

Anesthesia for coronary artery bypass grafting with hypothermic cardiopulmonary bypass in a patient with a A₂B negative Blood Group

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A₂B negative is one of rare subgroups of ABO blood group system. Herein, we report a 59-year-old male patient who was candidate for coronary artery bypass grafting surgery (CABG) due to coronary artery stenosis. The patient's blood group was reported as AB negative in routine laboratory, and because of doubtful result, a complementary test confirmed his blood group as A₂B negative. The consultant hematologist recommended reserving either negative A₂B packed red blood cell (PRBC) or if unavailable O⁻ blood group. After induction of anesthesia three units of patient's own blood were collected and replaced by colloid solution. The patient underwent CABG with hypothermic cardiopulmonary bypass. The collected autologous blood units were transfused at the end of operation. The patient received one unit of A₂B⁻ homologous PRBC in the postoperative period, and was discharged without any reaction to transfusion.

Introduction

Blood transfusion is frequently requested close to and during operations, by an anesthesiologist¹. There are different blood subgroups among different races and communities (Table 1).

Case Report

A 59-year-old man was candidate for CABG due to 3 vessel coronary artery stenosis. The patient had undergone an ear surgery 35 years ago, without any need for transfusion. His blood group was reported to be B negative at the time, but in the recent operation laboratory tests specified his blood group as AB negative and 4 units of AB negative was reserved. Because of unreliable results complementary laboratory tests were done and the blood group was reported as A₂B⁻. The consultant hematologist recommended reserving 3

units of A₂B⁻ PRBC and O⁻ PRBC if unavailable. Other preoperational laboratory findings are shown in Table 2.

After induction of anesthesia by Suftanil, Midazolame and Athrocorium according to Hct value, 3 units of autologous blood was collected and blood volume was replaced with colloid solution. After sternotomy the patient underwent CABG of 3 vessel graft with hypothermic cardiopulmonary bypass (28°) by receiving cold cardioplegin.

The collected autologous blood units were transfused at the end of operation. Two million units of Aprathinin (KIU) were injected during the operation and heparin was neutralized by protamine. Cardiopulmonary pumping time was 93 minute while the operation took 5 hours. Then the patient was taken to Intensive Care Unit (ICU). Blood drainage from chest and mediastinal tubes was 1000ml/24h and Hct decreased to 27 % whereas preoperational Hct was 47%. Therefore, 1 unit of homologous A₂B⁻ was transfused and tracheal tube was taken

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Table 1: Different phenotypes of ABO in different races

Blood group	O	A ₁	A ₂	B	A ₁ B	A ₂ B
Caucasian	44%	33%	10%	9%	3%	1%
Black people	49%	19%	8%	20%	3%	1%
Asian	43%	27%	Rare	25%	5%	Rare

off after 4 hours. He was transferred from ICU to the ward after 48 hours and was discharged on the 7th day, without any complication.

Discussion

ABO blood group system includes different genotypes and phenotypes of A, B, O antigens due to different gene mutations. Group A comprise 44.6% of all blood groups and includes subgroups A₁ and A₂, with respective prevalence of 80% and 20%². A₂ antigen, so called weak A², has weaker antigenicity than A₁ and is not detected by macroscopic agglutination but is just observed in microscopic studies. The prevalence in the community of A₂B⁻ blood group is 0.9% - 1%, which is lower than other groups and subgroups²⁻⁵. Considering 15% prevalence of Rh negative, the prevalence of A₂B⁻ is about 0.1%.

A₂ and A₂B⁻ individuals may produce anti A₁ in their serum. Individuals with A₂ and A₂B⁻ have approximately 0.4% and 25% of serum anti- A₁ respectively⁶. Expression of A₂ becomes even weaker in presence of B antigen. ABO system is of crucial importance in kidney transplantation⁷⁻¹³. Blood group A with its unknown subgroups of weaker antigens is diagnosed as blood group O and causes no problem on receiving transfusion. But transfusion of subgroup A₂, as blood group O, into another individual with O blood group causes intense hemolytic intravascular reaction due to the presence of antibody to A₁ antigen. Because of weaker antigenicity of A₂, hemolytic reac-

tion is not severe and lethal. Severe reaction in transfusion is due to anti- A₁ at lower temperatures below 25°C. Therefore, severe reactions are observed in patients undergoing CABG with hypothermic cardiopulmonary bypass¹⁴. Studies carried out during 1984- 1985 on ABO blood grouping, revealed increased error of 0.19% relative to that performed in 1982- 1983 which is due to A₂B⁻ subgroup¹⁴.

It is crucial for an anesthesiologist to know that such blood subgroups account for mistakes in blood transfusion centers. Transfusion with O negative blood group is recommended for A₂B⁻ patients. However, low prevalence of this subgroup demands autologous transfusion during the operation. Collecting the individual's blood during the operation after induction of anesthesia and acute normovolemic hemodilution (ANH) seems to be safe without any probable transfusion reaction. In the present case, successful cardiopulmonary bypass and CABG were preformed at 28°C hypothermia and 4°C cardioplegia without any reaction, by using ANH without homologous transfusion. The patient receiving just one unit of A₂B blood in the postoperative period, while in ICU, avoided complications of heterologous transfusion. In conclusion, any differences in blood grouping should be considered seriously, and

Table 2: Laboratory findings

White blood cell(WBC)	6700
Hemoglobin(Hb)	15.5
Hematocrite(Hct)	47%
platelet	183000

referred to a transfusion center and hematologist for complete studies.

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