

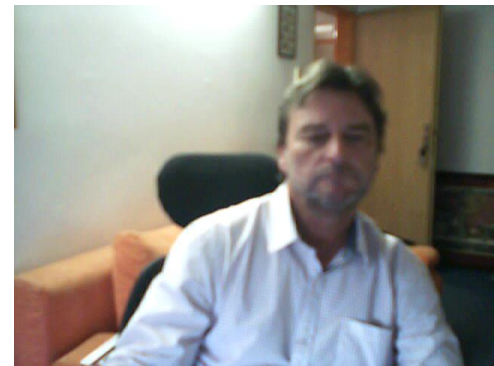
Sequence of hemostatic mechanisms

- local vasoconstriction
- Interaction of thrombocytes and vessel wall (primary clot)
- coagulation cascade(koagulum)
- fibrinolytic activity



Bleeding states – diagnostic approaches

- History
- Physical examination
- Laboratory examinations
 - screening tests
 - special laboratory tests

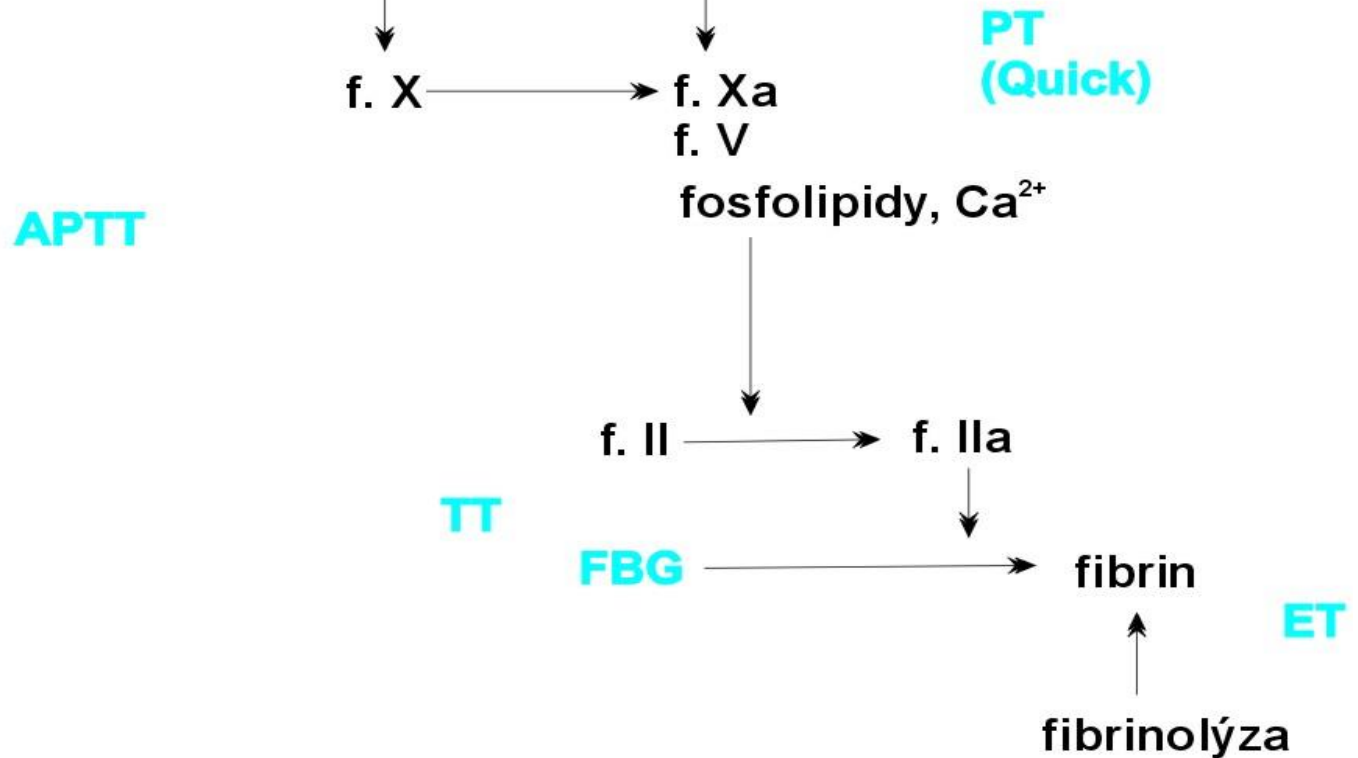


Vnitřní systém

(povrchy, prekalikrein, f. XII, XI, IX, VIII, Ca²⁺, fosfolipidy)

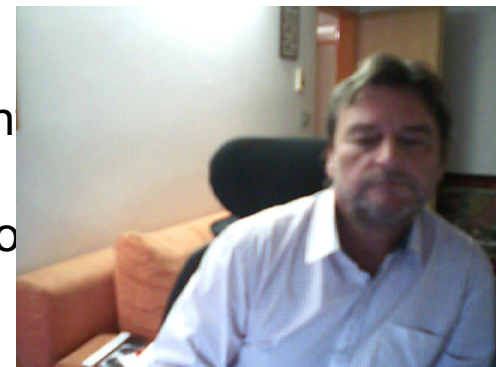
Zevní systém

(tkáňový faktor, VII, Ca²⁺)



Síťový proces (spíše než kaskádovitá reakce) - častá in obou systémů

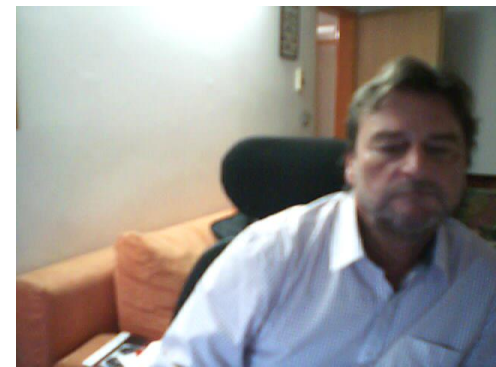
Klíčový f.- TROMBIN: FBG, FV, FVIII, FXIII, FIX, trombo zvyš.tvorbu t-PA



Bleeding states – laboratory diagnostics

▪ **Screening tests I**

- *Capillary resistance test (Rumpel-Leedeheo T.) (tonometer cuff)*
- **Tests of primary hemostasis**
 - **Bleeding time (Duke test, earlobe)**
 - **Blood platelet count**
- **Tests of plasma coagulation**
 - **APTT**
 - **prothrombin time (PT, Quick t.), INR**
 - **thrombin time [TT]**
 - **fibrinogen**



Bleeding states – laboratory diagnostics

▪ **Sreening test II**

- *Tests of fibrinolytic activity*
- **Euglobulin lysis time (Eugl. I.T)**
- *Test for fibrin{fbg degaradation products (FDP)*
- **Test for intravascular coagulation**
- **D-dimers**
- **Ethanol gelation test (ET)**



Bleeding states – diagnostics, normal values

Bleeding time	3-5 min.
Blood platelets count	150-350 . 10⁹/l
APTT	28-40 sec.
PT (INR)	0.8-1.2
TT	± 2 sec
Fbg	2-4g/l
Eugl. lyse T	120-240 min.
D-dimers	0-180
Ethanol. gel.T	neg
ATIII	70-140%



Bleeding states - laboratory diagnostics

- **Special laboratory tests I**

vessel wall

primary hemostasis

platelet function tests - adhesion, aggregation, procoagulant activity

plasmatic coagulation

correction tests using substrate plasma

detection of coagulation ff. defect

determination of coagulation ff. plasma level

determination of coagulation ff. Ag – ELISA metody



Bleeding states - laboratory diagnostics

- **Special laboratory tests II**

fibrinolytic system

**determination of plasminogen, t-PA, α_2 -antiplasmin,
plasminogen activator inhibitor I, II (PAI I, II)**

tests for intravascular activation of hemostasis (DIC)

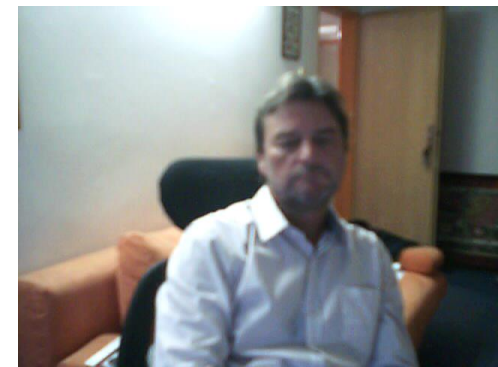
**determination of prothrombin fragments F1, 2, fibrinopeptids A, B,
trombin-antitrombin. complexes (TAT)**



Patient: M.S., 19 years
Dg.: trombocytopenia

normal values

Bleeding time	>20	3-5 min.
Platelet count	5	150-350 . 10⁹/l
<i>Rumpel-Leede t.</i>	<i>pos</i>	neg
APTT	32.6	28-40 sec.
PT (INR)	1.05	0.8-1.2
TT	14.8	± 2 sec
Fbg	4.3	2-4g/l
D dimers	97	0-180
Ethanol. gel.T	neg	neg
ATIII	126	70-140%



Thrombocytopenias

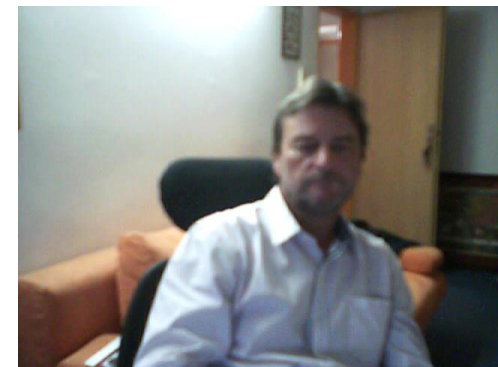
- **False pseudothrombocytopenia – EDTA (sodium citrate, heparin)**
- **Examination of bone marrow**
 - evaluation of megakaryocyte line**
 - all myeloid lines**
 - search for leukemic infiltration**
- **Morphology of blood platelets of peripheral blood**
- **Survival of blood platelets in circulation**
(⁵¹Cr, ¹¹¹I)
- **Determination of antithrombocyte autoantibodies on platelet s**



Patient: A.J., 40 years

Dg.: **Glanzmann's thrombastenia**

Bleeding time	>20	normální hodnoty
Blood platelets count	226	3-5 min.
Rumpel-Leede	neg (±)	150-350 . 10⁹/l
APTT	31.4	28-40 sec.
PT (INR)	0.98	0.9-1.1
TT	16.0	14.2 sec.
Fbg	4.3	2-4g/l
D dimers	112	0-180
Ethanol. gel.	neg	neg
ATIII	92	70-140%



Thrombocytopathies – the examinations of blood platelet functions

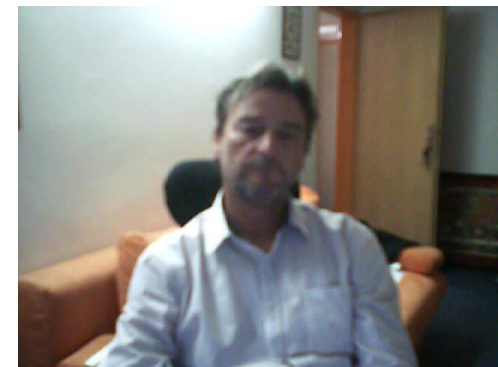
- **Bleeding time**
- **Adhesion function**
- **Platelet aggregation function**
inducers: collagen, ADP, epinephrin, arachidonic ac., TRA et c.
- **Procoagulant abilities**
Kaolin-Stypven test
- **Retraction activity of blood platelets**
- **Platelet function analyser (PFA-100)**
with collagen, ADP (the evaluation of adhesion/aggregation)



Patient: J.Š., 39 years
Dg.: hemophilia A

• normal values

Bleeding time	3.30	3-5 min.
Blood platelet count	188	150-350 . 10 ⁹ /l
APTT	112.	28-40 sec.
PT (INR)	1.03	0.8-1.2
TT	12.8	± 2 sec
Fbg	4.8	2-4g/l
ReptilaseT	-	± 2 sec
Eugl. lyse T	225	120-240 min.
D dimers	66	0-180
Ethanol.gel.T	neg	neg
ATIII	115	70-140%
F VIII	0.6%	80-160%

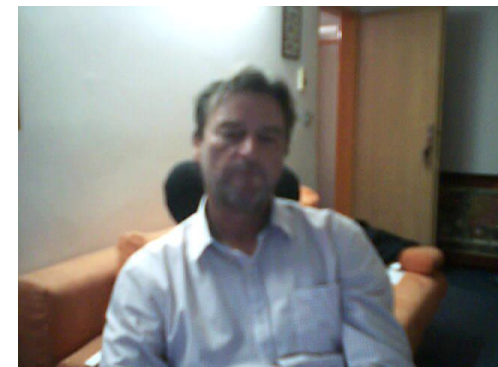


Patient: J.K., 69 years

Dg.: **FVII deficiency (hypoproconvertinemia)**

- normal values

Bleeding time	4	3-5 min.
Blood platelet count	149	150-350 . 10⁹/l
APTT	32.6	28-40 sec.
PT (INR)	2.2	0.8-1.2
TT	14.8	14.2 sec.
Fbg	4.3	2-4g/l
ReptilaseT	-	± 2 sec.
Eugl. lyse T	210	120-240 min.
D dimers	112	0-180
Ethanol. gel. T	neg	neg
ATIII	86	70-140%



Patient: XY,
Dg.: **deficiency FX**

- **Normal values**

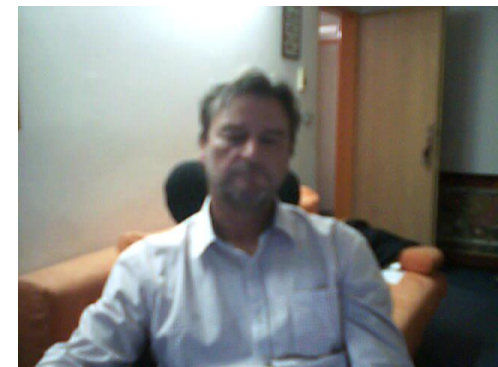
Bleeding time	4	3-5 min.
Blood platelet count	149	150-350 . 10⁹/l
APTT	88	28-40 sec.
PT (INR)	2.6	0. 8-1.2
TT	14.8	14.2 sec.
Fbg	4.3	2-4g/l
ReptilaseT		± 2 sec.
D dimers	145	0-180
Ethanol. gel. T	neg	neg
ATIII	86	70-140%



Patient: D.T., 72 years
Dg.: vonWillebrand's disease

• normal values

Bleeding time	>20	3-5 min.
Blood platelet count	312	150-350 . 10⁹/l
APTT	65	28-40 sec.
PT (INR)	1.3	0.8-1.2
TT	12.2	14.2 sec.
Fbg	4.0	2-4g/l
D dimers	172	0-180
Ethanol. gel. T	neg	neg
ATIII	96	70-140%
FVIII	22%	
RCo	8%	



Patient: L.V., 22 years

Dg.: acute hepatitis, VHA

normal values

Bleeding time	nd	3-5 min.
Blood platelet count	149	150-350 . 10 ⁹ /l
APTT	51	28-40 sec.
PT (INR)	2.4	0.8-1.2
TT	14.8	14.2 sec.
Fbg	6.2	2-4g/l
D dimers	240	0-180
Ethanol. gel. T	neg	neg
ATIII	66	70-140%



Patient: L.B., 56 years
Dg.: **cirrhosis hepatis**

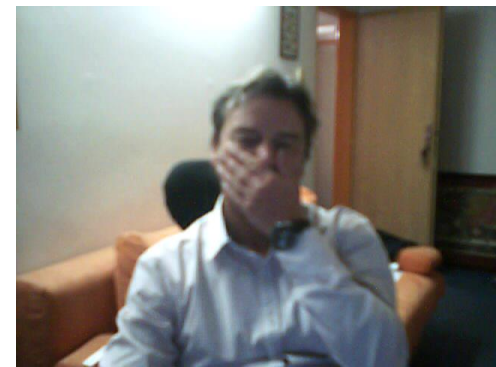
normal values

Bleeding time	19	3-5 min.
Blood platelet count	78	150-350 . 10⁹/l
APTT	69	28-40 sec.
PT (INR)	1.88	0.8-1.2
TT	108	14.2 sec.
Fbg	0.45	2-4g/l
D dimers	281	0-180
Ethanol. gel.T	neg	neg
ATIII	43	70-140%



DIC syndrome

- The International Society on Thrombosis and Haemostasis (ISTH) has defined disseminated intravascular congestion (DIC) as “an acquired syndrome characterized by the intravascular activation of coagulation with loss of localization arising from different causes. It can originate from and cause damage to the microvasculature, which if sufficiently severe, can produce organ dysfunction”. Indeed, a wide variety of diseases can cause DIC, including trauma, acute promyelocytic leukemia, and sepsis. Furthermore, DIC is an independent predictor of mortality in patients with critical illness. There is no single gold-standard diagnostic test for DIC; however, a combination of several conventional coagulation tests may be helpful in diagnosis.
- Platelet number
- Fibrin-related markers
- FBG
- Coagulation tests (PT)



Patient: J.H., 75 years

Dg.: **DIC, comp.**; bronchopneumonia

• normal values

Bleeding time	4.30	3-5 min.
Blood platelet count	78	150-350 . 10 ⁹ /l
APTT	24.8	28-40 sec.
PT (INR)	0.9	0.8-1.2
TT	16.0	14.2 sec.
Fbg	4.2	2-4g/l
D dimers	580	0-180
Ethanol. gel.T	pos/neg	neg
ATIII	72	70-140%



Patient: L.H., 25 years

Dg.: **DIC, decomp.**; acute myeloid. leukemia

- normal values

Bleeding time	nd	3-5 min.
Blood platelet count	21	150-350 . 10⁹/l
APTT	83.8	28-40 sec.
PT (INR)	1.9	0.8-1.2
TT	>180	14.2 sec.
Fbg	0.2	2-4g/l
D dimers	6436	0-180
Ethanol. gel. T	pos	neg
ATIII	22	70-140%

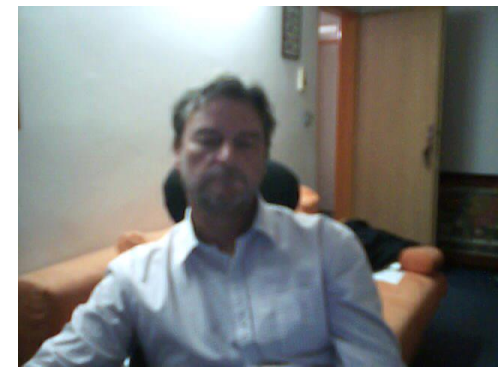


Patient: P.C., 63 years

Dg.: the overdose of **coumarins**; stp flebotrombosis

• normal values

Bleeding time		3-5 min.
Blood platelet count	222	150-350 . 10 ⁹ /l
APTT	73.7	28-40 sec.
PT (INR)	8.6	0.8-1.2
TT	16.0	14.2 sec.
Fbg	2.2	2-4g/l
D dimers	446	0-180
Ethanol. gel.T	neg	neg
ATIII	72	70-140%



Patient: P.C., 63 years

Dg.: **the overdose of heparin**; acute flebothrombosis

- **normal values**

Bleeding time		3-5 min.
Blood platelet count	152	150-350 . 10⁹/l
APTT	>180	28-40 sec.
PT (INR)	3.6	0.8-1.2
TT	>180	14.2 sec.
Fbg	2.8	2-4g/l
D dimers	4862	0-180
Ethanol. gel.T	neg	neg
ATIII	68	70-140%



Differential diagnostics

Dg.: Liver cirrhosis

(decr.production, consumption)

Bleeding time ↑
Blood platelet count ↓

APTT ↑

PT (INR) ↑

TT n ↑

Fbg ↑ n ↓

D dimers neg

Ethanol. gel.T neg

ATIII ↓

Dg.: DIC

(mostly consumption)

Bleeding time ↑↑
Blood platelet count ↓↓

APTT ↑

PT (INR) ↑

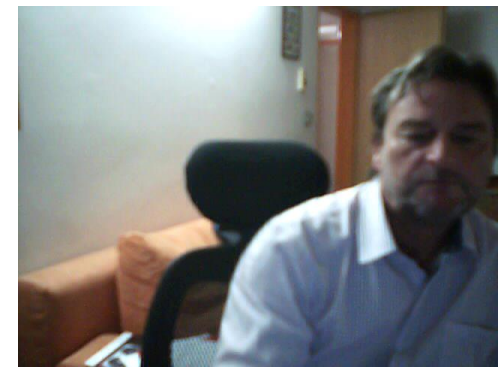
TT ↑

Fbg ↓↓

D dimers ↑↑

Ethanol. gel.T pos

ATIII ↓



Differential diagnostics II

Dg.: **DIC**

Bleeding time	↑ ↑
Blood platelet count	↓ ↓
APTT	↑
PT (INR)	↑
TT	↑
Fbg	↓ ↓
D dimers	↑ ↑
Ethanol. gel.T	pos
ATIII	↓

Dg.: **intoxication by heparin**

Bleeding time	n
Blood platelet count	n
APTT	↑ ↑
PT (INR)	↑
TT	↑ ↑
Fbg	n
D dimers	↑
Ethanol. gel.T	n
ATIII	↓

