



SNS COLLEGE OF ALLIED HEALTH SCIENCES
SNS Kalvi Nagar, Coimbatore - 35
Affiliated to Dr MGR Medical University, Chennai



DEPARTMENT OF CARDIO PULMONARY PERFUSION CARE
TECHNOLOGY

&

OPERATION THEATRE AND ANAESTHESIA TECHNOLOGY

COURSE NAME : GENERAL PATHOLOGY

I YEAR

TOPIC : CELLULAR ADAPTATION

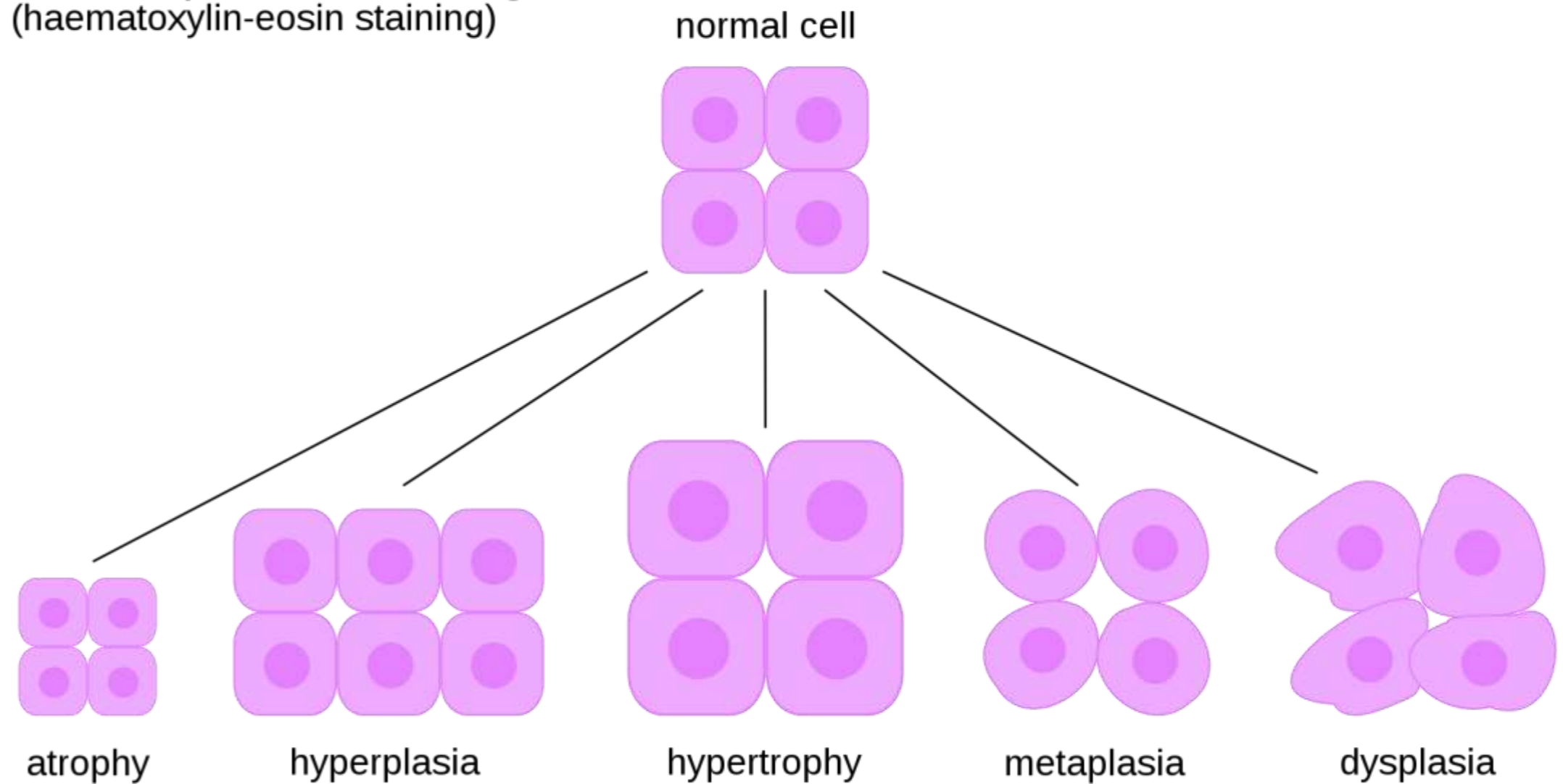


Cellular Adaptation

Contents

- Definition
- Types of Cellular Adaptations
 - Hypertrophy
 - Hyperplasia
 - Atrophy
 - Metaplasia
 - Dysplasia

Non-neoplastic cell changes
(haematoxylin-eosin staining)





Definition



- Adaptation – A process by which the cells change in size, number and appearance in response to changes in cell environment
- Changes may be **physiologic or pathologic**
- The cells can undergo adaptation to damaging stimuli and achieve a new, altered state that **allows the cells to survive** and continue to function in abnormal environment
- The changes in adaptation are **reversible changes**





Hypertrophy



Hypertrophy is defined as **an increase in the size of the tissue or organ** due to increase in the size of cells

Physiological

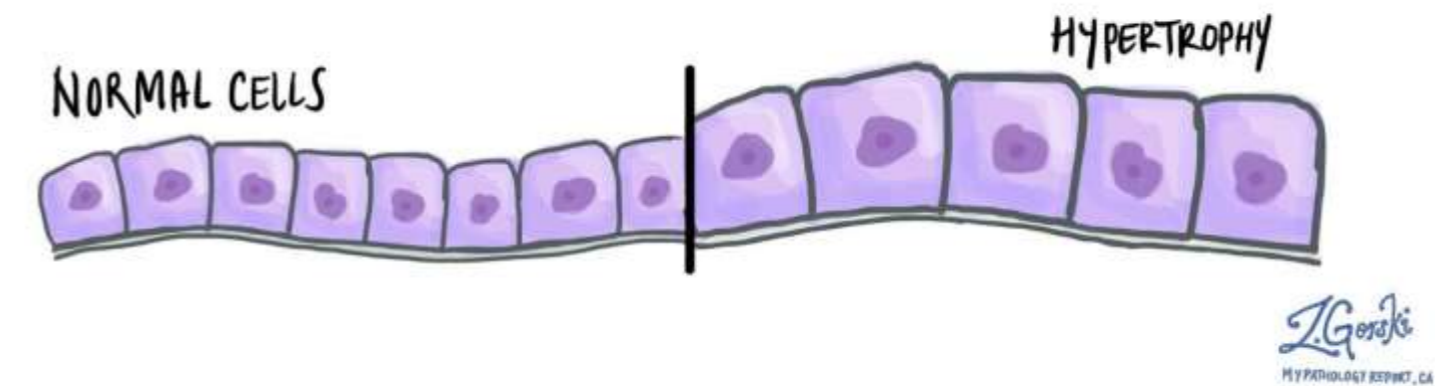
Hypertrophy of skeletal muscle – bulging muscles for **body builders**

Hypertrophy of smooth muscle – growth of uterus **during pregnancy** from estrogenic stimulation

Pathological

Hypertrophy of Cardiac Muscle – Left Ventricular Hypertrophy due to **hypertension** or aortic stenosis

Hypertrophy of smooth muscle – urinary bladder muscle in response to **urethral obstruction** (prostate hyperplasia)

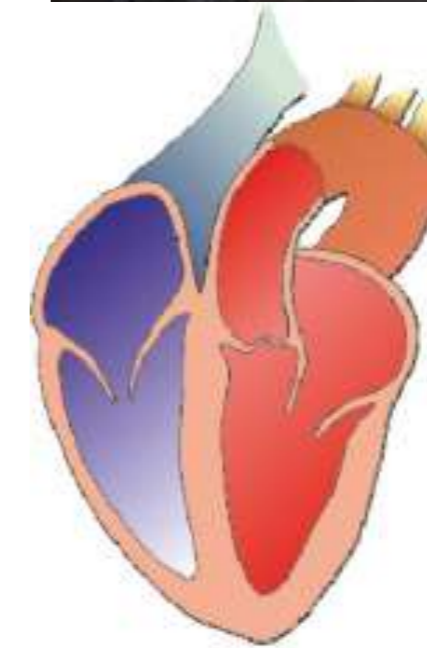




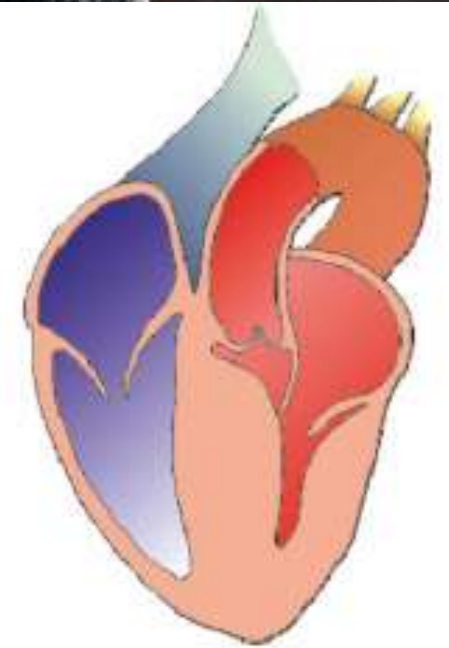
Morphology of Hypertrophy



- **Gross** – The organs are enlarged
- **Microscopy** – There is increase in size of cells as well as the nuclei



Normal heart



Heart with
left ventricular hypertrophy



Hyperplasia



Hyperplasia is defined as an increase in the number of cells in an organ or tissue, usually resulting in increased size of the organ or tissue

Physiological – Hormonal Stimulation or compensatory process

Hormonal - Female breast at puberty, pregnancy and lactation

-Uterus during pregnancy

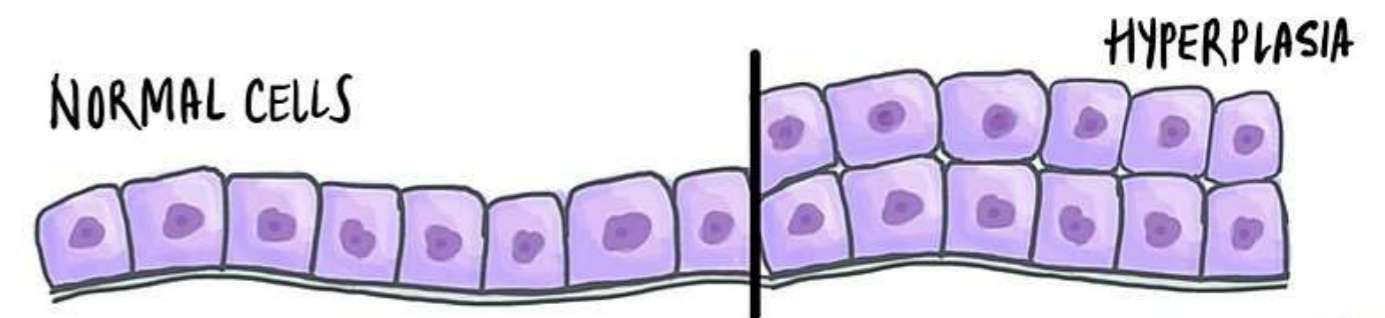
Compensatory – liver following hepatectomy (proliferation of cells)

Pathological –excessive endocrine stimulation or chronic injury / irritation

Excessive endocrine stimulation – Endometrial hyperplasia (due to estrogen)

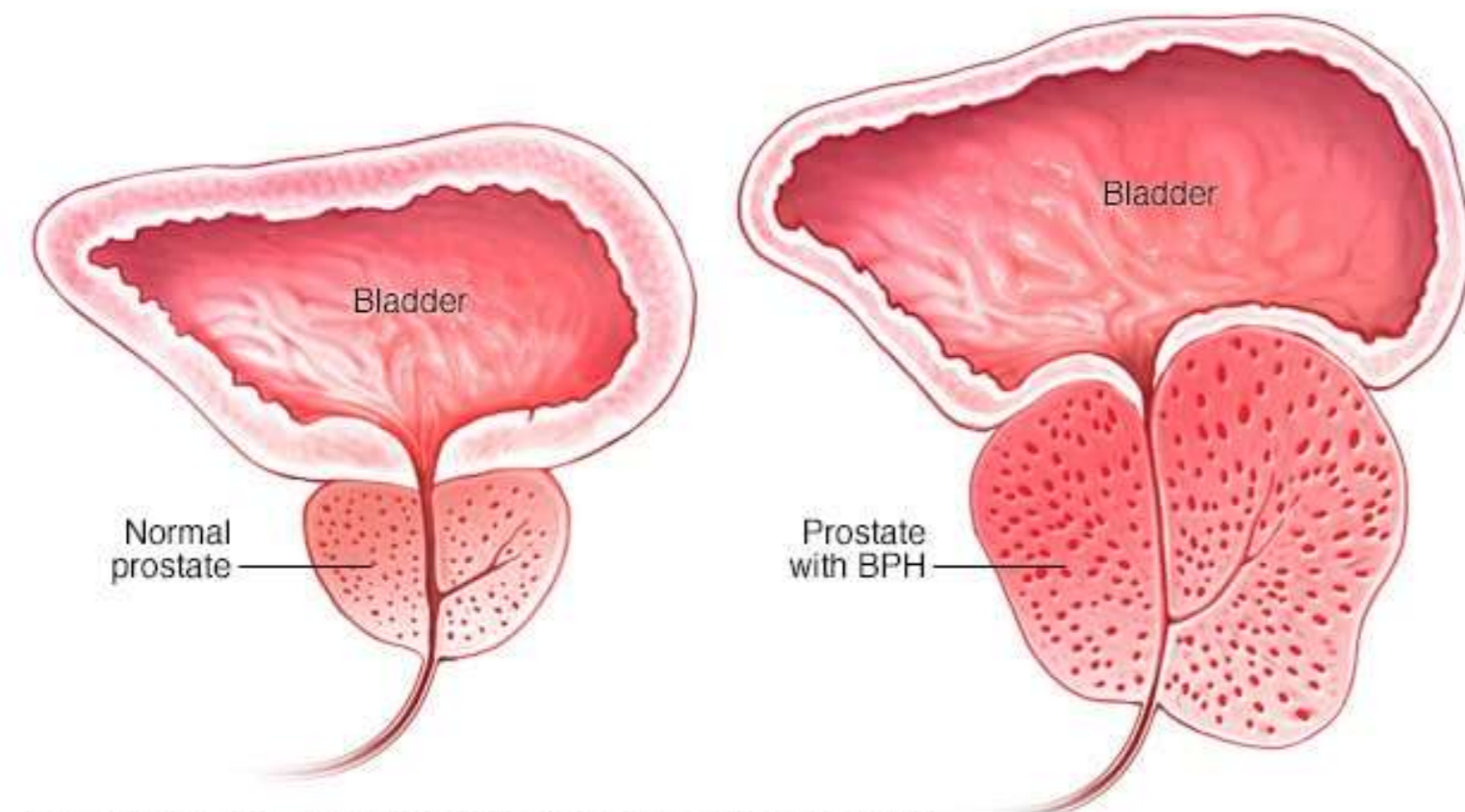
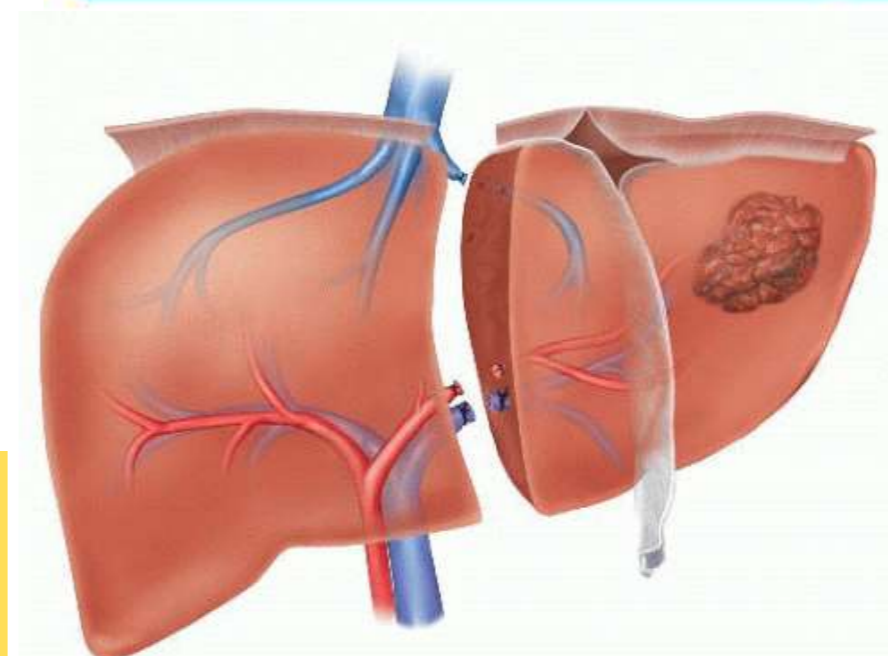
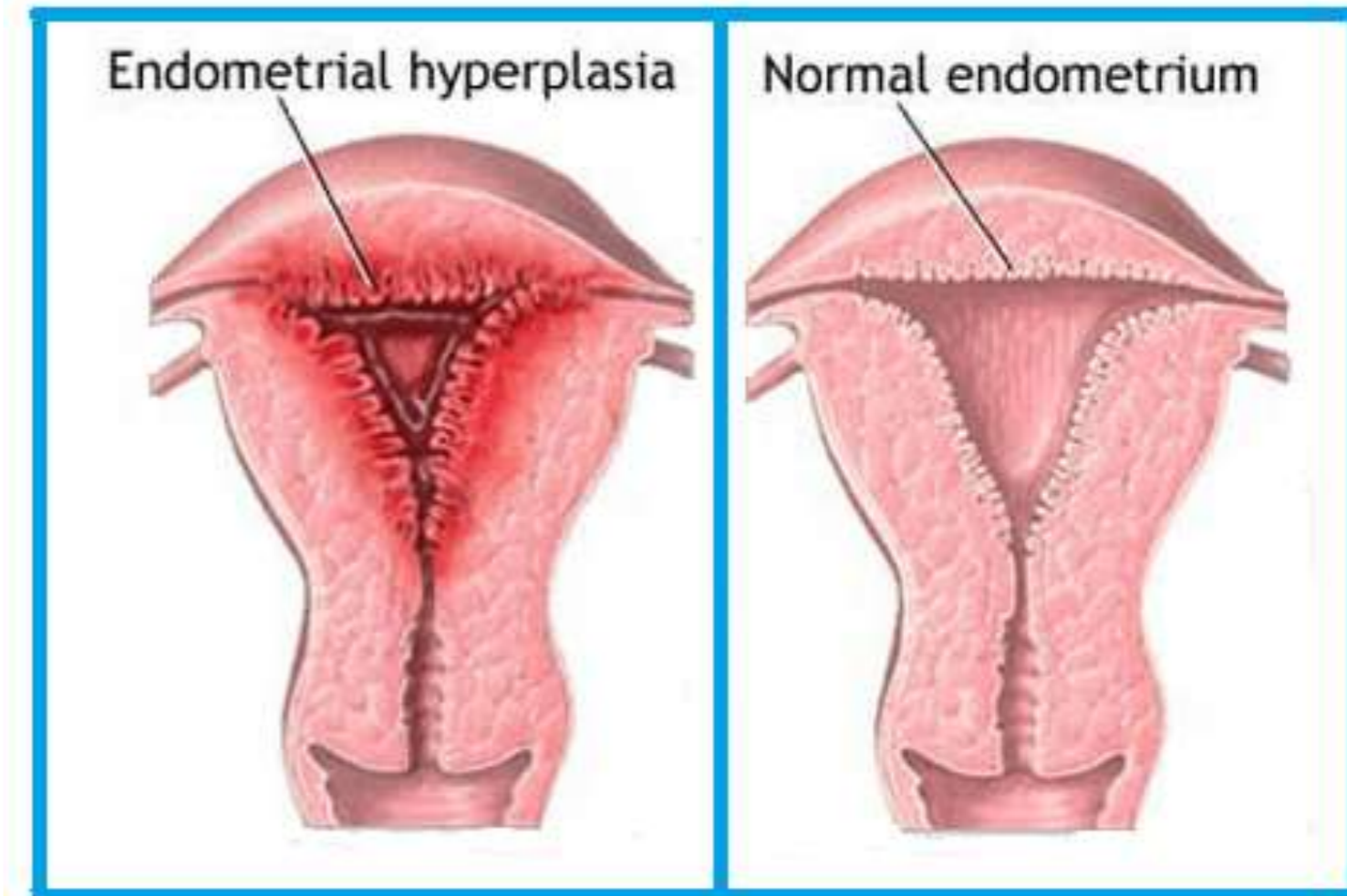
Chronic Injury / Irritation – Long standing inflammation in skin

Pathological hyperplasia can lead to cancer



Morphology of Hyperplasia

- **Gross** – The size of the affected organ is increased
- **Microscopy** – Show increased number of cells

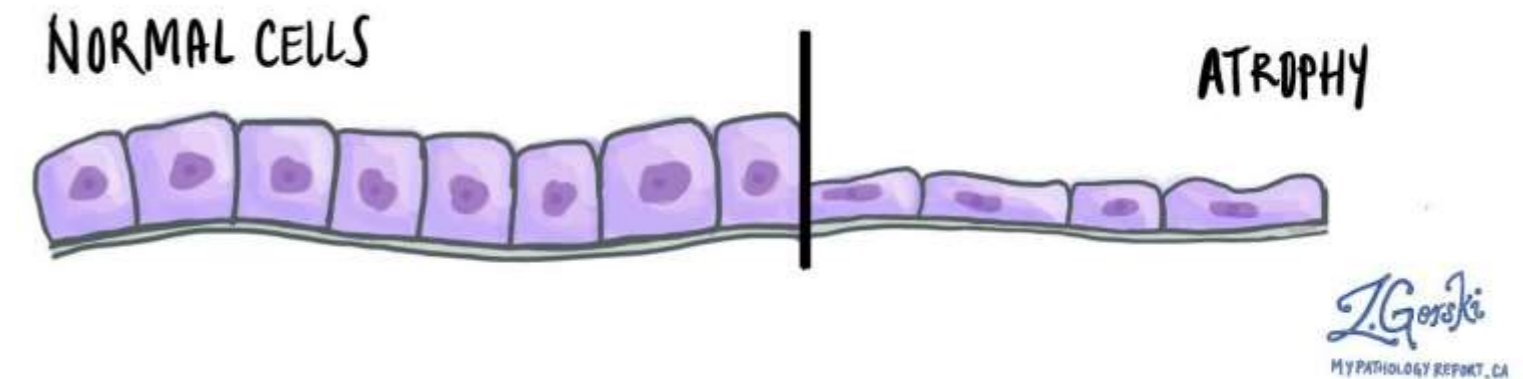




Atrophy



- Atrophy is defined as reduced size of an organ or tissue resulting from decrease in cell size and number.
- Functions of cells also reduced



Physiological – normal fetal development and in adult life

During fetal development – **Embryonic structure**

During adult life – **Atrophy of brain and heart during aging** (senile atrophy)

Pathological - It can be local or generalized

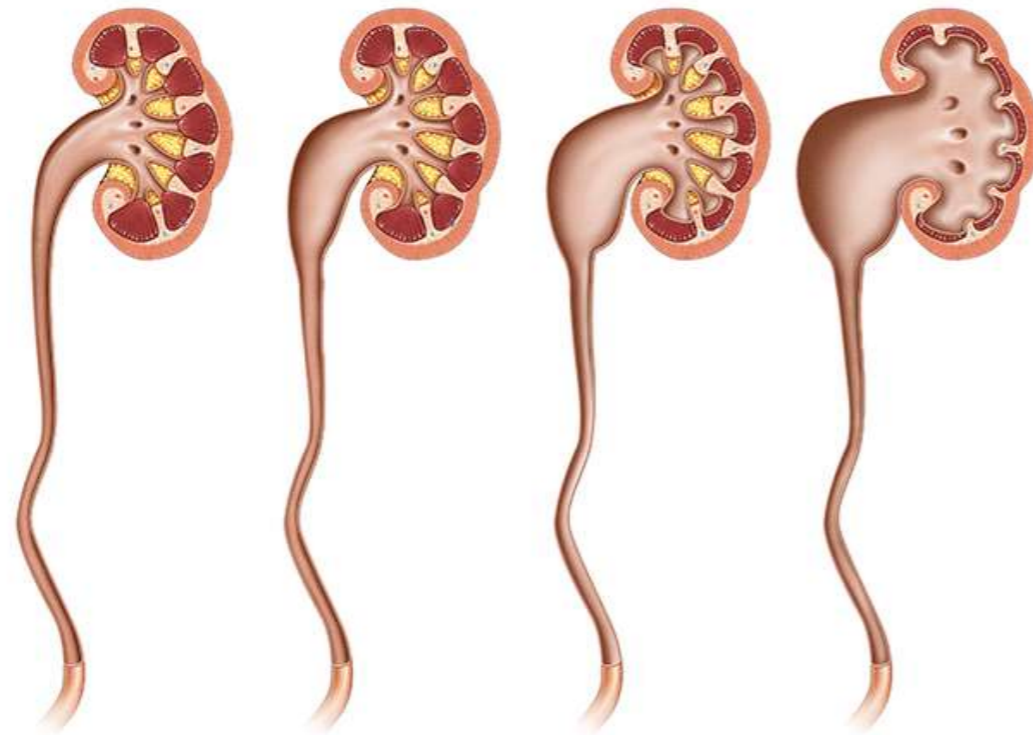
Local – **disuse atrophy** (decreased workload) – of limb muscles, **poliomyelitis** (denervation of nerves), **renal** parenchyma in hydronephrosis (distension of the pelvis and calyx of kidney)

Morphology of Atrophy

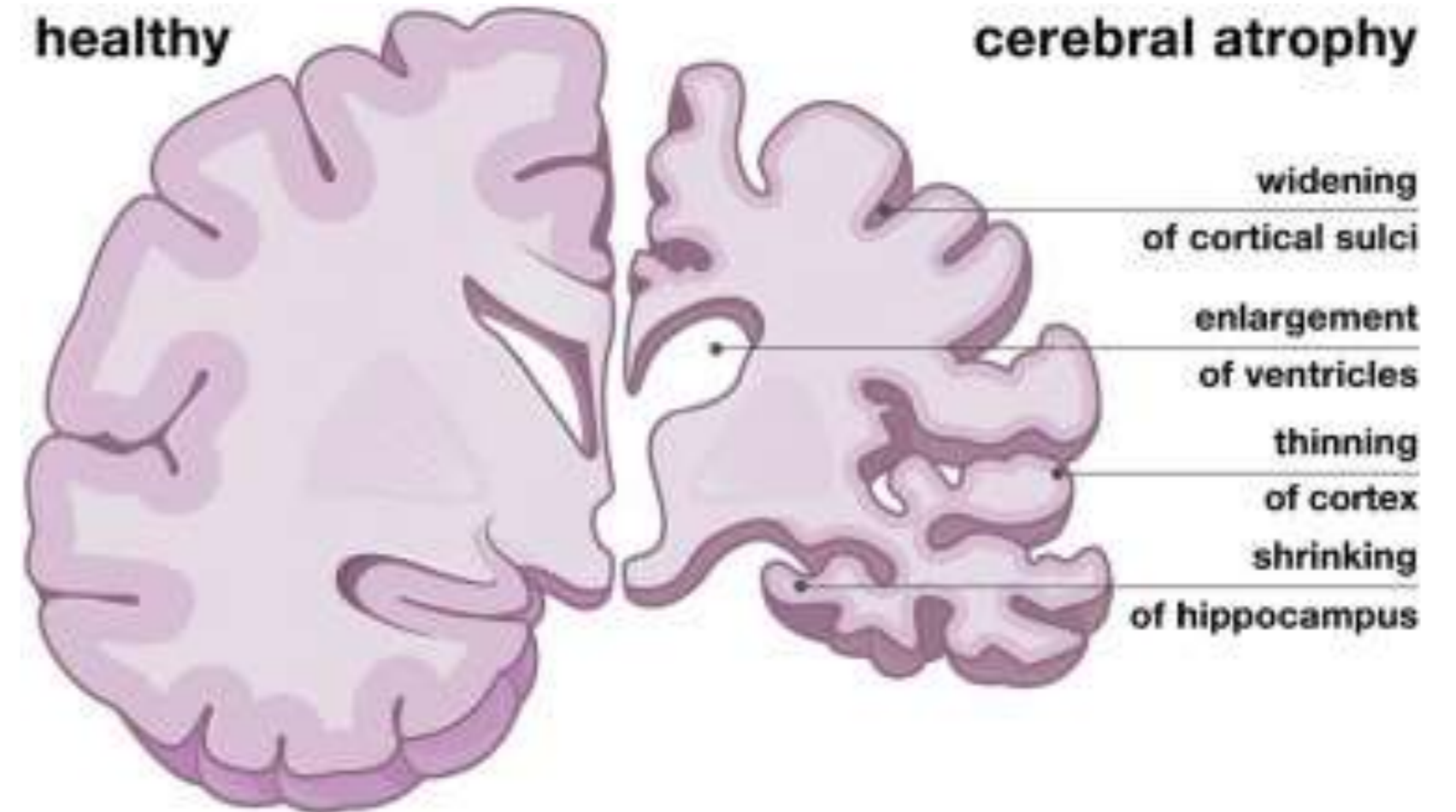
- **Gross** – The organ is small and often shrunken
- **Microscopy** – the cells are smaller in size



Hydronephrosis



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Metaplasia

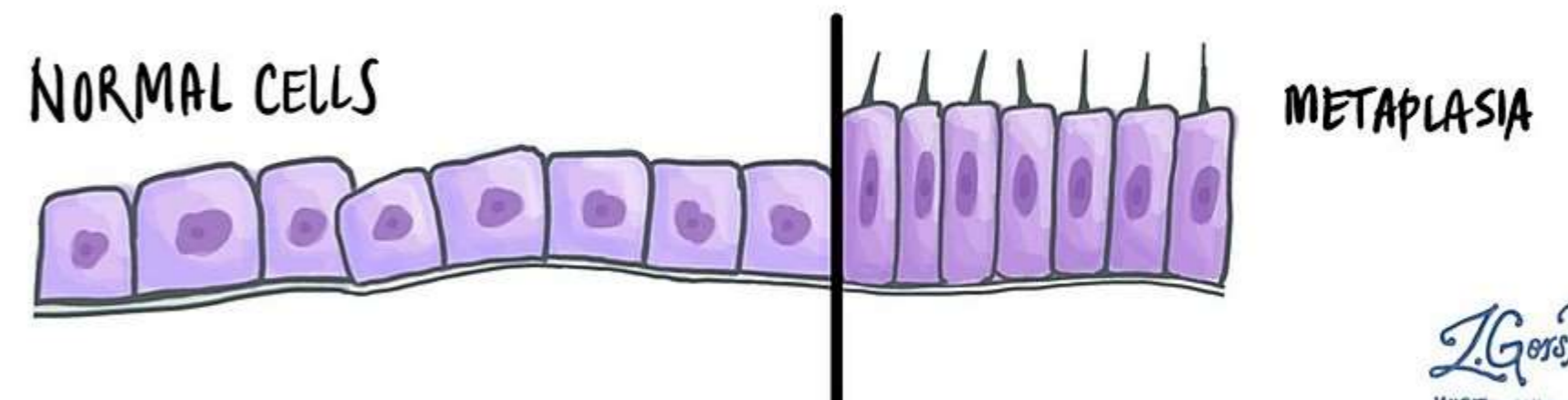


- Metaplasia is defined as a reversible change in which **one adult cell type** (epithelial or mesenchymal) is replaced by **another adult type cell**
- **Types of metaplasia - Epithelial and Connective tissue metaplasia**

Epithelial Metaplasia

Squamous Metaplasia - Respiratory tract – chronic irritation due to tobacco smoke (ciliated epithelial cells to squamous epithelium)

Columnar Epithelium – The gastric glands are replaced by cells resembling those of the small intestine





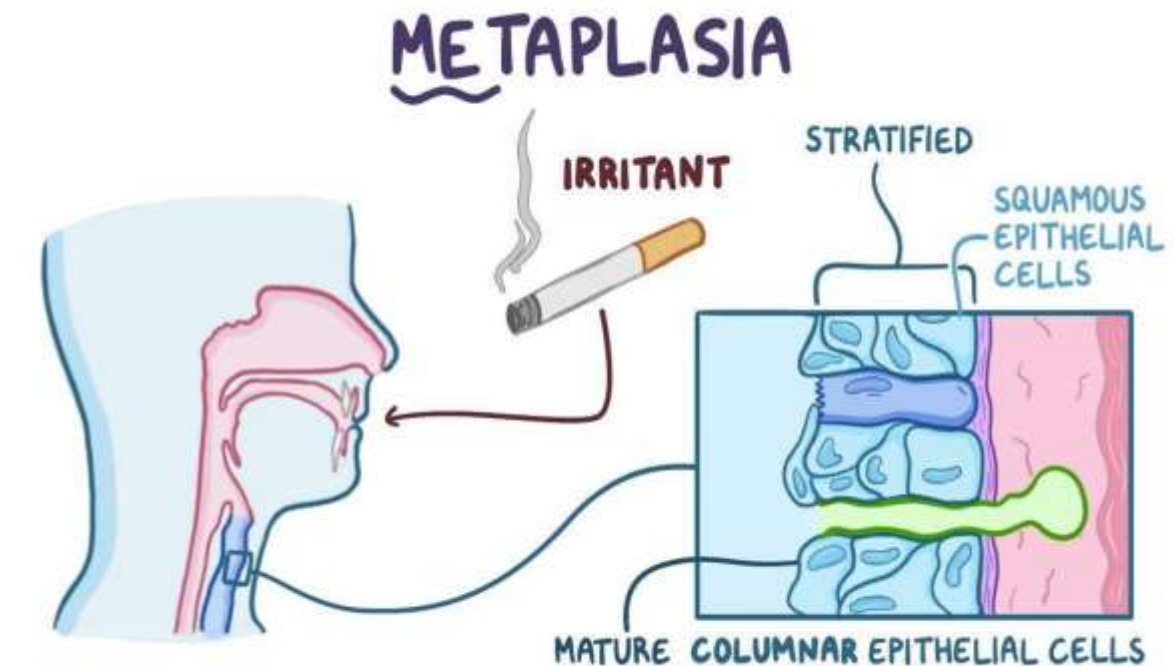
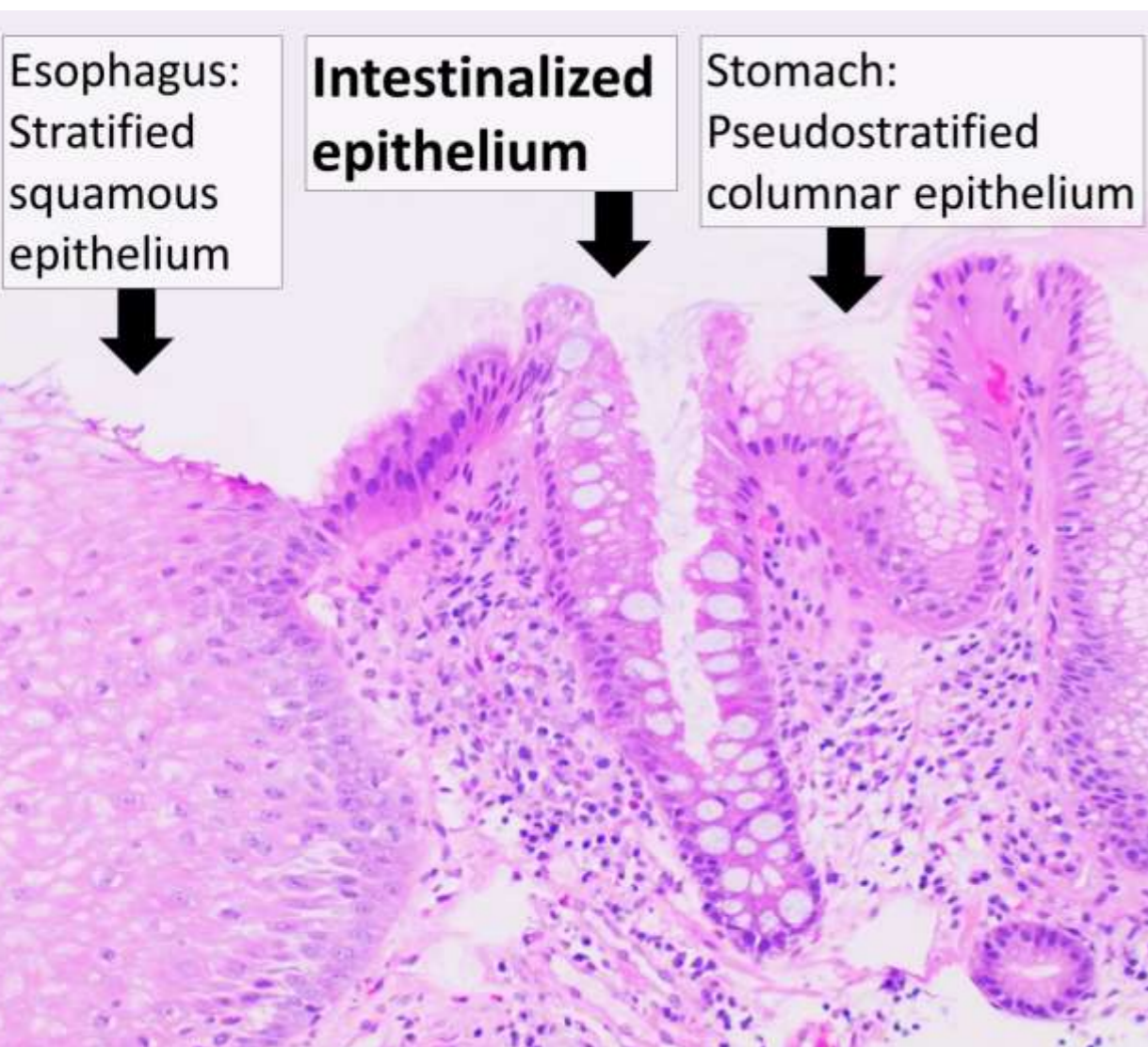
Metaplasia



Connective tissue metaplasia

Osseous Metaplasia – Formation of new bone at sites of tissue injury.

- Bone formation is known as **myositis ossificans**
- Occurs after intramuscular hemorrhage





Dysplasia



- A term used to describe the presence of abnormal cells within a tissue or organ
- It is called as disordered cellular development
- Dysplasia can also be considered as a transitional stage linking neoplasia to hyperplasia or metaplasia

Example:

Dysplasia cells in uterine and cervix

There is high change of malignancy development

