Para-Bombay phenotype of a pregnant mother in Malaysia: Transfusion for An Extremely Premature Baby

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ABSTRACT

Background

Para-Bombay blood phenotype is a rare blood group with limited cases reported worldwide. This blood group is characterised by the absence of ABH antigen on red blood cells but presence of ABH secretor substances in the body secretion. This rare phenotype is usually misinterpreted as O and may endanger patient if urgent blood transfusion is required.

Case Report

A mother who was labelled as Group O Rh D positive during antenatal follow-up was found to have ABO discrepancy during delivery. Baby was admitted for extremely premature delivery at 25 weeks. As the baby required transfusion, problem arose during crossmatching with the mother's sample. It was found that the mother was group O Rh D

positive in forward grouping. However, the reverse grouping showed the presence of reaction (2+) in O cells. Baby was grouped as O Rh D positive. As transfusion was urgently needed due to baby's unstable condition, group O Rh D positive packed cell was found compatible with baby's serum, subsequently transfused. Bombay blood donor was contacted, and the donated blood was sent to the hospital for further management. Further investigations were performed, indicating that the mother is Para-Bombay A. Due to recent transfusion to baby, we suggested to repeat baby's blood group after the baby is 1 year old.

Conclusions

Para-Bombay was usually mislabelled as O if the sample was not tested with O cell in reverse grouping. Additional tests may be needed during antenatal follow up to prevent complications during delivery which requires emergency blood transfusion.

Key word: blood transfusion; blood grouping; para-Bombay; delivery; Malaysia

INTRODUCTION

ABO blood group is known to be the most important blood group in transfusion medicine. The presence of A-antigen, B-antigen as well as H-antigen (O as amorph) on the red blood cells are controlled by few genes, i.e. the FUT1 (H) gene, ABO gene and FUT2 (SE) gene. Bombay phenotype was first described in year 1952 in Bombay (currently known as Mumbai), India. There were only about 4 per million of the world population presented with Bombay (Oh) phenotype. (1) Classical Bombay individual is known to have no H-antigen, A-antigen or B-antigen on the red blood cells and they are non-secretors. Para-Bombay, or H-deficient phenotype is another classification under Bombay phenotype. Individual with this phenotype may carry small amounts of H-antigens on the red blood cells or the red blood cells can be devoid of the H-antigen. Those antibodies present in

Para-Bombay individual may be different when compared to the Classical Bombay phenotype.

CASE

A 31-year-old no known medical illness primigravida presented to a teaching hospital in the East Coast of Malaysia for premature delivery at 25 weeks of gestation. Her antenatal follow up was labelled as group O Rh D positive, where the blood grouping was done using an automated gel card and no antibody screening was performed. She delivered an extremely premature baby girl via spontaneous vertex delivery. She had retained placenta during delivery and manual removal of placenta was performed. Estimated blood loss was 500mls. Her haemoglobin dropped from 11g/dL predelivery to 10.3g/dL postdelivery. No blood was required for the mother.

Baby was intubated in neonatal intensive care unit. On day six of life, the baby became tachycardic and desaturated with haemoglobin of 11.1g/dL. The baby was grouped as O Rh D positive in forward grouping. Blood crossmatching was performed using mother's serum. There was an ABO discrepancy discovered in the mother's blood grouping result (Table 1). Father's blood group is A Rh D positive. This is non-consanguineous marriage. Due to the urgent need transfusion, baby's blood was used for crossmatching instead of the mother's sample as the discrepancy was not yet resolved. At that point of time, it was suspected that the mother might be Para-Bombay. In view of post-partum and mother's Hb level (10.3g/dL) was insufficient for blood donation, mother's blood was not used. Group O packed cells were found to be compatible with the baby's sample. However, baby's haemoglobin did not pick up (12g/dL at Day 11 of life) despite 15mls Group O red cells

were transfused 2 times (baby's weight was 900gram), with no other bleeding sources observed. It was suspected that the baby might be Para-Bombay. If the baby is Group O, we were concerned that the alloantibodies (anti-H) may have been passively transferred to the baby. Even though the anti-H is generally Ig M, taking into consideration baby's premature condition and the nature of antibody is not known, decision was made to supply Bombay or Para-Bombay blood group to the baby. The case was referred to National Blood Centre (NBC) as the main reference laboratory and urgent search of Bombay blood.

Table 1: Tests performed for identification of mother's blood group in an East Coast tertiary hospital

Test	**Finding**	**Interpretation**
Forward Grouping[1]		
Anti-A	0	O Rh D positive
Anti-B	0	
Anti-A,B	0	
Anti-D	4+	
Reverse Grouping[2]		
A cells	4+	Presence of extra antibodies
B cells	4+	
O cells	2+	
Antibody Screening	1+ (all 3 panels) Autocontrol: Negative	
Antibody Identification (11 Panels)		

Normal Panels	0	Antibody only detected in enzyme enhanced panels
Enzyme-enhanced Panels	1+ (Cell 1 and 2) Mixed Field (Cell 3 to 11)	

Note: reaction for all tests ranged from 0 (no reaction) to 4+ (strongest reaction)
[1] Forward Grouping: Testing of known serum (Anti-A, Anti-B, Anti-A,B, Anti-D) with patient's red cells
[2] Reverse Grouping: Testing of patient's serum with known cells (A cells, B cells, O cells)

Table 2: Tests performed for identification of mother's blood group in National Blood Centre

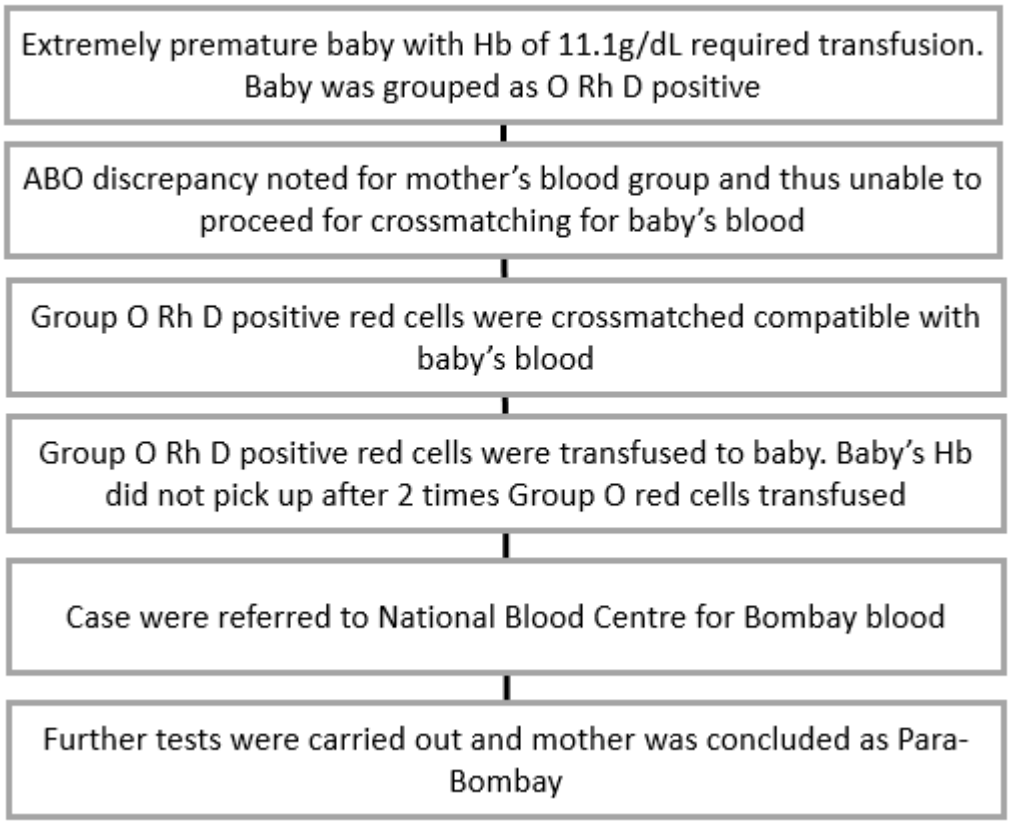
Test	Finding	Interpretation
Forward Grouping[1]		
Anti-A	0	O Rh D positive
Anti-B	0	
Anti-A,B	0	
Anti-D	4+	
Anti-H	0	H antigen negative
Reverse Grouping[2]		
A cells	4+	Presence of extra antibodies
B cells	4+	
O cells	4+	
Direct Anti Globulin Test	0	
Antibody Screening	0	
Antibody Identification (11 Panels)		
Normal Panels	0 (for all 11 panels)	Antibody only detected in enzyme enhanced panels
Enzyme-enhanced Panels	Panagglutination (1+) (for all 11 panels)	
Absorption Elution Test		
A cell	3+	A and H antigen present on patient's red cells
B cell	0	

O cell	2+	
Secretor Status (Saliva Test)		
A cells	0	A and H substance present
B cells	4+	in saliva
O cells	0	
Additional Tests		
Adult O cells	4+	Antibody reacting with I
Cord O cells	0	

Note: reaction for all tests ranged from 0 (no reaction) to 4+ (strongest reaction)
[1] Forward Grouping: Testing of known serum (Anti-A, Anti-B, Anti-A,B, Anti-D) with patient's red cells
[2] Reverse Grouping: Testing of patient's serum with known cells (A cells, B cells, O cells)

Mother's blood sample and saliva sample were sent to NBC for further investigation (Table 2). The mother was concluded as Para-Bombay A with Anti-IH. Due to the rarity of Para-Bombay A and urgency of blood needed for her baby, leuco-depleted and irradiated Bombay blood was supplied for the baby. Further testing for blood group confirmation of the baby will be done after the baby is 1 year old (Figure 1).

Figure 1: Flow of Case Summary



Discussion

Bombay phenotype is a rare phenotype, present in about 4 per million of the human population. Some population in Mumbai may have higher incidence of 1 in 10,000 (1). These cases had also been reported in other countries as well such as Taiwan (2,3) and Thailand. In Malaysia, there were cases of Bombay phenotype donors recruited into our National Registry for Rare Blood Donors Database. (4)

Para-Bombay is a rare RBC phenotype and only limited cases were reported worldwide. The reported ratio of Para-Bombay to Bombay phenotype was 1:15. (5) The weak or no reaction in forward grouping made the ABO grouping challenging in identifying Para-Bombay phenotype. In this case, the mother was grouped as O using manual method which

did not include O cell in reverse grouping during antenatal follow up. The mother's blood was found to be incompatible with Group O red cells. It showed the significance of anti-IH in this patient. If urgent blood is needed, the mother might be transfused with Safe O, where it may cause extensive haemolysis in this patient.

The Anti-IH present in Para-Bombay individuals can be weak or undetectable during screening. The antibody screening was negative in NBC but weak positive in the tertiary hospital. Given the contradicting screening outcomes, it was difficult to identify the exact antibody when urgent blood was needed during delivery with retained placenta. This also hindered the blood supply for the extremely premature baby. Direct Antiglobulin Test (DAT) of the baby was negative and thus IV Ig was not recommended for the baby. IV Ig should be recommended for baby with DAT positive. (6) Group O packed cells were crossmatched and found to be incompatible with mother's blood. Further crossmatching using baby's serum was performed because Anti-H/Anti-IH were usually Ig M and could not permeate through placenta. However, the baby in this case had reduced haemoglobin level post Group O packed cells transfusion. It could be due to the severe prematurity of the baby. Alternatively, the Anti-IH may consist certain amount of Ig G that were being transferred through placenta to the baby but was not picked up during crossmatching with Group O packed cells. Passive antibody may occur in second trimester and can cause haemolysis in baby. (6) Due to the rarity of Para-Bombay and uncertainty of baby's blood group, Bombay blood was transfused to this baby. In the NBC, Bombay blood is available in frozen stock. However, in view of the baby's condition, Bombay donor was contacted to obtain compatible fresh Bombay blood after crossmatching with mother's serum. This

highlighted the importance of rare donor registry in the management of transfusion for rare blood phenotype patient. (4, 6, 7)

Review of literature concerning blood transfusion among Para-Bombay individuals showed that Group O cells were well tolerated with appropriated haemoglobin increment and haematocrit respond. (8,9). More recent review by Bullock et al. (2018) concerning Bombay phenotype mother and foetuses' outcome showed no increased risk of haemolytic disease of foetus and newborn (HDFN) (10). Anti-IH tended to give stronger reaction than anti-H in indirect globulin test (11). In this case report, the baby required transfusion due to extreme prematurity and its associated complications. However, HDFN could not be excluded completely in this baby.

The procedure of ABO grouping for pregnant mother during booking currently is not standardized, depending on different centres. Current setting only includes ABO and Rh grouping (12) but no antibody screening. Red cell antibody may develop after exposure to blood transfusion, pregnancy and transplant. Antibody screening can be added into antenatal booking procedure to detect unexpected antibodies earlier during pregnancy and subsequently facilitate the process of blood supply. Early recognition of rare phenotype is important to ensure appropriate blood management for the pregnant mother. Family screening can be done to identify compatible blood in advance for rare blood phenotype (7). Optimization of haemoglobin level antenatally and a well delivery plan should be provided for Para-Bombay mothers. Additionally, we recommend autologous blood donation for frozen stock during early pregnancy. Paediatrician should be informed in advance of Para-Bombay delivery, so that they can standby for emergency delivery and resuscitation if HDFN occurred.

CONCLUSION

Para-Bombay A is an extremely rare phenotype which usually mislabelled as O when O cells were absent in reverse grouping. Additional tests may be required during antenatal follow up to prevent complications during delivery or emergency.

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