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Introduction:
Neoplasia is a very important topic because neoplasms are both common and serious diseases, cancer is the second leading cause of death worldwide after cardiovascular diseases.
Different terms has been used to describe neoplasia:

- **Tumor**, in the past has been used as a non-neoplastic term in describing the cardinal sign of inflammation meaning swelling but now is equated with Neoplasm.
- **Cancer** (crab): common term used for all malignant tumors, **Hippocrates** was the first to use the word “cancer” to describe tumors, it is derived from the Greek word “karkinos” which means crab It is thought Hippocrates was referring to the appearance of tumors.
- **Oncology:** is the science that studies the tumors.
- **Neoplasia:** literally means a new growth (Neos = New + Plasia =growth) , and this term is used interchangeably with a tumor (swelling) because most tumors present as a mass

Neoplasia defined as mass of tissue formed as a result of abnormal, excessive, uncoordinated, autonomous and purposeless proliferation of cells even after cessation of stimulus for growth which caused it, characterized by followings:

- ✓ Its growth is exceeded with that of the adjacent normal tissues.
- ✓ Neoplasia persist its growth after the cessation of stimuli which cause the change, the neoplasm become autonomous i.e. independent of physiologic growth stimuli and inhibitors
- ✓ Tumors increase in size regardless of their local environmental & nutritional status of the host, behave as a parasite and compete with normal cells and tissues for their metabolic needs

Neoplasia Definition in modern molecular pathology:

It is a genetic disorder of cell growth that is triggered by acquired or less commonly inherited mutations affecting a single cell and its clonal progeny, these causative mutations alter the function of particular genes and give the neoplastic cells a survival and growth advantage. The entire population of cells within any tumor originates from a

single cell referred to as stem cell or tumor initiating cell (T-IC) ,this cell has sustained the initial genetic changes (mutations). Therefore, the tumor consists of T-IC and its progeny forming a clone of cells and hence tumors are said to be clonal.

Is cancer curable disease?

- The answer to this simple question is difficult because cancer is not one disease but many disorders with widely different pathogeneses, natural histories, and responses to treatments. Some cancers, such as Hodgkin lymphoma, are curable, whereas others, such as pancreatic adenocarcinoma, are virtually always fatal. The only hope for controlling cancer lies in learning more about its causes and pathogenesis.

Nomenclature of Tumors:

- Tumors are either benign or malignant (some tumors have borderline type)
- All tumors (benign and malignant) have two basic parts:

1. Parenchyma Part: Formed by neoplastic cells.
2. Supporting par (stroma): Made up of blood vessels & connective tissue.

- The classification of tumors and their biologic behavior are based primarily on the parenchymal component, but their growth and spread are critically dependent on their stroma.

Naming of Benign tumors:

1- For benign mesenchymal tumors ⟹ (Cell of origin of tumor + Suffix Oma)

Like: Fibr**oma** (benign tumor of fibrous tissue)

Lip**oma** (benign tumor of adipose tissue)

Chondr**oma** (benign tumor of cartilage)

Leiomy**oma** (benign tumor of smooth muscles)

2- While benign epithelial tumors are classified on the basis of:

The cell of origin

Microscopic pattern

Macroscopic pattern

Certain Benign epithelial tumors or lesions:

Adenoma: benign epithelial neoplasm producing glandular pattern or benign neoplasm derived from glands e.g. Thyroid adenoma, renal adenoma, adrenal adenoma.

Papilloma: Benign epithelial neoplasm producing microscopically or macroscopically visible finger-like (warty) projections from epithelial surfaces e.g. squamous cell papilloma of the skin and transitional cell papilloma of the urinary bladder.

Polyp: is a benign neoplasm that forms a macroscopically visible projection above a mucosal surface (e.g. gastric, colonic, and laryngeal polyps) or skin. Malignant tumors may present as polyp (bulging masses simulating multiple fused polyps), mainly in the colon.

A cystadenoma: is an adenoma that form large cystic space (or spaces), e.g. ovarian cyst adenoma. A **papillary cystadenoma** is similar to cyst adenoma but has in addition papillary (warty) projections that protrude into the cystic spaces, e.g. ovarian papillary cystadenoma.

Naming of Malignant Tumors:

1- For malignant mesenchymal tumors ⟹ (Cell of origin of tumor + Sarcoma)

Like: Fibrosarcoma (malignant neoplasms of fibrous tissue).

Chondrosarcoma (malignant neoplasm of cartilage)

Liposarcoma (malignant tumor of adipose tissue)

Osteosarcoma (malignant neoplasm of bone).

2- Malignant neoplasms of epithelial cells origin are called Carcinoma.

- For malignant mesenchymal tumors ⟹ (Cell of origin of tumor + Sarcoma).

Like: Fibrosarcoma (malignant neoplasms of fibrous tissue).

Chondrosarcoma (malignant neoplasm of cartilage)

Liposarcoma (malignant tumor of adipose tissue)

Osteosarcoma (malignant neoplasm of bone).

Malignant epithelial tumors are called Carcinoma, carcinoma named on the basis of:

- **Type of malignant epithelia** gives the name of malignant tumor, like:

Squamous cell carcinoma, adenocarcinoma, transitional cell carcinoma

- **Sometime the tissue (or organ) of origin** can identify by the name of tumor, like Renal cell carcinoma **and** hepatocellular carcinoma

3 Malignant tumors arising from blood-forming cells are designated leukemias (white blood) or lymphomas (tumors of lymphocytes or their precursors).

4-Neoplasms ending in "-blastoma" resemble primitive embryonic tissues, which are often pediatric neoplasms. Examples include:

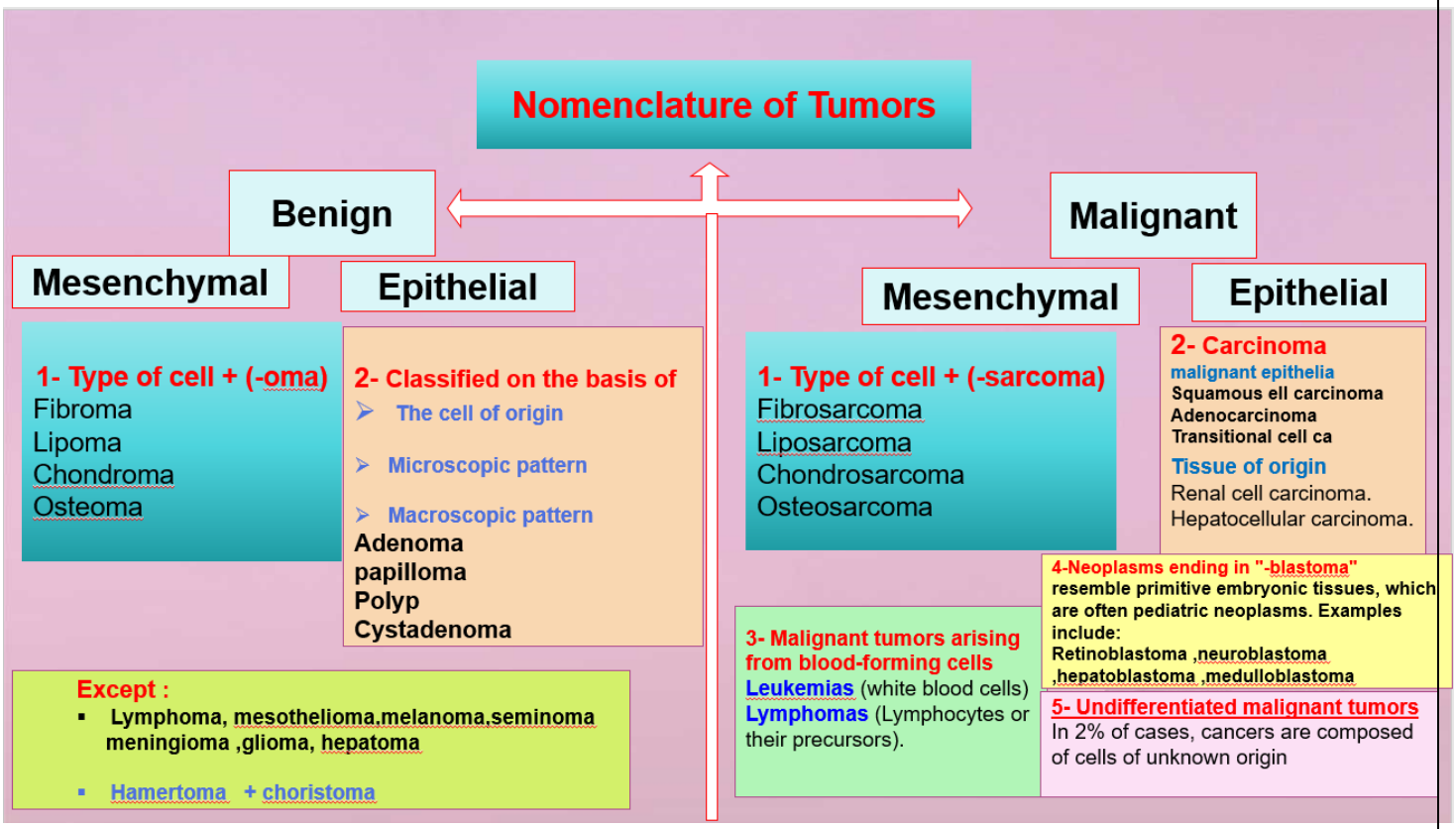
- Retinoblastoma
- Neuroblastoma
- Hepatoblastoma
- Medulloblastoma

5- In approximately 2% of cases, cancers are composed of cells of unknown origin and must be designated merely as undifferentiated malignant tumors.

Important note:

- ✓ Regarding tumors nomenclature, there is exception of some inappropriate designations that do not follow the above principles. Never the less, their usage continues by tradition.This include malignant tumors that end with OMA:
  - lymphoma
  - mesothelioma
  - Melanoma
  - Seminoma
  - Meningioma (could be benign or invasive tumor)
  - Glioma(could be benign or invasive tumor)
  - Hepatoma
- ✓ Also two additional terms, namely choristoma & hamartoma, both although ending with the suffix –oma, are not true neoplasms but rather tumor like lesions. **Hamartoma**: is a mass of disorganized but mature specialized cells or tissue indigenous to the particular site, e.g. Hamartoma of lung, contains islands of cartilage, blood vessels, bronchial structures and lymphoid tissues. Recently hamertomas considered as benign tumor due to the discovery that most hamartomas have clonal chromosomal aberrations that are acquired through somatic mutation

Choristoma : heterotopic rest of cells, refers to the presence of microscopically normal tissues in an unexpected location, for example, a rest (a remnant) of adrenal gland under the kidney capsule, or pancreatic tissue in the wall of the esophagus, stomach or small intestine. They are called choristoma because they may form masses or nodules that mimic neoplasms grossly.



Tumors can be divided according to their origin:

Monoclonal tumor: Malignant tumor in which the cells are derived from

Single progenitor cells (single germ layer).

Mixed tumors: tumors in which the stem cells may undergo divergent differentiation, like :

- Pleomorphic adenoma of parotid gland which contain epithelial part and fibromyxoid part.
- Fibroadenoma of breast which consist of two parts (Adenoma and fibroma)

These tumors differ from teratomas in that they are derived from one germ cell layer, that differentiates into more than one parenchymal cell type.

Teratoma: A tumor contains recognizable mature or immature cells or tissues, which

are derived from more than one germ layer (sometime from three germ layer .

These teratomas are arising from totipotential cells mainly in the ovary & testis, it may contain:

- Bone, muscle, fat, hair (these are mesoderm derivatives)
- Epithelia (respiratory, intestinal), this is endoderm derivative.
- Nerve (ectoderm derivatives).

Teratomas are commonly seen in the ovary and testis. In the ovary since these ovarian tumors are commonly cystic they are designated as **cystic teratomas**, and because the skin (and its adnexae such as hair & sebaceous glands) is a major component of such tumors they are also have the alternative name of **dermoid cysts**.

If all components of teratoma are benign, is called mature teratoma typically seen in ovary. If these components are immature, this is called immature teratoma (Malignant potential), typically seen in testis.