Lecture 6.

THE HEMOTOLGIACL EXAMINATION

The complete blood count (CBC) is often used as a broad screening test to determine an individual's general health status. It can be used to:

1. Screen for a wide range of conditions and diseases
2. Help diagnose various conditions, such as anemia, infection, inflammation, bleeding disorder or leukemia
3. Monitor the condition and/or effectiveness of treatment after a diagnosis is established
4. Monitor treatment that is known to affect blood cells, such as chemotherapy or radiation therapy

A CBC is a panel of tests that evaluates the three types of cells that circulate in the blood

1. Evaluation of white blood cells, the cells that are part of the body's defense system against infections and cancer and also play a role in allergies and inflammation: White blood cell (WBC) count is a count of the total number of white blood cells in a person's sample of blood.

White blood cell differential may or may not be included as part of the panel of tests. It identifies and counts the number of the various types of white blood cells present. The five types include neutrophils, lymphocytes, monocytes, eosinophils, and basophils.

2.Evaluation of red blood cells, the cells that transport oxygen throughout the body: Red blood cell (RBC) count is a count of the actual number of red blood cells in a person's sample of blood.

Hemoglobin measures the total amount of the oxygen-carrying protein in the blood, which generally reflects the number of red blood cells in the blood.

Hematocrit measures the percentage of a person's total blood volume that consists of red blood cells. In general the hematocrit mirror the result of the RBC count and hemoglobin a low hematocrit and low RBC indicate anemia some other causes:

Excessive loss of the blood for ex ,trauma, chronic bleeding like bleeding from digestive tract e.g ulcer polyps, colon cancer, ,heavy menstrual bleeding ,nutritional deficiencies such as iron ,folate or vit B12 deficiency, damage to the bone marrow ,aplastic anemia ,.leukemia, lymphoma ,multiple myeloma ,kidney disease ,erythropoietin production ,chronic inflammatory diseases ,thalassemia and ,hemolytic anemia caused by autoimmunity or defect in the red blood cell itself. While, high hematocrit indicate Dehydration .

- lung pulmonary disease
- congenital heart disease
- kidney tumor
- smoking and living at a high altitudes a compensation for decrease O2 in the air polycythemia vera

Red blood cell indices are calculations that provide information on the physical characteristics of the RBCs:

Mean corpuscular volume (MCV) is a measurement of the average size of a single red blood cell.

Mean corpuscular hemoglobin (MCH) is a calculation of the average amount of hemoglobin inside a single red blood cell.

Mean corpuscular hemoglobin concentration (MCHC) is a calculation of the average concentration of hemoglobin inside a single red blood cell.

Red cell distribution width (RDW) is a calculation of the variation in the size of RBCs.

The CBC may also include reticulocyte count, which is a measurement of the absolute count or percentage of young red blood cells in blood.

Evaluation of platelets, cell fragments that are vital for normal blood clotting:

3.. The platelet count is the number of platelets in a person's sample of blood.

Mean platelet volume (MPV) may be reported with a CBC. It is a calculation of the average size of platelets.

Platelet distribution width (PDW) may also be reported with a CBC. It reflects how uniform platelets are in size.

Note

The CBC is a very common test. Many people have a CBC performed when they have a routine health examination. If a person is healthy and has results that are within normal limits, then that person may not require another CBC until their health status changes or until their healthcare provider feels that it is necessary.ist When the dentist is used complete blood picture?

A CBC may be ordered when

1. a person has any number of signs and symptoms that may be related to disorders that affect blood cells.
2. When an individual has fatigue or weakness or has an infection, inflammation, bruising, or bleeding,
3. When a person has been diagnosed with a disease known to affect blood cells,
4. CBC will often be ordered on a regular basis to monitor their condition. Likewise, if someone is receiving treatment for a blood-related disorder, then a CBC may be performed frequently to determine if the treatment is effective.
5. Some therapies, such as chemotherapy, can affect bone marrow production of cells. Some medications can decrease WBC counts overall. A CBC may be ordered on a regular basis to monitor these drug treatments.

What does the test result mean?

A health practitioner typically evaluates and interprets results from the components of the CBC together. Depending on the purpose of the test, a number of additional or follow-up tests may be ordered for further investigation.

The following tables briefly and generally explain what the result for each component of the CBC may mean.

WBC evaluation , RBC evaluation, Platelet evaluation

Test	FUll Name	examples of causes of a low count	examples of causes of a high count
WBC	White Blood Cell Count	Known as leukopenia Bone marrow disorders or damage Autoimmune conditions Severe infections (sepsis) Lymphoma or other cancer that spread to the bone marrow Dietary deficiencies Diseases of immune system (e.g., HIV/AIDS)	Known as leukocytosis Infection, most commonly bacterial or viral Inflammation Leukemia, myeloproliferative disorders Allergies, asthma Tissue death (trauma, burns, heart attack) Intense exercise or severe stress
Diff	White Blood Cell Differential (Not always performed; may be done as part of or in follow up to CBC;		
Neu, PMN, polys	Absolute neutrophil count, % neutrophils)	Known as neutropenia Severe, overwhelming infection (sepsis) Autoimmune disorders Dietary deficiencies Reaction to drugs, chemotherapy Immunodeficiency Myelodysplasia Bone marrow damage (e.g., chemotherapy, radiation therapy) Cancer that spreads to the bone marrow	Known as neutrophilia Acute bacterial infections Inflammation Trauma, heart attack, or burns Stress, rigorous exercise Certain leukemias (e.g., chronic myeloid leukemia) Cushing syndrome

Lymph	Absolute lymphocyte	Known as lymphocytopenia Autoimmune disorders (e.g.,	Known as lymphocytosis Acute viral infections (e.g., chicken

	count, % lymphocytes	lupus, rheumatoid arthritis) Infections (e.g., HIV, viral hepatitis, typhoid fever, influenza) Bone marrow damage (e.g., chemotherapy, radiation therapy) Corticosteroids	pox, cytomegalovirus (CMV), Epstein-Barr virus (EBV), herpes, rubella) Certain bacterial infections (e.g., pertussis (whooping cough), tuberculosis (TB)) Toxoplasmosis Chronic inflammatory disorder (e.g., ulcerative colitis) Lymphocytic leukemia, lymphoma Stress (acute)
Mono	Absolute monocyte count, % monocytes	Usually, one low count is not medically significant. Repeated low counts can indicate: Bone marrow damage or failure Hairy cell leukemia Aplastic anemia	Chronic infections (e.g., tuberculosis, fungal infection) Infection within the heart (bacterial endocarditis) Collagen vascular diseases (e.g., lupus, scleroderma, rheumatoid arthritis, vasculitis) Monocytic or myelomonocytic leukemia (acute or chronic)
Eos	Absolute eosinophil count, % eosinophils	Numbers are normally low in the blood. One or an occasional low number is usually not medically significant	Asthma, allergies such as hay fever Drug reactions Parasitic infections Inflammatory disorders (celiac disease, inflammatory bowel disease) Some cancers, leukemias or lymphomas Addison disease

Baso	Absolute basophil count, % basophils	As with eosinophils, numbers are normally low in the blood; usually not medically significant	Rare allergic reactions (hives, food allergy) Inflammation (rheumatoid arthritis, ulcerative colitis) Some leukemias Uremia
Test	Full Name	examples of causes of low result	examples of causes of high result
RBC	Red Blood Cell Count	Known as anemia Acute or chronic bleeding RBC destruction (e.g., hemolytic anemia, etc.) Nutritional deficiency (e.g., iron deficiency, vitamin B12 or folate deficiency) Bone marrow disorders or damage Chronic inflammatory disease Chronic kidney disease	Known as polycythemia Dehydration Lung (pulmonary) disease Kidney or other tumor that produces excess erythropoietin Smoking Living at high altitude Genetic causes (altered oxygen sensing, abnormality in hemoglobin oxygen release) Polycythemia vera—a rare disease
Hb	Hemoglobin	Usually mirrors RBC results, provides added information	Usually mirrors RBC results
Hct	Hematocrit	Usually mirrors RBC results	Usually mirrors RBC results; most common cause is dehydration
RBC indices			
MCV	Mean Corpuscular Volume	Indicates RBCs are smaller than normal (microcytic); caused by iron deficiency anemia or thalassemias, for example.	Indicates RBCs are larger than normal (macrocytic), for example in anemia caused by vitamin B12 or folate deficiency, myelodysplasia, liver disease, hypothyroidism

MCH	Mean Corpuscular Hemoglobin	Mirrors MCV results; small red cells would have a lower value.	Mirrors MCV results; macrocytic RBCs are large so tend to have a higher MCH.
MCHC	Mean Corpuscular Hemoglobin Concentration	May be low when MCV is low; decreased MCHC values (hypochromia) are seen in conditions such as iron deficiency anemia and thalassemia.	Increased MCHC values (hyperchromia) are seen in conditions where the hemoglobin is more concentrated inside the red cells, such as autoimmune hemolytic anemia, in burn patients, and hereditary spherocytosis, a rare congenital disorder.
RDW (Not always reported)	RBC Distribution Width	Low value indicates uniformity in size of RBCs.	Indicates mixed population of small and large RBCs; young RBCs tend to be larger. For example, in iron deficiency anemia or pernicious anemia, there is high variation (anisocytosis) in RBC size (along with variation in shape – poikilocytosis), causing an increase in the RDW.
Reticulocyte Count (Not always done)	Reticulocytes (absolute count or %)	In the setting of anemia, a low reticulocyte count indicates a condition is affecting the production of red blood cells, such as bone marrow disorder or damage, or a nutritional deficiency (iron, B12 or folate).	In the setting of anemia, a high reticulocyte count generally indicates peripheral cause, such as bleeding or hemolysis, or response to treatment (e.g., iron supplementation for iron deficiency anemia).

Plt	Count Platelet reference (See range)	Known as thrombocytopenia: Viral infection (mononucleosis, measles, hepatitis) Rocky mountain spotted fever Platelet autoantibody Drugs (acetaminophen, quinidine, sulfa drugs) Cirrhosis Autoimmune disorders Sepsis Leukemia, lymphoma Myelodysplasia Chemo or radiation therapy	Known as thrombocytosis: Cancer (lung, gastrointestinal, breast, ovarian, lymphoma) Rheumatoid arthritis, inflammatory bowel disease, lupus Iron deficiency anemia Hemolytic anemia Myeloproliferative disorder (e.g., essential thrombocythemia)
MPV (Not always reported)	Mean Platelet Volume	Indicates average size of platelets is small; older platelets are generally smaller than younger ones and a low MPV may mean that a condition is affecting	Indicates a high number of larger, younger platelets in the blood; this may be due to the bone marrow producing and releasing platelets rapidly into circulation.
		the production of platelets by the bone marrow.	
PDW (Not always reported)	Platelet Distribution Width	Indicates uniformity in size of platelets	Indicates increased variation in the size of the platelets, which may mean that a condition is present that is affecting platelets

Many different conditions can result in increases or decreases in blood cell populations. Some of these conditions may require treatment, while others may resolve on their own. Recent blood transfusions affect the results of the CBC.

Normal CBC values for babies and children are different from adults. The laboratory will supply the reference ranges for various age groups, and a health practitioner will take these into consideration when interpreting data.

There are many types of anemia, including :

1- Iron deficiency anemia

Is a very common cause of anemia . This is because iron is major component of hemoglobin and essential for its proper function.

Chronic blood loss due to any reason is the main cause of low iron level in the body as it depletes the body's iron stores to compensate for the ongoing loss of iron. Anemia that is due to low iron levels is called iron deficiency anemia.

1- Young women are likely to have low grade iron deficiency anemia because of the loss of blood each month through normal menstruation .This is generally without any major symptoms as the blood loss is relatively small and temporary

2- Another common reason for iron deficiency anemia can be due to recurring or small ongoing bleeding, for instance from colon cancer or from stomach ulcers. Stomach ulcer bleeding may be induced by medications, even very common over-the-counter drugs such as aspirin and ibuprofen. Slow and chronic oozing from these ulcers can lead to loss of iron. Gradually, this could result in anemia.

3- In infants and young children, iron deficiency anemia is most often due to a diet lacking iron.

Interpretation of CBC may lead to clues to suggest this type of anemia. For instance, iron deficiency anemia usually presents with low mean corpuscular volume (microcytic anemia) in addition to low hemoglobin (microcytic hypochromic anemia).

2- Pernicious Anemia

Pernicious anemia is a condition in which the body can't make enough healthy red blood cells because it doesn't have enough vitamin B12.

People who have pernicious anemia can't absorb enough vitamin B12 due to a lack of intrinsic factor (a protein made in the stomach)..

This typically causes of macrocytic (large blood cell volume) anemia.

Vitamin B12, along with folate, is involved in making the heme molecule that is an integral part of hemoglobin.

Folate deficiency can be the cause of anemia as well. This may also be caused by inadequate absorption, and also long-term heavy alcohol use. However, other conditions and factors can also cause vitamin B12 deficiency.

Causes:

1- A lack of intrinsic factor is a common cause of pernicious anemia as the body can't absorb enough vitamin B12.

2- Some pernicious anemia occurs because the body's small intestine can't properly absorb vitamin B12 which may be due to the wrong bacteria in the small intestines;

3- Certain diseases that interfere with vitamin B12 absorption , 4-certain medicines

5- Surgical removal of part of the small intestine , 6- Tapeworm infection .

7 - Strict vegetarians are at risk if they do not take adequate vitamin supplement.

8- Under-consumption of green, leafy vegetables , 9- Long-term alcoholics.

Signs and symptoms

Apart from the symptoms of anemia (fatigue, dizziness, etc.), the vitamin B12 deficiency may also have some serious symptoms like Nerve damage, Neurological problems such as confusion, dementia, depression, and memory loss.

Symptoms in the digestive tract include nausea and vomiting, heartburn, abdominal bloating and gas, constipation or diarrhea, loss of appetite, and weight loss .An enlarged liver, A smooth, beefy red tongue. Infants who have vitamin B12 deficiency may have poor reflexes or unusual movements, such as face tremors.

Treatment

Pernicious anemia is treated by replacing the missing vitamin B12 in the body. People who have this disease may need Lifelong treatment.

3- Aplastic Anemia

Aplastic anemia is a blood disorder in which the body's bone marrow doesn't make enough new blood cells. This may result in a number of health problems including arrhythmias, an enlarged heart, heart failure, infections and bleeding .

Aplastic anemia is a rare but serious condition. It can develop suddenly or slowly and tends to worsen with time, unless the cause is found and treated .

Causes

Damage to the bone marrow's stem cells causes aplastic anemia. In more than half of people who have aplastic anemia, the cause of the disorder is unknown.

1- A number of acquired diseases, conditions, and factors can cause aplastic anemia including: Toxins, such as arsenic, and benzene, Radiation and chemotherapy, Medicines such as chloramphenicol, Infectious diseases such as hepatitis, Epstein-Barr virus, cytomegalovirus, parvovirus B19, and HIV

Autoimmune disorders such as lupus and rheumatoid arthritis

2- Inherited conditions, such as Fanconi anemia, Shwachman-Diamond syndrome, dyskeratosis congenital.

Signs and symptoms

The most common symptoms of aplastic anemia are Fatigue, Shortness of breath , Dizziness , Headache, Coldness in hands or feet, Pale skin, gums and nail beds,

Chest pain

Treatment

Treatment of aplastic anemia includes blood transfusions, blood and marrow stem cell transplants, and medication. These treatments can prevent or limit complications, relieve symptoms, and improve quality of life.

In some cases, a cure may be possible. Blood and marrow stem cell transplants may cure the disorder. Removing a known cause of aplastic anemia, such as exposure to a toxin, may also cure the condition.

4- Hemolytic Anemia

Hemolytic anemia is a condition in which red blood cells are destroyed and removed from the blood stream before their normal lifespan is up. A number of diseases, conditions and factors can cause the body to destroy its red blood cells. Hemolytic anemia can lead to various health problems such as fatigue, pain, arrhythmias, an enlarged heart and heart failure.

There are many types of hemolytic anemia's – some of which are inherited and others that are acquired.

1- Inherited hemolytic anemia's include:

Sickle cell anemia, Thalassaemias, Hereditary spherocytosis,

Glucose-6-phosphate dehydrogenase (G6PD) deficiency, Pyruvate kinase deficiency

2- Acquired hemolytic anemia include:

Autoimmune hemolytic anemia, Drug-induced hemolytic anemia

Mechanical hemolytic anemia, certain infections and substances can also damage red blood cells and lead to hemolytic anemia.

Causes

The immediate cause of hemolytic anemia is the early destruction of red blood cells. A number of diseases, conditions, and factors can cause the body to destroy its red blood cells. These causes can be inherited or acquired.

In **inherited hemolytic anemia** , this is due to affected genes .In each type of inherited hemolytic anemia the body makes abnormal red blood cells. The problem with the red blood cells may involve the hemoglobin, cell membrane, or enzymes that maintain healthy red blood cells.

In **acquired hemolytic anemia,** the body makes normal redblood cells , however, some disease, condition, or factor destroys the cells too early. Examples include immune disorders, infections and reactions to medicines or blood transfusions.

5-Thalassaemia

Thalassaemias are inherited blood disorders which cause the body to make fewer healthy red blood cells and less hemoglobin. The two major types of thalassaemia are: alpha- and beta thalassaemia.

•The most severe form of alpha thalassaemia is known as alpha thalassaemia major or hydrops fetalis

• the severe form of beta thalassaemia is known as thalassaemia major or Cooley's anemia.

Thalassaemias affect both males and females. Severe forms are usually diagnosed in early childhood and are lifelong conditions.

Hemoglobin in red blood cells has two kinds of protein chains:

alpha globin and beta globin. If the body doesn't make enough of these protein chains, red blood cells don't form properly and can't carry enough oxygen.

Genes control how the body makes hemoglobin protein chains. When these genes are missing or altered, thalassaemias occur.

Thalassaemias are inherited disorders. People who get abnormal hemoglobin genes from one parent but normal genes from the other are carriers. Carriers often have no signs of illness other than mild anemia. However, they can pass the abnormal genes on to their children.

Signs and symptoms

Symptoms of thalassaemias are caused by a lack of oxygen in the blood stream. This occurs because the body doesn't make enough healthy red blood cells and hemoglobin.

The severity of symptoms depends on the severity of the disorder: People who have alpha or beta thalassaemia can have mild anemia.

People with beta thalassaemia intermedia have mild to moderate anemia. They may also have other health problems including: slowed growth and delayed puberty; bone problems; and an enlarged spleen.

People with beta thalassaemia major have severe thalassaemia. Symptoms occur within the first two years of life and include severe anemia and other serious health problems. Pale

and listless appearance, Poor appetite, Dark urine, Slowed growth and delayed puberty, Jaundice, Enlarged spleen, liver and heart, Bone problems.

Treatment

Treatment for thalassaemias depends on the type and severity of the disorder. People who are carriers need little or no treatment.

Three standard treatments are used to treat moderate and severe forms of thalassaemia, these include blood transfusions, iron chelation therapy, and folic acid supplements.

6- Sickle Cell Anemia

Sickle cell anemia is a serious disease in which the body makes sickleshaped ("C"-shaped) red blood cells. Normal red blood cells are diskshaped and move easily through blood vessels.

Sickle cells contain abnormal hemoglobin that causes the cells to have a sickle shape, which don’t move easily through the blood vessels –they are stiff and sticky and tend to form clumps and get stuck in the blood vessels.

The clumps of sickle cells block blood flow in the blood vessels that lead to the limbs and organs. Blocked blood vessels can cause pain, serious infections, and organ damage.

In sickle cell anemia, a lower-than-normal number of red blood cells occur because sickle cells don't last very long.

Sickle cells usually die after about 10 to 20 days and the body can't reproduce red blood cells fast enough to replace the dying ones, which causes anemia.

Causes

Sickle cell anemia is an inherited, lifelong disease. People who have the disease inherit two copies of the sickle cell gene – one from each parent.

Signs and Symptoms

The most common symptoms of sickle cell anemia are linked to anemia and pain .Sudden pain throughout the body is a common symptom of sickle cell anemia.

This pain is called a "sickle cell crisis", and often affects the bones, lungs, abdomen, and joints.

Treatment

Sickle cell anemia has no widely-available cure. However, treatments can help relieve symptoms and treat complications.

The goals of treating sickle cell anemia are to relieve pain, prevent infections, eye damage and strokes, and control complications.

Bone marrow transplants may offer a cure in a small number of sickle cell anemia cases.

Diagnosis of iron deficiency anemia

1- CBC : **Red blood cell size and color (blood film) .**In iron deficiency anemia, red blood cells are smaller and paler in color than normal(.Microcytic,hypochromic)

Hematocrit(pcv). This is the percentage of blood volume made up by red blood cells. Normal levels are generally between 36-47 percent for adult women and 40-50 percent for adult men. These values may change depending on age .

Hemoglobin . Lower than normal hemoglobin levels indicate anemia.

2- **Ferritin** This protein helps store iron in the body, and a low level of ferritin usually indicates a low level of stored iron .

3- Total iron binding capacity

Total iron binding capacity (TIBC) is a blood test to see if there is too much or too little iron in blood. Iron moves through the blood attached to a protein called transferrin. 4-

Serum iron test

• Normal value range is: • Iron: 60 to 170 micrograms per deciliter (mcg/dL)

• TIBC: 240 to 450 mcg/dL, • Transferrin saturation: 20% to 50%

Other investigation that may be required by the dentist

Bleeding time is a medical test done on someone to assess their platelets function. It involves making a patient bleed then timing how long it takes for them to stop bleeding

Interpretation

Bleeding time is affected by platelet function, Certain vascular disorders and von Willebrand Disease—not by other coagulation factors such as haemophilia. Diseases that cause prolonged bleeding time include thrombocytopenia , disseminated intravascular coagulation (DIC),Glanzmanns thrombasthenia and Bernard-Soulier disease.

Asprin and other cyclooxygenase inhibitors can affect bleeding time

Other medication like wafarin and heparin also increase bleeding time .

It is also prolonged in hypofibrinogenemia

Clotting time : is the time required for a sample of blood to coagulate in vitro under standard conditions.

There are various methods for determining the clotting time, the most common being the capillary tube method. It is affected by calcium ion levels and many diseases. Normal value of clotting time is 8 to 15 minutes

A prothrombin time (pt) . this test used to detect and diagnosis a bleeding disorder or excessive clotting disorder ,used when the patient taking warfarin or when the patient have unexplained or prolonged bleeding or inappropriate blood clotting prolong in the pt may indicate decrease in the vitamine K or defective in factor VII ,or chronic low grade disseminated intravascular coagulation (DIC)

The **partial thromboplastin time** (**PTT**) or **activated partial thromboplastin time** (**aPTT** or **APTT**) is a medical test that characterizes blood coagulation .the typical reference range is betwen 30-50 sec. te prolong APTT may indicate the use of heparin or the antiphospholipid antibody especially lupus anticoagulant also the coagulation factor deficiency e.g hemophilia (very important).

also sepsis-coagulation factor consumption .sometimes the presence of antibodies against coagulation factor(factor inhibitors)

Deficiency of factors factors VIII, IX, XI and XII and rarely caused , von Willebrand factor (if causing a low factor VIII level) may lead to a prolonged aPTT

Erythrocyte Sedimentation Rate (ESR)

An erythrocyte sedimentation rate (ESR) is a type of blood test that measures how quickly erythrocytes (red blood cells) settle at the bottom of a test tube that contains a blood sample. Normally, red blood cells settle relatively slowly. A faster-than-normal rate may indicate inflammation in the body. Inflammation is part of the immune response system. It can be a reaction to an infection or injury. Inflammation may also be a sign of a chronic disease, an immune disorder, or other medical condition.

Other names: ESR, SED rate sedimentation rate; Westergren sedimentation rate

An ESR test can help determine if you have a condition that causes inflammation. These include arthritis, vasculitis, or inflammatory bowel disease. An ESR may also be used to monitor an existing condition.

- Headaches, Fever
- Weight loss, Joint stiffness
- Neck or shoulder pain, Loss of appetite
- Anemia

What do the results mean to the dentist?

- Infection, Rheumatoid arthritis
- Rheumatic fever, Vascular disease
- Inflammatory bowel disease, Heart disease
- Kidney disease , Certain cancers

Sometimes the ESR can be slower than normal. A slow ESR may indicate a blood disorder, such as:

- Polycythemia
- Sickle cell anemia
- Leukocytosis, an abnormal increase in white blood cells

If the results are not in the normal range, it doesn't necessarily mean that the patient have a medical condition that requires treatment. A moderate ESR may indicate pregnancy, menstruation, or anemia, rather than an inflammatory

disease. Certain medicines and supplements can also affect the results. These include oral contraceptives, aspirin, cortisone, and vitamin A.

Note

An ESR does not specifically diagnose any diseases, but it can provide information about whether or not there is inflammation in the body.

INR

INR stands for International Normalised Ratio, also referred to as Prothrombin time (PT), and is a standardised measurement of the time it takes for blood to clot.

What is an INR test?

An INR test measures how long it takes for the blood to clot. It is primarily used to diagnose unusual bleeding, blood clots, and monitoring people being treated with warfarin (an anti-clotting treatment).

The most common reasons for an INR test are:

- Monitoring as a part of warfarin therapy
- In relation to liver function tests - liver dysfunction can lead to decreased production of certain clotting factors
- Deep Vein Thrombosis (DVT) – a clot in a deep vein, commonly of the leg
- Pulmonary Embolism (PE) –Atrial Fibrillation (AF) Some cases of Heart failure (Left Ventricular, and Congestive Cardiac Failure), Artificial heart valves of the mechanical type

INR test results explained

The INR test result is given as a number, which is a ratio of:

- The test sample's Prothrombin time (a protein made by the liver and the time it takes to clot the blood) .
- The Prothrombin time of a normal sample of blood A result of 1.0, up to 1.5, is therefore normal.

A low INR result means the blood is 'not thin enough' or coagulates too easily and puts the patient at risk of developing a blood clot.

A high INR result means that the blood coagulates too slowly and you risk bleeding..

●Biopsy

A biopsy is a way of diagnosing diseases. A doctor removes a sample of tissue or cells to be examined by a pathologist, usually under a microscope.

A pathologist is a specialist who is trained to examine a sample of tissue for signs and extent of disease under a microscope. Tissue for a biopsy is normally taken from a living subject. Examining tissue under a microscope can provide information about various conditions.

Types of biopsy:-

1-Excisional

2-Incisional

3-FNA

4- Thick (core) needle biopsy

5- Exfoliative cytology

6-Frozen section

7-Oral brush biopsy

Depending on the aim, a biopsy may be excisional or incisional:

An excisional biopsy is when a whole lump or targeted area is surgically removed.

An incisional biopsy, or core biopsy, involves taking a sample of tissue

●cytology mean the study of the microscopic appearance of cells, esp. for the diagnosis of abnormalities and malignancies.

Fine needle aspiration (FNA)

is sometimes considered a cytology test and is sometimes considered a biopsy. During fine-needle aspiration, a long, thin needle is inserted into the suspicious area.

A syringe is used to draw out fluid and cells for analysis & smeared on slide, it is rapid & usually effective to diagnose of malignant from benign neoplasm although it is not completely conclusive.

Small size of the needle avoid damage to vital structure & it is valuable in case when incisional biopsy contra indicated as in pleomorphic adenoma or other types of malignant lesions in parotid gland

Disadvantage: it requires experience, small specimen may be unrepresentative, definitive diagnosis is not always possible.

Core needle biopsy

A larger needle with a cutting tip is used during core needle biopsy to draw a column of tissue out of a suspicious area.

The sample are larger than FNA & preserve architecture of tissue ,give more definitive diagnosis than FNA , but there is increase of the risk of seeding of neoplasm into the tissue & risk of damaging vital structures. It is used when incisional biopsy is inaccessible e.g. laryngeal tumor.

Exfoliative cytology

which is the examination of cells scraped from the surface of a lesion , it is quick & easy ,no local anesthesia is required also special techniques such as immune-staining can be applied.

It is useful in detection of virally damaged cells, acantholytic cells of pemphigues & candidal hyphae. But it provides no information on deeper tissue & has no value in diagnosis of cancer.

Frozen sections

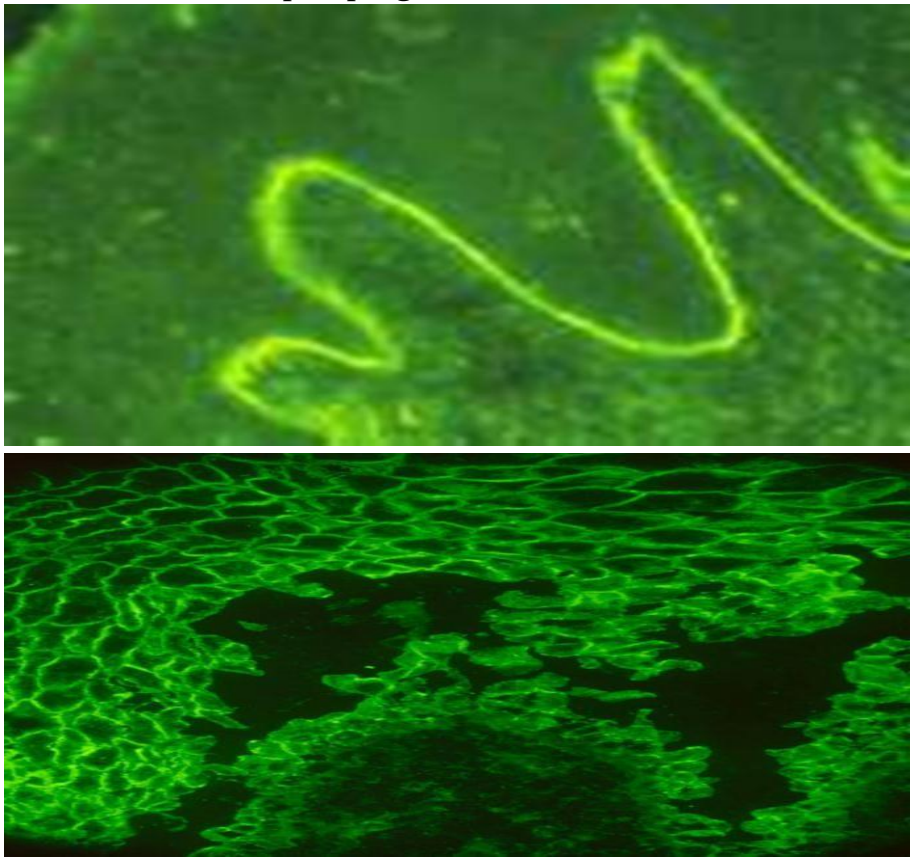
Frozen sections allows a stained slide to examined within 10 min of taking the specimen , the tissue is send fresh to lab. To be quickly frozen to about -70 c by liquid nitrogen or dry ice. Section is cut on refrigerated microtome and stained

The main advantage: is the time is too little so frozen section can be established at operation to determine whether tumor benign or malignant, but the section appear different from fixed material , also freezing artifacts can distort the cellular picture ,and definitive diagnosis sometimes impossible.

Immunofluorecent

Immunofluorecent staining. e.g used to identify pemphigus vulgaris asautoantibodybound to epithelial prickle cells (to desmosomes) & in mucous membrane pemphigoid autoantibodies bond to the basement membrane.

Mucous membrane pemphigoid



Pemphigus vulgaris

●Diagnostic ultrasound used in the soft tissue lumps and salivary gland

●Radioisotope imaging (nuclear scaning) very small quantities of radioactive materials called radioisotopes to image parts of the body may be used in salivary gland scanning like in the sjogrens or in the bone scanning

Imaging

Conventional radiography example (bitwing ,periapical)….

Computed tomography .in CT the dense bone is whit , soft tissue is present mid gray ,fat is dark gray and air is black and the dental filling may cause artifact

Magnetic resonance imaging (MRI) : for the soft tissue salivary gland and TMJ

●molecular –biological test

- chromosome studies
- comparative genomic hybridization
- DNA microarrays
- fluorescence in situ hybridization (FISH)
- polymerase chain reaction
- gene map

Culture and Sensitivity Testing if the body has an infection of any kind--from an upper respiratory infection ,to a jaw abscess to a urinary tract infection--it's critical to know which antibiotics will be effective against the particular pathogen (i.e., disease-causing agent) causing the problem. This means that (1) the species and strain of bacteria (or other pathogen) must be identified and (2) the drugs most effective at inhibiting their growth must be determined. The only reliable way this can be done is a culture and sensitivity test. The microbiological test which is used for the detection of the infection and also for the Bacterial study to determine the sensitivity of the infection agent for the treatment by the antibiotic sensitivity test .ex .in pus salivary gland …

Fungi by the direct smear from the area stained by the periodic acid shift or gram stain and the presence of the typical hyphae indicate the Candida proliferation.

Isolation and identification of candida albicans

Specimen collection

Samples were taken by a sterile swab, which rubbed and rotated vigorously over the mucosa, pressure put on the swabs in an attempt to pick up deeply seated microorganism. e.g. Swab was taken from the mucosa of palate beneath the upper complete denture.

Cultivation of candida albicans

The sample that collected was cultured on sabouraud dextrose agar (SD) for the growth of candida albicans, and then the plates were incubated aerobically for 48-72 hrs at 37C.

Identification Colony morphology:

The Candida species was identified according to the following morphological appearance on sabouraud dextrose agar. The colonies appeared medium size, moist, creamy, having a yeasty like odor, whitish cottony colonies

Viruses: the use of the virology lab from the fresh vesicle or by the titer of the antibody in the patient serum

●IMMUNOLOGIGICAL TESTS

Immunoglobulin's rheumatoid factor

HLA(human leukocyte antigens)

type antinuclear antibody anti-

DNA-antibody anti double strand

DNA test ant-Ro-ssa and anti-la-ssb