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Hemolytic Disease of the New-born Due to Anti-c Isoimmunization: A Case Report

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Abstract

Introduction:

The Rhesus (Rh) blood group system is one of the complex blood group systems in humans. The Rh system plays important role in transfusion and clinical applications. The Rh antibodies are being the main cause of

Hemolytic Disease of Newborn (HDN). Anti-D is the most common cause of severe HDN [1], but it does not mean other Rh antibodies won't cause HDN. The second common cause of severe HDN is Anti-cantibodies [2] which might miss during the routine screening of antenatal patients. Here we are discussing a case of HDN caused by Anti-c antibody isoimmunization. The relative ability of antigen to cause clinically significant HDN has been the focus of debate [3].

Material and Method:

The blood grouping was done for both mother and newborn in QWALYS 3 (DIAGAST) and confirmed with gold standard test tube method. Direct and Indirect Antiglobulin Test was done with polyspecific column agglutination card (BIORAD). The Antibody screening was done with 3- cell panel (BIORAD) and Antibody identification was done with 11-cell panel (BIORAD).

Results:

The blood group of mothers is "O" positive and the blood group of newborns is confirmed as "O" positive. The newborn got DAT Grade 4 positive. The mother sample is tested for IAT which gave Grade 3 positive. The antibody screening shows positive and antibody identification shows the presence of Anti-c antibody in the mother's serum.

Discussion:

The newborn had severe hemolytic anemia in which the cause was found to be Anti-c antibody. Though the antibody is severe next to Anti- D, still it produces very severe hemolytic disease. Among all severe HDN Anti-c antibodies cause 8.5% of cases [5].

Conclusion:

The newborn is treated with double volume exchange transfusion with same blood group [5] and discharged after 10 days. The case report shows the importance of implementation of protocols for screening irregular antibodies to avoid perinatal mortality.

Keyword: Hemolytic Disease, New-born, Anti-c Isoimmunization, Isoimmunization, Case Report

Introduction

The Rh blood group system is the second important clinically significant blood group system after ABO as it can cause Hemolytic Transfusion Reaction and Hemolytic Disease of Foetus and newborn (HDFN). Hemolytic disease of the foetus and newborn is the serious and fatal condition due to isoimmunization of Rh alloantibodies [1]. Anti-D is the common cause for severe HDN, but other Rh alloantibodies that cause severe HDFN is also not uncommon. Anti-c is the second clinically most important antibody to cause severe HDFN [2]. However, this is preventable by implementation of the proper protocols for identification of irregular antibodies in antenatal patients [3].

Case report

A term live male baby, adequate for gestation age, weighing 2.7kg was admitted to neonatal unit with respiratory distress. The baby was delivered by caesarean section through thick meconium stained amniotic fluid and cried only after resuscitation. The laboratory investigations were as follows: peripheral blood revealed anemia, thrombocytopenia, erythroblastemia and spherocytosis. Total bilirubin was 20.5 mg%. The baby's blood group was O positive andmother's blood group alsoO positive done by Erythrocyte Magnetized Technique (QWALYS-3, Manufacturer: Diagast, France). Direct antiglobulin test was grade 4 positive and Indirect antiglobulin test was grade 3 positive which was done in polyspecific antihuman globulin column agglutination card. In view of the persistent anemia and hyperbilirubinemia, the blood was tested for atypical antibodies with 11 cell panel (BIORAD) and evaluated with antigram provided along with the panel. Anti-c antibodies were found to be positive, however the presence of Anti-E antibodies cannot be ruled out. The baby was treated with double volume exchange transfusion and phototherapy. The baby recovered and was discharged on 10th day.

Discussion

The Rh blood group system is one of the polymorphic and highly immunogenic blood group system. There are nearly 51 antigens are present in the Rh blood group system to date. Among all antigens D, C, E, c and e are most important both clinically and immunogenically [1]. DCe is the most common haplotype in Caucasians (42 %), Native Americans (44 %) and Asians (70 %). In Blacks, the Dce haplotype is slightly more common. The sequence of amino acids determines the specificity of most of the Rh antigens. The D antigen accounts for 50 % of maternal alloimmunization [5]. Due to high immunogenic property anti-D stands as the most common cause for severe hemolytic disease, but it is not uncommon to see other antigens causing severe HDFN.The increased use of RhD immunoglobulin has markedly reduced the incidence of RhD isoimmunization and relative increase in non-RhD isoimmunization [3,7]. Anti-c antibody comes second in the row for causing severe and fatal HDFN. Moderate disease can be caused by anti-Cw and anti-Cx. Rh alloantibodies that are typically associated with mild HDN include anti-C, anti-E and anti-e.However,the presence of combination of Anti-c and Anti-E also causes severe HDN.Severe HDN resulting from immunization to antigens other than D and requiring intrauterine or postnatal transfusions developed in 21 of 567 (3.7 %) of the pregnancies that were at risk; the antibodies were anti-K in 11.6 %; anti-c in 8.5 %; anti-E in 1.1 %; and Rh antibodies other than anti-C, anti-D, or anti-E in 3.8 % [8].The relative ability of antigen to cause clinically significant HDN has been the focus of debate. In most of the transfusion centers in developing countries, screening irregular antibodies in Rh negative mothers are given much importance. So, the disease comes to focus only after the manifestation. Anti-c antibody causing HDFN in 0.7/1000 pregnant mothers with or without the association of Anti-E. Though the disease is more severe, the frequency of the disease is much lesser than HDN caused by Anti-D antibody. This is because of two reasons, first is about 40-50% of pregnant women with anti-c have been immunized by transfusion, the

fetus is relatively often c negative and the second reason, the antibody is often present in low titration, in which most of the c-positive infants have DAT negative. So, only 20% c-positive infants require exchange transfusion. The death rate is being 1 in 250000 births, where death due to anti-D is about 1 in 25000 and still ranks high [9].

In India, it is recommended to do routine antibody screening in all pregnant women not only in first trimester but also in third trimester. The first case of HDFN due to Anti-c isoimmunization was reported in 2007[4]. The management of anti-c isoimmunisation or isoimmunisation with any other irregular red cell antibody is similar to the management of anti-D isoimmunised pregnancy with a specification that blood used for fetal and/or neonatal transfusion should be negative for its respective antigen [4]. In the present case, the baby was treated with double volume exchange transfusion and phototherapy and responded well.

Conclusion

The isoimmunization with irregular antibodies might cause severe hemolytic disease in newborn and fetus, but the early diagnosis of antibodies and close follow up of the patient will prevent the perinatal mortality and morbidity. The antibody screening of both Rh positive and Rh-negative mothers should be done to reduce the risk of HDN. Quantitative real-time PCR can be used for c typing of cell-free fetal DNA from maternal blood in pregnancies at risk from HDN due to anti-c antibodies [9].

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Conflict of interest

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Table-1 showing results of investigations done on newborn sample:

Investigation	**Result**
Blood group	O Positive
Antibody screening	Positive

Antibody identification	Presence of anti-c antibodies
DAT	Grade 4 Positive
IAT	Grade 3 Positive
Auto control	Negative

Figure 1 showing results of antibody identification