MANAGEMENT OF A2B BLOOD GROUP IN A PATIENT FOR HYPOTHERMIC CARIOPULMONARY BYPASS SURGERY

- A Case Report -

RASOUL AZARFARIN* AND AZIN ALIZADEH ASL**

Abstract

A2 is one of the rare subgroups in the ABO blood group system. Because of the weak antigenic power of A2 subgroup, the hemolytic reaction is not severe under normothermic situations. Under hypothermic conditions, however, such as in cardiac surgery under hypothermic cardiopulmonary bypass (CPB), lethal hemolytic reaction may occur.

Autologous blood transfusion helps the anesthesiologist to avoid banked blood and thus avoid unwanted transfusion reactions. The following case report is a 59 yrs old man with an "A2B" negative blood group who underwent CABG under hypothermic CPB (28C, using cold cardioplegia 4C). Following induction, the anesthesiologist drew three units of patient's own blood (1200cc) and replaced it with the same volume of colloid solution (Acute Normovolemic Hemodilution-ANH). The collected autologous blood was then re-transfused at the end of surgery.

With the use of the ANH technique, the patient was successfully managed during hypothermic CPB without the risk of a hemolytic reaction.

Keywords: A2B blood group, cardiac surgery, hypothermia, transfusion, anesthesia.

Introduction

Much of the blood given to patients during the perioperative period is administered by the anesthesiologist[1]. Anesthesiologists, therefore, must have an up-to-date knowledge of transfusion medicine.

There are different blood subgroups among different races and countries (Table 1) that can be clinically important[2]. From these varying blood subgroups, A2B is one of the rare subgroups of ABO blood group system. Because of the weak antigenic power of A2 subgroups, hemolytic reaction is not severe under normothermic situations. But under hypothermic conditions, such as in cardiac surgery under hypothermic CPB, lethal hemolytic reaction may occur[3].

From Cardiovascular Research Center, Tabriz University of Medical Sciences.
* MD, Assoc. Prof. Anesth., Fellowship in Cardiac anesth.
** MD, Assist. Prof. Cardiology.
Correspondence: Dr. Azin Alizadeh Asl, Assistant Professor in Cardiology, Cardiovascular Research Center of Tabriz University of Medical Sciences, Tabriz, Iran. Tel: +98 (411) 3360894, Fax: +98 (411) 3344021.
E-mail: alizadeasl@yahoo.com

Table 1

Different phenotypes of ABO in different races

Blood groop	O	A1	A2	B	A1B	A2B
Caucasian	44%	33%	10%	9%	3%	1%
Black people	49%	19%	8%	20%	3%	1%
Asian	43%	27%	Rare	25%	5%	Rare

We report a patient with A2B blood group who underwent CABG surgery under hypothermic CPB and was successfully managed using the ANH technique, without hemolytic reaction.

Case Report

The patient is a 59 yrs old man, candidate for CABG due to severe stenosis of three coronary vessels. He had undergone ear surgery 45 years previously without need for transfusion. His blood group was reported to be "B negative" at that time, but in the present operation, blood group was reported to be "AB negative". Because of these contradictory reports, complimentary laboratory tests (agglutination by monoclonal anti-A) was requested. Patient's blood was reported to be "A2B negative". The consultant hematologist recommended reserving three units of blood: A2B group or O group if A2B group was not available.

Following induction by sufentanil, midazolam and atracurium, and in accordance to patient's Hematocrit (Hct) of 47% (Table 2), three units of autologous blood were collected, and the patient's blood volume was replaced by the same volume of colloid solution using the Acute Autonomous Hemodilution (ANH) technique. After sternotomy, patient underwent bypass grafting of three vessels under hypothermic CPB (28C and receiving cold cardioplegia). The previously collected autologous blood units were then re-transfused at the end of operation.

Table 2

Laboratory hematologic findings of the patient

White blood cell (WBC) count/ml^3	6700
Hemoglobin (Hb) g/dl	15.5
Hematocrit (Hct)	47%
Platelet count/ml^3	183000

The CPB lasted 93 min and the operation 5 hrs. Patient was then taken to the ICU. In the ICU, blood drainage from chest and mediastinal tubes was estimated to be 1000 ml in 24 hours causing a Hct decreases to 27% (preop. Hct was 47%), for which one unit of homologous A2B blood was transfused. Patient's trachea was extubated four hours after admission to the ICU. In 48 hours, patient was transferred to the ward and was discharged home on the 7th day, without any complications.

Discussion

ABO blood group system includes different genotypes and phenotypes of A, B and O antigens due to different gene mutations. 44.6% of all blood groups are A which includes two subgroups: A1 and A2 with a respective prevalence of 80% and 20%[2].

The A2 antigen has a weaker antigenic power than the A1, is not observed in macroscopic agglutination, and is just observed in microscopic studies hence its name "weak A"[2].

Prevalence of A2B blood group is 0.9%-1% in the general population[2-5]. Considering 15% prevalence of Rh negative, the prevalence of A2B negative, is about 0.1%.

A2 and A2B individuals have anti A1 in their serum. Approximately 0.4% of A2 and 25% of A2B individuals have anti A1 in the serum[6].

ABO system is of special significance in kidney transplantation[7-13]. A blood group with its subgroups of unknown weaker antigen is diagnosed as blood group O and causes no problem while receiving blood. However, when subgroup A2, as blood group O, is transfused to another individual with O blood group, causes hemolytic intravascular reaction, because of the presence of anti A1 in the serum.

Because of the weaker antigenic power of A2, hemolytic reaction is not severe or lethal under normothermic situations. However, severe reaction may occur due to presence of anti A1 at lower temperatures (≈ 25C). It follows that severe reaction may be observed in patients undergoing CABG under hypothermic CABG[14].

It is of great importance that anesthesiologists should be well aware that blood subgroups can be

causes of mistakes in blood transfusion centers. By reporting A2B negative, unless A2B negative blood is available, for patients when in need, the O negative transfusion is recommended.

Because of the lower prevalence of the A2B negative subgroup, the preoperative collection of autologous blood and the use of the ANH technique seems to be an effective method to avoid transfusion reactions. In our case, this kind of management under hypothermic CPB (28C and 4C cardioplegia), CABG surgery was performed successfully without hemolytic reaction. In ICU, patient received just one unit of A2B negative blood in the postoperative period.

In conclusion, it is recommended that differences in blood group reporting should be considered seriously. Samples should be referred to competent hematologist and a transfusion center, for definitive reporting. In case of rare blood subgroups, blood conservation strategies utilizing autologous transfusion together with the ANH technique, are the recommended ways to avoid transfusion reactions.

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