

Basic tests in hematology (pediatrics)

Blood count

The number of platelets is mainly important for the assessment of a coagulation disorder. Severe bleeding threatens when their number falls below 20,000. If DIC syndrome or microangiopathic hemolytic syndrome (HUS, TTP) is suspected, we also require an examination of the presence of fragmented erythrocytes (schistocytes).

Active partial thromboplastine time - aPTT

It tests the internal coagulation system. It indicates the function of factors VIII., X to XIII. It represents a control test for heparin dose titration (heparin antidote is protamine sulfate). A reduction in the aPTT value is accompanied by the activation of the coagulation system, but in children it is often accompanied by an incorrectly performed sampling.

To extend aPTT leads :

- lack of clotting factors of the internal system when their formation malfunctions or their increased consumption (massive bleeding, extensive thrombosis, DIC),
- high concentration of fission products of fibrin,
- the presence of inhibitors of clotting factors: heparin (watch out for arteficial admixture when taken from CVA), a specific inhibitor directed against the clotting activity of one of the factors, in the presence of a non-specific inhibitor (antiphospholipid antibody = lupus anticoagulant).

Even a small extension of aPTT, i.e. by 5 to 8 seconds, can already mean a light form of hemophilia (CAVE: preoperative screening is necessary in this case). APTT cannot be used for the treatment of low-molecular-weight heparin (LMWH) to control efficacy. The efficacy of LMWH should be verified by determining antiXa (aXa) activity. The recommended range is 0.5 to 1.0 aXa U/ml. A blood sample to check should be taken 3 to 5 hours after the drug is given.

Prothrombin time (Quick, PT, prothrombin time)

It tests the external clotting system. Points to the function of factors II., V., VII., X (on decrease of II and fibrinogen is a less sensitive test). The test is closely related to the activity of factors dependent on vitamin K (factors dependent on vitamin K: II., VII., IX., X). In order to assess the efficacy of drugs that reduce the activity of vitamin K-dependent clotting factors (warfarin), the INR index (the international normalized ratio) is used to exclude the effect of the reagent used on absolute PT levels. The causes of PT shortening are the same as for aPTT. PT extensions occur when factor deficiency occurs: II, VII, IX, X.

Thrombin time - TT

Measures thrombin-fibrinogen response. TT prolonged is due to a decrease in fibrinogen levels or functional deficiency (dysfibrinogenicity), the presence of heparin, fission products of fibrin or fibrinogen, or other pathological inhibitors. It is also extended for DIC.

Fibrinogen

Fibrinogen (FBG) is an acute phase protein. Its plasma concentrations increase not only in inflammation, in cancer, the first days after larger operations, but also in pregnancy. Decreases in fibrinogen lead to decreases, blood loss (major injuries, bleeding) or hemodilution. A marked decrease in fibrinogen may be a manifestation of its increased consumption (DIC) or thrombolytic treatment.

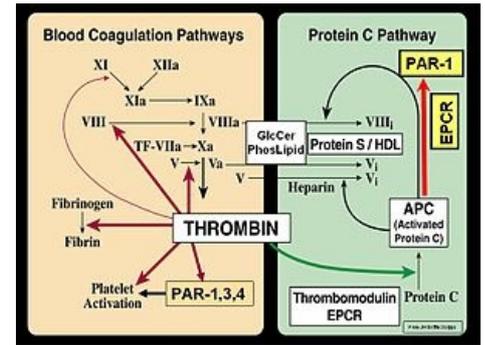
Antithrombin III (AT III)

AT values are given either in absolute terms or as a percentage of functional activity. Low AT activity is accompanied by a decrease in its production (liver lesions), increased consumption (DIC, major surgery, extensive thrombosis) or kidney loss (nephrotic syndrome). A softer decline in AT values also occurs during pregnancy and when using hormonal contraceptives. Congenital AT deficiency is rare.

D-dimer

It is a non-specific fission product of fibrin. Its elevated value suggests activation of fibrinolytic mechanisms, in a situation where fibrin coagula have already developed.

Ethanol gelling test, fibrin split test and protamine test



Coagulation cascade

The ethanol gelling test (EGT), fibrin split test and protamine test are used to determine the soluble complexes of fibrin monomers and allow the degree of activation of the clotting system to be assessed. Tests are positive for DIC, thromboembolic disease, sepsis and sometimes in the acute stages of systemic autoimmune diseases. In a traumatic, incorrectly performed sampling, they can be false positive.

Tests determining the disorder of primary haemostasis

- Trombocytopenia: blood count,
- Trombocytopenia: bleeding test(Duke, Simplate),
- Vasculopatia: capillary fragility test.

Physiological values of the clotting parameters

Parameter	Physiological values
Antitrombin III	> 60 to 70 %
aPTT	< 40 seconds
Quick	< 13 seconds (> 70 %)
INR	0,8 to 1,2
D-dimer	< 150 (moderate elevation of D-dimer values has little specificity)
Fibrinogen	< 2 to 4 g/l
Thrombin time	+ / - 20 %

Physiological values of some clotting parameters that are dependent on the child's age

TEST	newborns	1 month	6 months	big children
f II = protrombin (%)	50 (25–70)	70 (35–100)	90 (60–120)	100 (70–150)
AT III (%)	60 (30–90)	80 (50–100)	100 (80–120)	100 (60–125)
Protein C (%)	35 (20–50)	45 (20–65)	60 (40–80)	100 (65–130)
Protein S (%)	35 (15–60)	60 (35–90)	90 (55–120)	100 (50–120)

- *note:* For time-expressed tests (aPTT, PT), the reagents used matter. Each laboratory therefore has a range of normal values.

Links

Source

- HAVRÁNEK, Jiří. *Hematologie - obecný úvod* [online]. [cit. 11.1.2023]. <<https://webservices3.lf1.cuni.cz/printbook-render/data/v9UDidFIZOyCbVgkuzHMsjxhGQWjetLoE4lamK1r/Article.pdf>>.

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