ABNORMALITY OF HEMOSTASIS AT NONTRAUMATIC SUBDURAL HEMATOMAS IN CHILDREN

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НАРУШЕНИЕ ГЕМОСТАЗА ПРИ НЕТРАВМАТИЧЕСКИХ СУБДУРАЛЬНЫХ ГЕМАТОМАХ У ДЕТЕЙ

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Summary. The purpose of the work: to identify the role and changes in the subdural hematoma of the brain in children, the anticoagulant system of vascular-thrombocytic and hemostasis. In the period from 2014 to 2024, we studied the state of the hemostasis system of 79 sick children admitted to our hospital with hemorrhagic stroke. In order for all the research results to be consistent, Platelet Adhesion was determined in the process of comparing children taking collagen, ristomycin and adrenaline with children from the control group in several stages. This indicates that thrombocytopenia or thrombocytopathic syndrome has been detected. Decreased platelet activity leads to repeated bleeding in children. The result obtained is that it has been proven that blood clotting depends not only on platelet disorders, but also on blood clotting factors.

Keywords: *children, hemostasis, cerebral circulation of biood, stroke for children.*

Цель работы. Выявить роль и изменения при субдуральной гематоме головного мозга у детей антикоагулянтной системы сосудисто-тромбоцитарного и гемостазисного звеньев. За период с 2014 по 2024 год нами исследована система гемостаза у 79 детей с острыми нарушениями мозгового кровообращения по геморрагическому типу. Выявлено, что адгезия тромбоцитов была резко снижена с коллагеном, ристомицином, адреналином по сравнению с контрольной группой во все дни исследования. Это говорит о том, что у детей отмечается тромбоцитопения или тромбоцитопатия. Снижение активности тромбоцитов может обусловить рецидивирующий характер кровотечения. Полученные результаты свидетельствуют о сочетанных тромбоцитарно-коагуляционных нарушениях. Именно активация сосудисто-тромбоцитарного механизма лежит в основе запуска синдрома диссеминированного внутрисосудистого свертывания.

Ключевые слова: *дети, гемостаз, мозговое кровообращение, инсульты у детей.*

Introduction. 80 percent of brain hemorrhages in children are fatal, including the most significant vascular cerebropathy [4]. Damage to the blood vessels of the brain can lead to metabolic imbalances, brain edema, and several other pathophysiological changes. The activity of these changes determines the course and prognosis of pain.

Blood diseases, including leukemia, coagulopathy, thrombocytopenic purpura, diffuse connective tissue vasculitis, are the cause of brain hemorrhage in children [5].

The most common cause of acute cerebrovascular diseases is primary and secondary coagulopathies (scattered blood clotting syndrome). After bacterial and viral infections, the patient develops: spina bifida, sepsis, acute bacterial endocarditis, and the most common scattered blood clotting syndrome as a result of the herpes virus [3].

The platelet connects with the vascular wall between the plasma element and serves as the main component of the hemostasis System [2].

Hemostasis is subject to neurohumoral regulation and, performing the function of auroretination, controls bleeding on the one hand, and on the other, controls the process of stopping bleeding, that is, when bleeding, inhibits the transition of scattered blood to clotting syndrome.

The close Binding of the vascular wall and platelets to each other is intertwined by several authors with the general mechanism of vascular-thrombocytaric hemostasis. It forms primary hemostasis [2].

The hemostasis system plays a key role in maintaining the uniformity of the internal environment of the body, maintaining the permeability of blood vessels, microcirculation and hematopoiesis. It should not be assumed that the blood clotting system does not depend on anything in the body, on

the contrary, it is functionally and biochemically closely related to other physiological systems. This means that a pathological change in the blood clotting process in the body, not only in one, but also affects the pathology of the activity of other blood clotting elements. [1, 2]

The purpose of the work: to identify the role and changes in the subdural hematoma of the brain in children, the anticoagulant system of vascular-thrombocytic and hemostasis.

Materials and methods. Complex clinical laboratory, biochemical, paraclinic (craniography, echoencephalography, computerized tomography of the brain) research methods were carried out for all children.

This method is used when the child is admitted to the hospital, on the 1st, 3–5, 7–10 days of illness.

When the child was admitted to the hospital, the following indicators were determined: determination of the duration of bleeding by the DACA or Ivy method, determination of platelet count, thrombus retraction, Platelet Adhesion using inducers (adrenaline and ristocetin).

1. Prothrombin index according to the Kvik's method.
2. Plasma recalcification time according to the Bergergof's method.
3. Total fibrinogen according to the Rutberg's method.
4. Fibrinogen B (according to the methods of Kummin G and Lion R).
5. Ethanol gelation test (according to the method of G.S. Gadal, V.G. Lychev).
6. Protamine sulfate test (according to the method of Lipinskaya V.S. with co-author).

At the same time the special additional research methods were used:

1. Clot-lysis test on the fibrin plate and activity of the plasminogen activator test according to the Astrup's method.
2. Auto-coagulative test (ACT) according to the Berkard's method, in the modifications of Barkagan L.Z. and Ivanov E.L.
3. Fibrin/fibrinogen degradation products according to the method of Nanninga et Guest.
4. Protein C (IF A).
5. Antitrombin III according to the method of Abillgard.

To study the hemostasis system, in the morning on an empty stomach, we take blood from a peripheral vein into a selicon vessel. To keep the blood smooth, we use 3.8 percent sodium citrate in a ratio of 9:1 for the purpose of matching the hemotocrit.

1 method – for the platelets count, the microscopical platelets count method in the Goryaev's chamber was used. The automatized counters are used at the screening programs [6].

2 method – the research of the platelets aggregative activity. The platelet aggregation is measured by comparison of changes in the optical density of the investigated plasma samples before and after aggregation in an abundant and poor with platelets plasma. This method has an advantage of more accuracy and repeatability, and it compares favorably with other photometrical methods during of which the optical density changes within the platelet aggregation process is not investigated in the abundant and poor with platelets plasma. Summing aggregation index is calculated according to the obtained data. [7]

3 method – time duration of hemorrhage according to the Duck's or Ayvi's method. The rate of the clotting reaction in the venous blood is determined at 37^0 C with the correction for that the blood mixing in the vial forces the coagulation process. Three-vial test version is used more often [8].

4 method – definition of antitrombin III according to the method of Abillgard. Being studied platelets poor plasma is subjected to thermal defibrination and mixed with standard quality of the thrombin. After 3 minutes incubation of this mixture, the residual thrombin activity is determined in it. The more active antithrombin III in the test plasma, the lower the residual thrombin activity, and the slower fibrinogen, on which this activity is tested, coagulates. [9]

5 method – definition of the fibrin/fibrinogen degradation products. The test is based on the ability of some S. aureus strains to interact with two areas of the fibrinogen molecule, fibrin-monomer and early fibrinogen degradation product (fragment X) on the receptor level. From these components the soluble fibrin complex and fragment X are left in the serum obtained after plasma coagulation. The total content of the soluble fibrin complex and fragment X are determined using the agglutination at the mixing process of different serum dilution with homogenous staphylococcus suspension [10].

6 method – fibrinogen definition. Fibrin formed after plasma coagulation is dried off very fast and the fibrinogen content in plasma is determined in accordance with its weight. [11]

7 method – definition of the ethanol gelation test. The appearance of the jelly in plasma, when you add to it 50% of ethanol, demonstrates the presence of the fibrin-monomer complexes with the fibrinogen degradation products in the plasma. [12]

8 method – definition of the protamine sulfate test. The appearance of the clot in plasma, when you add to it the protamine sulfate, demonstrates the presence of the non-polymerizing fibrin-monomer complexes in this plasma. [13]

9 method – definition of the prothrombin index according to the Kvik's method. This method determines the clotting time of the recalcificational citrated plasma at the addition of the thromboplastin to it. The thromboplastin activity is tested with the normal plasma.

Results and discussion of them. In the period from 2014 to 2024, we studied the hemostasis system of 79 children who were admitted to the hospital with cerebral circulation disorders in children after hemarragic bleeding. A comparison was made with the blood system of children from the control group, who were hospitalized in a planned manner, who were admitted with different cracks in terms of location. In patients with acute cerebral hemorrhage, the disease is acute, starting from the extremities. When admitted to the clinic, petechiae on the skin, mucous membranes, blood transfusions at the sites of Drug Administration, according to which a decrease in hematocrit was detected – anemia of II–III degree after bleeding (erythrocytes 2.3 × 1012/L, hematocrit 16%, Hb - 56/l, color indicator– 0.6, platelets – 115 ×109/L), shock of II–III degree from bleeding. According to the neurological condition of the received children – lack of consciousness (in case of sopor, coma), as well as with clinical signs such as non-standing of the pupil or paresis of the eye nerve, lack of photosensitivity, inhibition of the corneal reflex, contact or divergence of the pupil, the presence of anisoreflex, lack of symmetry of the nasolabial triangle. Extended membranous symptomatology and generalized clinic tetanic convulsions have been found out.

Determining the number of platelets in the blood and their size and determining thrombocytopenia is the most important part. A decrease in the indicator by 30-50 percent indicates the beginning of blood clotting inside the vessel. Each injury carries a risk of bleeding, so we decided that there was no need to determine the resistance of the capillaries.

Heparin was not prescribed to 26 children in the control group. In addition, children in all subgroups received background treatment-actovegin, piracetam,vitamins, diuretic drugs, infusion therapy, depending on the physiological need, are prescribed.

According to the results of the study, the nature of fibrinogen breakdown products in all children remained reliably high for the entire period of the study ($p<0.001$). Compared to children in the control group, this figure is very high on the first day, and then gradually began to decline. Thrombin timing in children in the control group is normal. In the children under study, this indicator reliably decreases to 13.3±1.0 ($p<0.01$) on the first day compared to the children in the control group, by the seventh day it reliably decreases to 12.8±1.8 ($p<0.01$), and on the 7-10th day the indicator approached normal. In the comparison with the first day, the discharge of antitrombin III, protein C credibly were higher than in the control group ($p<0,01$). Excessive reduction of antithrombin III and protein C reserves leads to a sudden exacerbation of intravascular sputum clotting syndrome. At the disseminated intravascular coagulation its activity becomes lower. The normal values of the antitrombin III are 80-120 %, the regular level decrease to 50-60% and more is registered at the disseminated intravascular coagulation. In 16 patients, the ethanol test is positive. Positive ethanol test, the presence of fibrin-monomers, fibrin-oligomers and fibrin breakdown products, indicates the accumulation of fibrin complex soluble in blood yellow water. For the first day the fibrinogen accounts 1.0$\pm$0.2 ($p<0.01$), for the 3-5th day it accounts 1.5$\pm$0.3 and 2.1$\pm$0.7 – for the 7-10th day. The hypofibrinogenemia can be explained by the consumption syndrome. Normally, the content of the fibrinogen in plasma range from 2 to 4 g/l. The results obtained indicate joint disorders of the combined thrombocytic-blood clotting system. In the first degree of scattered blood clotting syndrome, kontrical, heparin, antispasmodics and deagregants were prescribed. The initial amount of heparin is prescribed 70-100 Units / kg of body weight per day , then titrated. In the second degree of the disease, freshly frozen blood yellow water was prescribed in the amount of 15-20 ml/kg. Only after the recovery of antithrombin III deficiency were disorganizers prescribed. The main cause of exacerbation of scattered blood clotting syndrome is diffuse fibrinolysis, which led to coagulopathic bleeding. Treatment of this degree begins with the introduction of freshly frozen blood yellow water, protease inhibitors, heparin in large doses. If scattered blood clotting syndrome succumbed to treatment, heparin was prescribed, monitoring blood clotting and coagulogram indicators.

The duration of treatment with heparin depends on the severity of the underlying disease. For the treatment of scattered blood clotting syndrome and improving microcirculation, trental (manufacturer - Aventis Pharma LLC, India). Trental normalizes the rheological properties of the blood, improves the microcirculations and widens the blood vessels. Solution for infusion. The dosage is settled by doctor in accordance with the patient's personality trait. Intravenously, by drop infusion, dose and prescription method are determined by the severity of the disturbed circulation. Curantyl (the

manufacturer is "Berlin-Hemi AG/Menarini Group", Germany). Curantyl widens the coronary vessels and provokes the considerable increase of the volumetric blood flow, raises the oxygen content in the venous blood of the coronary sinus and its absorption by the myocardium. Curantyl promotes the development of the collateral coronary circulation, decrease of the peripheral resistance, improves the microcirculation, has the vasoprotective effect.

According to the results of the treatment carried out, on the 10-15th day of treatment, hemostasis begins to recover. Bleeding views, bleeding from injection sites stopped. The hemoglobin and hematocrit rates were stabilized (Ht – 39-42%, Hb - 140/l).

Conclusion. In the period from 2014 to 2024, the Department of Neurosurgery of the Center for emergency medical care of children, the clinical base of the Kazakh National Medical University, conducted an examination of 79 children with acute cerebral circulation disorders.

On the back of the treatment 12 (15,8%) patients died, this fact is connected with the late health encounter in the moribundity, 67 children (84.2%) were discharged with mend to the next aftertreatment. The cerebral hemorrhage in childhood determines the high percentage of fatalities. In the catamnesis, all patients which had the cerebral hemorrhage, the psychoneurological changes in different measure with the precedence of syndrome movements disturbances and hypertension - hydrocephalic syndrome are noticed in all patients, in the catamnesis, which had the cerebral hemorrhage. The complex after treatment during the residual period of the cerebral hemorrhage allows to reach productive regressing course of the disease and full compensation of the patients.

On the ground of the obtained data, in the hospital the usage of the determination of the vessel-thrombocytic complex, coagulative hemostasis and physiological plasma blood-clotting agents in the blood plasma. Due to the high information value, proposed methods allow clinicians to receive full-rate information about state of coagulative-lytic system in whole, about of disorders of characteristics of this or that factor and what has an important significance for diagnostics of different forms of disseminated intravascular clotting syndrome. Obtained data allow pathogenetically to conduct the treatment of disseminated intravascular clotting syndrome based on the principles of correctional-substitutive therapy with the use of fresh-frozen plasma, realigically active medicines, transfusions of those reasonable to combine with heparin introduction.

In conclusion, according to the results obtained, it was found that children with severe hemorrhagic stroke have mixed thrombocytic-coagulation and platelet-coagulation disorders according to the hemostasis system.

Properly directed treatment, systematic treatment of patients with neuropsychiatric stroke will help to cope with the hemostasis system and hemorrhagic syndrome, stabilize the condition of patients.

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