

GENERAL ONCOLOGY

TUMOR

- A swelling of a part of the body
- CELSUS / rubor – calor – tumor – dolor – functio laesa

TUMOR

- Today, the term “tumor” is *used* as a synonym for a *neoplasm*
- *Neoplasia* - Terminology *neo* =new, *plasia* = growth
- The branch of science dealing with the study of neoplasm or tumor is called *oncology* (*oncos* = tumor, *logos* = study)

TUMOR

- "A neoplasm is an abnormal mass of tissue, the growth of which *exceeds* and is *uncoordinated* with that of the normal tissues, and *persists* in the same excessive manner after cessation of the stimulus which evoked the change." R.A. Willis

Persistent

Classification of neoplasms

- Etiological
- Anatomical features
- Embryological
- Functional
- Classification according to morphological characteristics

- Classification according to *the histogenetic or cytogenetic origin*
 - 1) Epithelial
 - 2) Mesenchymal

- Classification according to *biological behavior*
 - 1) Benign
 - 2) Malignant

Classification of neoplasms

- **Histogenetic (cytogenetic) classification,**
- It is a classification according to the *tissue type* from which the tumors *originate*.
Accordingly, tumors are divided into two main groups, **epithelial** and **mesenchymal**.
- This classification is practical.
Because cell type is one of the most important things and invariant features of the tumor.

Classification of neoplasms

- **Classification according to biological behavior** (TUMOR CHARACTERISTICS)

Divided into

benign and **malignant**

Classification of neoplasms

- **Classification according to biological behavior** (TUMOR CHARACTERISTICS)

BENIGN TUMORS ;

- similar to tissue cells they originated from (well-differentiated appearance)
- localized
- growing slowly and expansively
- encapsulated
- have basal membrane (intact)
- have low mitotic index
- not make metastase and invasion

Classification of neoplasms

- **Classification according to biological behavior** (TUMOR CHARACTERISTICS)

MALIGNANT TUMORS

- Not similar to tissue cells they originated from (lack of differentiation)
- have the ability to make invasion and metastase to surrounding tissues and veins
- growing rapidly and infiltrating
- mitotic index is high

Nomenclature of tumors

- **For mesenchymal tumors:**

1) **Benign:** The suffix “-oma” is added to the name of the tissue e.g. *fibroma, osteoma, chondroma*.

2) **Malignant:** The suffix “-sarcoma” is added to the name of the tissue e.g. *fibrosarcoma, osteosarcoma, chondrosarcoma*.

- **For epithelial tumors:**

1) **Benign:** The suffix “-oma” is added to the name of the tissue e.g. *adenoma, papilloma*.

2) **Malignant:** The suffix “-carcinoma” is added to the name of the tissue e.g. *adenocarcinoma, squamous cell carcinoma, basal cell carcinoma*.

Nomenclature of tumors

- **Mixed tumors:** Some tumors formed by different types of tissues which have resulted due to *metaplasia* of the original tissue, e.g. The mammary gland tumor may be formed of cartilage, bone, fibrous tissue and glandular tissue.

Nomenclature of tumors

- **Teratoma:** These are neoplasms of multiple tissues of different kinds, foreign to the area in which they arise and may be benign or malignant.
- These tumors are commonly associated with **gonads** and contain **hair, nerveous tissue**, glandular or epithelial lining of **bronchi** or **intestinum**. The tissues are from *ectoderm, endoderm and mesoderm.*

Nomenclature of tumors

- In tissues and organs tumors can develop *solitary* or *multiple*.
- If a tumor is more than one in the organism, the suffix "**-atosis**" is added to the tumor name.
e.g. papillomauatosis, adenomauatosis, fibromauatosis

Nomenclature of tumors

- The basic structure of all tumors is made up of two elements:
 - 1) Proliferating, neoplastic cells which comprise the **parenchyma** of the tumor
 - 2) Supportive **stroma** made up of connective tissue and blood vessels.
- If these two structures are intertwined with each other in the tumor, it is called "histioid tumor"
- If the stroma and parenchyma are separate, such tumors are called "organoid tumors".

General Characteristics of Tumors

- Tumor is **abnormal** tissue growth. It is a new cell type that differs in some characteristics and this change is **irreversible**.
- Grow as **unlimited**.
- Tumor cells proliferate **faster**, are **not beneficial** to the organism, and not need to **be stimulated**.
- Tumor cell shows **autonomy**.

General Characteristics of Benign and Malignant Tumors

Benign and malignant tumors are distinguished by their morphological findings.

- Cell morphology
- Cell arrangement and organization
- Mitosis
- Giant cells
- Stroma
- Vascularization
- Growth rate
- Developmental pattern
- Metastasis
- Recurrence
- Structure and shape properties

General Characteristics of Benign and Malignant Tumors

Cell morphology:

- Neoplastic cells often show considerable morphologic variability compared with the normal tissue from which they are derived.
- **The benign tumor cell** is very similar to the cell from which it originated; this is called a **typical** cell.
- **A malignant tumor cell** is not similar to the cell from which it originates; this is called the **atypical** cell.

General Characteristics of Benign and Malignant Tumors

Cell morphology:

- Each normal, fully differentiated, mature tissue type has a characteristic gross and microscopic appearance that varies between species.
- Neoplastic tissues lose these differentiated features of cellular morphology and organization to a variable extent.
- In general, **malignant tumors** appear **less differentiated** than benign tumors (atypical cells).
- **Benign tumors** are **well-differentiated** (typical cells).

General Characteristics of Benign and Malignant Tumors

- **Anaplasia** is a condition of cells with poor cellular differentiation, losing the morphological characteristics of mature cells.
- The term also refers to a group of morphological changes in a cell that point to a possible malignant transformation.
- This type of tumor is called as **undifferentiated** or **anaplastic** tumor.

Characteristics of Atypical (Anaplastic) Cells

- **Pleomorphism**

- * **Anisocytosis**

- * **Anisonucleosis**

- **Hyperchromasia**

- **Polychromasia**

- **Giant nucleus** (Tumor type giant cell)

- **Mitosis**

General Characteristics of Benign and Malignant Tumors

Growth rate:

- Benign tumors develop slowly. Sometimes it takes months to be noticed.
- Growth is faster in malignant tumors. However, this rate varies from tumor to tumor, the more malignant is one that has faster development.

General Characteristics of Benign and Malignant Tumors

Developmental pattern:

- Benign tumors, when growing, push the tissues of their surroundings and make place for themselves. Such development is called "expansile development".
- Benign tumors usually have a fibrous capsule that separates the tumor from the surrounding tissues. However, there is no rule that all benign tumors should be encapsulated.

General Characteristics of Benign and Malignant Tumors

Developmental pattern:

- “**Infiltrative development**” is one of the most important features of malignant tumors.
- Infiltrative is a term used for referring to that “which infiltrates or spreads”.
- Malignant tumor cells are not encapsulated in their surroundings, they **infiltrate** into adjacent tissues and cells, either singly or in groups.

General Characteristics of Benign and Malignant Tumors

Developmental pattern:

- Non-neoplastic epithelial cells generally rest on a specialized extracellular structure called the *basement membrane*, to which they are firmly attached by hemidesmosomes.
- In **benign epithelial tumors**, the basement membrane usually remains **intact**, whereas **in malignant tumors** the neoplastic epithelial cells penetrate the basement membrane to invade surrounding tissue. This is called “**invasion**”.

INVASION

- There are three basic stages of malignant tumor cell **invasion** to the normal tissue.
 1. adhesion of tumor cells
 2. enzymatic degradation of local tissue barriers
 3. movement of tumor cells

General Characteristics of Benign and Malignant Tumors

Metastasis:

- The spread of tumor cells and establishment of secondary areas of growth is called *metastasis*; most **malignant cells** eventually acquire the ability to **metastasize**. Thus the major characteristics that differentiate malignant tumors from benign ones are their **invasiveness and spread**.

General Characteristics of Benign and Malignant Tumors

Recurrence:

- After the removal of the tumors by operation, *Recurrence* is a formation of new tumor in the same location and with the same characteristics as the the original (primary) *tumor*.

Features of Malignant Tumor Spread

- Local
- Metastasis

Features of Malignant Tumor Spread

Local Spread:

- It is the extend of primer tumor into the organ where it developed or adjacent tissues

Metastatic Spread:

- *Metastasis* is a pathogenic agent's (now it is malignant tumor cells) spread from an initial or primary site to a different or secondary site within the host's body

Metastasis

- The characteristic of malignant tumors
- All tumors that metastasize are malignant
- However, there is no rule that every malignant tumor must metastasize.
- Anaplastic and large tumors are more likely to metastasize.
- Factors such as stress, surgical interventions, anesthetic materials, and some treatments may increase the risk of metastasis.

Metastasis

In order for tumors to metastasize, tumor cells must successfully complete multiple steps. These steps can be summarized as follows:

1. The cell or cells must be able to must detach (=separate) from the main tumor mass.
2. Must be able to invade the local tissue (penetrate the basement membrane, and enter the ExtraCellularMatrix-ECM)
3. Entry into blood vascular or lymphatic vessels to create an embolism.
4. Embolic tumor cells should survive in circulation.
5. Embolic tumor cells sould make adhesion to basement membrane of vessel and extravasation
6. Must defend host defense in new site.
7. It should multiply and vascularize by local invasion

Metastasis

- Lymphogenic metastasis
(Retrograde lymphoid metastasis)
- Hematogenous metastasis
- Implantation metastasis
- Contact metastasis
- Ductal metastasis