

MODULE

Hematology and Blood
Bank Technique



Notes

26

HEMOLYTIC DISEASE OF THE NEW BORN (HDNB)

26.1 INTRODUCTION

Hemolytic disease of the newborn is a condition in which IgG antibodies from maternal blood cross the placenta into the fetal circulation where they react with fetal red cells and break them.



OBJECTIVES

After reading this lesson, you will be able to:

- explain the pathology of Hemolytic disease of the newborn
- discuss the antenatal assessment of Hemolytic Disease of Newborn
- describe the tests on maternal and cord blood at delivery
- explain the prophylaxis for hemolytic disease of new born

26.2 PATHOPHYSIOLOGY

Hemolytic disease of the newborn is a condition which occurs due to destruction of fetal red cells by IgG antibodies from maternal blood. The antibodies cross the placenta during pregnancy and reach into the circulation of the fetus where they react with the red blood cells and break them. These antibodies are commonly directed against Rh or ABO blood group antigens on fetal red cells.

The risk of maternal immunization to blood group antigens depends on the following factors:

Hemolytic Disease of the New Born (HDNB)

- (a) Volume of incompatible fetal red cells that cross the placenta and reach the maternal circulation (fetomaternal hemorrhage)
- (b) Immunogenicity of the red cell antigen and maternal immune response

Rh incompatibility reactions occur where an Rh negative mother becomes pregnant with an Rh positive fetus. A small number of RBCs from fetus cross the placenta to the mother's blood and the mother gets immunized. The first baby of these mothers is unaffected. However, during the second pregnancy with an Rh positive fetus, the passage of fetal blood cells to maternal blood causes a severe immune response. Large number of IgG antibodies are produced in the mother that cross the placenta, reach the fetal blood and destroy its RBCs. This fetomaternal hemorrhage can occur after caesarean section, vaginal delivery, abortion, invasive procedures or clinical maneuvers. Similar condition can occur in Rh negative females who receive incompatible blood transfusion.

The ABO incompatibility is much more common than Rh but is usually of less severity. The antibodies are usually of the IgM type (which cannot cross the placenta). IgG antibodies are more likely to occur when mother of blood group "O" carries fetus of either group A or B. The ABO incompatibility may be seen even in first pregnancy, but it is very less severe than Rh incompatibility because:

1. The fetal red cells express A&B blood group antigens weakly.
2. There is widespread distribution of carbohydrate antigens in fetal fluids & tissues which mimic A and B red cell antigens and neutralize large part of maternal anti-A and anti-B antibody.

26.2.1 Clinical Features

About 50% of the infants are asymptomatic or have mild disease, 30% have moderate anemia and hyperbilirubinemia and approximate 20% are severely affected and may develop hydrops fetalis

26.2.2 Laboratory Evaluation

All pregnant women should have their blood group (ABO and Rh) and antibody screening (indirect Coomb's test) done at the first visit to obstetrician. This will help to identify women who will require Rh immunoglobulin and monitor the increasing titer of anti D in maternal serum.

Tests on maternal and cord blood at delivery

The following tests should be carried out:

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Hemolytic Disease of the New Born (HDNB)

Tests on cord blood:

- (a) ABO & Rh Group
- (b) Direct Coomb's test
- (c) Hemoglobin
- (d) Bilirubin

Tests on maternal blood

- (a) ABO & Rh Blood group
- (b) Maternal red cell antibody (anti D) titre using indirect Coombs test
- (c) Kleihauer- Betke acid dilution test for quantitative estimation of fetomaternal hemorrhage, this determines the prophylactic dose of anti D immunoglobulin to be given to mother.
- (d) Amniotic fluid analysis by spectrophotometer; based on the fact that optical density of the amniotic fluid increases with its bilirubin concentration. Liley curve is plotted and management of the patients is based on the optical density at 450 nm.
- (e) Noninvasive fetal monitoring using Doppler

Anti D Prophylaxis

Anti D is administered to Rh negative women during pregnancy and after delivery or abortion to minimize the risk of HDNB.



INTEXT QUESTIONS 26.1

1. Hemolytic disease of Newborn is due to or incompatibility
2. Rh incompatibility occurs when mother becomes pregnant with fetus
3. In ABO incompatibility the mother is of blood group & the fetus is of group
4. Increased in the serum is useful in identifying the risk of Hemolytic disease of Newborn
5. test determines the fetomaternal red cell damage



WHAT HAVE YOU LEARNT

- In HDNB IgG antibodies from maternal blood cross the placenta into the circulation of the fetus
- Majority of hemolytic disease of newborn is due to ABO incompatibility but cases of Rh incompatibility are clinically more severe
- Rh incompatibility occurs when Rh negative mother becomes pregnant with Rh positive fetus and the mother gets immunized when the fetal blood cells cross the placenta into maternal blood and produces antibodies
- During the second pregnancy when the fetal blood cells reach the maternal blood, large number of IgG antibodies are produced which cross the placenta and destroy fetal RBCs
- An increasing titre of Anti D in maternal serum is useful in identifying pregnancies at risk
- Anti D may be administered to Rh negative women during pregnancy and after delivery to minimize the risk of HDNB.



TERMINAL QUESTIONS

1. Explain the tests on maternal and cord blood at delivery
2. Explain briefly the pathogenesis of Hemolytic disease of Newborn



ANSWERS TO INTEXT QUESTIONS

26.1

1. ABO & Rh
2. Negative, Positive
3. O, A or B
4. Anti D titre
5. Kleihaurer- Betke test

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