Introduction to Pathology

Lecture: 1

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2/2/2026

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Systematic

Pathology Grade – 4

Outline:

- What is pathology?
- Who is a pathologist?
- What is a disease?
- How are diseases diagnosed?

Definition of pathology

- Pathology is derived from two Greek words pathos (disease or suffering) and logos (study).
- Is the study of the links between diseases and the basic science
- Pathology means scientific study of structure and function of the body in disease.

What is a Disease?

- A disease is a physical or functional disorder of normal body systems that places an individual at increased risk of adverse consequences
- **It is the "**State in which an individual exhibits an anatomical, physiological , or biochemical deviation from the normal"
- **Disease may also be defined as :**

An abnormal alteration of structure or function in any part of the body.

❖ **Diagnoses are made by three general categories of physicians or health care providers:**

- Clinical diagnosticians identify diseases by examination of patient's history and physical examination

-Radiologists identify diseases by imaging the intact body .

-Pathologists identify diseases by examining cells and tissues removed from the body

Specialties of pathology

1-Histopathology .
2-Hematology
3-Clinical pathology
4-Immunpathology
5-Experimental pathology
6-Molecular pathology

Classification of Diseases

1. Developmental – genetic, congenital.
2. Acquired:

a. Inflammatory – Trauma, infections, immune, etc.
b. Neoplastic – tumors cancers
c. Degenerative – aging.
d. Metabolic.
e. Iatrogenic: Drug induced.

Morbid anatomy (autopsy) (post-mortem examination)

This is one of the scientific ways in pathology to study diseases. ***It consists of external and internal examination of the body after death.***

Microscopic and cellular pathology

pathology, and consequently medicine, was revolutionized by the application of microscopy to the study of diseased tissues that studies changes in diseased tissues at a cellular level.

FIELDS OF PATHOLOGY

Experimental pathology refers to the observation of the effects of manipulations on animal models or cell cultures regarding researches on human diseases.

Clinical pathology

Clinical pathology is more concerned with analysis of the disease itself (etiology, pathogenesis and gross and microscopic pathology).

Subdivisions of clinical pathology

- **Histopathology**; concerned with the investigation and diagnosis of disease from gross and microscopic examination of tissues
- **Cytopathology**; (from the examination of isolated cells)

- **Hematopathology**; concerned with the study of disorders affecting the cells and the coagulation system of blood.

- **Medical microbiology**; the study of infectious diseases and the organisms responsible for them.

- **Immunopathology**; disturbances affecting the immune defense mechanisms of the body, and their contribution to the disease processes.

- **Chemical pathology**; the study and diagnosis of diseases from the chemical changes that occur in tissues and fluids.

- **Medical genetics**; the study of abnormal chromosomes and genes and their relevance to disease processes

- **Toxicology;** study of the effects of known or suspected poisons on the body.
- **Forensic medicine (pathology)**; the applications of pathology to legal purposes (e.g. investigations of death in suspicious circumstances)

Techniques of pathology

Histopathologic techniques

1. Gross pathology *(macroscopic pathology)*

This refers to the changes affecting various organs and tissues in diseases as seen by the naked unaided eye.

2. Light microscopy

Advances in light microscopic examination have resulted in a wealth of information about the structure of tissues and cells in health and disease.

3. Histochemistry

Certain cells produce chemical substances the detection of which through treatment with specific reagents (stains) is of diagnostic value.

4. Immunohistochemistry and immunofluorescence

These techniques employ antibodies (with antigen specificity) to visualize substances (for e.g. cellular proteins or surface receptors) in tissue sections or cytological cell preparations.

These antibodies are connected chemically to enzymes in (IHC).
Alternatively, fluorescent dyes (as in immunofluorescence) are used. IHC has become more popular than immunofluorescence because the latter requires a microscope modified for ultraviolet illumination and preparations are often not permanent because they fade with time.

5. Electron microscopy

Electron microscopy has extended the range of pathology to

- The study of disorders at an organelle (subcellular) level.

- The demonstration of viruses in tissue samples from some diseases.

The most common diagnostic use of electron microscopy is the interpretation of renal biopsies i.e. helps establish the diagnosis of various glomerular diseases (glomerulopathies).

Pathology is divided in to two branches:-

- **General pathology,** which is concerned with the causations, mechanisms and characteristics of the major categories of disease. (e.g. cell injuries and degenerations, inflammations, healing, neoplasia).
- **Systemic pathology** is the study of various systems that comprise the body such as cardiovascular pathology, gastrointestinal pathology and so on. It includes the descriptions of specific diseases as they affect individual organs or organ systems (e.g. appendicitis, lung cancer, atherosclerosis etc,).

There are four aspects of a disease process

1-Cause (Etiology),

2-Pathogenesis (mechanisms of development and progression of disease).

3-Morphologic changes (the structural alterations induced in the cells and organs of the body).

4- Clinical significance or clinical manifestations (the functional consequences of the morphologic changes).

1-Etiology :- means study the causes of disease. It refers to the underlying causes and modifying factors that are responsible for the initiation and progression of disease.

- If the causes of disease is known its called **primary etiology.**
- If the causes of disease is un known its called **idiopathic.**

➢ There are two major classes of etiologic factors :-

A- **Genetic or Intrinsic .**

B- **Acquired** (infectious , nutritional , physical , and chemical).

2-Pathogenesis:- The sequence events which result from the response of the cells or tissues to the etiologic agent, from the initial stimulus to the ultimate expression of the disease,"from the time it is initiated to its final conclusion in recovery or death

3- Morphological changes

Means all structural alterations in cell or tissue which occur following the pathogenic mechanisms **.**

These structural alterations can be seen with naked eye **(Gross morphological changes or macroscopic changes**)

or under the microscope (**microscopic changes**).

Gross or macroscopic changes

- **size , shape**
- **weight**
- **color**
- **consistency**
- **surface**
- **edge , section**

4 - **Clinical manifestations**

Means the morphologic changes in the organ influence the normal function of the organ . These morphologic changes determine the clinical features (**signs and symptoms**) , course , and prognosis of disease.

There are **three types of medical signs**:-

An amnestic signs indicate the past existence of a certain disease or condition. An example is paralysis stroke .

Prognostic signs predict the future disease, means by observing the signs doctor predicts the chances of occurrence of disease.

Diagnostic signs that lead to the recognition and identification of a disease (i.e., they indicate the name of the disease).

There are three types of medical symptoms

Chronic Symptoms: In this kind of symptom there is a long-lasting pain, which does not go away like in cancer, AIDS, asthma.

Relapsing symptoms: These are the symptoms which reoccur, after disappearing in the past. The best example is multiple sclerosis and cancer.

Remitting symptoms: Symptoms which get completely escape from the body.

prognosis

Expected outcome of the disease, It is the clinician's estimate to the severity and possible result of a disease.