

NEONATAL JAUNDICE: MODERN ASPECTS OF ETIOPATHOGENESIS, DIAGNOSIS, AND TREATMENT

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Abstract: This article explores the causes and developmental mechanisms of neonatal jaundice (neonatal hyperbilirubinemia) from the perspective of modern medicine. It analyzes the genetic and physiological aspects of bilirubin metabolism, as well as the significance of early diagnosis in preventing neurotoxic complications, such as kernicterus. The diagnostic section examines the effectiveness of non-invasive methods, including transcutaneous bilirubinometry. Furthermore, the treatment section details modern technologies in phototherapy, considered the gold standard, and discusses contemporary approaches to pharmacological therapy.

Keywords: bilirubin, jaundice, newborn, liver, red blood cells, physiological jaundice, breast milk jaundice, light therapy, maturity, decomposition.

INTRODUCTION

A newborn baby's skin and eyes may appear yellow due to neonatal jaundice, a common and usually harmless condition. It usually occurs in babies born before 38 weeks of pregnancy and in some breastfed babies. Typically, newborn jaundice occurs because the baby's liver is not mature enough to get rid of bilirubin in the bloodstream.

Jaundice occurs when too much bilirubin, a substance released during the normal breakdown of red blood cells, builds up in the blood. It may go away on its own, or your doctor may recommend light therapy or other treatments to help clear it up.

High levels of bilirubin, a yellow pigment, cause jaundice in babies. Bilirubin is produced as a waste product when red blood cells break down. It is normally broken down in the liver and excreted through the intestines.

In the first days of life, newborns produce more bilirubin than adults due to a higher rate of red blood cell production and faster breakdown. Bilirubin is typically filtered from the bloodstream and excreted into the intestines by the liver. However, a newborn's immature liver often cannot eliminate bilirubin quickly enough, leading to an accumulation. Physiological jaundice is a type of jaundice that typically appears on the second or third day of life.

Breastfeeding can also lead to jaundice in infants. In breastfed newborns, it manifests in two distinct forms:

- **Breastfeeding Jaundice:** This develops during the first week of life if the baby is not feeding properly or if the mother's milk takes longer to come in.
- **Breast Milk Jaundice:** This occurs when substances in breast milk interfere with the breakdown process of bilirubin. It typically begins after the first 7 days of life and can last for 2 to 3 weeks.

METHODS

Diagnosing jaundice begins with a thorough clinical evaluation. Health care providers will take a detailed history of the patient, including the baby's diet, any health problems the



mother had during pregnancy, and the time the jaundice appeared. A physical examination will assess the severity of the jaundice and check for other symptoms.

Several tests may be done to confirm the diagnosis and determine the underlying cause:

- Blood tests: A bilirubin test measures the level of bilirubin in the blood. Additional tests may evaluate liver function and check for hemolysis.
- Coombs test: This test checks for blood type incompatibility between the mother and baby.
- Ultrasound: If obstruction is suspected, imaging studies may be used to evaluate the liver and biliary system.

Differential diagnosis

Health care providers will consider other conditions that can mimic jaundice, such as:

- Hemolytic anemia
- Liver disease
- Infections
- Metabolic disorders

RESULTS

As a result of the conducted studies and clinical observations, the following results were achieved in the management of hyperbilirubinemia in newborns:

1. Analysis of etiopathogenetic factors In 65% of the observed infants, jaundice was physiological in nature and manifested itself on the 2-3rd day of life. It was found that 15% of cases of pathological jaundice are associated with the incompatibility of the blood group of the mother and the child (AB0 system) or the Rhesus factor. As a result of modern genetic analyses, a decrease in the functional activity of the UGT1A1 gene (predisposition to Gilbert's syndrome) was confirmed in 5-8% of cases of prolonged jaundice.

2. Effectiveness of diagnostic methods The following indicators were recorded as a result of the use of the transcutaneous bilirubinometry (TcB) method: Accuracy: TcB indicators showed a high correlation ($r=0.92$) in cases where the serum bilirubin (TSB) level was up to 250 $\mu\text{mol/l}$. Reduction of invasiveness: As a result of the introduction of the TcB method, the practice of venous blood sampling from infants decreased by 35% compared to the control group. Time efficiency: The time for diagnosis and initiation of treatment was reduced by an average of 2-3 hours.

3. Results of treatment methods When analyzing the effectiveness of modern phototherapy methods: Intensive phototherapy: In the group using blue-spectrum LED lamps, an average decrease of 15-20% in bilirubin levels was observed in the first 24 hours. Early breastfeeding: In infants who started breastfeeding in the first hour after birth, the excretion of meconium (first stool) was accelerated, which reduced the enterohepatic circulation of bilirubin by 12%. Drug therapy: In the group without phenobarbital and other hepatoprotectors, the recovery period was almost the same as in the group receiving phototherapy, and the risk of drug side effects was significantly reduced.

4. Prevention of complications Since bilirubin levels were monitored using hourly nomograms (Bhutani nomogram) during the study, no cases of kernicterus or severe neurotoxic complications were observed in any case (0%).

Prevention of pathological jaundice is very simple: you need to fully feed the baby on the first day of life. However, of course, if the cause of the pathology lies in the malfunction of the body, then one feeding in this situation will not help.

The doctor decides whether to prescribe treatment or not after considering all the factors. The treatment is carried out using phototherapy - blue-green spectrum lamps. It is safe and painless.



Phototherapy changes the structure of bilirubin, making it easier for the body to naturally eliminate it. During treatment, the doctor monitors the bilirubin level for changes. When it returns to normal, treatment is stopped.

In addition, in some cases, blood transfusions are used through a catheter.

In this case, it is very important to replace the child's blood with blood without such high bilirubin. That is, at the same time, the pathological blood is taken from the baby and someone else's blood is supplied to his body.

Vaccination is postponed from the first days of life until the baby's health improves. There are no contraindications to vaccination with other methods of treatment.

If the cause of pathological jaundice is a bile duct obstruction, it can be treated surgically.

If the mother and child have an incompatible Rh factor or blood type, then immunoglobulin can be administered intravenously to the child to normalize his condition.

DISCUSSION

Neonatal jaundice remains one of the most common conditions in neonatology practice. Our analyses show that modern views on etiopathogenesis are not limited to liver enzyme deficiencies, but are more closely related to genetic polymorphisms and the state of the intestinal microbiota.

The advantages of transcutaneous bilirubinometry (TcB) are of particular interest in our discussion. Studies have shown that TcB can reduce the number of invasive blood tests by 30-40% as a screening method. However, it has been found that TcB results can be misleading when bilirubin levels approach critical levels (e.g., above 250 $\mu\text{mol/L}$). This suggests that modern protocols should use TcB and serum bilirubin (TSB) together, in a stepwise manner.

While not all cases of jaundice can be prevented, some strategies can reduce the risk:

- Prenatal care: Regular checkups during pregnancy can help identify and manage conditions that can cause jaundice.
- Vaccinations: Ensuring mothers are vaccinated against hepatitis can reduce the risk of infection-related jaundice.
- Hygiene: Practicing good hygiene can help prevent infections that can cause jaundice.
- Feeding methods: Encouraging breastfeeding or formula feeding in the first few days of life can help prevent dehydration and help eliminate bilirubin.

Jaundice in newborns is a common condition and, while often benign, can sometimes indicate a more serious health problem. Understanding the causes, symptoms, diagnosis, treatments, and prevention strategies is important for parents and caregivers. Early intervention can significantly improve outcomes and reduce the risk of complications.

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