CASE REPORT: RARE ANTIBODY AGAINST HIGH FREQUENCY FY5

Young-Lan Song1, Charlotte Engström1, Adriana Komarek1, Gabriella Rizzi1, Nadine Trost1, Pietro Paghini2, Inga Hegemann3, Sofia Lejon Crottet4, Christoph Gassner1, Beat M. Frey1

1Blood Transfusion Service Zurich, Swiss Red Cross, Switzerland, 
2Practicing Doctor for Hematology and Internal Medicine, Zurich, Switzerland, 
3Division of Hematology, University and University Hospital Zurich, Switzerland, 
4International Blood Transfusion SRC, Berne, Switzerland

Introduction

The Duffy (FY) blood group system consists of 6 antigens. Fy3 and Fy5 are expressed on red blood cells (RBC) of all Duffy phenotypes apart from Fy(a-b-), whereas Fy5 is not present on Rhnull cells even if there is a FY gene. This phenomenon suggests that Fy5 is a composite antigen of FY and RH proteins. Both Fy3 and Fy5 are, in contrast to other FY antigens, protease-resistant antigens. Anti-Fy5 has been associated to delayed HTR.

We report a case of anti-Fy5 in a 24-year-old African, gravida 2, para 0, with transfusion dependent sickle cell disease. The patient's red cells presented Fy(a-b-) phenotype with homozygous c.1-67T>C mutation of FY'B alleles. In the past, the patient received multiple transfusions of Fy5 positive RBC without sequelae except forming anti-E.

Methods

Standard serological methods for antibody detection and specification were used (gel-card and tube test; BioRad, Cressier, CH). The KEL, JK, FY and MNS systems were analyzed by molecular typing with PCR-SSP (inno-train GmbH, Kronberg i. T. D). Monocyte monolayer assay (MMA) was carried out for assessing the likely clinical significance of RBC antibodies.

Paternal serological typing was performed (Erytra®, Grifols, Duedingen, CH) in order to predict the antigen profile of the fetus.

Results

The indirect antiglobulin test (IAGT) showed weakly reactive anti-Fy5, which was positive with all test cells, including papainized cells, except Fy(a-b-) and Rhnull Fy(a+b-) cells. Anti-E was only reactive on enzyme treated RBC. Based on molecular typing, the patient's predicted phenotype was R0bF, K-k+, Fy(a-b-), Jk(a+b-).

Paternal antigen profile showed incompatibility in the FY and JK blood group systems, namely Fy(a+b+), Jk(a+b-). The MMA of anti-Fy5 on O rr, Fy(a-b+) RBC revealed 0.7% reactive monocytes.

Currently we have 4 registered C-, E-, Fy(a-b-), Jk(a-) blood group O donors in Switzerland.

In total 6 fully antigen compatible RBC products were transfused during pregnancy and further 2 perioperative when a semi-elective cesarean section was performed because of looming cardiac decompensation in 34th week of pregnancy.

Serological phenotype of the newborn was R0bF, K-, Fy(a-b-). Therefore the father must be most likely heterozygote for the c.1-67T>C mutation of the FY'B allele. Hence, the newborn presented a negative direct antiglobulin test and no clinical signs of HDFN.

Aknowledgements

We would like to thank Thierry Peyrard, PharmD, PhD, for confirming our results at the French National Immunohematology Reference Laboratory, National Institute of Blood Transfusion, Paris.

Figure 1: The proximity between the Rhesus and Duffy proteins in the 4.1R-complex may explain the dependence of the two systems to present Fy5.

Figure 2: Serological results of antibody differentiation in indirect antiglobulin test and with papain treated cells showing panreactivity with all cells except Fy(a-b-) and Rhnull cells.

Conclusion

So far, only few cases with anti-Fy5 have been reported and its clinical relevance is obscure. In our case, the request of several compatible RBC in order to maintain hemoglobin level during pregnancy and for cesarean section was challenging. Based on in vitro data (MMA) we recommend transfusing Fy5 positive RBC if no Fy(a-b-) units were available.

By doing so, one has to keep in mind the potential risk of delayed hemolysis due to boosting of anti-Fy5. According to postnatal assessment it is not possible to make any statement about placental transmission of anti-Fy5, as the inherited FY genotype was preventing HDFN.