Case Report

Access this article online

Quick Response Code:

Website:
www.ajts.org

DOI:
10.4103/ajts.ajts_180_21

Management of Bombay Rh negative with clinically significant anti-S for CABG surgery

S. Anuragaa, Dibyajyoti Sahoo, Pragya Silwal, Abhishekh Basavarajegowda, Esha Toora

Abstract:

The Bombay Rh D negative is the rarest of the rare in blood groups. A 65-year-old male patient with coronary artery disease was admitted for CABG. During grouping, forward showed no agglutination in A, B, D, and H, and reverse showed agglutination in A, B, and O cell. The blood group was confirmed as Bombay Rh D negative. Four units of PRBC was requested for the surgery as it was cardiothoracic surgery. We checked our inventory and rare donor list for Bombay-negative blood. Acute normovolemic hemodilution was done for 2 units preoperatively with saline replacement. Autologous platelet apheresis was done for this patient. During routine cross-match, one unit was incompatible. The patient had naturally occurring anti-S, which was reactive at 37°C and clinically significant. A total of 4 PRBC (Packed Red Blood Cell), 1 Single Donor Platelet (SDP), 12 Fresh Frozen Plasma (FFP), and 9 cryoprecipitate were transfused throughout the hospital stay. The patient was Bombay Rh negative with anti-S with major surgery, which was re-explored twice; the patient was managed successfully in spite of all these difficulties with cooperation from different blood banks from all over India.

Keywords:

Bombay Rh negative, CABG, clinically significant anti-S, autologous plateletpheresis, incompatible crossmatch

Introduction

Bombay blood group is a rare blood group with an incidence of 1 in 10,000 in the Indian population.[1] Moreover, Rh negative among the Bombay population further increases the rarity. The H antigen forms the basis for ABO blood group system. The presence of H antigen on red cells and in the secretion is coded by the genes fucosyltransferase (FUT) 1 and FUT 2, which is present on the chromosome 19. Absence of H antigen on the red cells and secretion leads to Bombay (Oh) phenotype, and it is mostly due to mutation in the coding FUT 1 and FUT 2 genes. The corresponding anti-H in the serum is highly potent, making the transfusion of any other A/B/O blood group deadly. Hence, Bombay blood group is the only option available for a Bombay patient needing a transfusion.

With the prevailing incidence of the Bombay group, finding a Bombay Rh D negative group in a particular geographical area is challenging. The chance of forming a naturally occurring alloantibody reacting at 37°C is less, which along with having a Bombay Rh D negative phenotype increases the complexity of the situation. Here, we present a case report of a 67-year-old male patient with Bombay Rh D negative group with suspected anti-S who underwent CABG with re-exploration done twice and managed successfully. In our country, proper coordination among blood banks and social organizations, donor mobilization, and patient counseling made this lifesaving procedure successful.

Department of Transfusion Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Address for correspondence:
Dr. S. Anuragaa, Department of Transfusion Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India.
E-mail: anuragaasrini@gmail.com

Submitted: 14-12-2021
Revised: 24-12-2021
Accepted: 26-01-2022
Published: 28-09-2022

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Anuragaa S, Sahoo D, Silwal P, Basavarajegowda A, Toora E. Management of Bombay Rh negative with clinically significant anti-S for CABG surgery. Asian J Transfus Sci 2022;16:269-72.

Case Report

A case of 67-year-old male patient with a diagnosis of recent inferior wall myocardial infarction (MI), postthrombolysis, and coronary artery disease (triple-vessel disease) referred from an outside hospital for CABG. A routine blood sample was sent to our blood center for pretransfusion testing. During grouping, forward showed no agglutination in A, B, and D while reverse showed agglutination in A, B, and O cells. Since the O cells had reaction, we used H antisera to check for agglutination. There was no agglutination with the H antisera. The blood group was confirmed as Bombay Rh D negative [Table 1].

Consultation by the CTVS department was taken for blood availability and patient management. A total of 4 PRBC(Packed Red Blood Cell), 4 RDPs (Random Donor Platelets), and 4 FFPs (Fresh Frozen Plasma) were requested. We checked our inventory and rare donors' list for Bombay-negative blood. Preoperative management for surgery was initiated. With the baseline hemoglobin (Hb) of 12.8 g/dl, hematinic and iron supplements in erythropoietin, iron tablets, and folic acid were given. We tried screening the patient's siblings, but they were over age >65 years for donation. Meanwhile, availability for Bombay-negative blood was sought for in various blood centers and blood donor organizations throughout the country. With the response from a few centers from Pune and Chennai, 5 PRBCs could be obtained. Acute normovolemic hemodilution (ANH) was done for 2 units preoperatively with saline replacement.

Due to the short shelf-life of RDPs, the demand of 4 RDPs could not be met. Platelet transfusion was mandatory because of heparinization of blood for the bypass circuit. We tried for A2 voluntary SDP donor, but due to other logistics, it was unavailable. Autologous platelet apheresis was done for this patient. A single unit SDP procedure was done. Autologous SDP collection was done 2 days before the surgery. The patient tolerated the procedure well, and there was no adverse reaction during the procedure. Plasma transfusion was not a problem since any group plasma can be given.

The patient's Hb was built up during 3-week preoperative period. One of the units turned to be incompatible during cross-match. With the available Bombay units, pooled cell was prepared for ICT (Indirect Coombs Test). ICT was positive [Table 2]. Since it was Bombay, 3 and 11 cells could not be performed. The patient had no previous history of transfusion. Phenotyping of the patient [Figure 1] and the compatible unit was done. The patient had naturally occurring clinically significant S antibody.

Table 1: Blood grouping confirming Bombay Rh D negative

<A	<B	<D	<H	A cell	B cell	O cell
0	0	0	0	4+	4+	4+

Table 2: Immunohematological workup

Tests Done	Results
ICT	Positive (with Bombay pooled cell)
DCT	Negative
AC	Negative
3 and 11 cell	Could not be done

ICT=Indirect Coombs Test, DCT=Direct Coombs Test, AC=Auto Control

With two PRBCs in hand and a single dose of SDP, the patient was taken for coronary artery bypass graft (CABG). Preoperative autologous donation of 2-pint RBC was made, and the surgery was completed without any allogeneic transfusion. However, the patient was again reexplored on the same night due to a continuous bleed in the drain with no identification of the bleeder intraoperatively. Thus, it was managed with packing and fluid supplements. The patient also required 2 units of allogeneic PRBC transfusion, FFPs, and cryoprecipitate.

On postoperative day 2, due to a drop in Hb, PRBC was again requested. Call for help to the blood centers was again made, and two more units could be arranged from Pune and Chennai. One voluntary Bombay donor donated in-house for this patient. The patient had wound dehiscence, so again, the patient was taken to operation theater for wound exploration and debridement. One unit of Bombay-negative, anti-S-negative bag was confirmed by card and tube technique and was transfused. One more unit was transfused in the subsequent days. The patient was subsequently extubated and shifted to the ward. A total of 4 PRBC, 1 SDP, 12 FFP, and 9 cryoprecipitate were transfused throughout the hospital stay. After 25 days, the patient was discharged.

Discussion

Bombay blood group is a very rare red cell phenotype first discovered in Bombay, India, in 1952 by Bhende, hence the name Bombay. Its prevalence in India is 1:10,000, whereas in western countries, 1:1,000,000. It is more prevalent in Southeastern Asia. In India, it is more prevalent in Southern India, with a prevalence of 0.05%, 0.005%, 0.004% in Andhra Pradesh, Tamil Nadu, and Karnataka, respectively.[2] It is more common in geographical regions where consanguineous marriage is prevalent.

Bombay group does not possess any antigen on the RBC. For expression of A, B, and AB antigen, its precursor H antigen is essential. The H antigen belongs to H blood group system. FUT 1 and FUT 2 genes are responsible for the presence of H antigen on the red cell

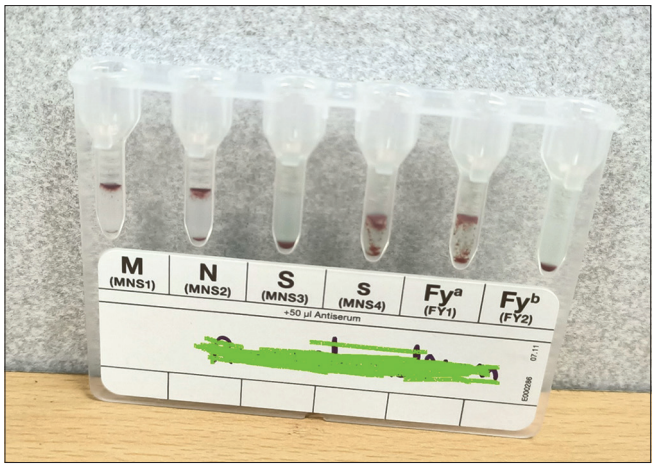

Figure 1: Phenotype of the patient

and secretions. Bombay phenotype Oh is also known as H-deficient phenotype. It occurs due to mutation in FUT 1 and FUT 2 genes, which leads to silencing and no expression of H antigen.[3] In para Bombay, there is weakened expression or presence of H antigen in the secretions. Since there is no antigen expression in the Bombay blood group, their serum will have and anti - H antibodies. This anti-H is highly potent. Bombay persons should receive blood only from the Bombay group. There is a high chance of typing Bombay person as O group. By mistake, if they are transfused with O blood, the highly potent anti-H will cause severe intravascular hemolysis.

We faced many challenges in the management of this patient, such as the need for blood products for reexploration, naturally occurring clinically significant S antibody, and need for more platelets, as the patient was in antiplatelets, and the patient is Bombay Rh negative rarer than Bombay Rh positive.

Bombay blood group *per se* is rare. Bombay blood group with Rh negative is much rarer. They are no case reports available in Bombay Rh-negative patients taken for CABG surgery. Many case reports are available for the successful management of Bombay-positive patients.

The patient's Hb was improved preoperatively with hematinics, and Acute normovolemic hemodilution (ANH) was done before the start of surgery with saline replacement. Two-unit PRBC was collected by ANH, which was used during the surgery. ANH is generally performed in all cardiac surgeries to reduce the need for allogenic transfusion. Especially in these cases when getting a compatible unit is very difficult, ANH is a boon for the patient and the treating physician.[4] Many case reports are published in Bombay patients with successful management by ANH. ANH is done successfully in pregnant patients with the Bombay blood group. In a case series, Shrivastava *et al*. have reported successful management of Bombay phenotype with ANH.[5]

Luckily, FFP and cryoprecipitate transfusion was not a problem since any group can be given. However, since platelets also contain ABH antigens and the chance of platelets being afunctional is high in this case because of heparinization of the bypass circuit, platelet transfusion was a problem. The patient was also taking antiplatelets because of MI. As voluntary A2 SDP donor was not available, so we decided to do an autologous SDP collection, which was successful. Most pregnant patients with Bombay blood group with a high risk of bleeding are successfully managed with autologous transfusion. Autologous blood was collected at 32 weeks near term to be used during delivery when needed. Paudyal *et al.*, in their case report, have described how they have managed an elderly gravida with placenta previa with autologous transfusion.[6] Sprawka *et al*. have described how they managed a Bombay pregnant woman with double red cell apheresis without any complications.[7] There are no case reports where SDP apheresis is done in MI Bombay patient successfully.

Alloantibodies develop in patients who are chronically transfused or who received a transfusion. Naturally occurring antibodies appear in patients without prior transfusion or pregnancy. They occur due to natural stimulus and can also be clinically insignificant. If clinically insignificant, it is convenient from the transfusion medicine aspect to support the patient with compatible units. In our case, we faced a major challenge due to clinically significant naturally occurring anti-S, Bombay Rh negative for CABG surgery, and reexploration was a tough situation to manage. We were fortunate because we got help from blood centers throughout India. A total of five Bombay Rh D negative PRBC were arranged, four from Pune and one from Chennai. However, S antigen status was not known. After receiving whichever S negative was, only those units were issued to the patient [Table 3].

Maintaining a rare donor registry is very important. It is beneficial in these challenging times. Through our rare donor registry, we contacted a Bombay Rh negative, and the donor genuinely accepted our request to donate blood in our Blood center for that patient. Many centers in India do not have a rare donor registry, but it must be initiated. Luckily, our center had a rare donor registry, which was very helpful during this crucial time. Polavarapu *et al*., in their study on implementation of a regional rare donor registry in India, have shown the importance of having a rare donor registry in our country.[8] It reduces the turnaround time for issuing blood to rare phenotype patients. Polavarapu *et al*. have issued six Bombay Rh positive to three patients with a

Table 3: Compatibility testing

Patient	S negative	Cross match	Final
1 unit	S negative	Compatible	Issued
2 unit	S negative	Compatible	Issued
3 unit	S positive	Incompatible	Not issued
4 unit	S negative	Compatible	Issued
5 unit	S positive	Incompatible	Not issued
6 unit	S negative	Compatible	Issued

decreased turnaround time, proving the importance of having a rare donor registry in each institute. With support from all the blood centers throughout India, we were able to successfully manage this case. It is mandatory that we have a good rapport with our neighboring blood banks to join hands to help each other during these crucial times.

Conclusion

Although it was very rare blood with a clinically significant antibody with major surgery, we managed the case with cooperation from blood banks of other part of India. Surgeons, anesthetists, and transfusion medicine specialists must have well coordination and collaboration with each other for successful management of the case.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Balgir RS. Identification of a rare blood group, "Bombay (Oh) phenotype," in Bhuyan tribe of Northwestern Orissa, India. Indian J Hum Genet 2007;13:109-13.
2. Verma A, Vani KG, Chaitanya Kumar IS, Jothi Bai DS. Prevalence of Bombay blood group in a tertiary care hospital, Andhra Pradesh, India. Asian J Transfus Sci 2011;5:57-8.
3. Kelly RJ, Ernst LK, Larsen RD, Bryant JG, Robinson JS, Lowe JB. Molecular basis for H blood group deficiency in Bombay (Oh) and Para-Bombay individuals. Proc Natl Acad Sci U S A 1994;91:5843-7.
4. Goldberg J, Paugh TA, Dickinson TA, Fuller J, Paone G, Theurer PF, *et al*. Greater volume of acute normovolemic hemodilution may aid in reducing blood transfusions after cardiac surgery. Ann Thorac Surg 2015;100:1581-7.
5. Shrivastava M, Navaid S, Peethambarakshan A, Agrawal K, Khan A. Detection of rare blood group, Bombay (Oh) phenotype patients and management by acute normovolemic hemodilution. Asian J Transfus Sci 2015;9:74-7.
6. Paudyal P, Gurung G, Adhikari A, Maskey S, Baral J. Elderly Gravida with Bombay blood group and placenta previa managed with autologous blood transfusion. Case Rep Obstet Gynecol 2020;2020:8850500.
7. Sprawka N, Young C, O'Brien B. Bombay blood type and use of red cell apheresis during pregnancy. Obstet Gynecol 2011;117:463-5.
8. Polavarapu I, Shastry S, Chenna D. Implementation of a regional rare donor registry in India. Med J Armed Forces India 2021. DOI: https://doi.org/10.1016/j.mjafi.2021.06.004.