Severe haemolytic disease of newborn with possibility of blocked D phenomenon:A Case Report

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ABSTRACT

Anti-D is the most common antibody causing severe hemolytic disease of foetus and newborn (HDFN).The mothers who have very high titres of anti-D,antibodies can coat and block D antigens on red blood cells (RBCs) of the newborn.This blocking phenomenon prevents the agglutination of RBCs with IgM type of anti-D antisera.This results in false negative results.Here, we report the case of 1 day old baby born to a multiparous female with Rh Negative blood group suffering from severe HDFN.Mother and baby's samples were sent to our blood centre for the advanced immunohaematological analysis.On detailed immunohaematological work up, possibility of blocked D phenomenon was considered.

key-words: Haemolytic disease of foetus and new born, Blocked D Phenomenon, Maternal anti-D antibody.

INTRODUCTION

Rh blood group system is one of the most important blood group systems after ABO blood group system. Out of 56 antigens in the blood group system, "D" antigen is routinely typed and has the highest clinical significance. Individuals lacking "D" antigen may develop anti-D on exposure. The exposure can be of any kind such as transfusion or pregnancy.[1]

Haemolytic disease of fetus and newborn(HDFN) can range from asymptomatic new born with positive DAT to new born with severe signs and symptoms and evidence of haemolysis. When there is very high titre of anti-D in mother the Rh "D" antigenic site on foetal red cells are saturated with anti-D antibody of maternal origin. This is called blocking phenomenon. Here, blocking of antigenic sites is done by anti-D antibody which is identified as Blocked D Phenomenon.[2]Weiner was the first scientist to describe blocked D phenomenon for the first time *in vitro* [3]

CASE HISTORY

A female baby was born to a 25 year woman ($G_4P_3A_1L_2$) at 37 weeks of gestation at a peripheral hospital.Blood group of mother was reported "B" Rh Negative.No anti-D was given to mother in any previous pregnancies.Mother had no history of blood transfusion, jaundice, thyroid, addiction or any specific drug consumption. The newborn had paleskin, poor feeding, and tachycardia.Subsequent lab findings indicated HDFN which included hyperbilirubinemia with anemia. Baby's blood group was reported "O" Rh Negative. Mother and baby's blood samples were sent at our blood center for further immunohaematological analysis

MATERIAL AND METHOD

Blood Grouping and Rh D typing was done with the help of conventional test tube (CTT) method. Direct agglutination test(DAT),indirect agglutination test(IAT) and Antibody titre of mother was performed by Column agglutination technique(CAT).Antibody screening and identification was done

using 3 cell panel (DiaCel I-II-III Biorad, Switzerland) and 11-cell panel (Diapanel, Biorad, , Switzerland) respectively. Gentle heat elution was performed on newborn's blood sample.

RESULT

Blood group of the neonate was "O", and RhD typing was inconsistent. CTT showed a negative reaction with anti-D.Neonate's DAT was positive (+4) for IgG only.

Blood grouping and Rh D typing of the mother was B Rh D Negative. The mother was found to have anti-D using antibody screening and identification. Anti-D titre in the mother's serum was 1:512. Anti-D was identified in the neonate's serum as well. Since the results of RhD typing in the neonate was inconsistent coupled with high maternal anti-D titre and strong DAT of neonate's red cells, blocked D phenomenon was suspected. Other non-immune causes for HydropsFoetalis were ruled out by the clinicians.

To confirm this, the neonate's red cells were subjected to gentle heat elution. RhD typing of the eluted red cells was repeated using CTT. Using CTT, the grade of reaction with anti-D antisera was enhanced to +1. Antibody identification of the elute showed the presence of anti-D.

DISCUSSION

HDFN due to Rh "D" antibody has decreased to a great extent after introduction of Anti-Dimmunoprophylaxis in Antenatal patients having Rh "D" Negative blood group.Still,diagnosis and appropriate management of HDFN have been a task in many parts of developing world. Anti-D is most common found antibody to cause the blocking phenomenon. Blocked D phenomenon should be suspected in cases where all non-immune causes of Haemolysis are ruled out and there are evidences of maternal alloimmunozation by anti-Dup to level of critical titre (1:16-1:32)[2] . As such, very few cases of blocked D phenomenon are reported in literature.

Sulochna*et al*in 2008 reported one such rare case where they found blocking phenomenon by anti-D in baby having clinical features of HDFN but Rh "D" negative blood group born to Rh "D" Negative mother with very high titres of anti-D(IgG 1:32 &IgM 1:1024).Later the diagnosis of blocked D phenomenon was proved by author after doing elution studies by heat elution.[4]

Verma*et al* in 2013 came up with similar case of suspected blocked D phenomenon where baby having hydrops was born to Rh "D" Negative mother with Anti-D titre of 256.He used chloroquinediphosphate to do elution studies on foetal cells to reach to conclusion that baby had Rh "D" positive blood group.[5]

Rajeshwari*et al* reported a case of diagnostic dilemma wherein they suspected Blocked D Phenomenon in 2018. Baby had developed jaundice on day 2 of life with raised indirect bilirubin. DAT performed on the baby was positive (+2s). All clinical and laboratory findings pointed to the diagnosis of HDFN. However, blood grouping performed using the tube and column agglutination technique, using IgM monoclonal anti D consistently showed the baby's blood group to be "O" Rh negative. , It seemed prudent to consider the possibility of the Rh negative status of the baby being secondary to the blocked D phenomenon. Towards demonstrating this phenomenon a partial elution was performed by the gentle heat elution technique. The post elution sample was DAT negative and the blood group and Rh typing performed showed the blood group to be O Rh positive.[6]

One more case of similar entity was reported by Subramaniyan*et al* in 2019.They suspected Blocked D because of discordant results of Rh Typing in CTT and CAT technique along with strong positive(+4) DAT.Mother's anti-D titre was found to be 1:1024 in this case. Blocked D phenomenon was confirmed after performing heat elution on baby's sample.[7]

In our case, false positive Rh typing was found in neonate's blood sample, which was solved by performing gentle heat elution on blood sample. There are reportedcases where blocking in foetal RBC is done by anti-K and anti Fy^a antibody in mother.[8] Lee et al. reported a case of false-negative

Fy^a typing wherein murine monoclonal anti-Fy^a (MIMA-19) was blocked by maternal anti-Fy^a antibodies (anti-Fy^atitre>1:256).[9] These type of cases are very rare.Blocking phenomenonby Anti-D is most common.

CONCLUSION

Lack of awareness of this phenomenon could lead to unacceptable delays diagnosis of HDFN by routine serological investigations. This may lead to delay in treatment of new-born followed by increased mortality .This can be avoided by proper immunohaematological work up on time.

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