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Case Report

Is it easy to miss Bombay blood group? A case report

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ABSTRACT

Bombay blood group is clinically significant blood group as it not compatible with other blood groups, such as A, B, AB, and especially the O type. Transfusion with any other blood group can lead to fatal hemolytic transfusion reactions. This is a case report where Bombay blood group was misdiagnosed as O blood group despite performing forward and reverse blood group on a gel card (column agglutination Technique). While performing, reverse grouping reaction with O cells was not checked as it was not present in the gel card. A simple test like blood grouping should be done with serious intention with incorporation of both forward and reverse grouping (with A, B and O cells), so that no patient receives wrong blood leading to fatal hemolysis due to transfusion.

Keywords: Bombay blood group, O blood group, Incompatible, Reverse group, Anti H

INTRODUCTION

ABO blood group is the most clinically important due to the presence of active natural antibodies.[1] Accurate identification of patient's ABO blood group is thus imperative to ensure safe blood transfusion.[2] Besides A, B, AB and O blood group, Bombay blood group is also an important member of this system. Bombay' phenotype, a rare blood group was first identified in 1952 by Dr. Bhende in Bombay, India.[3] The prevalence of the Bombay blood group is about 1 in 10,000 in India and 1 in 106 in Europe. The Bombay phenotype arises from a point mutation in the H gene, resulting in the improper production of the functional protein needed for H antigen synthesis, called fructosyltransferase. Individuals with this blood type are incompatible with all other ABO blood types, making blood transfusions extremely challenging.[4] Bombay blood group is clinically significant blood group as it not compatible with other blood groups, such as A, B, AB, and especially the O type.[5] Transfusion with any other blood group can lead to fatal hemolytic transfusion reactions, with symptoms including fever, flank pain, and red-brown urine, along with the development of intravascular hemolysis.[6] Accurate identification of the Bombay blood group relies on reverse grouping, which reveals distinct reactions with O cells due to anti-H antibodies. Bombay individuals show agglutination with O cells due to the presence of anti-H, in contrast to the O blood group. Confirmation can be done with Anti H lectin which shows negative reaction with Bombay blood group.[7] Therefore, reverse grouping is extremely important to establish the correct ABO type and to resolve any ABO blood discrepancy. In this case report, the patient was initially misdiagnosed as an O blood group.

CASE REPORT

A 22 years old female patient was admitted in obstetrics & gynaecology department with G4P3L3 with ectopic pregnancy. There was no clinically significant medical history. All pregnancies (P3) were uneventful. No H/O previous blood transfusion. No significant drug history. Lab investigations showed haemoglobin 9.1 g/dl, HCT-27%, MCV, MCH, MCHC decreased, WBC 8000/cumm, platelet count -2 lakh /cumm, LFT-normal, RFT-normal.

Peripheral blood film

RBCs showed mild anisopoiekilocytosis with presence of microcytes and pencil cells. Mild degree of hypochromia noted. Leucocytic series showed normal maturation. Platelet count was within normal limits. A request for urgent blood grouping was received in blood centre at midnight as the patient had to be shift in operation theatre for emergency C- section. Blood group was reported as O Rh D positive by column agglutination method by technician on duty.

This was followed by a request for PRBCs transfusion. Cross match was done by Column Agglutination technology with O Rh D Positive PRBCs as per departmental SOP, but the unit was found incompatible with +4 reaction strength. Repeat test was done on same sample to rule out technical error but was again +4 incompatible. Crossmatch was then repeated with fresh sample yet similar result were noted. Detailed immunohematological workup was done to find the cause of incompatibility. Repeat blood grouping was done by conventional tube technique and a discrepancy was observed between forward and reverse grouping.

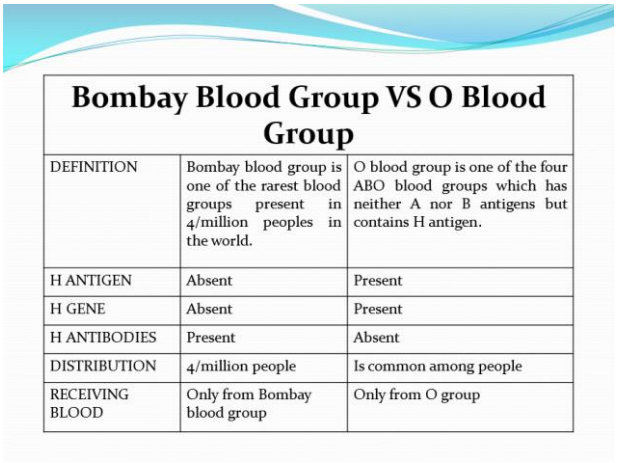
Figure 1: Blood group by column agglutination technique.

Table 1: Blood group by conventional tube technique.

Forward grouping			Reverse grouping		
Anti A	Anti B	Anti D	A cell	B cell	O cell
0	0	4+	4+	4+	4+

Patient's DAT and auto control were negative. Antibody screen and ID panel was performed using Biorad ID-DiaCell and both were pan reactive. Two possibilities were suspected-alloantibody to high prevalence antigen and Bombay blood group. To rule out Bombay blood group, the sample was tested with anti H lectin and it was negative i.e. H antigen was absent. This confirmed our result of Bombay blood group and also explained the panreactive results of antibody screen and panel. Clinician was informed about the incompatibility and as patient's haemoglobin was 9.1 g/dl, she was managed without transfusion.

Figure 2: Crossmatch of patient with O PRBCs (incompatible).



Bombay Blood Group VS O Blood Group

DEFINITION	Bombay blood group is one of the rarest blood groups present in 4/million peoples in the world.	O blood group is one of the four ABO blood groups which has neither A nor B antigens but contains H antigen.
H ANTIGEN	Absent	Present
H GENE	Absent	Present
H ANTIBODIES	Present	Absent
DISTRIBUTION	4/million people	Is common among people
RECEIVING BLOOD	Only from Bombay blood group	Only from O group

Figure 3: Comparison between Bombay blood group and O blood group.

DISCUSSION

Blood group discrepancies are not a rare occurrence in blood centres but to identify one you need to be vigilant and have knowledge of the common findings. Bombay blood group is considered as a rare but still seen from time to time in blood centre. Its frequently misidentified as O blood group as most centres rely on only forward grouping to report blood group in which it presents as O due to lack of A and B antigens.

It is inherited as an autosomal recessive trait and the individuals lack H gene and inherit h gene in homozygous form. Thus, H antigen is not formed on the RBC and these individuals fail to express A or B antigen even if they inherit A/B gene.[8] In the given case the ABO and Rh Blood Group was identified as O positive by applying the

standard forward and reverse grouping by column agglutination technology (gel card) where only A cell and B cell was used for reverse grouping. O control cell was not used in reverse blood grouping by technician on duty as it was not present in the gel card.

This is in striking contradiction as mostly Bombay blood group is missed because only forward grouping is done. In the present case reverse blood grouping was also performed but the gel card lacked O cell column and has an auto control column which was negative.

General characteristics of Bombay O_h (H_{null} phenotypes)

RBCs of individuals of Bombay blood group lack H, A, and B antigens hence do not agglutinate with anti-A, anti-B, or anti-H lectin. There is presence of anti-A, anti-B, anti-A, B in the sera along with a potent anti-H with a wide thermal range.

These individuals are A, B, H non-secretor (no A, B, or H substances present in saliva). Red cells of the Bombay phenotype Oh are compatible only with the serum from another Bombay individual.[9]

What are the similarities between Bombay blood group and O blood group

Neither A antigens nor B antigens are present in both blood groups. Moreover, A and B antibodies are present in both blood groups. Furthermore, usual forward grouping for ABO blood group system would show both blood groups as group O, which is incorrect.

Thus, specific antigen test for H antigen is required to differentiate both Bombay blood group and O blood group. Also, both can receive blood only from the people who have the same blood group.[10]

CONCLUSION

As Bombay blood group is commonly misinterpreted as O blood group, it is imperative to do reverse grouping with O cell to avoid misinterpretation. Due to lack of correct blood grouping practices, the rare Bombay Oh phenotype may be missed, subjecting patients to the risk of severe hemolytic transfusion reaction.

As individuals with Bombay phenotype are often misdiagnosed as O blood group on forward typing and reverse typing is not routinely performed in some blood centres, these individuals may be transfused with O blood group in an acute emergency situation. This may lead to an acute hemolytic transfusion reaction.

In the absence of blood donor registry, transfusion management of patients needing immediate surgery is a challenge. A simple test like blood grouping should be done with serious intention with incorporation of both forward and reverse grouping, so that no patient receives wrong blood leading to fatal hemolysis due to transfusion.

Even in institutes where reverse grouping is not performed routinely, protocols must be established to test all O blood group samples with anti H and if negative then reverse grouping with O cells can be done. This helps to ease the burden of blood centers which are already running in constrains of manpower and resources.

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