# GENERAL PATHOLOGY

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**ONCOLOGY:**

Is the study of tumor or neoplasm.

**Dysplasia**:

Refers to the abnormal development of cells within tissues or organs. It can also lead to the formation of precancerous cells. Dysplasia can occur in any area of the body and can vary in degree of severity.

**Metaplasia**:

Is the conversion from one type of normal adult cell to another type of normal adult cell. The most common types of metaplasia observed by pathologists involve the conversion from squamous to glandular cells and vice versa.

**Neoplasia:**

Is the process of the formation of new tissue and it is literally meaning "new growth" and the new growth is called neoplasm.

**Neoplasm (tumor or tumour):**

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 cessation of the stimuli which evoked the change.

## Causes of neoplasia:

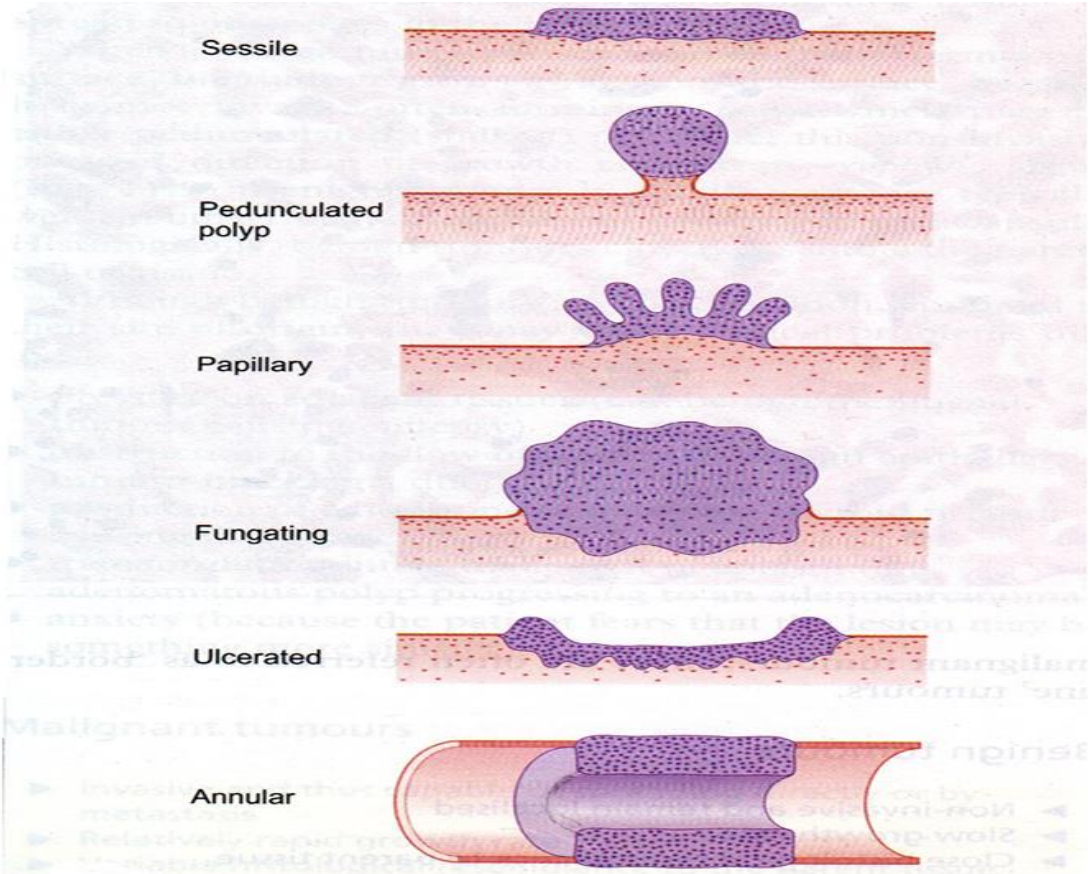
Recent advance in molecular biology have demonstrated that many tumors arise as a consequence of alteration in the genetic material of cells (e.g., mutation), where the cells escape permanently from normal growth regulatory mechanisms.

Tumors can result from the neoplastic transformation of any nucleated cell in the body, the transformed cells are called neoplastic cells.

Several factors are known to induce neoplastic transformation of cells including physical agents (e.g., irradiation), chemical agents (e.g., tar), some chronic diseases (e.g., ulcerative colitis) and certain viruses (e.g., HIV).

# 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.

# Structure of tumors:

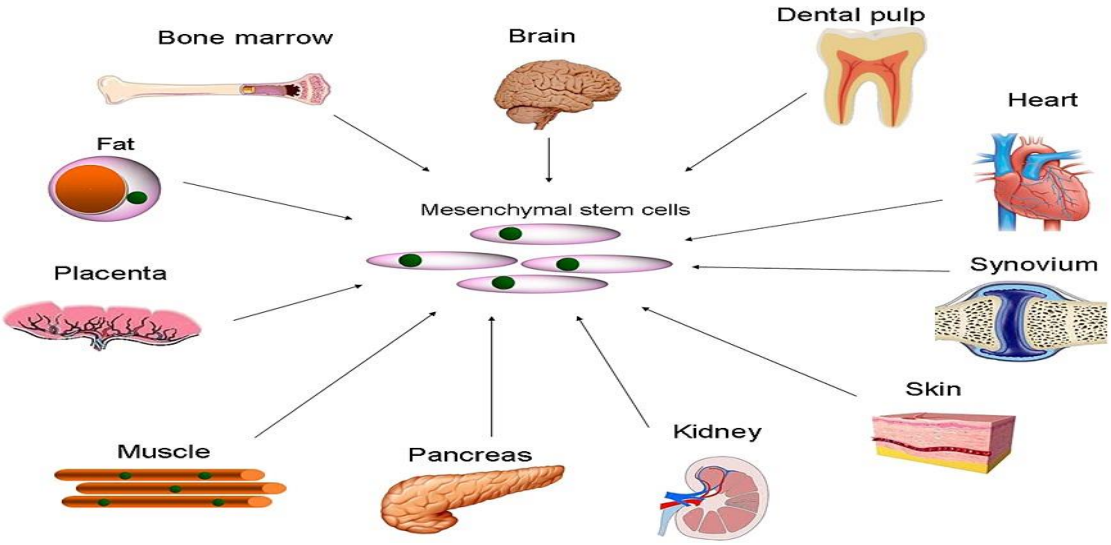
All tumors have two basic components:

1. Proliferating neoplastic cells that constitute their parenchyma.

2. Supportive stroma made up of connective tissue and blood vessels. Stroma provides mechanical support and nutrition to the parenchymal neoplastic cells.

Every tissue or organ in our body is composed of parenchymal cells (functional cells) and mesenchymal (supporting cells) contained within an

extracellular matrix to form a microenvironment, and these microenvironments collectively form our tissues and organs.




## Classification of tumors:

Tumors are classified according to:

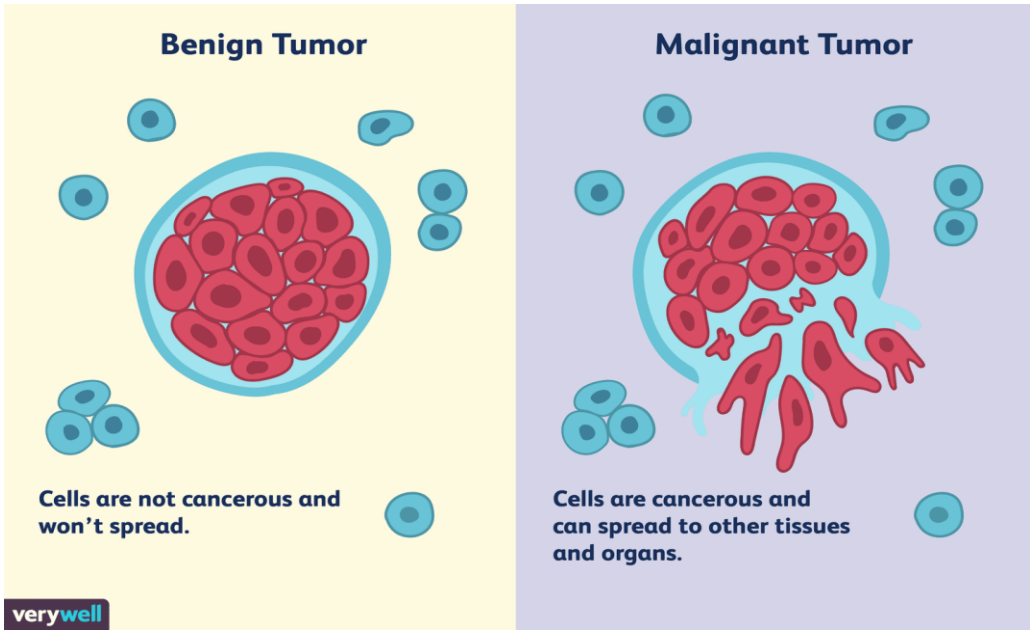
1. Behavior.

2. Histogenesis (cells of origin).

### Behavioral classification:

The behavioral classification divided tumors into:

- Benign
- Malignant.



# Grading and staging of tumors:

Grading is an attempt to assign a rough numerical value to the extent of histological division from normal.

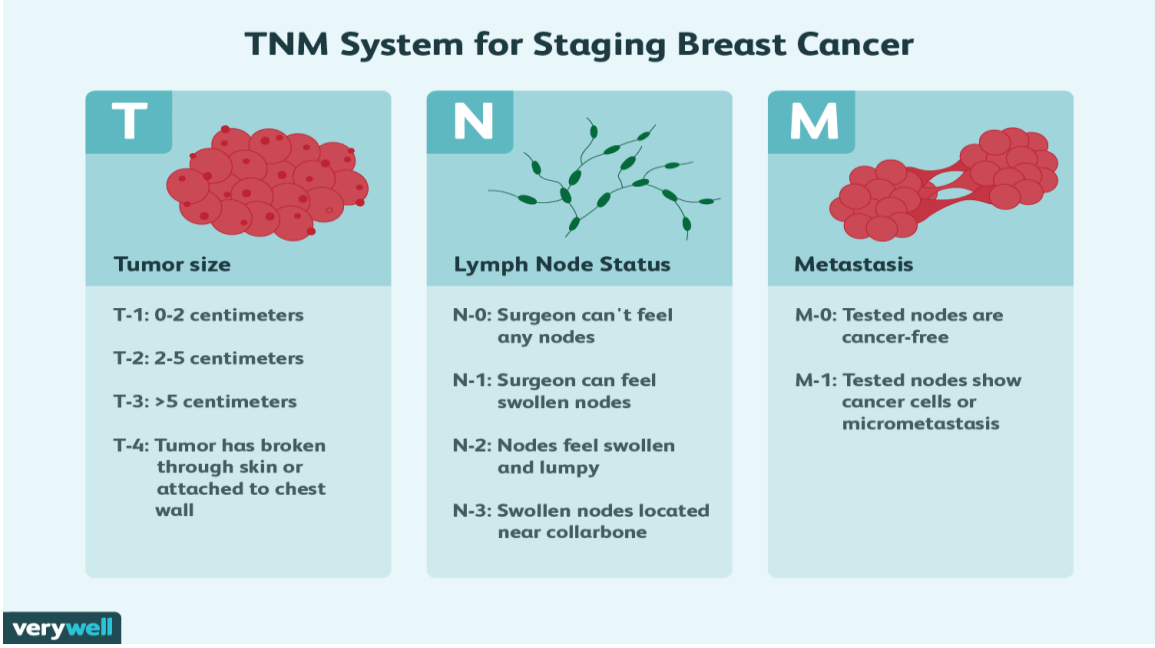
Malignant tumors are usually graded either as well, moderate, or poorly differentiated or numerically as grade 1, grade 2, grade 3.

Thus, a grade 1 tumor would show less cytological abnormality (aggressiveness) than a tumor of grade 3.

## Staging:

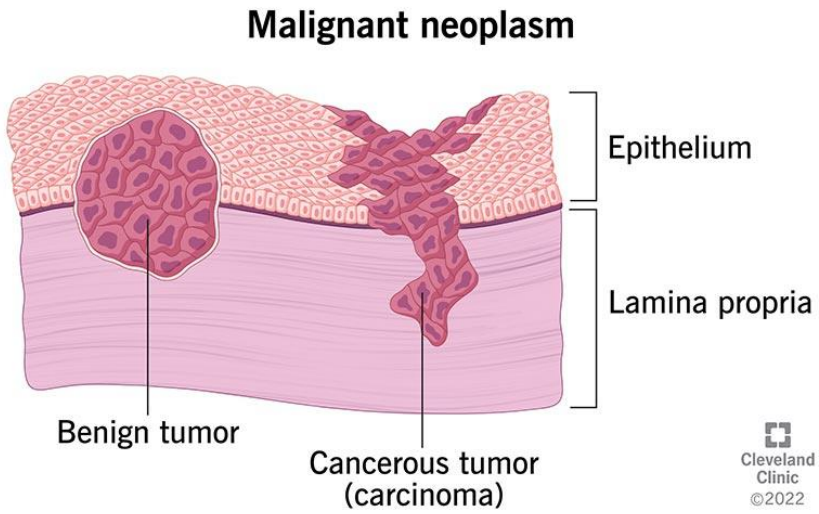
Is an exercise in which clinical and histological information is combined to describe the extent of tumor spread. The most widely applied staging system is (TNM) system.

In the TNM system, the overall stage is determined after the cancer is assigned a letter or number to describe the tumor (T), node (N), and metastasis (M) categories. T describes the original (primary) tumor. N tells whether the cancer has spread to the nearby lymph nodes.



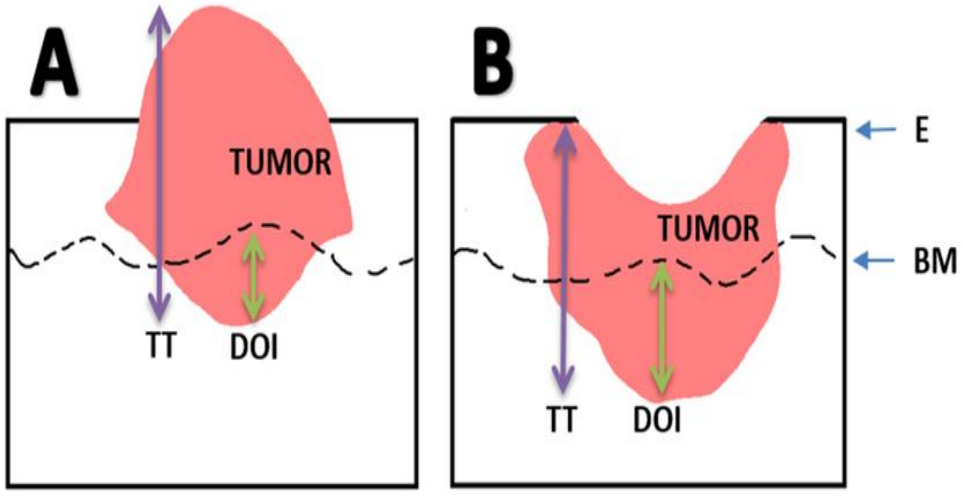

# Rate of growth:

Most of benign tumors grow slowly over a period of years, whereas most malignant tumors grow rapidly. The growth rate of tumors correlates with their level of differentiation, and thus most malignant tumors grow more rapidly than do benign tumors.




## Local invasion:

Nearly all benign tumors grow as cohesive expansile masses that remain localized to their site of origin and don't have the ability to infiltrate, invade, or metastasize to distant sites, because they grow and expand slowly, they usually develop a rim of compressed connective tissue called fibrous capsule. Malignant tumors grow by local infiltration destroying the adjacent tissues through which they invade.




## Metastasis:

Metastases are tumor implants discontinuous with the primary tumor. Metastasis marks a tumor as malignant because benign neoplasms do not metastasis. The invasiveness of malignant tumors permits them to

penetrate into blood vessels, lymphatics, and body cavities, providing the opportunity for spread.

# Pathways of spread:

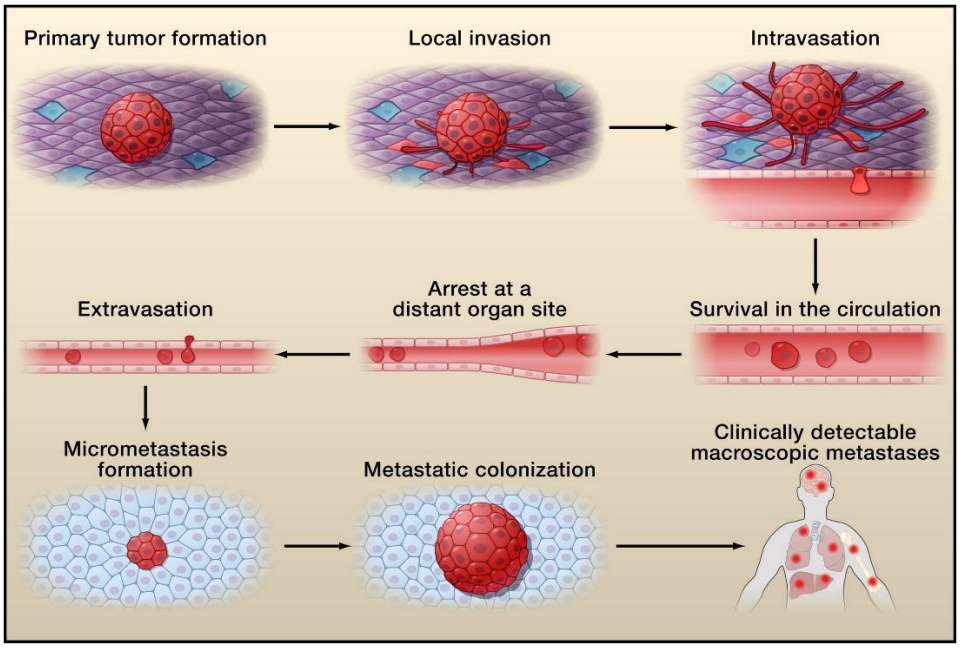
Through one of three pathways

1. Direct seeding of body cavities or surfaces

2. Lymphatic spread.

3. Hematogenous spread.

4. Through nerve tissues.




# Necrosis:

Malignant tumors often show central necrosis because of defective vascular perfusion.

## Histogenetic classification:

Histogenetic classification includes numerous subdivisions, but the major categories of origin are:

- From epithelial cells.
- From connective tissues.
- From lymphoid and haemopoietic organs.

## Nomenclature of tumors:

Tumor nomenclature usually has a histogenetic and behavioral component.

The histogenetic component gives information about the type of the cell from which the tumor has arisen, or at any rate the predominant cell type of which it is presently constituted.

The behavioral component tells whether the tumor is benign or malignant.

## Nomenclature of benign tumors:

1. Benign tumors of mesenchymal cells:

These are designated by attaching the suffix "-oma" to the cell of origin:

Fibroblastic cells

Fibroma

Osteoblasts Osteoma

2. Benign epithelial tumors are either:

- Papilloma's
- Adenomas

Papilloma is a benign tumor of non-glandular or non-secretory epithelium e.g., squamous cell papilloma is the benign tumor of stratified squamous epithelium.

Adenoma is a benign tumor of the glandular or secretory epithelium.

Carcinoma in situ:

The term carcinoma in situ refers to an epithelial neoplasm exhibiting all the cellular features with malignancy, but which has not yet invaded through the epithelial basement membrane. Carcinoma in situ may be preceded by a phase of dysplasia. Recently the term intraepithelial neoplasia is used to embrace both carcinoma in situ and the precursor dysplastic lesions.

## Nomenclature of malignant tumors:

The nomenclature of the malignant tumors follows the same schema used for benign neoplasms, with certain additions:

1. Malignant tumors arising in mesenchymal tissues usually called sarcoma. They have little connective tissue stroma and are so fleshy e.g., fibrosarcoma, liposarcoma, leiomyosarcoma.

2. Malignant tumors of epithelial cell origin, derived from any three germ layers are called carcinoma. Those with a glandular growth pattern microscopically are termed as adenocarcinoma.

There is an exception to the rules of nomenclature, for example, the word melanoma represents malignant tumor of melanocytes, lymphoma represents malignant tumor of lymphoid cells, myeloma represents malignant tumor of plasma cells.

Malignant tumors in solid organs tend to be poorly circumscribed, sometimes throwing out strands of neoplastic tissue into the adjacent normal structure; It is from the resemblance of the cut surface of these lesions to a crab (Latin: cancer) that the disease gets its popular name.

### Eponymously named tumors:

Some tumors have inherited the name of the person who first described the lesion;

- Burkitt's lymphoma: a B-cell lymphoma.
- Ewing's sarcoma: a malignant tumor of bone.
- Kaposi's sarcoma: a malignant tumor derived from vascular endothelium, commonly associated with AIDS.

### Miscellaneous tumors:

Most of the tumors can be categorized according to the scheme of nomenclature described. There are, however, important exceptions:

### Teratoma:

It is a neoplasm formed of cells representing all the three germ cell layers (ectoderm, mesoderm and endoderm). They occur most often in the gonads. The tumor may contain teeth, hair, and cartilage.

## Mixed tumors:

Mixed tumors show characteristic combination of cell types (epithelial and mesenchymal cells).

**Hamartomas:** is a tumor like lesion. They are always benign and usually consists of two or more mature cell types normally found in the organ in which the lesion arises.

# Clinical effects of tumors:

Tumors can produce a wide range of clinical effects, and these are important partly because their recognition leads to diagnosis and treatment.

### Benign tumors:

Although benign tumors are confined to their site of origin, they may cause clinical problems due to:

1. Pressure on the adjacent tissues (e.g., benign meningeal tumor causing epilepsy)

2. Obstruction to the flow of fluid (e.g. benign epithelial tumor blocking a duct)

3. Production of hormone (e.g., benign thyroid tumor causing thyrotoxicosis).

4. Transformation into malignant neoplasm (e.g., adenomatous polyp progressing to an adenocarcinoma).

5. Anxiety (because the patient fears that the lesion may be sometimes more sinister).

### Malignant tumors:

The considerable morbidity and mortality associated with malignant tumors may be due to:

1. Pressure on and destruction of adjacent tissue.

2. Formation of secondary tumors (metastasis).

3. Blood loss from ulcerated surfaces>

4. Obstructions of flow (e.g., malignant tumors of the colon causing intestinal obstruction).

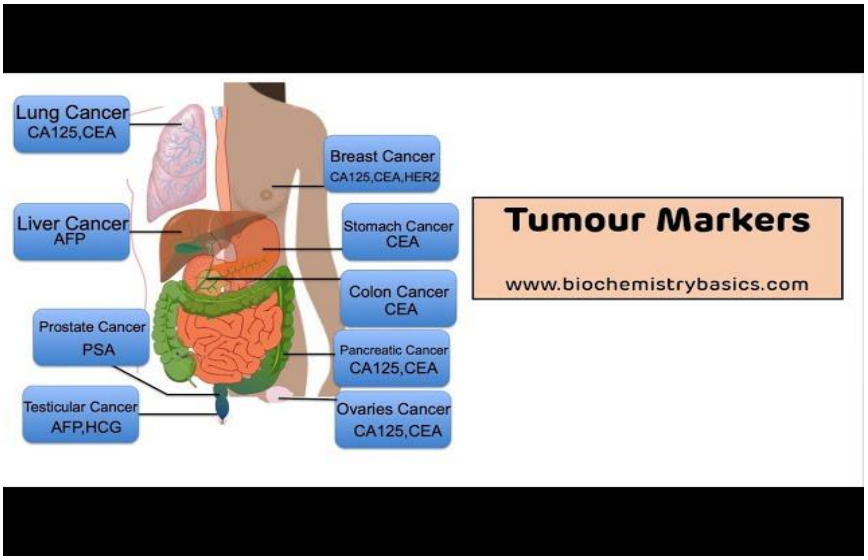
5. Production of hormone (e.g., ACTH and ADH from some lung tumors).

6. Weight loss, debility and fever.

7. Anxiety and pain.

## Tumor markers:

Tumor cells frequently synthesized molecules, which would be relatively unusual in the normal tissue. These molecules result from the expression of genes, which are silent in the majority of cells in the adult tissues. Tumor markers are products of malignant neoplasms that can be detected in the cells themselves or in body fluids. Examples of tumor markers: Carcinoembryonic antigen, alpha-fetoprotein, prostate specific antigen, vimentin. These markers are useful in the diagnosis and treatment of tumors.



| Nomenclature of epithelial tumors | | |
|---|---|---|
| **Tissue of origin** | **Benign** | **Malignant** |
| Epithelium: | Papilloma, Adenoma | Carcinoma |
| Squamous- | Squamous cell papilloma | Squamous cell carcinoma |
| Transitional- | Transitional cell papilloma | Transitional cell carcinoma |
| Glandular: | Adenoma | Adenocarcinoma |
| Thyroid- | Thyroid adenoma | Thyroid adenocarcinoma |
| Kidney- | Renal adenoma | Renal adenocarcinoma |
| Liver- | Hepatic adenoma | Hepatic adenocarcinoma |

| Nomenclature of connective tissue (mesenchymal) tumors | | |
|---|---|---|
| **Tissue of origin** | **Benign** | **Malignant** |
| Fibrous | Fibroma | Fibrosarcoma |
| Bone | Osteoma | Osteosarcoma |
| Cartilage | Chondroma | Chondrosarcoma |
| Adipose | Lipoma | Liposarcoma |
| Smooth muscle | Leiomyoma | Leiomyosarcoma |
| Skeletal muscle | Rhabdomyoma | Rhabdomyosarcoma |
| Blood vessel | Hemangioma | Hemangiosarcoma |