

Peri-operative red cell transfusion management in a rare H-deficient (Para-Bombay) blood group variant

INTRODUCTION

“Bombay” and “Para-Bombay” phenotypes are uncommon blood groups with absence or deficiency of H antigen, the former being more common than the latter in the Indian subcontinent. These blood group phenotype individuals develop anti-H antibodies and crossmatching with O blood group becomes incompatible.^[1] We report a case of Para-Bombay blood group where H antigen was deficient and needed blood transfusion for coronary artery bypass graft (CABG) surgery. Our emphasis is mainly on the diagnosis of these rare red cell phenotypes possible only with proper blood grouping and combating with blood transfusion.

In patients with high-titre anti-H antibodies, only H antigen negative red cell transfusions are compatible. Cardiac surgery under cardiopulmonary bypass (CPB) has high potential for requiring transfusion due to surgical blood loss and coagulopathy induced by the CPB. Blood conservative measures help to reduce the need of red cell transfusions in such cases.^[2]

CASE REPORT

A 51-year-old male with coronary artery disease (CAD)/triple vessel disease (TVD) was admitted to the hospital for CABG procedure. He was a known diabetic, hypertensive, and hypothyroid patient. His chief complaint was chest pain with class-III angina, class-III

New York Heart Association (NYHA). His haemoglobin was 14 g/dl and biochemical investigations were unremarkable. Coronary angiogram demonstrated TVD.

ABO, Rh typing, and antibody screening was done by both tube and gel column haemagglutination methods. This patient showed “O” cell group, but weak positive and delayed reaction was observed with anti-H lectin [Table 1]. However, cell grouping with anti-H usually shows strong positive reaction with “O” group individuals and completely absent reaction with Bombay blood group people. In addition, the serum grouping showed extra antibody or unexpected antibody reacting with pooled “O” cells (control), which was considered as anti-H antibody [Table 1]. This was further confirmed by incubation at 4°C and elution of antibody at 50°C. The weak antigen in Para-Bombay phenotype was identified by virtue of the cells giving weak reactions with anti-H and by successful elutions of antibodies.

Based on the strong positive (4+) reaction with O cells, and weak and delayed reactivity with lectin *Ulex europaeus* (anti-H), the diagnosis of Para-Bombay blood group was considered. In view of the non-availability of compatible blood for this patient, his siblings were tested for blood grouping and typing. Three out of four siblings showed similar blood group phenotype. Red cell compatibility was confirmed with these siblings and considered for transfusion.

In the operation theatre, the patient received bolus dose of tranexamic acid (10 mg/kg) followed by continuous infusion before skin incision to reduce blood loss. Sternotomy was performed and two units of autologous blood were collected with acute normovolemic haemodilution technique before heparinisation and the haemoglobin dropped to 10 g/dl. After cannulation, CPB was started, and after aortic cross clamp, the coronary artery bypass was done with left internal mammary artery grafted to left anterior descending artery, sequential radial artery graft to obtuse marginal obtuse marginal II and I. CABG

Table 1: ABO group discrepancy

Cell grouping (forward grouping)				Serum grouping (reverse grouping)		
Anti-A	Anti-B	Anti-D	Anti-H	O cells	A1 cells	B cells
0	0	4+	Weak, delayed positive	4+	4+	4+
			H deficient	Anti H antibody-para Bombay		

Forward grouping: “O”, anti-H-weak and delayed positivity-weak expression of H antigen on patient red cells. Reverse grouping: Unexpected reaction with “O” cells due to anti-H antibodies

procedure with three grafts was uneventful. After successful completion of the procedure, the heparin was reversed with protamine sulphate and gradually the patient was weaned off the bypass machine.

Intraoperative blood loss was about 1000 ml and one unit of autologous blood was transfused intraoperatively. Postoperatively, the patient received two units of blood, one autologous and the other from his brother with similar blood group. Patient had good recovery and was discharged home on eighth postoperative day. He was advised follow-up for 1 month and to have an identity card with his blood group and donor list for emergency.

DISCUSSION

Bombay blood phenotype was first discovered in Bombay in India by Dr. Y. M. Bhende in 1952, named for the city in which it was first discovered. It describes individuals whose RBCs lack the H antigen, also known as Oh group.^[3]

Both the Bombay and Para-Bombay phenotypes are the result of point mutations in the *FUT1* gene,^[4] which results in the formation of complete H-deficient phenotype (Bombay) or partial H-deficient (Para-Bombay) phenotype. These two rare phenotypes naturally develop anti-H antibodies that cause problems in pretransfusion testing. Reagents with the specificity for anti-H antibodies can be obtained from the plant extract *Ulex europaeus*. *Ulex* extract is the most commonly used reagent for determining H antigen status on red cells and secretor status.^[5]

Para-Bombay red blood cell phenotype can be described in two ways: Weak expression of A, B, H antigens on the red cells, which react weakly with antisera to A, B, H antigens, and another type where the H antigen is present in the secretions, but there is no expression on red cells. Serum contains anti-H antibodies and the genotype is (H), Se/Se or Se/se, or se/se.^[6]

A single case of Para-Bombay blood group has been reported from South India^[7] and another case of voluntary blood donor has been reported from Iran.^[8] This is the first patient diagnosed to have Para-Bombay blood group and had undergone major open cardiac surgery without any eventuality. In the present case, three out of four (75%) siblings inherited similar blood group phenotype. This may suggest mandatory blood grouping and typing of all the family members in procuring homologous compatible red cells in such patients.^[3]

CONCLUSION

Pre-transfusion testing is mandatory to avoid transfusion risks in this rare Bombay and Para-Bombay blood group phenotype patients. Rare blood group registry,^[9] cryopreservation of red cells and blood conservative measures are helpful for emergency transfusions.

**Nirmala Jonnavithula, Shanthi Bonagiri¹,
Gopinath Ramachandran, RC Mishra²**

Departments of Anesthesiology and Intensive Care, ¹Transfusion Medicine and ²Cardiothoracic Surgery, Nizam's Institute of Medical Sciences, Hyderabad, Andhra Pradesh, India

Address for correspondence:

Dr. Shanthi Bonagiri,
Department of Transfusion Medicine, Nizam's Institute of Medical Sciences, Punjagutta, Hyderabad, Andhra Pradesh, India.
E-mail: shanthikoppukonda@yahoo.com

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