SAWA UNIVERSITY

HISTOPATHOLOGY
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NEOPLASIA

Sawa University — جامعـــــة ســـــــاوة الاهلية

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Third Stage — المرحلـــــــــــة الثالثة

الجانب النظري محاضرة رقم 8

Theoretical Lecture No. 8

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OBJECTIVE

- Define neoplasia and differentiate between benign and malignant tumors based on growth behavior, differentiation, and invasiveness.
- Classify tumors according to their histogenesis and apply correct nomenclature for benign and malignant neoplasms.
- Explain the major mechanisms of tumor spread,
- Identify environmental and genetic factors

Introduction

- **Oncology (Greek oncos = tumor)** is the study of tumors or neoplasms.
- **Neoplasia :** "new growth" An abnormal mass of tissue that results when cells divide more than they should or do not die when they should.
- Neoplasms may be benign (not cancer), or malignant (cancer). Also called tumor.
- The tumors arise from one clone that undergo genetic changes and uncontrolled proliferation.
- All tumors have two basic components:
  - Neoplastic cells.
  - Supportive stroma; made up of connective tissue & blood vessels (providing blood supply and offering support).

Classification of tumors

- Tumors are classified according to their **behaviour** and **histogenesis**.
- **Behavioral classification**: **benign or malignant**

1. Benign tumors : Non-invasive and remain localized , Slow growth rate , Close histological resemblance to parent tissue "differentiated tissue" , Do not invade the surrounding tissues or spread to other sites.

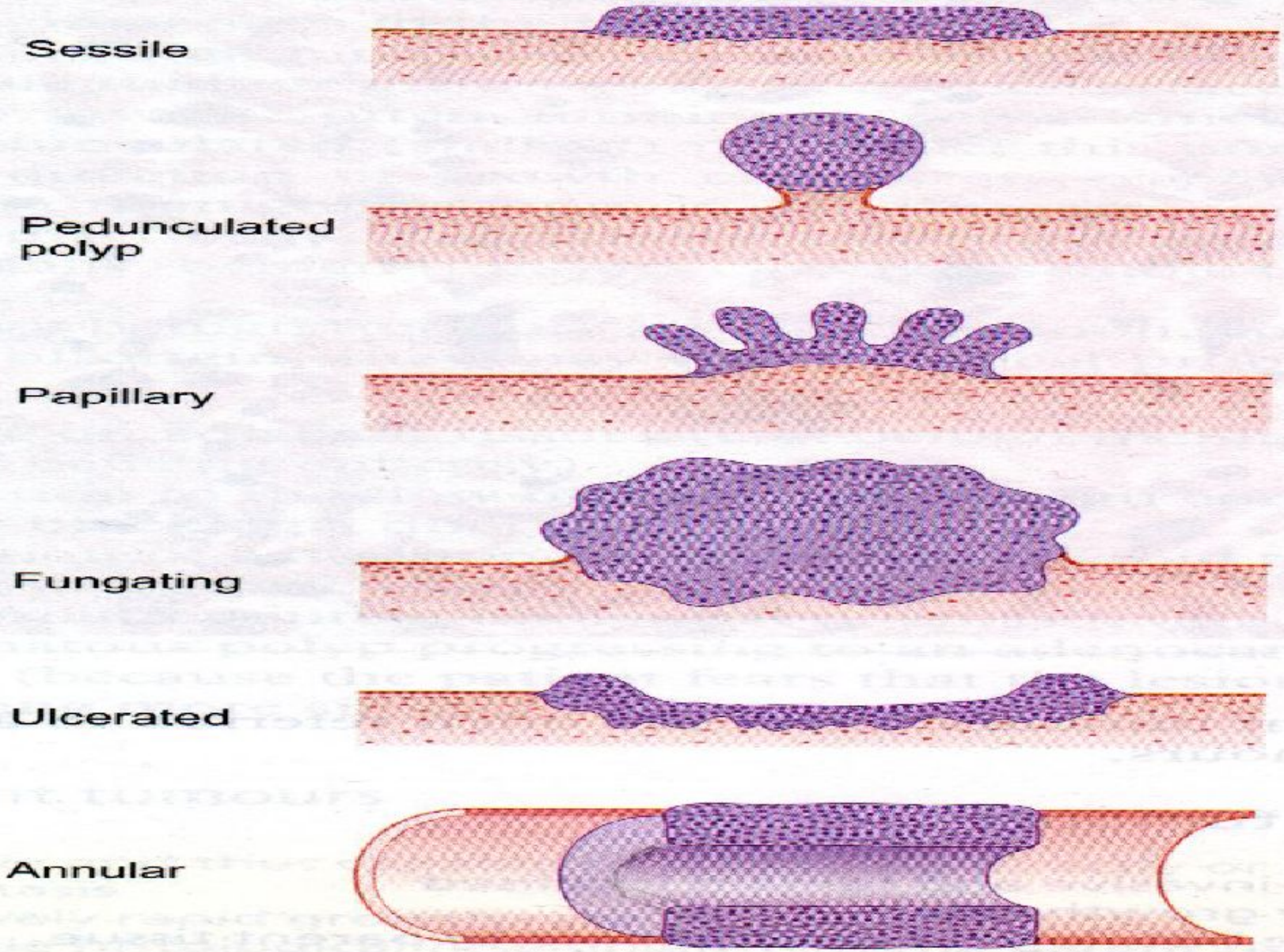
2. Malignant tumors : Invasive and thus capable of spreading directly or by metastasis , Relatively rapid growth rate , Variable histological resemblance to the parent tissue

❖**Histogenetic classification:** cell or tissue of origin; epithelial or connective tissue (

All epithelia , Fibrous tissue , Squamous , Bone and cartilage , Transitional , Muscle ,

Glandular , Fat tissue , Columnar , Nerve , Pseudostratified ,Vessels).

Tumor shape (Gross appearance): The gross appearance of a tumor on the surface may be described as sessile, pedunculated, papillary, polypoid, fungating, ulcerated, or annular



Tumour shapes. Sessile, polypoid and papillary tumours are usually benign. Fungating, ulcerated or annular tumours are more likely to be malignant. Annular tumours encircling a tubular structure (e.g. intestine) are common in the large bowel, where they often cause intestinal obstruction.

Nomenclature of tumors:

1- Nomenclature of benign tumors: By attaching suffix **-Oma** to cell of origin

A- Benign connective tissue (mesenchymal) tumors

E.g.: Benign tumor of fibroblastic cells →**fibroma**

Benign cartilaginous tumor →**chondroma.**

Benign tumor of adipose tissue →**lipoma**

Benign tumor of bone → **osteoma**

Benign tumor of vessels → **angioma**

B- Benign epithelial tumors are more complex variously classified according to (Cells of origin, Microscopic &/or macroscopic appearance).

- **Papilloma:** tumor arising from covering epithelia & producing micro- or macro-visible finger-like (warty) projections from epithelial surfaces, e.g. squamous papilloma arising from tissue that lined by stratified squamous epithelium like skin, esophagus….
- **Polyp:** producing macro. visible projection above mucosa e.g. Adenomatous polyp of stomach & colon.
- **Adenoma:** benign tumor arising from glandular epithelia or forms glandular structure e.g. renal cell adenoma, breast adenoma, thyroid adenoma……
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- **Cystadenoma:** adenoma forming large cystic space(s) e.g. ovarian cystadenoma.
- **Papillary cystadenoma:** as above + papillary projections e.g. ovarian papillary cystadenoma.

2-Nomenclature of malignant tumors:

A- Malignant tumors arising in solid mesenchymal connective tissues are called sarcomas (Greek sar = fleshy)

E.g Fibrosarcoma (fibroblast) , **Liposarcoma** (lipocytes) , **Leiomyosarcoma** (smooth muscle cells) , **Rhabdomyosarcoma** (striated muscle cells) , **Angiosarcoma** (vessels) , **Osteosarcoma** (bone) , **Chondrosarcoma** (cartilage) }

B-Malignant tumors of epithelial cell origin, are called carcinomas.

- **Squamous cell carcinoma;** malignant tumor arise from squamous epithelia.
- **Adenocarcinoma;** malignant tumor arise from glandular epithelia.

E.g. Adenocarcinoma of colon .

❖ **Specify organ of origin:**

E.g. Renal cell carcinoma, Breast carcinoma

❖ **Mixed tumors (Tumors with mixed differentiation):**

E.g. **Mixed tumor of salivary glands (pleomorphic adenoma)**, in reality adenomas, these tumors contain epithelial/myoepithelial components scattered within a myxoid stroma that may contain islands of cartilage or bone.)

❖ Teratoma (germ cell tumor):

- Tumor consists of mature and/ or immature cells belonging to one or more of the 3 germ cell layers (ecto-, endo- & mesoderm).
- It originates from totipotential germ cells that are normally present in the gonades (ovary and testis).

Type of tissue	Origin	Benign tumor	Malignant Tumor
Mesenchymal tissues (Connective tissue)	Fibrous tissue	Fibroma	Fibrosarcoma
	Fatty tissues	Lipoma	Liposarcoma
	Cartilage	Chondroma	Chondrosarcoma
	Bones	Osteoma	Osteosarcoma
	Skeletal muscle	Rhabdomyoma	Rhabdomyosarrcoma
	Smooth muscle	Leiomyoma	Leiomyosarcoma
	Blood vessels	Haemangioma	Angiosarcoma
	Lymphatic vessels	lymphangioma	lymphangiosarcoma
Parenchymal tissue	Skin surfaces	Squamous cell papiloma	Squamous cell carcinoma
	Skin	Basal cell papilloma	Basal cell carcinoma
	Gland	Adenoma	Adenocarcinoma

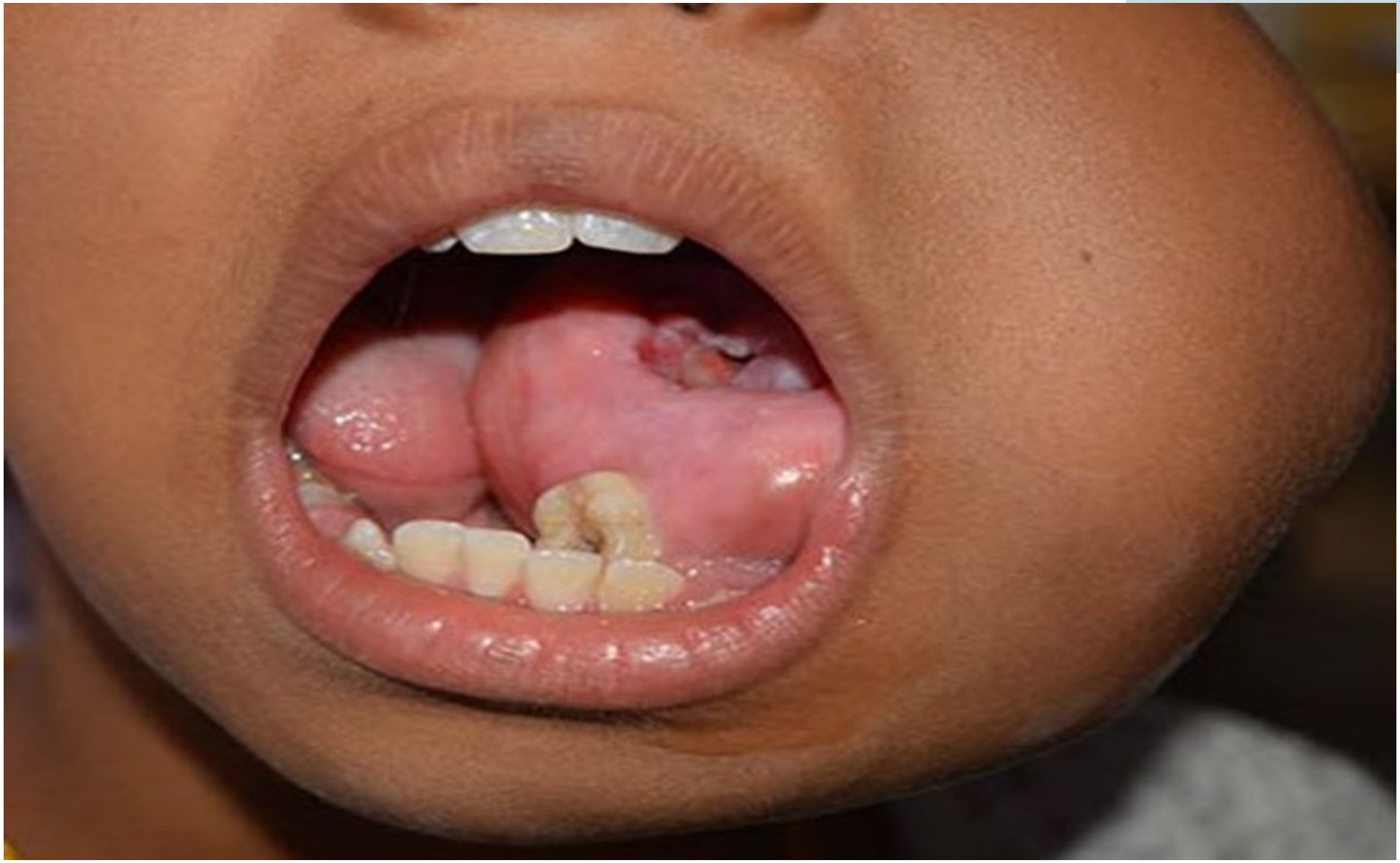
Spread of Malignant Tumors:

Malignant tumors can spread in several ways:

- **Transcoelomic spread :** Transcoelomic spread : It means spread of tumor across body cavities, (the peritoneal, pleural and pericardial spaces): ovarian carcinoma and gastric carcinoma that spread to peritoneal cavity
- **Lymphatic spread :** The very thin walls of lymphatics are readily penetrated by tumor cell , which is carried along in the lymph to Sentinel lymph node.
- **Blood (hematogenous) spread**: It is typical of sarcomas but is also seen with carcinomas (in the later stages). Tumor cells are able to invade thin walled veins and grow along the venous system or embolize into the blood stream.

Canalicular spread : Carcinomas may metastasize along anatomical canalicular spaces, for example the bile ducts, the urinary system, the airways and the subarachnoid space.

Feature	Benign	Malignant
Mode of growth	Expansion	Infiltration and metastasis by lymphatics, blood vessels, and across tissue spaces.
Growth rate	Slow	Relatively rapid
Mitotic activity	Low	High
Histological features	Similar to tissue of origin	May differ from tissue of origin
	Nuclei normal	Nuclei enlarged usually hyperchromatic, irregular outline, often with prominent nucleoli, abnormal mitotic figures and pleomorphic.
	Cells uniform in shape and size.	Cells variable in shape and size (pleomorphism)
Invasion	No	Yes
Metastases	Never	Frequent
Border	Often circumscribed or encapsulated	Often poorly defined or irregular
Necrosis	Rare	Common
Ulceration	Rare	Common on skin or mucosal surfaces
Direction of growth on skin or mucosal surfaces	Often exophytic	Often endophytic



Benign and Malignant Tumors Of Oral Cavity

Causes of Neoplasia:

A - Environmental Factors : Account for over 80% of human tumors .

1- Chemical Carcinogens: such as

- Alkylating agent (Chemotherapy) → Leukemia
- Aniline dyes → bladder cancer
- Cigarette smoke → lung cancer
- Aflatoxin → hepatocellular carcinoma.

2 - Oncogenic viruses :

- RNA viruses: (Human T-cell leukemia virus type 1 (HTLV-1) → adult T-cell leukemia/lymphoma , HCV→ hepatocellular carcinoma)
- DNA viruses: (Human papilloma virus (HPV) , hepatitis B virus (HBV)→ hepatocellular carcinoma.)

3- Radiation (UV light→ skin cancer)

4 - Diet , Others as obesity, alcohol consumption .

B- Genetic Factors:

- **Familial adenomatous polyposis coli:** (APC) gene (autosomal dominant) characterized by the growth of numerous adenomas in the colon and the almost inevitable development of colonic carcinoma by middle age.
- **Retinoblastoma gene (Rb):** lies on the long arm of chromosome 13.
- **Familial breast carcinoma:** BRCA1 and BRCA2 genes .

Laboratory Diagnosis of Cancer :

1-Histopathology (Excisional or incisional biopsy and Fine needle aspiration.

2-Immunohistochemistry: special technique which is depended on antigen –antibody reaction (using antibodies to cell constituents) .

3-Molecular and Cytogenetic Diagnostics (Polymerase chain reaction PCR)

4-Tumor Markers : These are substances produced by tumor cells, They are detectable in the blood . Are of value in: (Diagnosis of tumor Monitoring progress following treatment or detect recurrence) such as :

- Carcinomas of the colon, pancreas, stomach, and breast ⟶Carcinoembryonic antigen (CEA).

- Hepatocellular carcinomas → Alpha-fetoprotein (AFP)
- Ovarian tumors → CA-125
- Prostate cancer → Prostate-specific antigen (PSA)

References

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2. Mitchell, R. N. (2023). Basic Pathology. Elsevier.

Any questions?