MAIN SYNDROMES IN HEMATOLOGY

Lecture 5. For 2nd year dentistry faculty students.

Department of internal medicine # 3
Docent Borzykh Oksana Anatoliivna

BLOOD

- **Erythrocytes**: 4,0-5,5 x 10*12/l by men,
  3,5-4,5 x 10*12/l by women
- **Leukocytes**: 4-10 x 10*9/l;

Leukocytes count:
eosinophilles-1-4%,
basophiles – 0-1%,
neutrophyles – 60-70%,
lymphocytes – 20-35%,
monocytes -3-9%,
Trombocytes – 200-400 x 10*9/l
CI (color index) – 0.86-1.05
ESR – 1-10 by men
- 2-15 by women

Hematology

- **1. Pathology of erythrocytes** –
- 1.1 Anemia's (erythropenia)
- 1.2 Erythrocytosis (blood cancer)
- **2. Pathology of leukocytes:**
- 2.1. Leukemia's (blood cancer)
- 2.2. Neutropenia's (agranulocytosis);
- 2.3. Leukosytosis (inflammation)
- **3. Coagulation disorders:**
- 3.1 Hemophilia
- 3.2 Thrombocytopenia, thrombocytopatia
- 3.3 DIC (disseminate intravascular coagulation)

Anemia

- **Anemia**, from the Greek meaning "without blood", is a deficiency of red blood cells (RBCs) and/or hemoglobin.
- For adult's RBC count less 3.5 mln/mcl for women, 4.0 - for men **are diagnostic**
- For adult men a hemoglobin level less than 13.0 g/dl (130 g/l) is diagnostic of anemia, and for adult women, the diagnostic is below 12.0 g/dl (120g/l).

Anemia

- Anemia results in a reduced ability of blood to transfer oxygen to the tissues, causing tissue hypoxia. Since all human cells depend on oxygen for survival, varying degrees of anemia can have a wide range of clinical consequences.

Anemia's

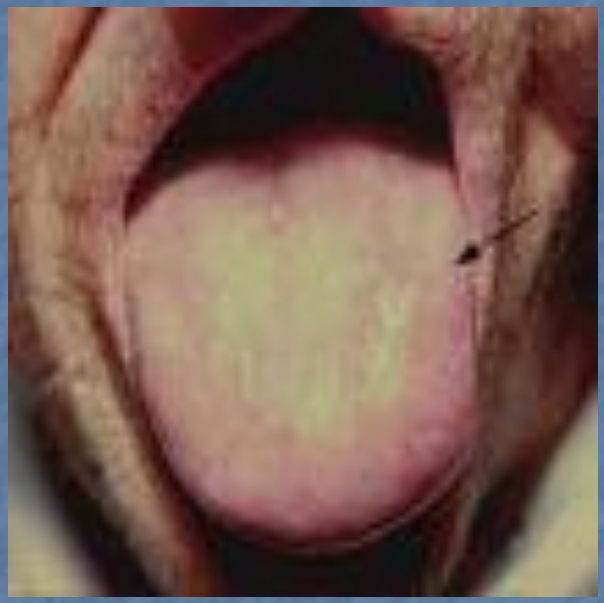
- Anemia is the most common disorder of the blood.
- There are several kinds of anemia, produced by a variety of underlying causes.
- Anemia can be classified in a variety of ways, based on the:
- morphology of RBCs,
- underlying etiologic mechanisms, and
- discernible clinical spectra, to mention a few.

Signs and symptoms

- Anemia goes undetected in many people, and symptoms can be vague. Most commonly, people with anemia report a feeling of **weakness or fatigue**, general malaise and sometimes a poor concentration. People with more severe anemia often report dyspnea (shortness of breath) on exertion. Very severe anemia prompts the body to compensate by increasing cardiac output, leading to palpitations and sweatiness, and to heart failure.

Pallor

- Pallor (pale skin, mucosal linings and nail beds) is often a useful diagnostic sign in moderate or severe anemia, but it is not always apparent. Other useful signs are cheilosis and koilonychia



Some other related symptoms

- Fever, chills, night sweats and other flu-like symptoms
- Weakness and fatigue
- Loss of appetite and/or weight
- Swollen or bleeding gums
- Excess bleeding (from minor cut)
- Neurological symptoms (headache)
- Enlarged liver and spleen
- Easy bruising
- Frequent infection
- Bone pain
- Joint pain
- Swollen tonsils

Diagnosis of anemia

- Clinicians use many tests:
- ferritin,
- serum iron,
- transferrin,
- RBC folate level,
- serum vitamin B12,
- hemoglobin electrophoresis,
- renal function tests (e.g. serum creatinine).

Anemia's classification

Iron deficiency anemia

B12 or folium deficiency anemia

Aplastic anemia

Hemolytic anemia

Anemia of chronic disease

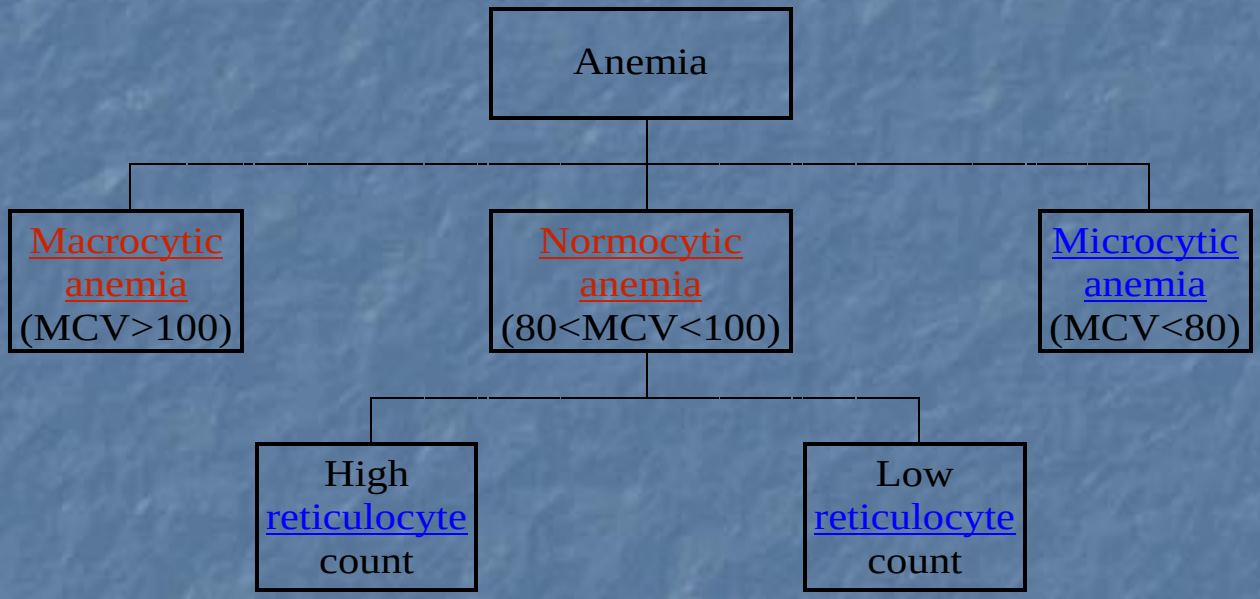
RBC mean corpuscular volume by ANEMIA

- **Hematocrit** (Ht) is the part of blood volume with RBC.
- Normal Ht is 0,38-0,42.
- **Normal mean corpuscular volume (MCV) is 80-100 fl**
- **MCV= Ht : RBC**

Anemia's:

- **Microcytic MCV < 80 fl,**
- **Macrocytic MCV > 100 fl,**
- **Normocytic MCV = 80-100 fl**

Here is a schematic representation of how to consider anemia with MCV as the starting point:



Color index (CI)

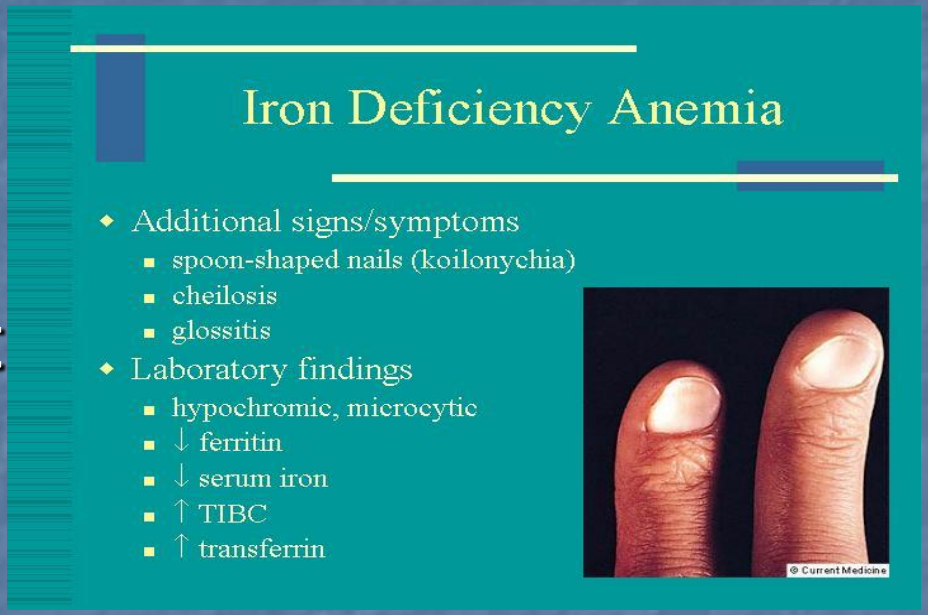
- Normal color index

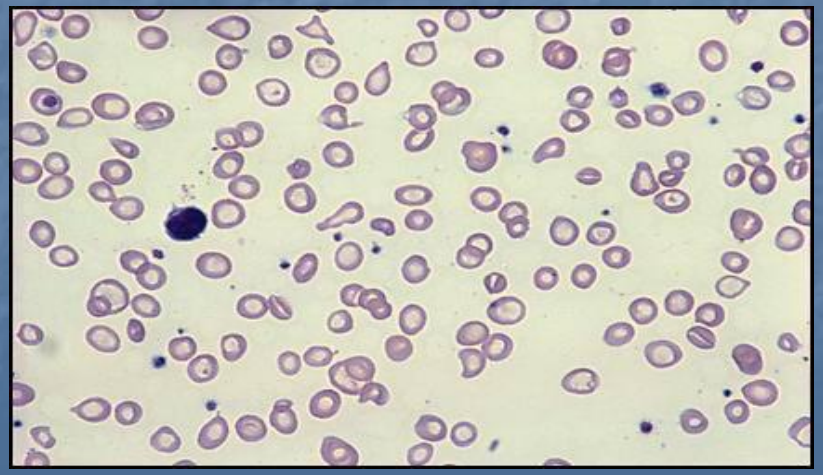
(or mean concentration of hemoglobin (MCH)) is **0.86-1.05**

- Anemia's can be:
- **hyperchromic CI>1,05**
- **Hypochromic CI<0,86**
- **Normochromic CI=** 0.86-1.05
- **hyperchromic (CI>1,05) are B12 or folate deficiency anemia's (macrocytic)**
- **Hypochromic CI<0,86 are iron deficiency anemia's or talassemia's (microcytic)**
- **Normochromic are the hemolytic or bone marrow deficient anemia's**

Microcytic anemia

- Iron deficiency anemia is the most common type of anemia overall and it has many causes.
- RBCs often appear hypochromic (paler than usual) and microcytic (smaller than usual) when viewed with a microscope.





Iron deficiency anemia

- Iron deficiency anemia is caused by insufficient dietary intake or absorption of iron; to replace losses from menstruation or losses due to diseases.
- Iron is an essential part of hemoglobin, and low iron levels result in decreased incorporation of hemoglobin into red blood cells.
- In the United States, 20% of all women of childbearing age have iron deficiency anemia, compared with only 2% of adult men

Iron deficiency sings and symptoms

- Sometimes the cause of abnormal fissuring of the angular (corner) sections of the lips (angular cheilitis).

- Iron deficiency anemia can also due to bleeding lesions of the gastrointestinal tract.

  Fecal occult blood testing, upper endoscopy and lower endoscopy should be performed to identify bleeding lesions.

  In men and post-menopausal women the chances are higher that bleeding from the gastrointestinal tract could be due to colon polyp or colorectal cancer.
- Worldwide, the most common cause of iron deficiency anemia is parasitic infestation (hookworm, amebiasis, schistosomiasis and whipworm).

Microcytic anemia

- A mnemonic commonly used to remember causes of microcytic anemia is ***TAILS***:
- ***T*** - Thalassemia,
- ***A*** - Anemia of chronic disease,
- ***I*** - Iron deficiency anemia,
- ***L*** - Lead toxicity associated anemia,
- ***S*** - Sideroblastic anemia.

Macrocytic anemia

- Megaloblastic anemia due to a deficiency of either vitamin B12 or folic acid (or both) due either to inadequate intake or insufficient absorption.
- Folate deficiency normally does not produce neurological symptoms, while B12 deficiency does.
- Megaloblastic anemia is the most common cause of macrocytic anemia.

Pernicious anemia

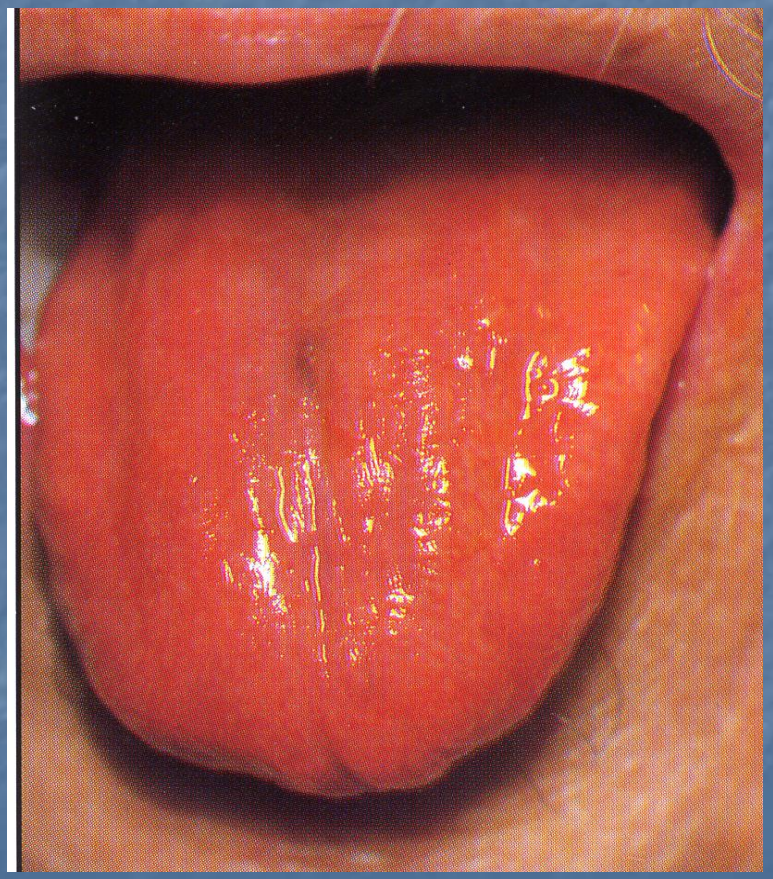
- Pernicious anemia is an autoimmune condition directed against the parietal cells of the stomach. Parietal cells produce intrinsic factor, required to absorb vitamin B12 from food. Therefore, the destruction of the parietal cells causes a lack of intrinsic factor, leading to poor absorption of vitamin B12.
- Alcoholism
- Methotrexate, zidovudine, and other drugs that inhibit DNA replication. This is the most common etiology in nonalcoholic patients.

Specific symptoms of vitamin B12 deficiency

- In addition to the non-specific symptoms of anemia, specific symptoms of vitamin B12 deficiency include neuropathy, in particular balance difficulties from posterior column spinal cord pathology, and having a smooth, red tongue, (glossitis).

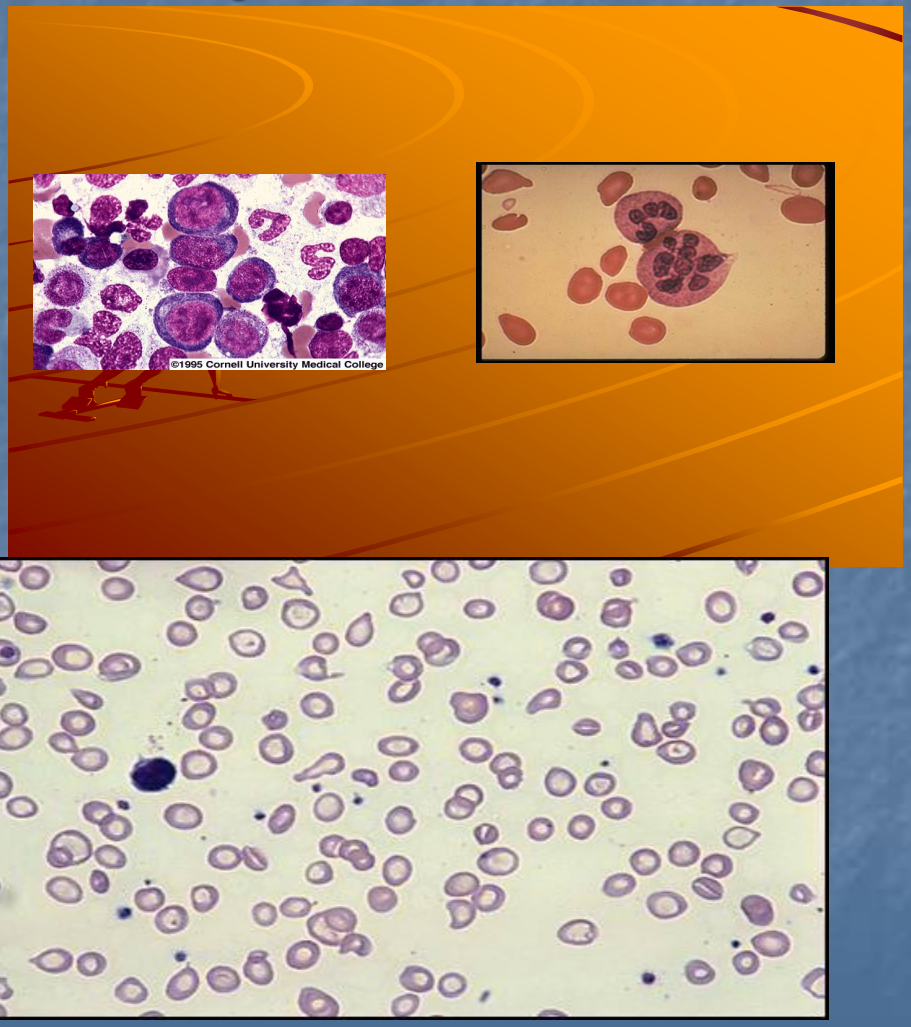
Hanter glossitis

- . George Minot and George Whipple then set about to chemically isolate the curative substance and ultimately were able to isolate the vitamin B12 from the liver. All three shared the 1934 Nobel Prize in Medicine.



Specific symptoms of vitamin B12 deficiency

- Other characteristics visible on the peripheral smear may provide valuable clues about a more specific diagnosis; for example, abnormal white blood cells may point to a cause in the bone marrow



Normocytic anemia's

- 1/ Hemolytic anemia
- 2/ Aplastic anemia

Hemolysis:

- **Jaundice**
- **High undirect bilirubine**
- **High reticulocyte count**
- Anemia **normochromic**

- A reticulocyte count is a quantitative measure of the bone marrow's production of new red blood cells.
- Normal Reticulocyte counts is 1%
- By hemolysis it is 5-10%
- By aplastic anemia’s <1%

Aplastic anemia's

- Pancytopenic syndrome:
- RBC < 3,5, often < 2,0
- WBC < 3,0
- Thrombocytes < 50 000

Leukemia

- **Leukemia** is a cancer (sarcoma) of the blood or bone marrow and is characterized by an abnormal proliferation (production by multiplication) of blood cells, usually white blood cells (leukocytes).
- It is part of the broad group of diseases called hematological neoplasms.

leukemia

- The word leukemia, which means 'white blood,' is derived from the disease's namesake high white blood cell counts that most leukemia patients have before treatment.
- The high number of white blood cells are apparent when a blood sample is viewed under a microscope.
- Frequently, these extra white blood cells are immature or dysfunctional.
- The excessive number of cells can also interfere with the normal function of other cells.

- Some leukemia patients do not have high white blood cell counts visible during a regular blood count. This less-common condition is called aleukemia.
- The bone marrow still contains cancerous white blood cells, and they are disrupting the normal production of blood cells.
- However, they are staying in the marrow instead of entering the bloodstream, where they would be visible in a blood test.
- For an aleukemic patient, the white blood cell counts in the bloodstream can be normal or low. Aleukemia can occur in any of the four major types of leukemia, and is particularly common in hairy cell leukemia.

Four major types

- Leukemia is a broad term covering a spectrum of diseases.
- Leukemia is clinically and pathologically split into its *acute* and *chronic* forms.
- *Acute leukemia* is characterized by the rapid proliferation of immature blood cells. This crowding makes the bone marrow unable to produce healthy blood cells. Acute forms of leukemia can occur in children and young adults. (In fact, it is a more common cause of death for children in the US than any other type of malignant disease). Immediate treatment is required in acute leukemias due to the rapid progression and accumulation of the malignant cells, which then spill over into the bloodstream and spread to other organs of the body.
- *Chronic leukemia* is distinguished by the excessive build up of relatively mature, but still abnormal, blood cells. Typically taking months to years to progress, the cells are produced at a much higher rate than normal cells, resulting in many abnormal white blood cells in the blood. Chronic leukemia mostly occurs in older people, but can theoretically occur in any age group. Whereas acute leukemia must be treated immediately, chronic forms are sometimes monitored for some time before treatment to ensure maximum effectiveness of therapy.

- Furthermore, the diseases are classified according to the type of abnormal cell found most in the blood
- lymphoid cells vs. myeloid cells

Combining these two classifications provides a total of four main categories:

	Acute	**Chronic**
lymphocytic leukemia	Acute lymphocytic leukemia (also known as Acute Lymphoblastic Leukemia, or ALL) is the most common type of leukemia in young children. This disease also affects adults, especially those age 65 and older.	Chronic lymphocytic leukemia (CLL) most often affects adults over the age of 55. It sometimes occurs in younger adults, but it almost never affects children.
myelogenous leukemia (or "myeloid")	Acute myelogenous leukemia (also known as Acute Myeloid Leukemia, or AML) occurs more commonly in adults than in children. This type of leukemia was previously called "acute nonlymphocytic leukemia".	Chronic myelogenous leukemia (CML) occurs mainly in adults. A very small number of children also develop this disease.

Typical blood analysis

Acute leukemia's:

- RBC, Hb –normal,
- WBC – slate elevated 10-12 x 10*9/l,
- **blast cells > 30%**

Chronic myeloid *leukemia* **– L -50-100** x 10*9/l;

eos – 7-8%, bas – 5-6%, myeloblasts – 3-4%; promyelocytes -5-6%, myelocytes – 10-20%, neutrophills -30-40%, lymphocytes- 3-5%, monocytes -3-5%.

Chronic lymphoid *leukemia***– L -50-100 th./mkl**

lymphocytes > 60%

Symptoms

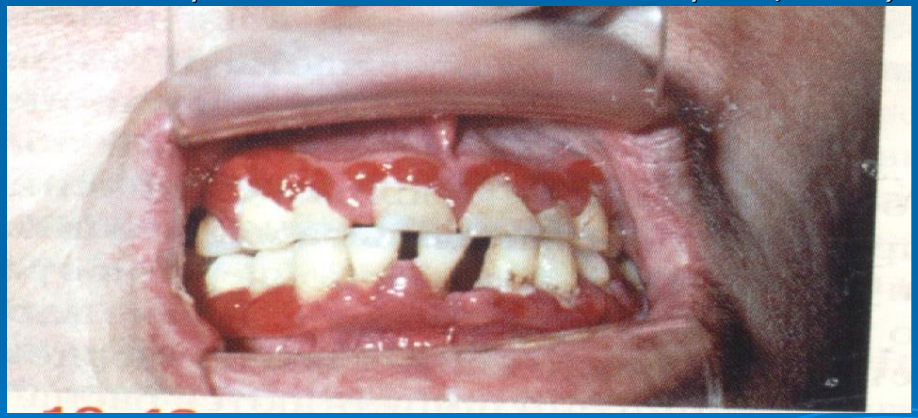
- Damage to the bone marrow, by way of displacing the normal bone marrow cells with higher numbers of immature white blood cells, results in a lack of blood platelets, which are important in the blood clotting process.
- This means people with leukemia may become bruised, bleed excessively, or develop pinprick bleeds (petechiae).
- White blood cells, which are involved in fighting pathogens, may be suppressed or dysfunctional. This could cause the patient's immune system (white blood cells etc.) to start attacking other body cells.
- Finally, the red blood cell deficiency leads to anemia, which may cause dyspnea. All symptoms may also be attributable to other diseases; for diagnosis, blood tests and a bone marrow examination are required.

Hyperplasia of gums by leukemia

Гематоонкологические заболевания в практике врача-стоматолога

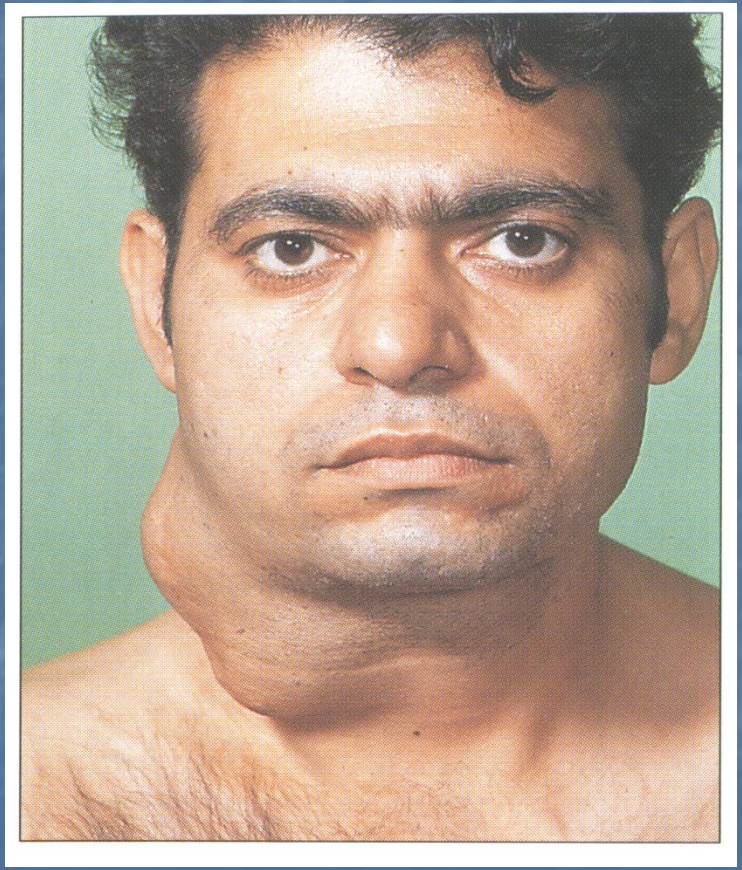
Гематоонкологические заболевания принадлежат к болезням, которые могут, манифестировать изменениями в ротовой полости.

Врач-стоматолог может быть первым, к кому обратится

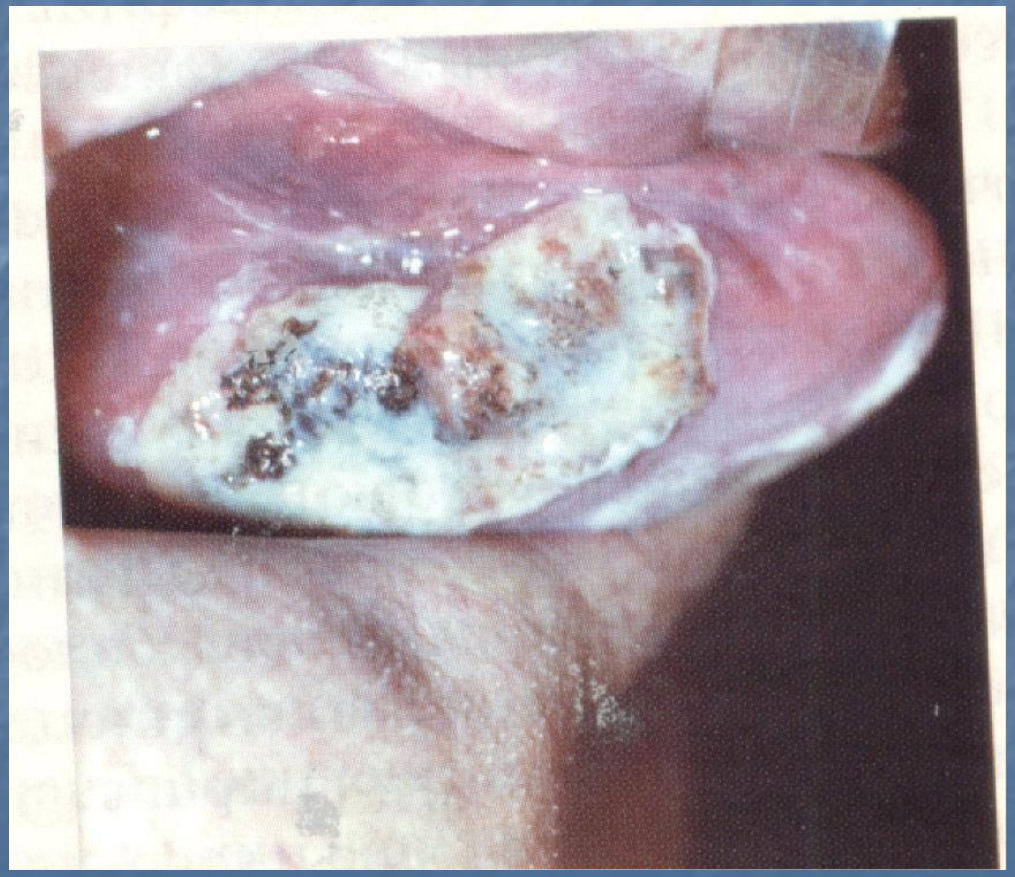


- Лейкемиды в ротовой полости при хроническом лимфолейкозе

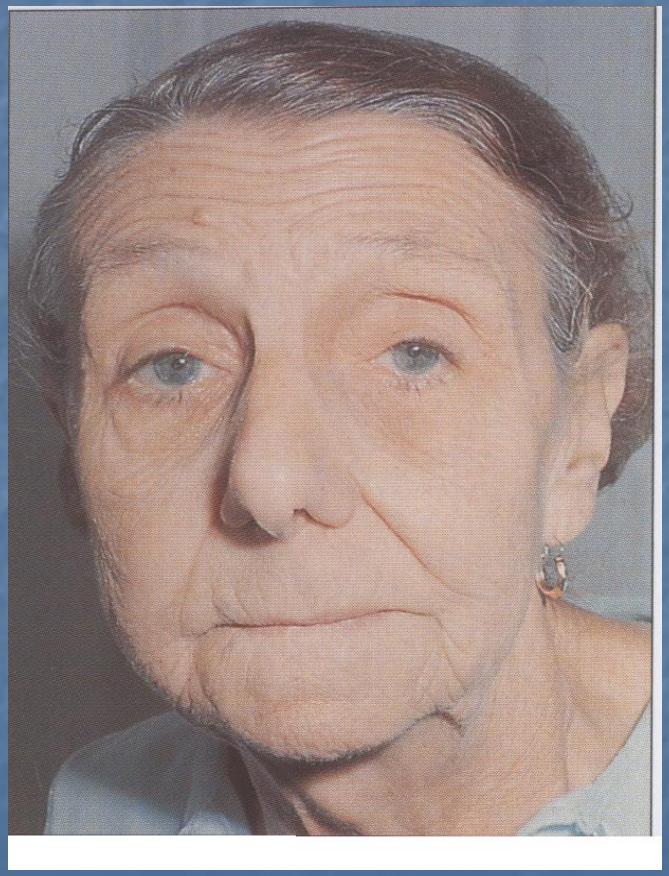
Lymphoma



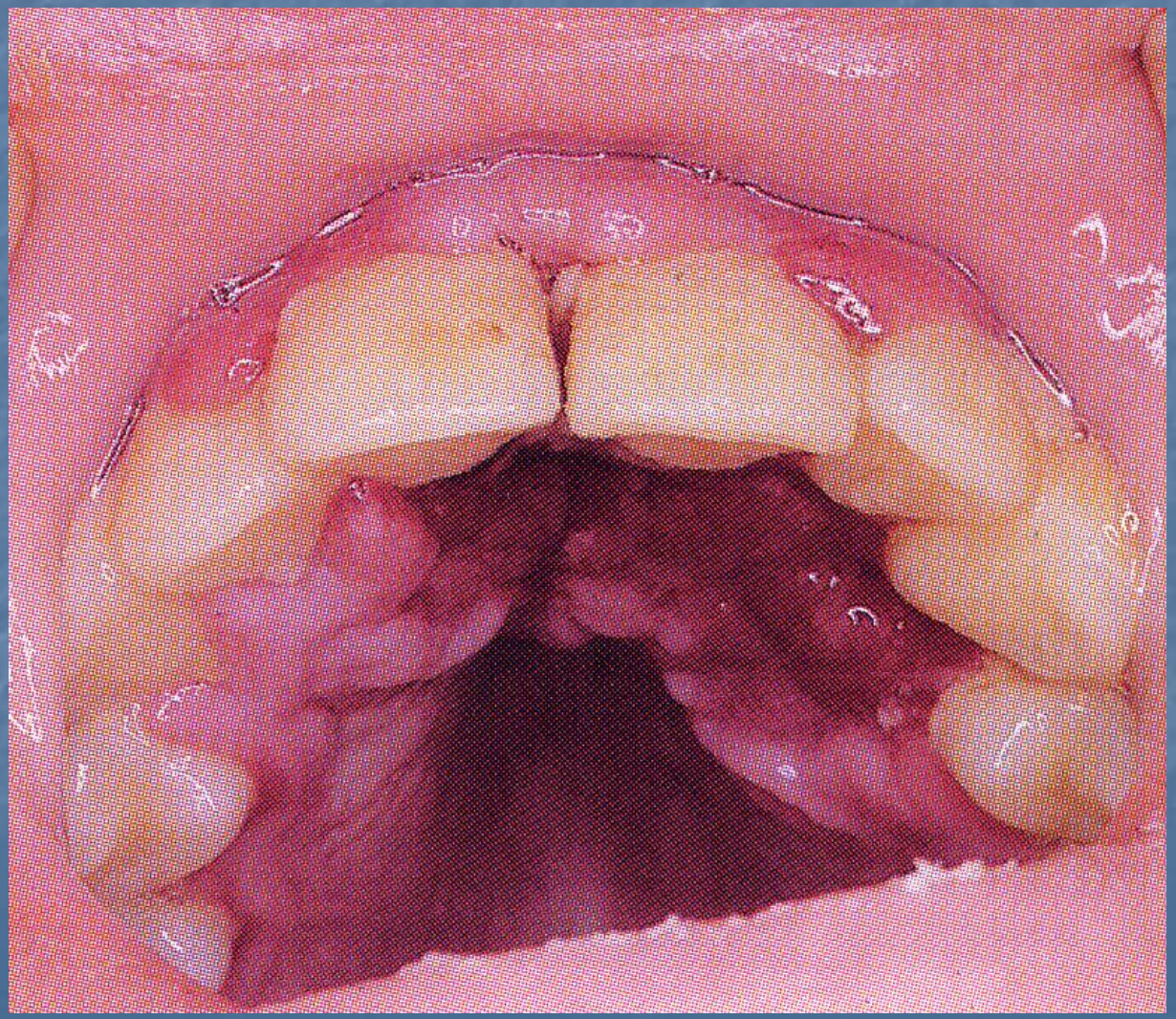
Necrose of tongue



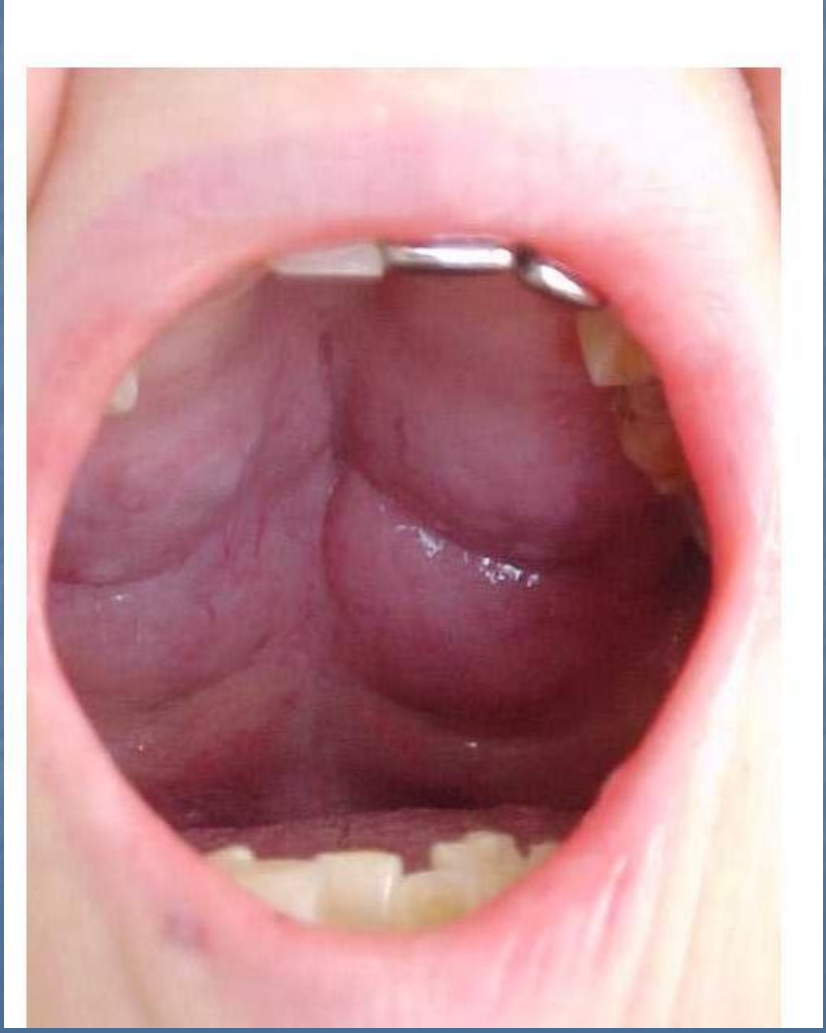
Anemia by leukemia



Leukemoidas



Leukemoidas



Haemorrhagic syndromes hemophillia and thrombocytopenia

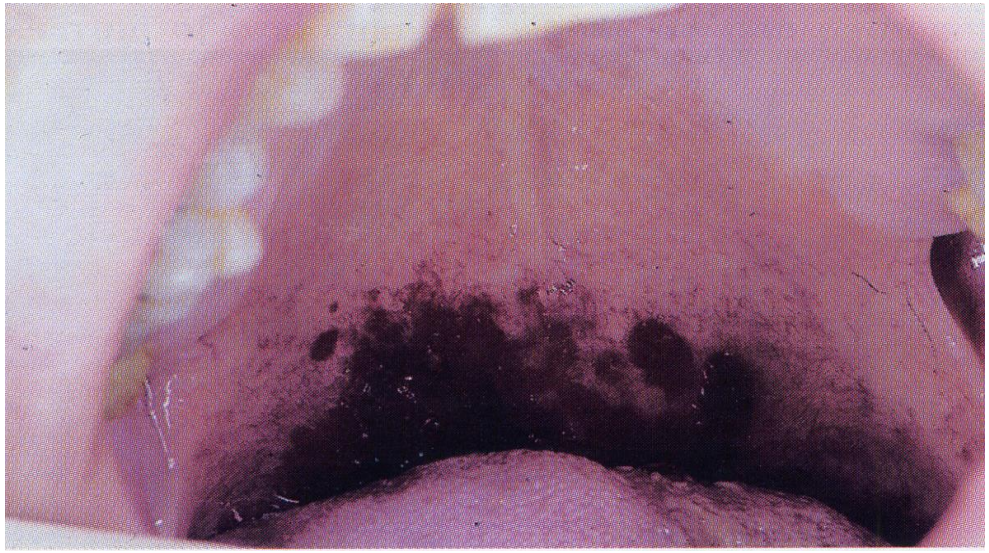
- **Hemophilia**
- Genetic deficiencies and a rare autoimmune disorder may lower plasma clotting factor levels of coagulation factors needed for a normal clotting process.
- When a blood vessel is injured, a temporary scab does form, but the missing coagulation factors prevent fibrin formation which is necessary to maintain the blood clot.
- Therefore, there is no increase in bleeding time with hemophilia because platelets are intact, allowing the formation of these temporary hemostatic plugs (clots).

hemophillia

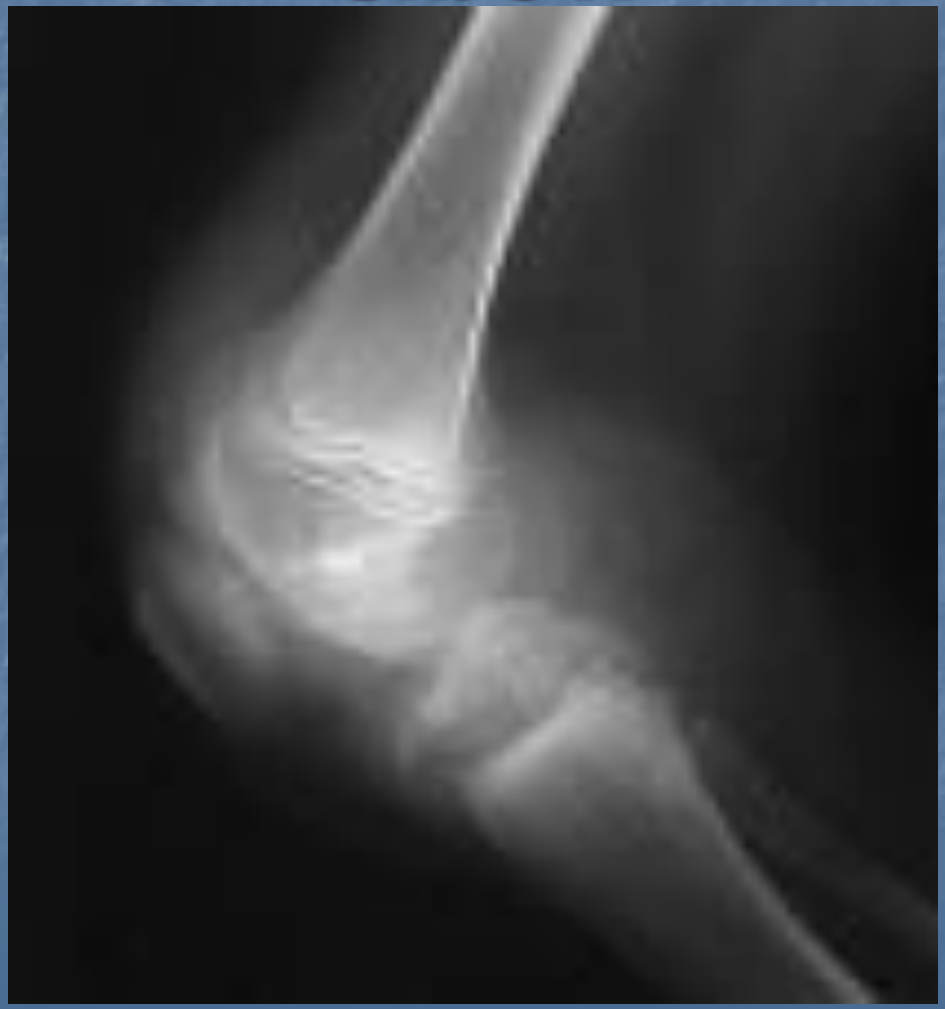
- However, "late" bleeding is affected, because these hemostatic plugs are not able to be maintained.
- The bleeding with external injury is normal, but incidence of late re-bleeding and internal bleeding is increased, especially into muscles, joints, or bleeding into closed spaces.
- Major complications include hemarthrosis, hemorrhage, Gastrointestinal bleeding, and menorrhagia.

Hematoma in oral cavity

Обширная гематома мягкого неба при гемофилии



Hematoma and ankilosis of elbow



Causes of haemophilia

- It is caused by a lack of clotting factors:
- Haemophilia A has a lack of the clotting Factor VIII. (Haemophilia A occurs in 90% of cases.)
- Haemophilia B has a lack of the clotting Factor IX.
- Haemophilia C has a lack of the clotting Factor XI.

Diagnosis of Haemophillia

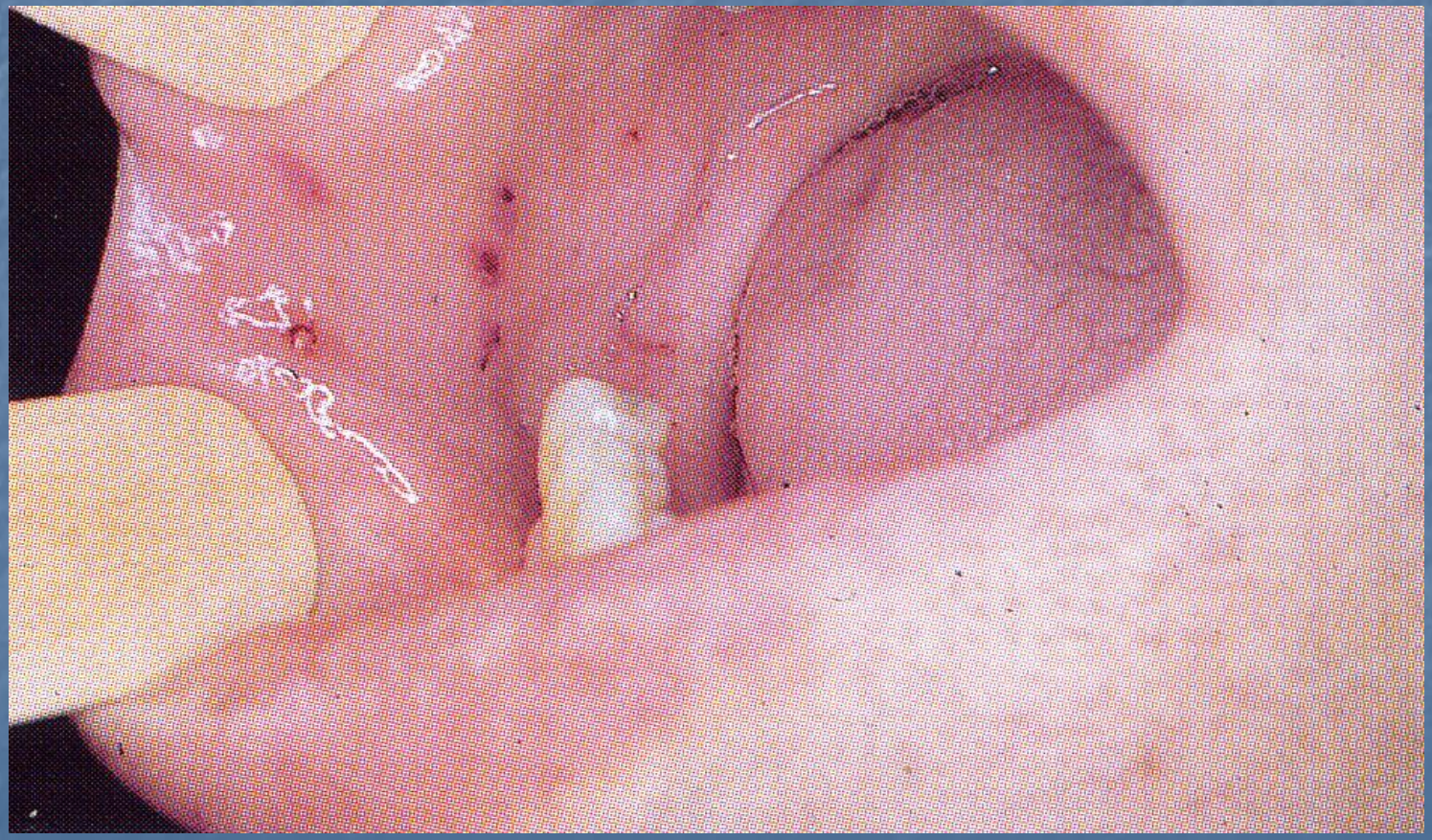
- 1. Prolonged coagulation time by Li-Waite > 10 min
- 2. Plasma recalcification time > 2 min
- 3. PTT (partial thromboplastine time)
  > 30 sec.

Thrombocytopenia

- **Causes**
- Decreased platelet counts can be due to a number of disease processes:
- **Decreased Production**
- **Increased Destruction**
- **Medication-induced**

Trombocytopenic purpura

Hemorrhagia by thrombocytopenia



Trombohemorrhagic syndrome

Diagnosis of causes thrombocytopenia

- Laboratory tests might include: full blood count, liver enzymes, renal function, vitamin B12 levels, folic acid levels, erythrocyte sedimentation rate, and peripheral blood smear.
- If the cause for the low platelet count remains unclear, bone marrow biopsy is often undertaken, to differentiate whether the low platelet count is due to *decreased production* or *peripheral destruction*.

Thrombocytopathie

- Bleeding time by Duke > 4 min
- Normal thrombocytes count
- Nose and other mucus bleedings
- Abnormal aggregation of Thr

Teleangioectasia