Bombay blood group - Case report

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The Bombay Blood Group is the rarest blood group first reported in Bombay, India. The blood sample of 40 year old female patient who presented with signs and symptoms suggestive of anemia was submitted to blood bank for grouping and cross-matching. Both forward and reverse grouping was done by tube method, resulting discrepancy between forward and reverse grouping. Both grouping is important for safe transfusion, if not followed may lead to people with Bombay blood group not being detected and categorized as O group. So therefore reverse or serum grouping is necessary to detect this group. We present one rare case which was diagnosed in our hospital.

Keywords: Bombay phenotype, H antigen, Oh blood group, rare blood type, transfusion reaction

INTRODUCTION

Bombay blood group, known as Oh (or) h/h blood group is the rare blood type. Bhende (1952), first discovered this blood group in Bombay (now called Mumbai), India (Balgir, 2005; 2007; Chowdhury et al., 2013). The Bombay group (Oh) results from the inheritance of two rare recessive h genes which occur at a locus other than the ABO gene locus (Balgir, 2007; Chowdhury et al., 2013). It is a blood group which shows absence of A, B, H antigens on red cells and presence of anti-A, anti-B and anti-H antibodies in serum (Balgir, 2007; Chowdhury et al., 2013). The H antigen is located on the surface of red blood cells and is the precursor of A and B antigens. H antigen can be synthesized by H gene (FUT1) and (FUT2) which is located on chromosome 19 and give rise to glycosyltransferase that add 1-fucose to a precursor substance to produce H antigen on red cells (Balgir, 2005; 2007; Khan and Mansoor, 2009).

India has the highest number of people with Bombay blood group and probability of finding person with Bombay blood type is 1: 10,000. In Tamil Nadu the prevalence is about 0.005 % (Anju et al., 2011; Balgir, 2007; Khan and Mansoor, 2009). A patient with Bombay blood group should be transfused only with same group. Whereas O Bombay donors packed cells can be transfused across ABO group (Hayedeh et al., 2013; Khan and Mansoor, 2009; Yashovardhan et al., 2012).

CASE REPORT

We report a case of 40 year old female patient, with complaint of lower abdominal pain and increased menstrual bleeding for 4 months with signs and symptoms suggestive of anaemia. The investigation revealed a haemoglobin of 9.2 g/dL; RBC count 4.14 millions/mm³; packed cell volume 30.3 %; Total leucocyte count 10,700/mm³; differential leucocyte count: neutrophils 59%; lymphocytes 36 %; eosinophils 1.7 %; and monocytes 2.9 %; mean corpuscular volume 73.1 fL; mean corpuscular haemoglobin 22.2 pg and platelet count 2.96/mm³. Urea and creatinine were within normal limits. USG abdomen shows bulky uterus measuring 9.5 x 6.5 x 5.3 cm and fibroid measuring 2.7 x 2.1 cm approximately noted in anterior wall. Endometrial curettage and endocervical biopsy was done and sent for histopathological examination. Microscopic examination showed disorderly proliferative endometrium, cervix biopsy showed features of chronic cervicitis. Patient was first treated with hormone therapy for 6 months and observed.

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Since all medical therapies were failed in patient, it was planned and she underwent for total abdominal hysterectomy with bilateral salphingo-oopherectomy. One unit of packed cell transfusion was advised and her blood sample was sent to blood bank for grouping and cross matching. Both forward and reverse blood grouping was done using tube technique, forward grouping (Figure 1), was done using commercial antisera and reverse was done using known pooled A, B and O cells (Figure 2).

On routine testing we have found a discrepancy between forward and reverse grouping. Forward grouping shows as O positive and in reverse we have noted an unusual reaction with O cells. So, the patient’s red cells was tested against anti - H lectin, showed the absence of H antigen. This confirms O Bombay. Simultaneously both major and minor cross matching was done using a tube technique. We have noticed a strong 4+ reaction in the major cross matching and minor cross matching was compatible.

Transfusing O group blood would lead to acute transfusion reaction, so Bombay phenotype should be transfused only with Bombay phenotype. Since it is a rare group, finding a donor is a big task. We have screened the patient siblings and their children for Bombay phenotype and we were not able to find a Bombay phenotype. From the past history of patient we found that her sister also died due to complication of anaemia whose blood group was diagnosed as Bombay phenotype. Patient is doing well after surgery, and her hemoglobin was raised to 12.8gm/dl.

**DISCUSSION**

Discovery of the ABO system by Landsteiner (1901), and anti D typing by Philip Levin (1939), marked the beginning of safe blood transfusion (Baligir, 2007; Chowdhury et al., 2013). There are four main blood groups: A, B, AB and O, accordingly their frequency is (A 42%, B 9%, AB 3%, and O 46%) in the population of British Caucasian (Anju et al., 2011; Chowdhury et al., 2013). The expression of ABO antigens is controlled by three separate genetic loci: ABO located on chromosome 9 and FUT1 (H) and FUT2 (Se), both of which are located on chromosome 19 (Baligir, 2005; 2007; Yashovardhan et al., 2012).

In addition to ABO blood types, there are many other inherited phenotypes. One of the important is rare Bombay phenotype RBCs, first reported in Bombay, India. It lacks H antigen and, consequently AB antigen (Yashovardhan et al., 2012). Other variant with weak H expression on RBCs is called para-Bombay phenotype. A blood group system is a group of antigens encoded by alleles at a single gene locus or at gene loci so closely linked that crossing over does not occur or is very rare (Baligir, 2007; Khan and Mansoor, 2009; Yashovardhan et al., 2012). Yunis et al. (1969) found seven individuals of Oh phenotype in two generations in an Indian family settled in the USA (Baligir, 2007). They were the natives of Orissa state. Similarly, Moores (1980) found 24 cases of Oh phenotypes in eleven unrelated Indian families settled in Natal, South Africa (Baligir, 2007). This Bombay phenotype were also found in Japan, Malaysia, Thailand and Sri Lanka (Baligir, 2005; 2007). This H antigen is expressed mainly in band 2, 4.5 of RBC carrier, and attached to lipids in plasma. These antigens are distributed in plasma, secretions, tissue, epithelial / endothelial cells (Baligir, 2005). Bombay phenotype is characterized by point mutation in FUT1 gene (Baligir, 2005; Hayedeh et al., 2013). It is believed genetically that number of people with Bombay blood group is high in Indian people, where consanguineous marriages are more prevalent (Khan and Mansoor, 2009; Anju et al., 2011).

In this rare Oh Bombay phenotype, the individual is homozygous recessive (hh) genotype of FUT1 and hence cannot form the H precursor of the A and B antigen whereas in ABO blood group, the individuals carries the homozygous dominant (HH) or heterozygous (Hh) genotype, and form H precursor of A.
and B antigen (Khan and Mansoor, 2009). The expression of A and B antigen is determined by H and Se gene, which both give rise to glycosyltransferases that add L-fucose, producing the H antigen. Therefore H antigen is present in all human erythrocytes except those in rare individuals of oh-(Bombay) phenotype (Balgir, 2005).

During cell grouping or forward grouping Bombay blood group may be categorized as O group. When cross matching with other O blood group it would show incompatibility. Therefore reverse grouping and anti H lectin has to be performed to detect the Bombay blood group. These basic tests can prevent a patient from acute transfusion reaction (Hayedeh et al., 2013). Finding an O Bombay donor may be the tough part, but with the help of the rare donor registry in internet it is made very easy to find O Bombay donor. Every blood bank should maintain a rare donor register.

CONCLUSION

Bombay blood group is the rare phenotype and it can be mistaken as O. So proper testing is required to detect Bombay phenotype. Basic test with Anti H lectin confirms the absence of H antigen and reverse grouping with O cell confirms the presence of Anti H in the patient plasma.

Patient should be aware of Bombay phenotype and sufficient number of units should be reserved prior to the surgery as there is no alternative red cell transfusion in O Bombay phenotype. Autologus transfusion can be tried if the patient meets the selection criteria. In emergency if there is any delay in obtaining Bombay phenotyped units, patient should be supported only with the plasma or plasma expander. Never to transfuse the patient with O blood group as it contains higher number of H antigen which leads to acute transfusion reaction.

REFERENCES