THROMBOCYTOPENIA

TERM DEFINITION

Platelet count <2.5th percentile of normal platelet count range, typically < 150 x 10^9/L

THROMBOCYTOPENIA

Platelet count < 150 x 10^9/L

CAUSES

CAUSES ACCORDING TO CLINICAL CONTEXT

OUTPATIENT

Primary care

- ITP
- Cirrhosis
- MDS
- Familial thrombocytopenia

OB/GYN

- Gestational thrombocytopenia

INPATIENT

WARDS*

- Drugs
- Infection

ICU/CCU

- Drugs
- Infection +/- DIC
- Extracorporeal circuit
- HLH
- TTP, other TMA

ITP, immune thrombocytopenia; MDS, myelodysplasia; DIC, disseminated intravascular coagulation; HLH, hemophagocytic lymphohistiocytosis; TTP, thrombotic thrombocytopenia purpura; TMA, thrombotic microangiopathy

* *de novo thrombocytopenia occurring in hospital*

URGENT CARE

EMERGENCY ROOM

- Alcohol use
- ITP with bleed
- TTP

CAUSES ACCORDING TO MECHANISM

Decreased Production	Increased Destruction	Sequestration
Alcohol	*ITP*	*Cirrhosis*
Infections (viral)	*TTP*	
	Drugs	

DIAGNOSTIC CLUES

ADDITIONAL FINDINGS	CONSIDERATIONS
Anemia	TTP Evans syndrome Babesiosis
Elevated PT, PTT	DIC, heparin, APS

ADDITIONAL FINDINGS	CONSIDERATIONS
Pancytopenia	B12 deficiency, hypersplenism, AA and others
Neutrophilia, left shift, toxic neutrophils	Sepsis

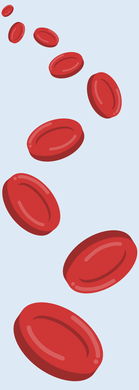
PT, prothrombin time; PTT, partial thromboplastin time; APS, antiphospholipid syndrome; AA, aplastic anemia

CLINICAL PEARLS

Remember to rule out **platelet clumping** as a cause of thrombocytopenia by looking at a smear

Thrombocytopenia + thrombosis, consider DIC, APS, or HIT

ITP is a diagnosis of exclusion; once it is being considered, consider ordering HIV and HCV serologies per clinical practice guidelines



New onset thrombocytopenia in hospitalized patient is almost always caused by drugs (especially heparin) or infection (with or without DIC)

The **risk for bleeding** does not increase until the platelet count falls < 10 x 109/L, provided patient not taking antiplatelet agent or anticoagulant

Most **surgeries** can be carried out with platelet count > 50 x 10^9/L, with exception of neurological procedures, which require platelet count >80-100 x 10^9/L

PROXIMATE MECHANISMS

Different mechanisms can lead to thrombocytopenia, including:

- **Platelet clumping** in vitro, caused by EDTA-dependent antibodies
- **Decreased production**, most often associated with additional cytopenias, but may also occurs as isolated thrombocytopenia from alcohol use, viral infections, cirrhosis (the latter from decreased thrombopoietin production) or amegakaryocytic thrombocytopenia
- **Increased destruction**
  - In ITP, antibody-mediated phagocytosis
  - In HIT, antibody-mediated platelet activation
  - In TMA, consumption of platelets in microvessels
  - In infection, increased sequestration on endothelial surface
- **Sequestration** - pooling of platelets in spleen

EVOLUTIONARY MECHANISMS

All vertebrates have platelets, though only mammals have anucleate platelets. In other vertebrate classes (fish, amphibians, reptiles and birds), the nucleated platelets are called **thrombocytes**. They can be hard to distinguish from white blood cells in the peripheral smear.

It is tempting to speculate that the presence of a nucleus and other organelles in the non-mammalian vertebrate thrombocyte provides the cell with a greater reparative capacity compared to the mammalian form and therefore may render the organism more resistant to developing thrombocytopenia.

The **gene-environment mismatch** hypothesis explains some propensity to develop thrombocytopenia. Our genome is adapted to a period of time 10,000 years ago, and has not had time to catch up to cultural changes such as introduction of alcohol and medications such as heparin.

HISTORY OF MEDICINE

Platelets were discovered in 1877 by a famous French physician, Georges Hayem. Since the cells **lacked a nucleus** there was a lot of controversy over whether they represented a true cell type. In the 1890s, physicians recognized a connection between low platelet count and hemorrhagic tendency, and by 1910 had proven it using animal models of experimentally induced **thrombocytopenia**.

NOTES

ATTRIBUTIONS

Written by Dr. William Aird

Input from Dr. Stephen Stearns *(Evolutionary Medicine)*
Dr. John Harvey *(Comparative Physiology)*
Dr. Jane Maienschein & Dr. Kate McCord *(History of Medicine)*

The Blood Project
ENCYCLOPEDIA OF BLOOD