International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: SJIF: 5.995
Available Online at www.journalijcar.org
Volume 6; Issue 12; December 2017; Page No. 8532-8534
DOI: http://dx.doi.org/10.24327/ijcar.2017.8534.1380

Review Articles

RH INCOMPATIBILITY

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A R T I C L E I N F O

Article History:
Received 19th September, 2017
Received in revised form 25th October, 2017
Accepted 4th November, 2017
Published online 28th December, 2017

Key words:
Hemolytic disease newborn, red cell alloimmunisation, antenatal antibody screening

A B S T R A C T

The spectrum of hemolytic disease of the newborn has changed over the last few decades. With the implementation of Rhesus D immunoprophylaxis, hemolytic disease due to ABO incompatibility and other alloantibodies has now emerged as major causes of this condition. Though in developing countries, anti D is still a common antibody in pregnant women, many Asian countries have identified alloantibodies other than anti D as a cause of moderate-severe hemolytic disease. The most concerned fact is that, some of these have been described in Rh D positive women. It appears that universal antenatal screening in all pregnant women needs to be initiated, since Rh D positive women are just as likely as D negative women to form alloantibodies. Many developed nations have national screening programs for pregnant women. This is necessary to ensure timely availability of antigen negative blood and reduce effects on the newborn. Although universal screening seems justified, the cost and infrastructure required would be immense. Developing countries and under resourced nations need to consider universal antenatal screening and frame guidelines accordingly.

INTRODUCTION

Rhesus (Rh) incompatibility refers to the discordant pairing of maternal and fetal Rh type. It is associated with the development of maternal Rh sensitization and hemolytic disease of the neonate (HDN). An individual can be classified as Rh-positive if their erythrocytes express the Rh D antigen; otherwise, an individual is Rh-negative if they do not. This phenomenon becomes clinically significant if a mother that is Rh-negative becomes sensitized to the D antigen and subsequently, produces anti-D antibodies (i.e., alloimmunization) that can bind to and potentially lead to the destruction of Rh-positive erythrocytes. This is of particular concern if a Rh-negative mother is carrying a Rh-positive fetus, which can result in consequences along the spectrum of HDN ranging from self-limited hemolytic anemia to severe hydropsfetalis.

Definition

Rh incompatibility is a condition that develops when a pregnant woman has Rh-negative blood and the baby in her womb has Rh-positive blood.

Causes

- During pregnancy, red blood cells from the unborn baby can cross into the mother's blood through the placenta.
- If the mother is Rh-negative, her immune system treats Rh-positive fetal cells as if they were a foreign substance. The mother's body makes antibodies against the fetal blood cells.
- These antibodies may cross back through the placenta into the developing baby. They destroy the baby's circulating red blood cells.
- When red blood cells are broken down, they make bilirubin.
- This causes an infant to become yellow (jaundiced). The level of bilirubin in the infant's blood may range from mild to dangerously high.
- Firstborn infants are often not affected unless the mother had past miscarriages or abortions.
- This would sensitize her immune system. This is because it takes time for the mother to develop antibodies. All children she has later who are also Rh-positive may be affected.
- Rh incompatibility develops only when the mother is Rh-negative and the infant is Rh-positive. This problem has become less common in places that provide good prenatal care.
- This is because special immune globulins called RhoGHAM are routinely used.

Risk of Rh Incompatibility

Before pregnancy, if by any chance the mother to be is exposed to Rh positive blood, then she is at a higher risk of Rh incompatibility. This exposure may happen:

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- If the mother to be has bleeding or abdominal pain during pregnancy
- Pregnancy which is ectopic
- Miscarriage or even an abortion that has been induced
- An incompatible blood transfusion
- Using an injection whose needle had blood which was Rh-positive
- Amniocentesis test and also chorionic villus sampling (CVS) test can expose the pregnant woman to Rh positive blood

Pathophysiology

When a Rh-negative mother is exposed to the Rh D antigen, the D antigen is perceived as a foreign threat similar to how bacteria and viruses are perceived. This leads to a series of activations of immunogenic pathways that culminates in the production of anti-D antibodies. Those antibodies can bind to the D antigen present on the erythrocytes of Rh-positive fetuses to further activate immunologic pathways that lead to the hemolysis of the fetal erythrocytes.

Diagnosing Rh Incompatibility

Blood tests

Maternal blood

The Kleihauer–Betke test or flow cytometry on a postnatal maternal blood sample can confirm that fetal blood has passed into the maternal circulation and can also be used to estimate the amount of fetal blood that has passed into the maternal circulation.

Paternal Blood

- The direct Coombs test is used to confirm that the fetus or neonate has an immune mediated hemolytic anemia.
- Full blood count—the hemoglobin level and platelet count are important
- Bilirubin (total and indirect
- Hgb - the infant's hemoglobin should be tested from cord blood.
- Reticulocyte count - Reticulocytes are elevated when the infant is producing more blood to combat anemia. A rise in the retic count can mean that an infant may not need additional transfusions. Low retic is observed in infants treated with IUT and in those with HDN from anti-Kell
- Neutrophils - as Neutropenia is one of the complications of HDN, the neutrophil count should be checked.
- Thrombocytes - as thrombocytopenia is one of the complications of HDN, the thrombocyte count should be checked.
- Bilirubin should be tested from cord blood.
- Ferritin - because most infants affected by HDN have iron overload, a ferritin must be run before giving the infant any additional iron.
- Newborn Screening Tests - Transfusion with donor blood during pregnancy or shortly after birth can affect the results of the Newborn Screening Tests. It is recommended to wait and retest 10–12 months after last transfusion. In some cases, DNA testing from saliva can be used to rule out certain conditions.

Symptoms of Rh Incompatibility

As explained above, Rh incompatibility affects the unborn baby and some symptoms will be seen in them. Some of the signs that show up in the baby are:

- Low muscle tone
- Symptoms of jaundice like yellowish color of the skin and the white part of the eyes
- Lethargy

Management

Antenatal management

- Explains the mechanism involved in is immunization.
- During pregnancy all women have their blood groped for ABO and Rhesus type.
- Women who one Rh negative are screened fro Rhesus antibodies.
- In the absence of antibodies the blood is retested at 28^{th} and 34^{th} weeks of pregnancy.
- If antibodies are found, antibody titres are measured regularly.
- Fetos is monitored closely by ultrasound for any edema and hepatosplenomegaly.
- Amniountesis may be carried out in the presence of a high maternal antibody titer.
- The pregnancy may be allowed to continues with ongoing monitoring of bilirubin and antibody levels and fetal status.
- Delivery of the fetus may be undertaken
- Emotional support to family.

Postnatal Management

- At birth cord blood samples one taken from the placental end of the cut cord.
- ABO blood group and Rhesus type.
- Direct comb's test to detect the presence of maternal antibodies on fetal red cells.
- Hacmoglobin estimation and serum billirobin level.
- Infants with rhesus iso-immonization one cored for in intensive care unit.
- A packed cell transfusion may be used to restore hemoglobin level.
- Phototherapy and exchange transfusion.

Nursing Management

- Nurse should collect prenatal history about blood type and Rh factor.
- Nurse should ask the mother if she has eves received Rho GAM.
- Nurse should provide emotional support to family.
- Encourage the mother for ongoing assessment of fetal-wellbeing by USG and amniocentesis.
- Advice the mother to have regular follow-up.

Complications

- Perinatal asphyxia.
- Apgar score of 3 or less at 5mts.
- Hypothermia (se 95^{o}F or less than 35^{0}C).
- Hypoglycemia.
- Deterioration of the infants condition.
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- Maternal infection leading to neonatal sepsis.
- Preterm birth.
- Low birth weight.

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How to cite this article:

Hemavathy., Sathyalatha Sarathi and Amul M (2017) 'RH Incompatibility', *International Journal of Current Advanced Research,* 06(12), pp. 8532-8534. DOI: http://dx.doi.org/10.24327/ijcar.2017.8534.1380

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