

GENERAL PATHOLOGY

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Introduction

- Pathology – study of disease
 - ❖ Patho – suffering
 - ❖ Logos – study
- Pathology is the study of the structural, biochemical, and functional changes in cells, tissues, and organs that underlie disease.

Definition of pathology...

- It is the "Scientific study of disease"
- "scientific study of the molecular, cellular, tissue, or organ system response to injurious agents."
- ❖ Pathology serves as a "**bridge**" or "**link**" between the preclinical sciences (**anatomy, physiology, ...etc.**) and the courses in clinical medicine.

Ctd...

- Pathology is divided in to :
 - 1. General pathology – deals with basic reactions of cells & tissues to abnormal stimuli that underlie all disease.
 - 2. Systemic pathology – specific responses of specialized organs & tissues to more or less well defined stimuli.

The core of pathology

- Pathology gives explanation of a disease by studying the four aspects of the disease
 1. Etiology
 2. Pathogenesis
 3. Morphological changes
 4. Functional derangement & clinical significance

Ctd...

1. Etiology

- ✓ Cause of the disease
- ✓ If the cause of the disease is known it is called primary etiology
- ✓ If the cause of the disease is unknown it is called idiopathic
- ✓ Knowledge or discovery of the primary cause remains the back bone on which a diagnosis can be made, a disease understood & a treatment developed

Ctd...

- Two factors:-
 - ✓ Intrinsic or genetic
 - ✓ Acquired (infectious, nutritional, chemical, physical...)

Etiology



One etiologic agent-
one disease, as Malaria



- **Several etiologic agents - one disease, as diabetes**
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- **One etiologic agent - several diseases, as smoking.**

Ctd...

2. Pathogenesis

- ✓ Mechanisms of disease development
- ✓ It refers to the sequence of molecular, biochemical, and cellular events that lead to the development of disease.
- ✓ Thus, pathogenesis explains how the underlying etiologies produce the morphologic and clinical manifestations of the disease.
- ✓ The study of pathogenesis is a central focus of pathology.
- ✓ The pathogenic mechanism could take place in the latent or the incubation period
- ✓ It will lead to morphological changes

Ctd...

3. Morphological changes

- ✓ Structural alterations induced in the cells & organs of the body
- ✓ Characteristic to the disease or diagnostic to the etiologic process
- ✓ Seen with naked eye or under the microscope

Ctd...

- Both the gross & the microscopic morphologic changes may only be seen in that disease, i.e. they may be specific to that disease (pathognomonic).
 - Therefore, such morphologic changes can be used by the pathologist to diagnose the disease
- In addition, the morphologic changes will lead to functional alteration & to the clinical signs & symptoms of the disease

Ctd...

4. Functional derangement & Clinical significance

- ✓ Functional consequence of the morphologic change
- ✓ The morphologic changes influence the normal function → determine the clinical feature
- ✓ Also the course & prognosis of the disease

Diagnostic modalities

- Most are based on morphologic changes
- Diagnostic techniques:
 1. Histopathology
 2. Cytopathology
 3. Hematopathology
 4. Immunohistochemistry
 5. Microbiological examination
 6. Biochemical examination
 7. Cytogenetics
 8. Molecular techniques
 9. Autopsy

Histopathology

- Studies the tissue under the microscope
- Tissues are obtained by biopsy
 - **Biopsy** – tissue sample from living person
- Biopsy – Incisional
 - Excisional
- It is usually the **gold standard** for pathologic diagnosis

Cytopathology

- Examining cells from bodily tissues or fluids .
- Since cytology only examines cells, pathologist only need a very small sample of tissue.
- Used in:
 - ❑ Screening for early detection of cancer
 - ❑ Diagnosis of symptomatic cancer
 - ❑ Diagnosis of inflammatory condition, infectious
 - ❑ Surveillance of pts treated with cancer

Ctd...

- Its advantage:
- Cheap
- Takes less time
- Needs no anesthesia
- ❖ Cytopathological methods:
 1. FNAC(fine needle aspiration)
 2. Exfoliative cytology
 3. Abrasive cytology

Ctd...

1. FNAC

- ✓ Easy in superficial organs
- ✓ May need guidance in deep seated mass

2. Exfoliative cytology

- ✓ From cells that are shed from spontaneously into body fluids or secretion or manually scraped or brushed from the surface of your tissue

3. Abrasive cytology

- ✓ Cells are dislodged from skin or mucous membrane by various tools

Hematological examination

- This is a method by which abnormalities of the cells of the blood & their precursors in the bone marrow are investigated to diagnose the different kinds of anemia & leukemia.

Immunohistochemistry

- This is a method used to detect a specific antigen in the tissue in order to identify the type of the disease.
- Uses antibodies to check for certain antigen in a sample of tissue.

Microbiological examination

- This is a method by which body fluids, excised tissue, etc... are examined by microscopical, cultural, serological techniques to identify microorganisms responsible for many diseases.

Biochemical examination

- This is a method by which the metabolic disturbances of disease are investigated by assay of various normal & abnormal compounds in the blood, urine, etc...

Eg. High serum HCG level - choriocarcinoma

Clinical genetics (cytogenetics)

- This is a method in which inherited chromosomal abnormalities in the germ cells or acquired chromosomal abnormalities in somatic cells are investigated using the techniques of molecular biology .

Molecular techniques

- Different molecular techniques such as fluorescent in situ hybridization, southern blot, etc... can be used to detect genetic diseases.

Autopsy

- Autopsy is an examination of the dead body to identify the cause of death
- This can be for
 - forensic or
 - clinical purposes

Diseases

- Disease is defined as an abnormal variation in structure or function of any part of the body
- Causes of disease
 - ☐ Environmental
 - ☐ Genetic or
 - ☐ Both

Environmental factors

Are many & are classified into:-

1. Physical agents
2. Chemicals
3. Nutritional deficiencies & excesses
4. Infections & infestations
5. Immunological factors
6. Psychogenic factors

Genetic factors

- These are hereditary factors that are inherited genetically from parents.

Course of disease

- The course of disease in the absence of any intervention is called the natural history of the disease.
- Stages
 1. Exposure - when a pathogen enters to the host
 2. Latency period - the period between exposure and infection
 3. Biological onset
 4. Incubation period - the period between exposure and onset of clinical symptom
 5. Clinical onset
 6. Permanent damage
 7. Death

Ctd...

The course of disease is shown with a simplified diagram as follows

Exposure → biological onset → clinical onset



Latency period



permanent damage



death

Out come of diseases

- Resolution can occur leaving no sequelae
- The disease can settle down, but sequelae are left, or
- It may result in death

Clinical & biological death

- Clinical death is the reversible transition between life & biological death.
- Clinical death is defined as the period of respiratory, circulatory & brain arrest during which initiation of resuscitation can lead to recovery

Signs indicating clinical death

- The pt is without pulse or blood pressure & is completely unresponsive to the most painful stimulus.
- The pupils are widely dilated
- Some reflex reactions to external stimulation are preserved. For example, during intubations, respiration may be restored in response to stimulation of the receptors of the superior laryngeal nerve, the nucleus of which is located in the medulla oblongata near the respiratory center.
- Recovery can occur with resuscitation

Biological death

- Biological death (sure signs of death), which sets in after clinical death, is an irreversible state of cellular destruction
- It manifests with irreversible cessation of circulatory & respiratory functions, or irreversible cessation of all functions of the entire brain, including brain stem

Postmortem changes

- ✚ Rigor mortis – contraction of muscle
- ✚ Livor mortis – bluish discoloration on dependent part of the body
- ✚ Algor mortis – cooling of the body
- ✚ Autolysis – degradation of the body

- THANK YOU

REFERENCE

- PATHOLOGIC BASIS OF DISEASE 10TH EDITION
- LECTURE NOTES