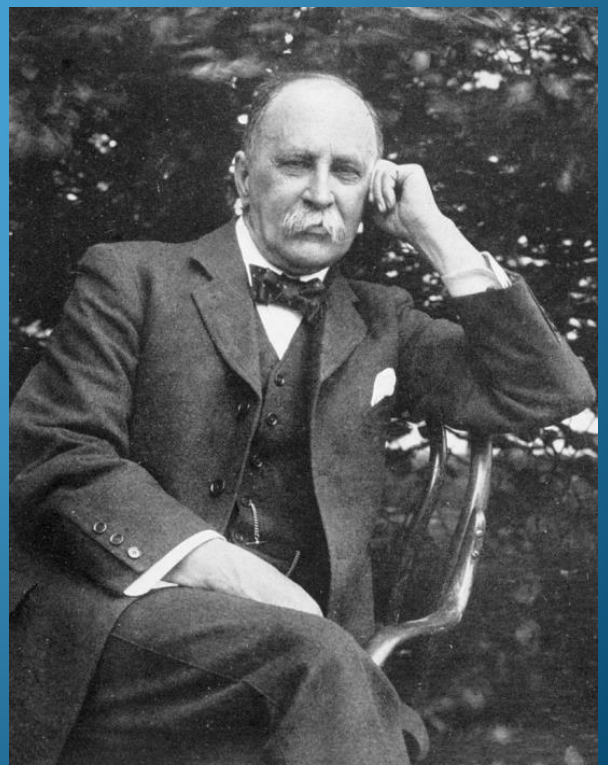
"Your practice of medicine will be as good as is your understanding of pathology"

Sir William Osler



Introduction to Pathology

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Learning objectives:

- By the end of this lecture student should be able to:

1. Define term Pathology,
2. Understand the importance of Pathology,
3. Differentiate between General and Systemic/Special Pathology,
4. Know core areas with which Pathology deals,
5. Identify important branches of Pathology.

- Word “Pathology” is derived from two Greek words—Pathos(suffering) and Logos (study).
- Pathology is the study of biochemical, structural and functional changes that occur in cells, tissues and organs during a disease process.

Health.

- According to the World Health Organization:
  - Health is a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity".

What is Disease?

- "State in which an individual exhibits an anatomical, physiological, or biochemical deviation from the normal".
- Or a condition marked by profound deviation from normal and healthy state.
- Symptom: Different clinical subjective features as a single entity.
- Syndrome (running together) means several clinical features existing at same time in a disease process.

- Pathology serves as a "bridge" or "link" between the basic sciences and clinical sciences.
- Scientific foundation for all of the medicine.

- Study of pathology is broadly divided into areas

a. General pathology

b. Systemic/special pathology.

- General pathology is concerned with common reactions of cells and tissues to injury.
- Such reactions are mostly not tissue specific: so acute inflammation in response to bacterial infections is similar in most tissues.

- Systemic pathology discusses changes and mechanisms involved in specific diseases in specific tissues.
- The four aspects of a disease form the core of pathology:

A. Etiology or cause,
B. Pathogenesis,
C. Morphologic changes,
D. Clinical manifestations.

A. **Etiology or cause: (Why?)**

- Etiological factors can be grouped mainly as:
  i. Genetic factors (Even before birth, Inherited & mutations),
  ii. Acquired factors (After birth, Infections, chemical, physical agents etc).
- Few disorders have single cause.
- Infections and single-gene disorders have single cause.
- Most of time they are involved together such as hypertension, diabetes, and cancer, are caused by a combination of different factors.

Etiology

One etiologic agent
one disease, as Malaria
or single gene disorders.

Several etiologic agents
one disease as diabetes ,
hypertension

B. Pathogenesis: (How?)

- Pathogenesis is the sequence of biochemical and molecular events occurring in cells or tissues after injury.
- One of the main domains of pathology.
- Even when the initial cause is known (e.g., infection or mutation), it is many steps away from the expression of disease.

- In 19th century Rudolf Virchow , proposed that injury to cells (the smallest living units) in the body, is the basis of all diseases.
- To this day, this concept is applied to all of pathology.

C. Morphologic Changes(Morphology):

- Way to diagnose the pathologic process by seeing it.
- Structural changes occurring in cells and tissues can be :

a. **Gross:** Seen by naked eye (macroscopic morphology)

b. **Microscopic:** Seen with the help of microscope.

- Italian anatomist and pathologist, Giovanni B. Morgagni (1682–1771) was the first to contribute to the knowledge of gross morphology.

- German Pathologist Rudolf Virchow (1821–1905)

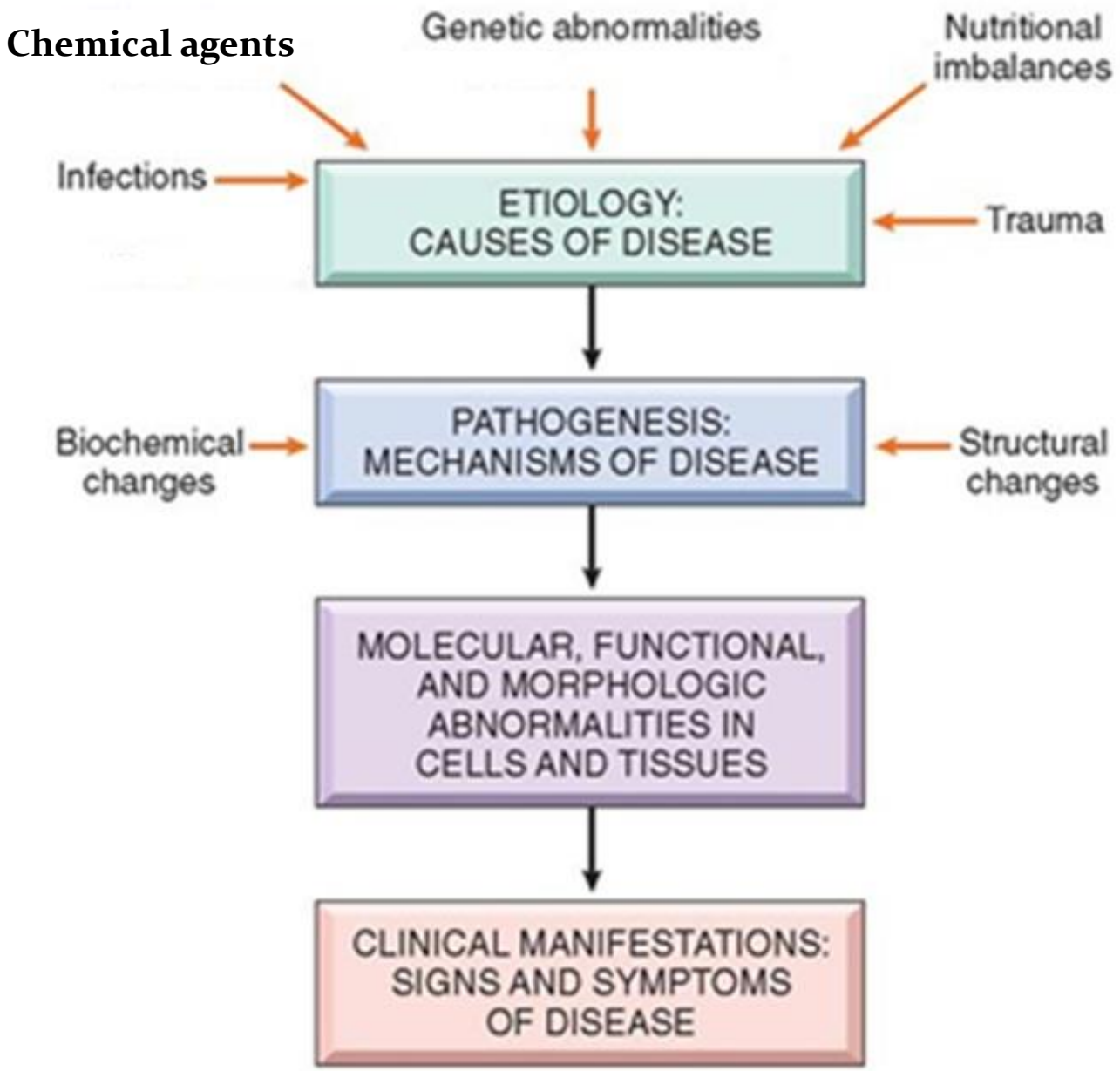
started microscopic examination of diseased tissues and thus was founder of microscopic morphology.

Rudolf Virchow

- Morphologic changes alone can not be sufficient.
- In many cases morphologic study should be coupled with molecular and immunologic studies.
- As different tumors may look alike but different on molecular analysis and their behavior, treatment and therapeutic approach .

D. Clinical Manifestations:

- The end results of genetic, biochemical, and structural changes in cells and tissues are functional abnormalities leading to clinical manifestations (symptoms and signs) of disease.


Chemical agents
Genetic abnormalities
Nutritional imbalances
Infections
ETIOLOGY: CAUSES OF DISEASE
Trauma
Biochemical changes
PATHOGENESIS: MECHANISMS OF DISEASE
Structural changes
MOLECULAR, FUNCTIONAL, AND MORPHOLOGIC ABNORMALITIES IN CELLS AND TISSUES
CLINICAL MANIFESTATIONS: SIGNS AND SYMPTOMS OF DISEASE

- **BRANCHES:**
- Roughly can be divided into:

1. **Morphological branches,**
2. **Non morphological branches.**

1.

1. Morphological branches:

- Mainly deal with those branches concerned with morphology and especially with microscopic morphology.

a. **Histopathology:**

- Study of morphological changes occurring in tissues caused by a disease.
- Involves both gross examination and microscopic examination.

b. **Cytopathology**

- It includes study of cells shed off from the lesions and obtained through fine-needle aspiration cytology (FNAC) of superficial and deep-seated lesions.

- **Lesions** are the characteristic changes in tissues and cells produced by disease in an individual or experimental animal.

c. **Hematology:**

- The study of blood and blood related disorders. Hematology involves the use of instruments to study different parameters and microscope to study morphology of different blood cells.

2. Non morphologic branches:

- Qualitative, semi-quantitative or quantitative measurements are carried out in laboratory e.g. strip method, elisa or pcr.
- Microscope may be required for some of these lab tests.

a. Clinical Pathology

- Analysis of various fluids including blood, urine, semen, CSF is carried out.

b. **Chemical pathology:**

- It deals with analysis of different substances in the serum or other body fluids like glucose, creatinine, urea etc.
- Also called clinical biochemistry

c. **Microbiology:**

- Study of microorganisms and diseases caused by them.

d. **Genetics:**

- Study of genes, chromosomes and their disorders

e. **Molecular biology:**

- Study of **biology** on a **molecular** level, like structure, makeup and function of biologically important **molecules** such as proteins, DNA and RNA.