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CASE REPORT

Identification of alloantibody causing hemolytic disease of newborn with multiple maternal IgG antibodies

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ABSTRACT

Introduction: Hemolytic disease of the fetus and newborn (HDFN) results from passage of maternal alloantibodies like anti-Fya (IgG) through placenta. They attach with fetal red blood cells cause hemolysis. It is a rare but sometimes a serious health concern.

Case Report: A preterm 12-day-old male child was born preterm, presented with a complaint of yellowish discoloration of skin and sclera for 5 days. He weighed 3.2 kg at birth and at the time of hospital admission the weight was 2.6kg. On examination, he was a deeply icteric child, and no active bleeding was observed. CBC showed Hb 16.2 g/dL, TLC $6x10^9$ /L, and platelets $437x10^9$/L. Reticulocyte counts 0.92%, and total bilirubin 19 mg/dL.

Conclusion: It is suggested that once throughout the antenatal care of pregnant women minor blood group antibody screening be performed.

Key Words: Antibodies, Hemolytic Disease, Maternal Antibodies

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Introduction

Hemolytic disease of the fetus and newborn (HDFN) is a significant cause of neonatal morbidity and mortality, most commonly arising from maternal alloimmunization against paternal RBC antigens. Although Rh incompatibility, specifically anti-D antibodies remains the common, plus Fya may cause severe HDN (1-2).

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Less commonly, the Duffy blood group system, including Fya and Fyb antigens, is responsible for HDFN. However, the presence of anti-Fya antibodies may result in very severe hemolysis, leading to severe jaundice to fatal extreme anemia or hydrops fetalis. The pathogenesis includes maternal IgG antibodies passing the placenta and attaching to Fya antigens on fetal red blood cells, causing hemolysis. (3).

There will be ongoing anemia after birth, due to passive antibodies from the mother until these maternal antibodies disappear which takes weeks and months after delivery (4). It happens through previous or present pregnancy, previous transfusions, or by an organ transplant (5). FMH causes accidental blood circulation mixing between maternal and fetal circulatory systems (6).

Case Report

A 12-day-old preterm male child (born at 35 weeks), the weight at the time of birth was 3.2kg presented with a complaint of yellowish discoloration of skin and sclera for

5 days. At the time of admission weight was 2.6kg. On examination, he was a deeply icteric child, with no active bleeding. His physical examination was normal.

Infant's mother was para 4+1. She had gestational diabetes. Baby was delivered by vaginal delivery with an instant cry. Mother's blood group is O negative. She was transfused in 2023. The antibody titer results: anti-D 64, anti-C 128, and Fya 128. There is no history of Rhogam in the mother. The father's blood group was B positive. Baby's blood group (BBG) was B Negative. The infant was placed under phototherapy.

Laboratory Test	Day 1	Day 2	Day 3	Day 4	Day 5
Full blood count					
Hemoglobin, mg/dL	16.2mg/dL	16.0mg/dL	-	-	14.2mg/dL
Reticulocyte Count %		0.92%	-	-	0.72%
Liver Function Test					
Total bilirubin	19.06mg/dL	17.00g/dL	12.92mg/dL	-	12.99 mg/dL
Indirect bilirubin	18.2 mg/dL	16.04 mg/dL	12.1 mg/dL	-	12.19 mg/dL
Direct bilirubin	0.86 mg/dL	0.96 mg/dL	0.82 mg/dL	-	0.80 mg/dL

Compatibility testing was done on the first sample received, including Blood grouping (ABO/Rh), Allo-antibody screening and identification panel, cross match and Direct Ant globulin Test (DAT) results. Rh (D) typing at the IS phase was negative, requiring a Weak-D test. DAT was performed and result was Positive. Hence the Rh (D) status is invalid; testing was performed for Allo-antibody screening and cross-match. The B negative cross match was incompatible, whereas both O negative crossmatches were compatible. Allo-antibody screening was positive.

The baby's sample was then phenotyped for D, C, and E antigens, all were negative. This suggested that these three antibodies could not cause HDFN in this case. Despite the absence of detectable anti-Fya in the baby's serum, anti-Fya could still be present, with the reasoning that all antigenic sites could be heavily sensitized, leaving no free antibodies in the serum to be detected.

Another specimen was taken from the baby 1.5 months later. Results showed: DAT was negative, Weak-D was negative, and Fya phenotype was positive. The findings confirmed the earlier conclusion that the baby was suffering from HDFN due to anti-Fya antibodies.

Table 2: Showed the Laboratory test follow-up. and maternal antibody Screen results.

Mother Screening	
Red Cell Alloantibody Screening	Positive
Antibody Identified	Maternal Anti-D, Anti-C, and Anti-Fya
Auto Control	Positive
DAT (Polyspecific AHG)	Positive
Phenotype for C antigen	Negative
Phenotype for D antigen	Negative

Discussion

Hemolytic disease of the fetus and newborn (HDFN) resulting from maternal alloantibodies like anti-Fya is a relatively rare but serious health concern (7). In this case an unusual HDFN caused by anti-Fya alloantibody, as reported in the previous studies the major causes of HDFN were ABO and Rh incompatibility(8).

Some reports show that minor blood groups have been a major cause of HDFN even though these cases remain uncommon (4,9). Study indicates that minor blood group antigen incompatibility leads to neonatal hemolytic jaundice in 3% to 5% of cases (10). Neurotoxic and indirect bilirubin cross the blood-brain barrier resulting in acute to chronic neurological signs such as choreoathetosis, sensorineural hearing loss and gaze anomaly (11). Among the different causes of HDFN, A Duffy blood group system antibody called anti-Fya leads to jaundice ranging from mild to severe, this case was published by Babinszki and Berkowitz in 1999 (12).

The HDFN management for anti-Fya requires close follow-up and further intervention. Phototherapy is employed to manage cases of hyperbilirubinemia, for more severe conditions such as where bilirubin level needs to be reduced rapidly exchange transfusion is usually used (13). The lack of preventive measures for non-RhD antigens such as Fya calls for the use of antenatal screening. Antibody screening during pregnancy can detect high-risk pregnancies and care must be taken that the outcome of pregnancy and fetal health is monitored properly (14).

Conclusion

The case report highlights the importance of minor blood group antibody screening for pregnant women. Positive cases need thorough testing for antibody titers together with regular checks of fetal antenatal well-being.

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Data acquisition, analysis and interpretation	WS, STA, AH
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All the authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed.