



AL-Mustaqbal University College

Pharmacy Department

Third stage

Practical Pathophysiology

(Growth Disturbances)

Lab 3



Lecturer: Noor Muhsen Jawad

Growth Disturbances

Cells exist in and must adapt to an environment that is continually changing, reflecting not only physiological processes but also external influences such as drugs or toxins. If the stimulus is overwhelming, the cells undergo degeneration or cell death. However, many less noxious stimuli cause cells to adapt by altering their pattern of growth.

This may occur in three main ways:

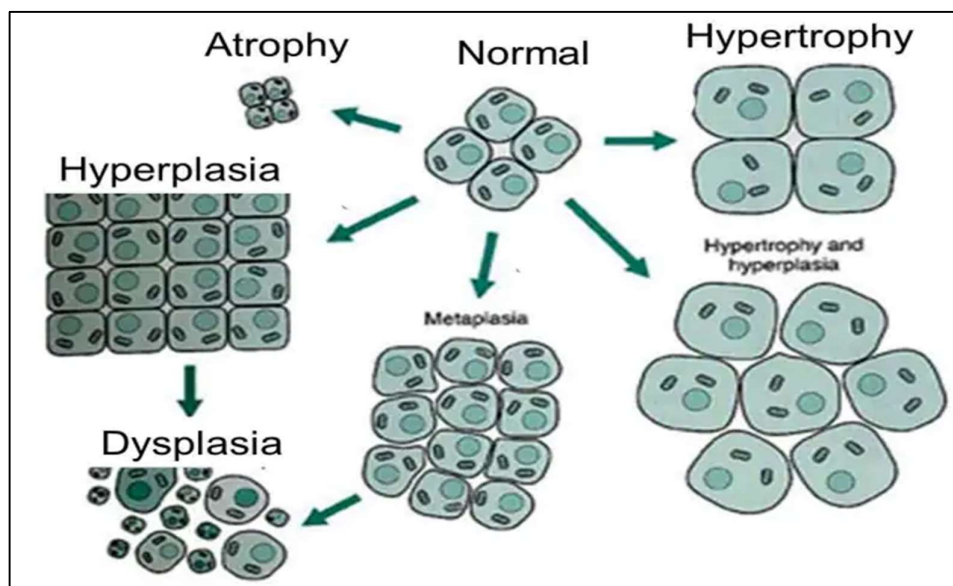
Alteration in the size of cells

- ❖ **Hypertrophy:** Increase in size of existing cells.
- ❖ **Atrophy:** Decrease in size of existing cells.

Increase in the number of cells (**Hyperplasia**).

Change in the differentiation of cells (**Metaplasia**).

Growth disturbances: Adaptive changes, Change in structure, number, size and types of cells. e.g., Atrophy, Hypertrophy, Hyperplasia and Metaplasia.



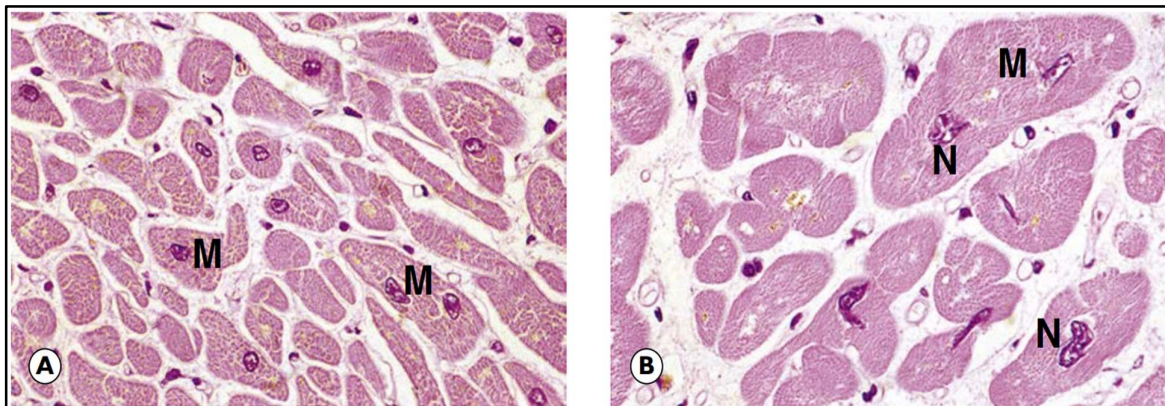
(Figure1): Types of growth disorders

Hypertrophy: An increase in the size of the cells, which results in enlargement of organ without any changes in the number of cells. Occurs due to increased functional demand & hormonal stimulation. A typical example is muscular hypertrophy in response to exercise.

Causes

Physiologic- Enlargement of uterus in pregnancy

Pathologic- Hypertrophy of cardiac muscle, smooth muscle, skeletal muscle compensatory hypertrophy.



(Figure 2): Hypertrophy. (A) Normal myocardium; (B) hypertrophic myocardium show enlargement of Myocardial cells (M) and their nuclei (N).

Atrophy: Shrinkage in the size of the cell by loss of cell substance. It represents a form of adaptive response.

Causes

Physiologic: Normal process of aging in some tissues, which could be due to endocrine stimulation & arteriosclerosis. E.g.: Atrophy of lymphoid tissue.

Pathologic: Starvation atrophy- carbohydrate/fat

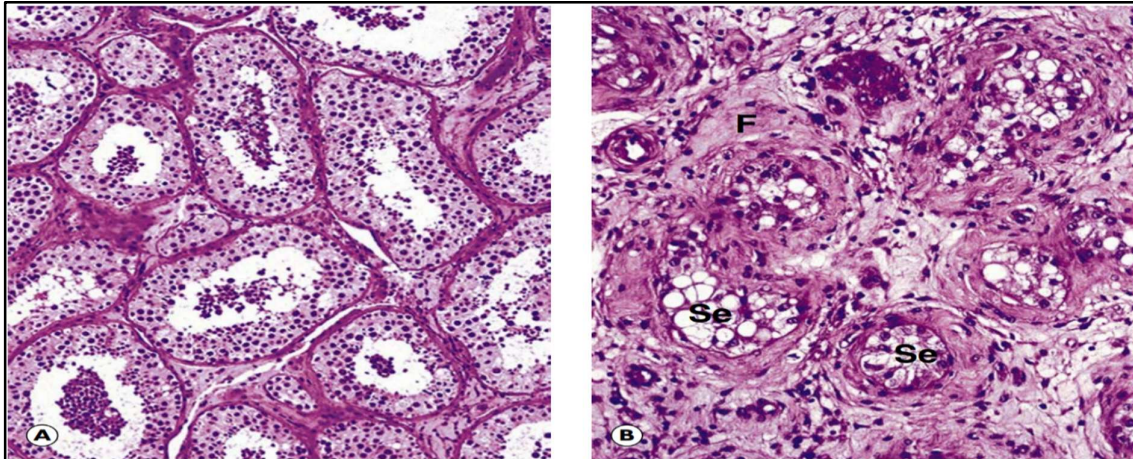
Ischemic atrophy- atrophic kidney

Disuse atrophy- atrophy of pancreas

Neuropathic atrophy- poliomyelitis

Endocrine atrophy- hypopituitarism

Pressure atrophy- erosion of spine **Idiopathic atrophy-** testicular atrophy



(Figure 3): Atrophy. (A) Normal testis; (B) Atrophic testis, the Sertoli cells (Se) are still easily identified. The interstitial tissue shows an increased deposition of fibrous tissue (F)

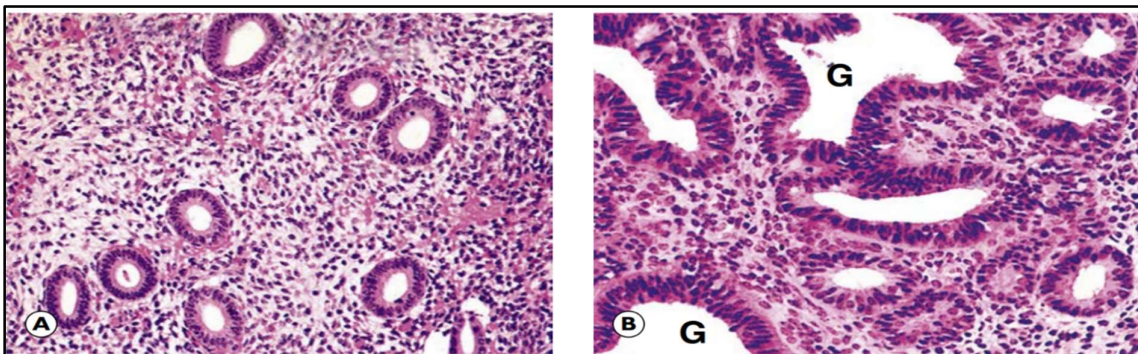
Hyperplasia: An increase in number of parenchymal cells, which results in enlargement of organ/tissue.

Causes

Physiologic: Hyperplasia of pregnant uterus and regeneration of liver.

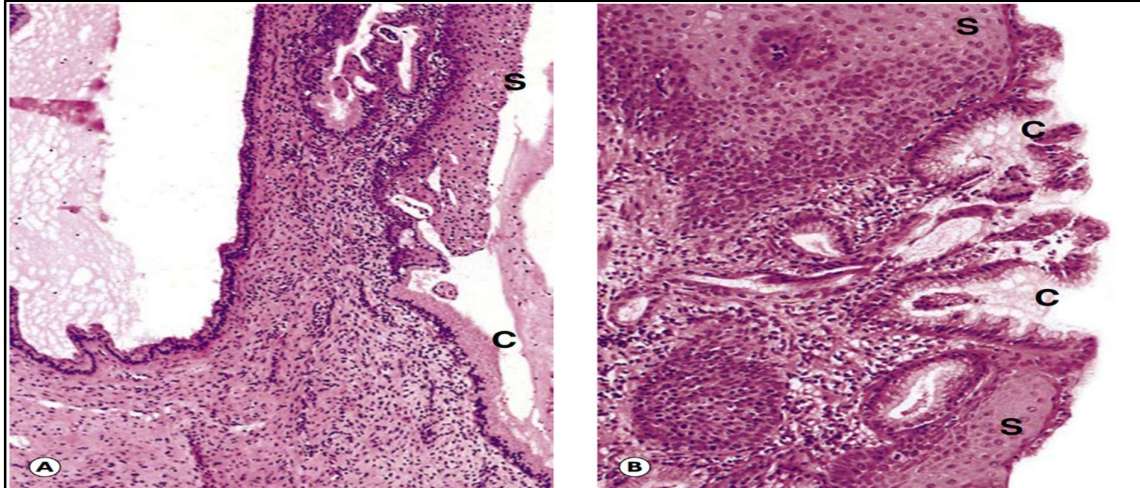
Pathologic: Occurs due to excessive stimulation of hormones & growth factors.

E.g.: Endometrial hyperplasia following estrogen excess.



(Figure 4): Hyperplasia. (A) Normal proliferative phase endometrium; (B) hyperplasia of endometrium the endometrial glands are markedly hyperplastic and continued increase in the number of cells in each gland has resulted in some glands (G) and continued increase in the number of cells in each gland has resulted in some glands (G) showing cystic dilatation

Metaplasia: -META-Transformation -PLASIA-Growth: It is a reversible change of one type of epithelial or mesenchymal cells, usually in response to persistent abnormal stimulus which in turn may change into a malignant cell.



(Figure 5): Metaplasia. (A) Squamous metaplasia of cervix; (B) gastric metaplasia of lower esophagus. the surface is covered by mature stratified squamous epithelium (S), which overlies endocervical glands lined by the normal mucus-secreting columnar epithelium (C) the reverse change is occurring in the lower esophagus where normal native squamous epithelium (S) at the top and bottom is being replaced by gastric-type columnar epithelium (C)

Classification of Metaplasia

- ✚ **Epithelial Metaplasia:** The most common type. Metaplastic change can either be patchy or diffuse leads to alterations in the epithelium. Deprivation of protective mucous secretion. More prone to infection.
 - **Squamous metaplasia** E.g., respiratory epithelium of chronic smokers, vitamin A deficiency.
 - **Columnar metaplasia** E.g., Intestinal metaplasia in healed chronic gastric ulcer
- ✚ **Mesenchymal Metaplasia:** Less often there is transformation of one type of mesenchymal tissue to another.
 - **Osseous** - Formation of bone in fibrous tissue, cartilage & myxoid tissue. E.g., In arterial wall in old people.
 - **Cartilaginous** - In healing of fractures, where there is undue mobility.