



HEMORRHAGIC DISEASE OF THE NEWBORN

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Abstract:

Hemorrhagic disease of the newborn (HDN) (ICD code – P53), or vitamin K-dependent hemorrhagic syndrome, is an acquired or congenital disease manifested by increased bleeding in newborns and children in the first months of life due to insufficiency of blood coagulation factors (II, VII, IX, X), the activity of which depends on vitamin K. The biological role of vitamin K is to activate the gamma-carboxylation of glutamic acid residues in prothrombin (factor II), proconvertin (factor VII), antihemophilic globulin B (factor IX) and Stewart-Prower factor (factor X), as well as in plasma antiproteases C and S, which play an important role in the anticoagulation system, as well as osteocalcin and other proteins.

Keywords: HDN, ICD, method, treatment, diagnosis

INTRODUCTION

Without prevention, the incidence of early and classic HDN is 0.25–1.7%, late – 4.4–7.2% per 100,000 newborns [1]. In countries where parenteral vitamin K is given immediately after birth, the incidence of GRPH is 0.01% or less. The incidence of the disease does not depend on the sex or race of the child.

MATERIALS AND METHODS

There are two types of vitamin K found in nature: vitamin K1, or phylloquinone, which is widely present in foods (green vegetables, vegetable oils, dairy products), and vitamin K2, or menaquinone, which is synthesized by intestinal microflora and absorbed in small quantities.

Menadione, a synthetic water-soluble analogue of vitamin K, sometimes called vitamin K3, is currently not used for the prevention of HDN in developed foreign countries [2]. Menadione does not act on its own, but after going through the metabolic pathway of transformation in the liver into phylloquinone (K1) and menaquinone (K2), so its effect after entering the body develops slowly [3].

RESULTS AND DISCUSSION

The transfer of vitamin K across the placenta is limited, so its reserves in the liver of newborns, as well as the concentration in the umbilical cord blood, are very low [4]. In addition, vitamin K belongs to the group of fat-soluble vitamins, so its absorption in the intestine is possible only in the presence of bile salts. The ability to store vitamin K in the body is very low, and the half-life of vitamin K-dependent coagulation factors is very short. As a result of all of the above, vitamin K deficiency with insufficient intake develops very quickly.

In healthy newborns, the plasma level of vitamin K-dependent coagulation factors is 30–60% of the level in

adults. Their concentration increases gradually and reaches adult levels by the 6th week of life. Almost all healthy full-term newborns in the first 5 days of life experience a concomitant decrease in the levels of procoagulants, physiological anticoagulants and plasminogen [4].

Risk factors for developing hemorrhagic disease of the newborn:

1. Exclusive breastfeeding.
2. Lack of prophylactic administration of vitamin K immediately after the birth of the child.
3. Chronic fetal hypoxia and asphyxia at birth.
4. Birth trauma.
5. Intrauterine growth retardation.
6. Childbirth by cesarean section.
7. Prematurity.
8. Use of broad-spectrum antibiotics.
9. Long-term parenteral nutrition in conditions of inadequate supply of vitamin K.

The clinical picture of HDN is characterized by the appearance of spontaneous bleeding of any location:

- bleeding from the gastrointestinal tract (melena, hematemesis);
- from the umbilical wound (including when the remainder of the umbilical cord falls off);
- skin hemorrhages (ecchymoses, petechiae);
- bleeding from sites of invasion;
- pulmonary and nasal bleeding;
- hemorrhages in the abdominal organs;
- hemorrhages in the adrenal glands;
- against the background of vitamin K deficiency, hematomas at the site of injury can progress (cephalohematoma, ecchymoses);
- the late form is characterized by intracranial hemorrhages: subdural hematomas (40%), parenchymal (40%), intraventricular (10%) and subarachnoid (10%) hemorrhages [5]. In more than



1/2 children, ecchymoses may appear several weeks before cerebral hemorrhage [1]. As a rule, intracranial hemorrhages are recorded in children who are exclusively breastfed.

Examination for suspected HDN includes:

1. Complete blood count with platelet determination.
2. Coagulogram: fibrinogen, prothrombin time (PT) [or prothrombin index (PTI)], or international normalized ratio (INR)], activated partial thromboplastin time (aPTT), thrombin time.
3. Ultrasound examination of the abdominal organs, kidneys, adrenal glands.
4. Neurosonography (NSG).

It is typical for GrBN [3]:

1. Prolongation of prothrombin time, often 4 times or more, decrease in PTI, increase in INR.
2. Prolongation of APTT.
3. Normal thrombin time.
4. Typically, fibrinogen levels and platelet counts are normal.

Prothrombin test values are the first to change in case of HF, and in more severe cases, aPTT prolongation occurs.

When assessing a coagulogram, it is necessary to take into account that the normative values of hemostasis indicators in newborns and children in the first months of life differ from the reference values in adults and are subject to significant changes immediately after birth. Premature infants have their own characteristics of hemostasis depending on gestational age, characterized by a significant range of values.

Newborns and premature infants are characterized by a hypocoagulation orientation of the plasma-coagulation link of hemostasis against the background of increased intravascular coagulation and fibrinolysis activity (increased levels of fibrin degradation products and D-dimers) [5].

The absolute values of hemostasis parameters depend on the reagent and analyzer, therefore, each laboratory is recommended to determine its own reference values for newborns and premature infants in accordance with the methodology used [2].

- The main goal of treatment is to stop bleeding!
- Any newborn with suspected HDN should be given vitamin K immediately, without waiting for laboratory confirmation.
- If the disease manifests itself outside the hospital, urgent hospitalization is indicated.
- In case of bleeding, simultaneous administration of fresh frozen plasma and menadione sodium bisulfite ("Vikasol") is recommended [5]. This recommendation is due to the fact that menadione sodium bisulfite is currently the only drug registered in

our country for the treatment of vitamin K-dependent bleeding, and its effect will begin only 8–24 hours after administration.

CONCLUSION

Considering the lack of a vitamin K1 preparation currently registered in our country, intramuscular administration of a 1% solution of menadione sodium bisulfite is recommended for the prevention of vitamin K-dependent hemorrhagic syndrome. For this purpose, the drug is administered intramuscularly, in the first hours after birth, once, at the rate of 1 mg/kg (0.1 ml/kg), but not more than 0.4 ml [3]. For surgical interventions with possible severe parenchymal bleeding, its prophylactic administration is recommended for 2–3 days before surgery.

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