. Robbins and Cotran: Pathologic Basis of Disease. 7ed. Elsevier 2005; 532-34.
2. Mészáros I, Mórocz J, Szlávi J, et al. Epidemiology and clinicopathology of aortic dissection: a population-based longitudinal study over 27 years. Chest 2000; 117: 1271-8.

3. Patel AY, Eagle KA, Vaishnava P. Acute type B aortic dissection: insights from the International Registry of Acute Aortic Dissection. Ann Cardiothorac Surg 2014; 3: 368-74.
4. Hughes GC. Management of acute type B aortic dissection; ADSORB trial. J Thorac Cardiovasc Surg 2015; 149 (2 Suppl.): S158-62.
5. Coady MA, Ikonomidis JS, Cheung AT, et al.; American Heart Association Council on Cardiovascular Surgery and Anesthesia and Council on Peripheral Vascular Disease. Surgical management of descending thoracic aortic disease: open and endovascular approaches: a scientific statement from the American Heart Association. Circulation 2010; 121: 2780-804.
6. Januzzi JL, Isselbacher EM, Fattori R, et al.; International Registry of Aortic Dissection (IRAD). Characterizing the young patient with aortic dissection: results from the International Registry of Aortic Dissection (IRAD). J Am Coll Cardiol 2004; 43: 665-9.
7. Anstee DJ. The relationship between blood groups and disease. Blood 2010; 115: 4635-43.
8. Ohira T, Cushman M, Tsai MY, et al. ABO blood group, other risk factors and incidence of venous thromboembolism: the Longitudinal Investigation of Thromboembolism Etiology (LITE). J Thromb Haemost 2007; 5: 1455-61.
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: 231-4.
10. Wu O, Bayoumi N, Vickers MA, Clark P. ABO(H) blood group and vascular disease: a systematic review and meta-analysis. J Thromb Haemostsis 2008; 6: 62-9.
11. Garrison R, Havlik R, Harris R, Feinleib M, Kannel W, Padgett S. ABO blood group and cardiovacular disease: The Framingham study. Atherosclerosis 1976; 25: 311-8.
12. Clark P, Wu O. ABO blood groups and thrombosis: A causal association, but is there value in screening? Future Cardiol Mar 2011; 7: 191-201.
13. Racial and ethnic distribution of ABO blood types. Bloodbook.com. Retrieved 2010-08-01.2.
14. Viklander G, Wallinder J, Henriksson AE. ABO blood groups and abdominal aortic aneurysm. Transfus Apher Sci 2012; 47: 351-3.
15. Kingsbury KJ. Relation of ABO blood-groups to atherosclerosis. Lancet 1971; 1: 199-203.
16. Morris T, Bouhoutsos J. ABO blood groups in occlusive and ectatic arterial disease. Br J Surg 1973; 60: 892-3.
17. Norrgård O, Cedergren B, Angquist KA, Beckman L. Blood groups and HLA antigens in patients with abdominal aortic aneurysms. Hum Hered 1984; 34: 9-13.
18. Fatic N, Lukac H, Radojevic N, Simanic I, Banzic I, Pajovic B. O blood group as an indicator for abdominal aortic aneurysm. Eur Rev Med Pharmacol Sci 2015; 19: 2997-3000.
19. He M, Wolpin B, Rexrode K, et al. ABO blood group and risk of coronary heart disease in two prospective cohort studies. Arterioscler Thromb Vasc Biol 2012; 32: 2314-20.
20. Irarrazaval LI MJ, Moran VS, Zalaquett SR, et al. Partial or total replacement of the aortic arch. Experience in 23 patients. Rev Med Chil 2006; 134: 575-80.
21. Apaydin AZ, Islamoglu F, Posacioglu H, et al. Surgical treatment of acute arch dissection. Jpn J Thorac Cardiovasc Surg 2003; 51: 48-52.
22. Ghavidel AA, Tabatabaei MB, Yousefnia MA, Omrani GR, Givtaj N, Raesi K. Mortality and morbidity after aortic root replacement: 10-year experience. Asian Cardiovasc Thorac Ann 2006; 14: 462-6.
23. Khalil A, Tarik T, Porembka DT. Aortic pathology: aortic trauma, debris, dissection, and aneurysm. Crit Care Med 2007; 35: 392-400.
24. Schachner T, Vertacnik K, Nagiller J, Laufer G, Bonatti J. Factors associated with mortality and long time survival in patients undergoing modified Bentall operations. J Cardiovasc Surg (Torino) 2005; 46: 449-55.
25. Banbury MK, Brizzio ME, Rajeswaran J, Lytle BW, Blackstone EH. Transfusion increases the risk of postoperative infection after cardiovascular surgery. J Am Coll Surg 2006; 202: 131-8.
26. Hanke AA, Herold U, Dirkmann D, Tsagakis K, Jakob K, Görlingerc K. Thromboelastometry based early goal-directed coagulation management reduces blood transfusion requirements, adverse events, and costs in acute type A aortic dissection: a pilot study. Transf Med Hemother 2012; 39: 121-8.
27. Marik PE, Corwin HL. Efficacy of red blood cell transfusion in the critically ill: a systematic review of the literature. Crit Care Med 2008; 36: 2667-74.
28. Murphy GJ, Reeves BC, Rogers CA, Rizvi SIA, Culliford L, Angelini GD. Increased mortality, postoperative morbidity, and cost after red blood cell transfusion in patients having cardiac surgery. Circulation 2007; 116: 2544-52.
29. Khan H, Belsher J, Yilmaz M, et al. Fresh frozen plasma and platelet transfusions are associated with development of acute lung injury in critically ill medical patients. Chest 2007; 131: 1308-14.
30. Sarani B, Dunkman J, Dean L, Sonnad S, Rohrbach J, Gracias VH. Transfusion of fresh frozen plasma in critically ill surgical patients is associated with an increased risk of infection. Crit Care Med 2008; 36: 1114-8.