

# **NEOPLASIA**

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# Neoplasia

- **Definition:**
- Is an abnormal type of neo-growth or abnormal proliferation of tissue which is neither physiological nor reparative.

# Features of neoplasia:

- It arises spontaneously and it has no stimulus or purpose.
- If there is a stimulus it is not physiological, e.g: ionizing irradiation, chemical carcinogens or viral infection.
- It has no biological control and once it started it precedes irrespective of the stimulus.

- If the stimulus is removed growth persists.
- There is no regular rate of growth and no coordination.

# Carcinoma *in situ*

- **Definition:**
- It is the early malignant changes in the epithelial cells before the invasion of the basement membrane.
- It is called dysplasia, intraepithelial or pre-invasive carcinoma.
- Cells show all the characteristic features of malignancy.

## ■ Sites:

(1) Mucous membranes of the cervix uteri, bronchi, oral cavity, urinary bladder, colon and gall bladder.

## *Classification of tumors:*

- They are classified into **benign, locally malignant and malignant tumors**

# ***Classification of tumors:***

| <b>Site</b>  | <b>Benign</b> | <b>Malignant</b> |
|--------------|---------------|------------------|
| Epithelium   | Papilloma     | Carcinoma        |
| Glands       | Adenoma       | Adenocarcinoma   |
| Bone         | Osteoma       | Osteosarcoma     |
| Cartilage    | chondroma     | chondrosarcoma   |
| Lymph node   |               | Lymphoma         |
| Blood vessel | hemangioma    | angiosarcoma     |



# Causes of human cancer:

- Chemical carcinogens
- Physical carcinogenic agents
- Viruses and bacteria
- Hereditary predisposition
- Hormonal imbalance
- Cancer following chronic diseases

- **Chemical agents** incriminated in human cancer were derived from soot, coal tar and mineral oils.
- **Physical carcinogens** includes: ionizing radiation, ultraviolet radiation, and thermal radiation.
- **Viruses** incriminated in carcinogenesis are: Epstein-Barr virus (EBV), herpes simplex virus, hepatitis B virus and hepatitis C viruses.

- There is significant hereditary predisposition to some cancers e.g: breast, ovarian or large intestinal cancer is commoner in e relatives of the affected woman.
- There is increased risk of endometrial cancer in women treated with estrogen for menopausal symptoms or osteoporosis.
- Prolonged chronic irritation may produce cancer e.g., chronic varicose ulcers, sinuses of chronic osteomyelitis, and old burn scars.

# Precancerous lesions:

## ■ 1. Chronic inflammations:

Bilharziasis of the urinary bladder

## ■ 2. Hyperplastic lesions:

Liver cirrhosis, mammary hyperplasias.

## ■ 3. Benign tumors:

■ Thyroid adenoma, papilloma of the bladder or colon, and nevi.

## ■ 4. Miscellaneous lesions:

Peptic ulcer, scars of burns, and undescended testicle.

# Comparison between Benign and Malignant tumors

|                     | Benign tumors  | Malignant tumors  |
|---------------------|--|---|
| <b>I) Gross:</b>    |  |   |
| <b>-Size</b>        | <ul style="list-style-type: none"> <li>• Usually small size.</li> </ul>  | <ul style="list-style-type: none"> <li>• Usually large size.</li> </ul>   |
| <b>-Shape</b>       | <ul style="list-style-type: none"> <li>• Spherical or oval in solid organs.</li> <li>• On body surfaces: Polypoid mass</li> </ul>                  | <ul style="list-style-type: none"> <li>• Hard fixed irregular mass with ill-defined edge.</li> <li>• On body surfaces: polypoid (fungating), ulcerative or Infiltrative.</li> </ul> |
| <b>-Capsule</b>     | <ul style="list-style-type: none"> <li>• Usually capsulated, except: hemangioma, nevus, leiomyoma, benign tumors of surface epithelium.</li> </ul> | <ul style="list-style-type: none"> <li>• In tubular organs (intestine, ureter) it is annular.</li> </ul>  |
| <b>-Cut surface</b> | <ul style="list-style-type: none"> <li>• Usually solid, but may be cystic. Rare ulceration, hemorrhage and necrosis.</li> </ul>                    | <ul style="list-style-type: none"> <li>• Usually not capsulated due to rapid rate of growth and secretion of hyaluronidase enzyme by malignant cells.</li> </ul>                    |
| <b>-Margins</b>     | <ul style="list-style-type: none"> <li>• Well-defined</li> </ul>   | <ul style="list-style-type: none"> <li>• It shows a solid structure. Areas of necrosis and hemorrhage are common</li> <li>• Ill-defined or blurred.</li> </ul>                      |

|                             | <b>Benign tumors</b>  | <b>Malignant tumors</b>   |
|-----------------------------|---|---|
| <b>2)Microscopic</b>        |   |   |
| <b>-Proliferating cells</b> | <ul style="list-style-type: none"> <li>• Resemble the cells of origin as regard the cell type and patterns of arrangement. i.e. differentiation.</li> </ul>   | <ul style="list-style-type: none"> <li>• Malignant cells fail to reproduce the exact appearance and pattern of the parent tissue i.e. they show loss of differentiation.</li> </ul>   |
| <b>-Cell morphology</b>     | <ul style="list-style-type: none"> <li>• The cells are usually small.</li> <li>• They have equal size and similar shape.</li> <li>• Normal N/C ratio.</li> <li>• Nuclei are NOT hyperchromatic</li> <li>• Nucleoli are not prominent</li> </ul> | <ul style="list-style-type: none"> <li>• Pleomorphism; the cells are larger than normal.</li> <li>• Cells show variation in size and shape.</li> <li>• The (N/C ratio is increased.</li> <li>• Nuclei are hyperchromatic; enlarged, variable in size, shape, position within the cells.</li> <li>• The nucleoli are present and often large.</li> </ul> |
| <b>-Mitosis</b>             | <ul style="list-style-type: none"> <li>• Mitotic figures are few or absent.</li> </ul>  | <ul style="list-style-type: none"> <li>• Mitotic figures are frequent, may be abnormal in shape and variable in size and pattern.</li> </ul>  |
| <b>-Stroma</b>              | <ul style="list-style-type: none"> <li>• Benign tumors have well formed stroma and few blood vessels.</li> </ul>  | <ul style="list-style-type: none"> <li>• The stroma is scanty, poorly developed and contains many thin walled blood vessels.</li> </ul>   |

|                            | <b>Benign tumors</b>   | <b>Malignant tumors</b>  |
|----------------------------|--|--|
| <b>II)</b>                 |  |  |
| <b>Behavior:</b>           |  |  |
| <b>-Rate of growth</b>     | <ul style="list-style-type: none"> <li>• <b>Slow.</b></li> </ul>   | <ul style="list-style-type: none"> <li>• <b>Rapid.</b></li> </ul>  |
| <b>-Mode of growth</b>     | <ul style="list-style-type: none"> <li>• <b>Grow by expansion, i.e. compresses the surrounding tissue.</b></li> </ul>  | <ul style="list-style-type: none"> <li>• <b>Grow by infiltration (invasion of the surrounding tissue).</b></li> </ul>    |
| <b>-Invasion</b>           | <ul style="list-style-type: none"> <li>• <b>Does not destroy surrounding tissues</b></li> </ul>  | <ul style="list-style-type: none"> <li>• <b>Infiltrates and destroy adjacent tissue.</b></li> </ul>                      |
| <b>-Spread</b>             | <ul style="list-style-type: none"> <li>• <b>They do not spread to other sites.</b></li> </ul>  | <ul style="list-style-type: none"> <li>• <b>Spread to other distant organs (secondaries or metastasis).</b></li> </ul>   |
| <b>-Effect on the host</b> | <ul style="list-style-type: none"> <li>• <b>Not dangerous except when it compresses vital structures as the brain, spinal cord, heart, trachea.</b></li> </ul> | <ul style="list-style-type: none"> <li>• <b>Usually kills the patient wherever it grows even in the skin.</b></li> </ul> |
| <b>-</b>                   |  |  |
| <b>Recurrence</b>          | <ul style="list-style-type: none"> <li>• <b>Does not recur if well excised, so prognosis is good.</b></li> </ul>   | <ul style="list-style-type: none"> <li>• <b>Surgical removal is often followed by recurrence.</b></li> </ul>             |

# Locally malignant tumors

- **Characteristics of intermediate tumors:**
  - This category includes tumors that are locally invasive (spread by infiltration only) and therefore not benign.
  - They have no tendency to metastasize, so they are not frankly malignant.
- **Histologically:**
  - The cells show malignant features.



## ■ **Examples of locally malignant tumors:**

1. Basal cell carcinoma
2. Osteoclastoma
3. Ameloblastoma
4. Craniopharyngioma
5. Astrocytoma

# **Routs of Spread of malignant tumors**

## **■ I. Direct local spread:**

Direct infiltration of surrounding tissues

## **■ 2. Lymphatic spread:**

Detachment tumor cells invaded lymphatic vessels leads to the production of emboli which reaches regional lymph nodes

### ■ **3. Blood spread:**

Malignant cells invade small vessels or veins become detached and then carried by the blood stream to distant sites. The emboli become impacted, penetrate the vessel wall, and develop into secondary tumors

# Effects of Malignant Tumors

1. Mechanical pressure and obstruction.
2. Destruction of the tissue by infiltration and destruction of vital structures.
3. Hemorrhage: Carcinoma of the surface epithelium usually ulcerates and bleeds.
4. Secondary bacterial infection of ulcerated tumors
5. Starvation due to failure of food intake in cancer mouth, esophagus and stomach, or due to diarrhea and malabsorption in cancer colon.

6. Pain: in advanced cancer may be severe leading to anxiety and insomnia.

7. Hematological disorders: anemia due to hemorrhage, malabsorption and bone marrow replacement. Leucocytosis is found in progressive cancers and sometimes eosinophilia.

8. Cachexia: weakness and anemia (due to secretion of toxic metabolites probably by macrophages within the tumor).

9. Immunological effects: impairment in immune response in cases of lymphoma, and leukemia.

# Causes of death in malignant tumors

- 1. Anemia
- 2. Malnutrition
- 3. renal failure
- 4. obstructive jaundice and hepatic failure
- 5. Increased intra-cranial tension and pressure on vital centers
- 6. Chronic toxemia; Due to secondary bacterial infection in ulcerated tumors.
- 7. *Malignant cachexia*: Generalized weakness and wasting

***THANK YOU***