CLASSIFICATION OF TUMORS

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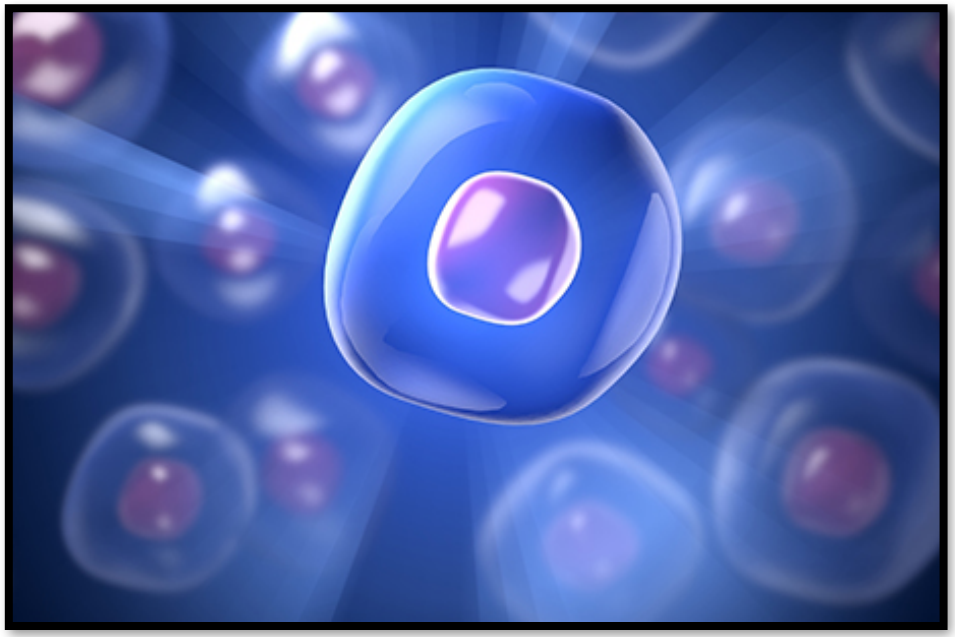
Objectives

- Definitions: neoplasm, tumor, oncology.
- Classification of tumors into benign and malignant.
- Nomenclature of tumors.
- Characteristics of benign and malignant tumors.
- Definitions: teratoma, hamartoma, choristoma.

Definitions

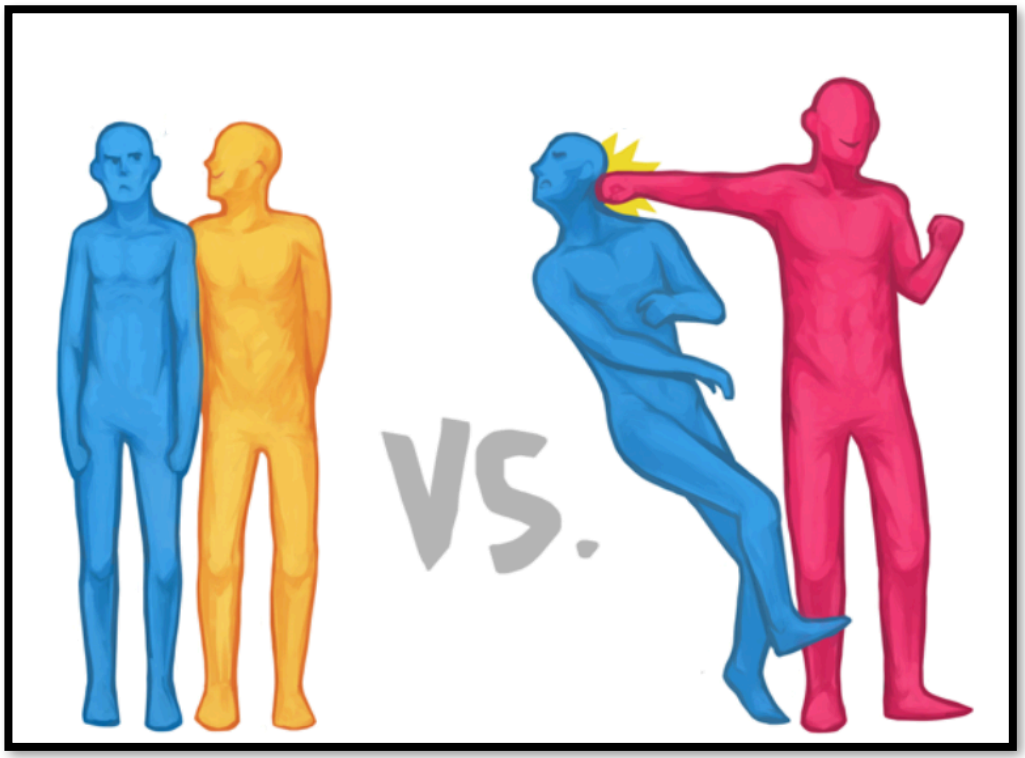
- *Neoplasia*: literally means “new growth.”

- A neoplasm often is referred to as a *tumor,* and the study of tumors is called *oncology* (from *oncos,* “tumor,” and *logos,* “study of”).



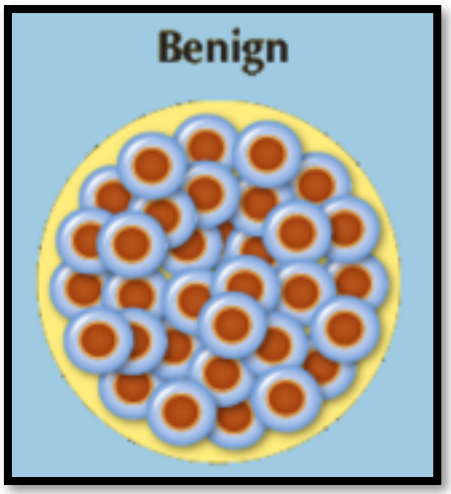
Classification of Tumors

- The division of neoplasms into benign and malignant categories is based on their potential clinical behavior.



Classification of Tumors

- Benign: the microscopic and gross characteristics of the lesion are considered to be relatively innocent.
  - Tumors remain localized.
  - Tumors are amenable to local surgical removal.
  - Patients generally survive.



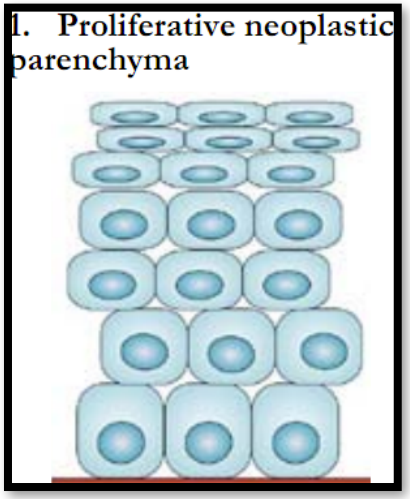
Classification of Tumors

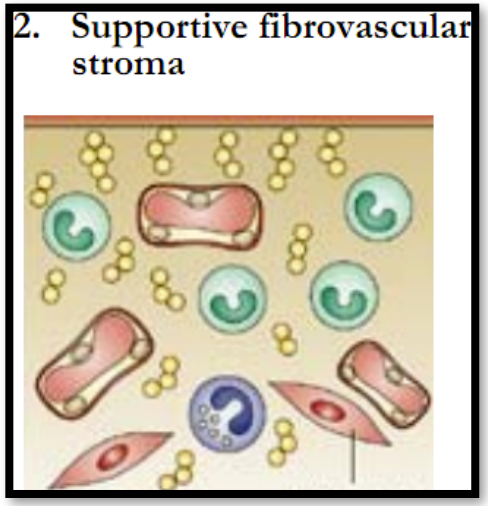
- Malignant: lesions can invade and destroy adjacent structures and spread to distant sites (metastasize) to cause death.

Classification of Tumors

- All tumors, benign and malignant, have two basic components:

1. The *parenchyma,* made up of transformed or neoplastic cells.
2. The supporting, host-derived, non-neoplastic *stroma,* made up of connective tissue, blood vessels, and host-derived inflammatory cells.





Classification of Tumors

- The nomenclature of tumors and their biologic behavior are based primarily on the parenchymal component.

- However, the growth and evolution of tumors is critically dependent on their stroma as an adequate stromal blood supply is a requisite for the tumor cells to live and divide.

Nomenclature of Tumors - Benign

- Benign tumors are designated by attaching the suffix *-oma* to the cell type from which the tumor arises.

- The nomenclature of mesenchymal tumors usually apply this rule e.g.

  - Fibroma: a benign tumor arising in fibrous tissue.
  - Chondroma: a benign tumor arising in cartilaginous tissue.
  - Osteoma: a benign tumor arising in bone tissue.

Nomenclature of Tumors - Benign

- The nomenclature of benign epithelial tumors is more complex: cell of origin, microscopic pattern or macroscopic appearance.

- *Adenoma* is generally applied to benign epithelial neoplasms producing gland patterns and to neoplasms derived from glands but not necessarily exhibiting glandular patterns.

Nomenclature of Tumors - Benign

- Benign epithelial neoplasms producing microscopically or macroscopically visible finger-like or warty projections from epithelial surfaces are referred to as *papillomas*.

Nomenclature of Tumors - Benign

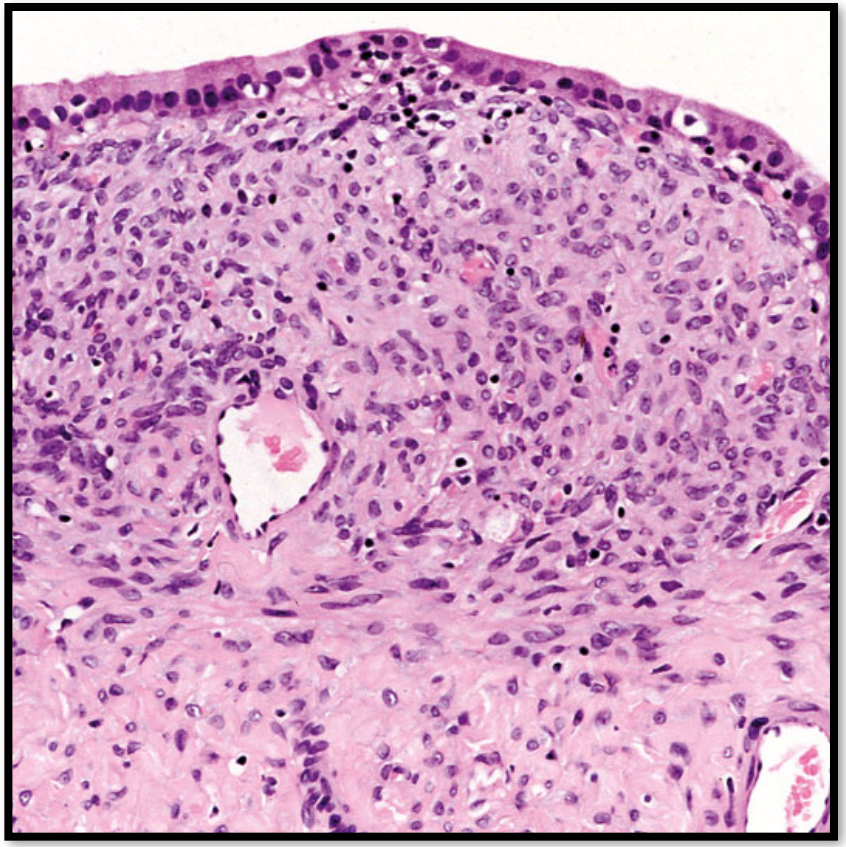
- Benign epithelial neoplasms forming large cystic masses, as in the ovary, are referred to as *cystadenomas*.

- Some of the latter produce papillary patterns that protrude into cystic spaces and are called *papillary cystadenomas*.

Nomenclature of Tumors - Benign

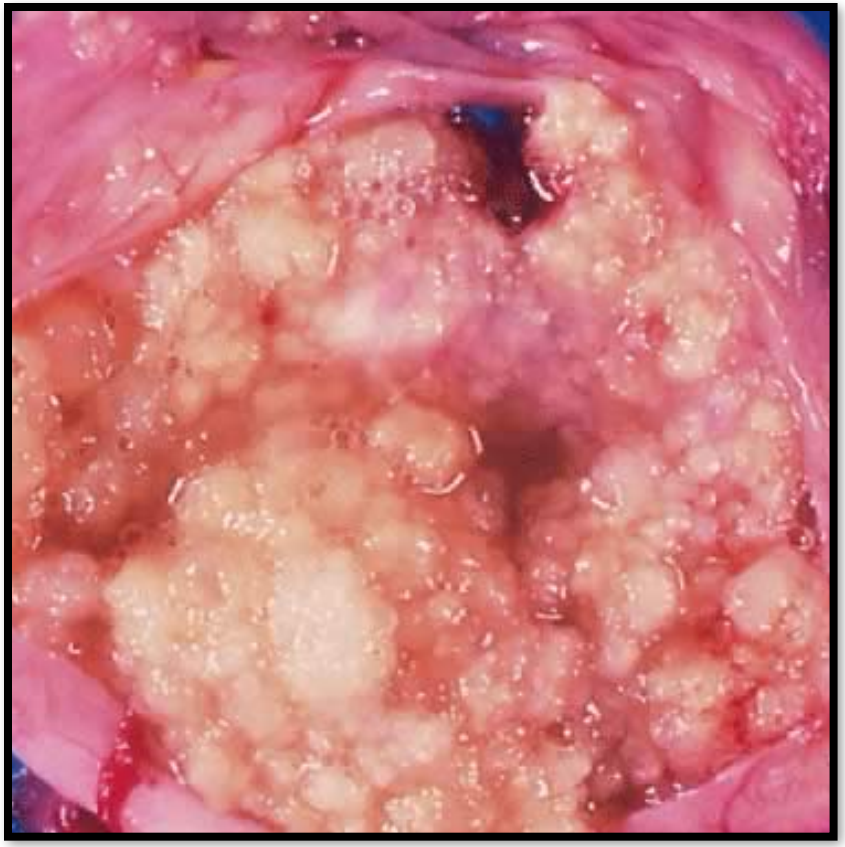
Cystadenoma – Macroscopically

Cystadenoma – Microscopically

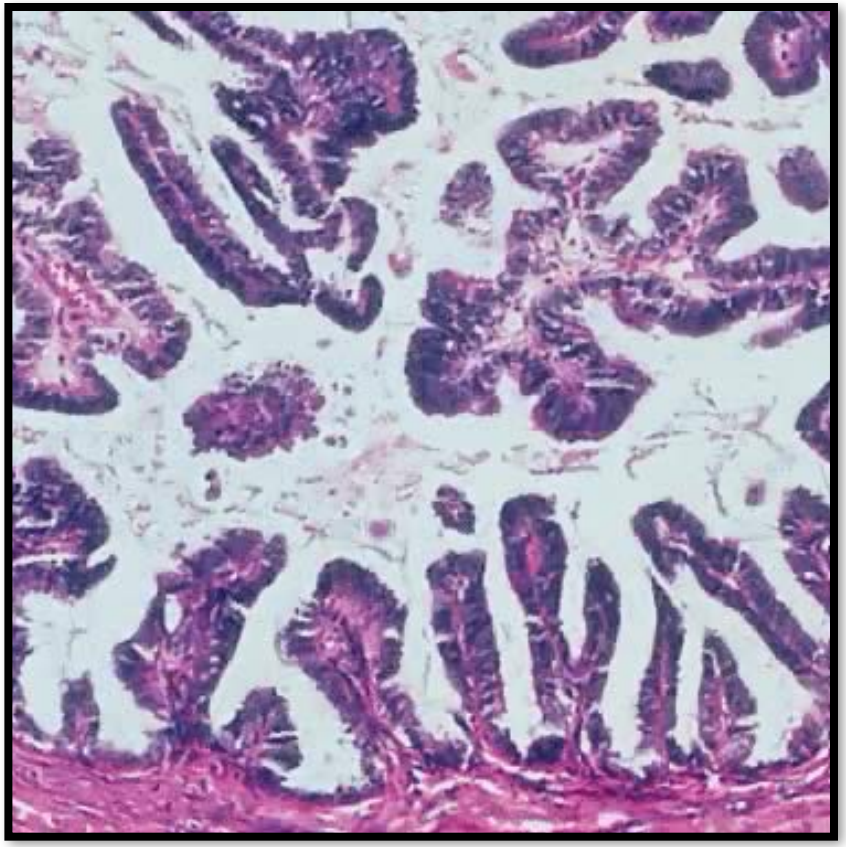


Nomenclature of Tumors - Benign

Papillary cystadenoma – Macroscopically

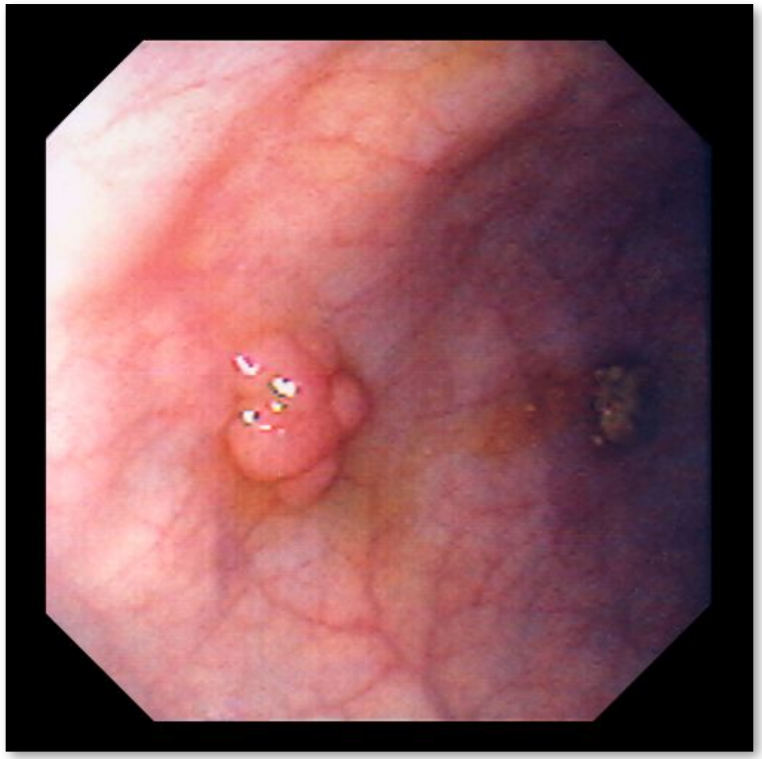


Papillary cystadenoma – Microscopically



Nomenclature of Tumors - Benign

- A *polyp* is a mass that projects above a mucosal surface, as in the gut, to form a macroscopically visible structure.



Nomenclature of Tumors - Malignant

- Malignant neoplasms arising in mesenchymal tissues are called *sarcomas*.
  - Fibrosarcoma: a malignant tumor arising in fibrous tissue.
  - Chondrosarcoma: a malignant tumor arising in cartilaginous tissue.
  - Osteosarcoma: a malignant tumor arising in bone tissue.

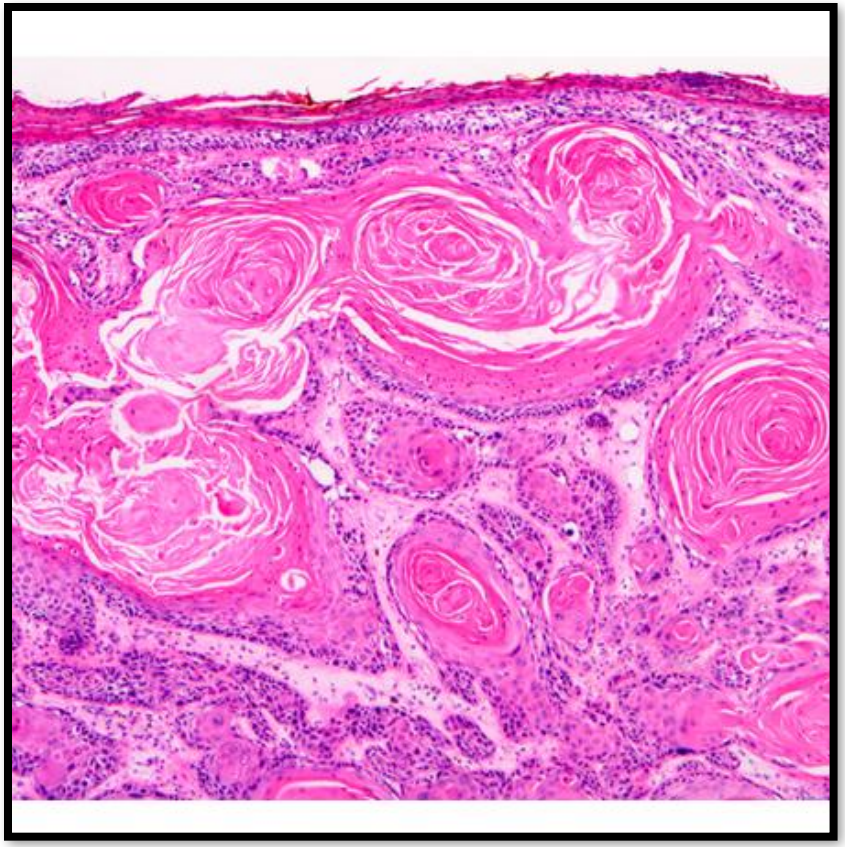
Nomenclature of Tumors - Malignant

- Malignant neoplasms arising from epithelial cells are called *carcinomas*.

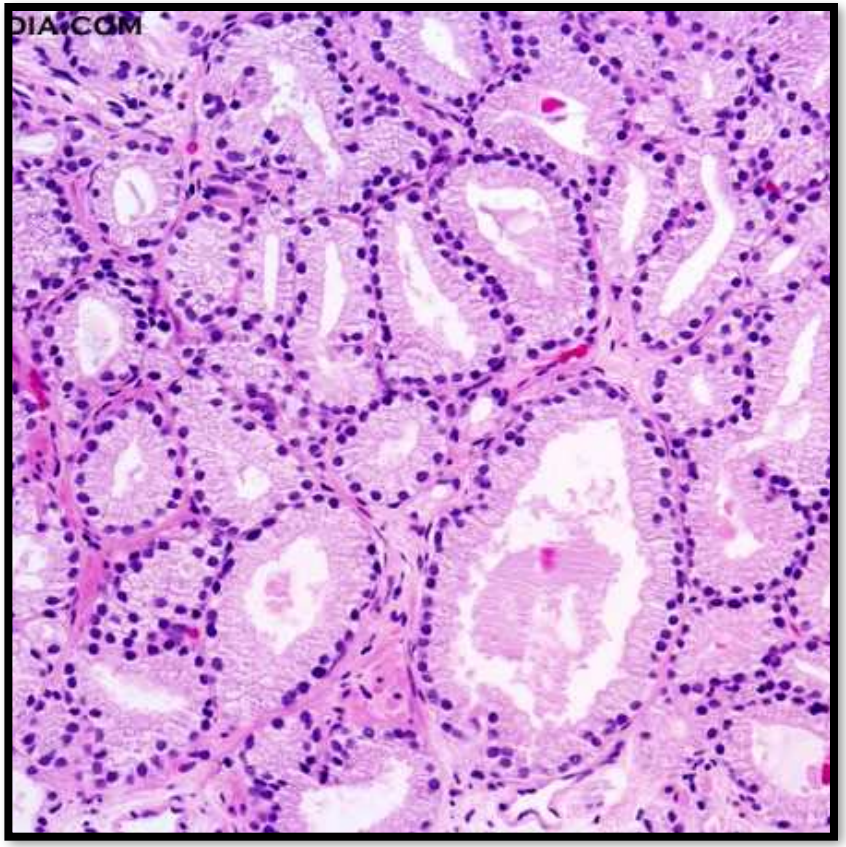
- Carcinomas include:
  - Carcinomas that arise from glandular epithelial cells (with or without forming glands): *adenocarcinomas*
  - Carcinomas that arise from squamous cells (some producing keratin): *squamous cell carcinomas*.
  - Carcinomas that show little or no differentiation: *poorly differentiated or undifferentiated carcinoma.*

Nomenclature of Tumors - Malignant

Squamous cell carcinoma

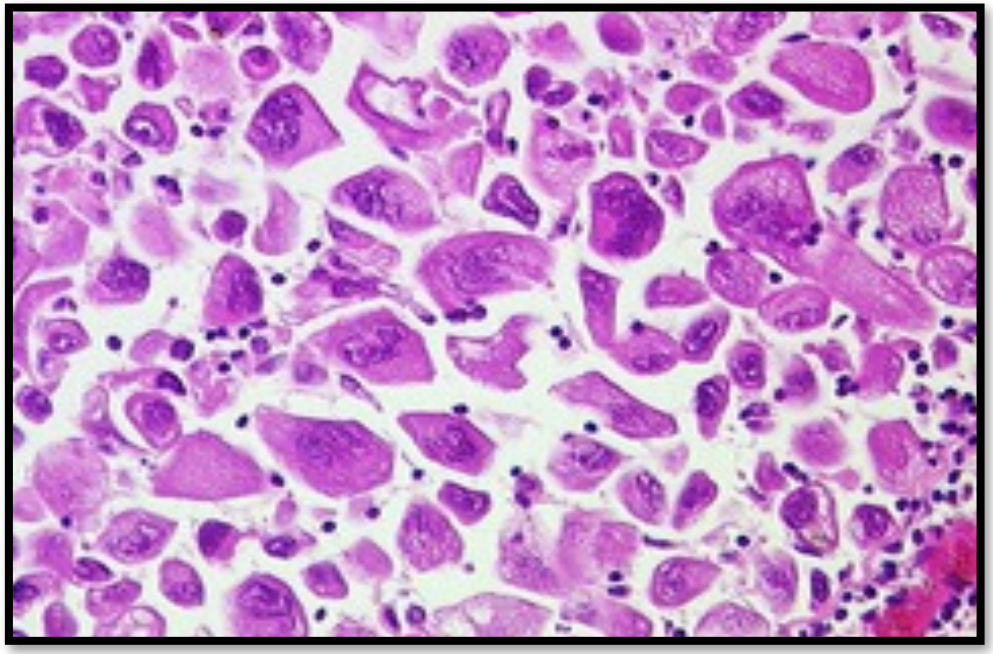


Adenocarcinoma



Nomenclature of Tumors

- Not infrequently, however, a cancer is composed of undifferentiated cells of unknown tissue origin, and must be designated merely as an *undifferentiated malignant tumor.*



Nomenclature of Tumors

- The transformed cells in a neoplasm, whether benign or malignant, often resemble each other, as though all had been derived from a single progenitor, consistent with the monoclonal origin of tumors.

- In some unusual instances, however, *divergent differentiation* of a single neoplastic clone along two lineages occurs, creating the so-called *mixed tumors*.

Nomenclature of Tumors

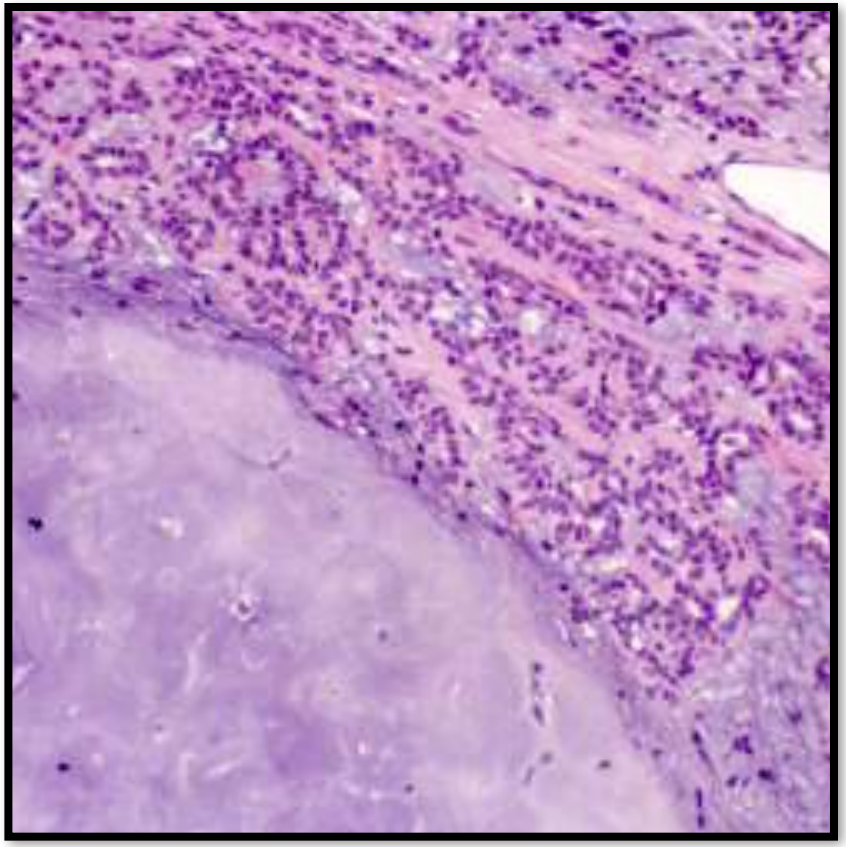
- The best example is the mixed tumor of the salivary gland. These tumors have obvious epithelial components dispersed throughout a fibromyxoid stroma, sometimes harboring islands of cartilage or bone.

- All of these diverse elements are thought to derive from a single clone capable of giving rise to epithelial cells or myoepithelial cells, or both, and the preferred designation for these neoplasms is *pleomorphic adenoma*.

Pleomorphic Adenoma

Macroscopically

Microscopically



Nomenclature of Tumors

- Some glaring inconsistencies may be noted. For example, the terms *lymphoma, mesothelioma, melanoma,* and *seminoma* are used for malignant neoplasms.

Teratoma

- *Teratoma* is a special type of mixed tumor that contains recognizable mature or immature cells or tissues representative of more than one germ cell layer and sometimes all three.

- Teratoma originates from *totipotential* cells such as those normally present in the ovary and testis and sometimes abnormally present in sequestered *midline embryonic rests.* Such cells have the capacity to differentiate into any cell type found in the adult body.

Teratoma

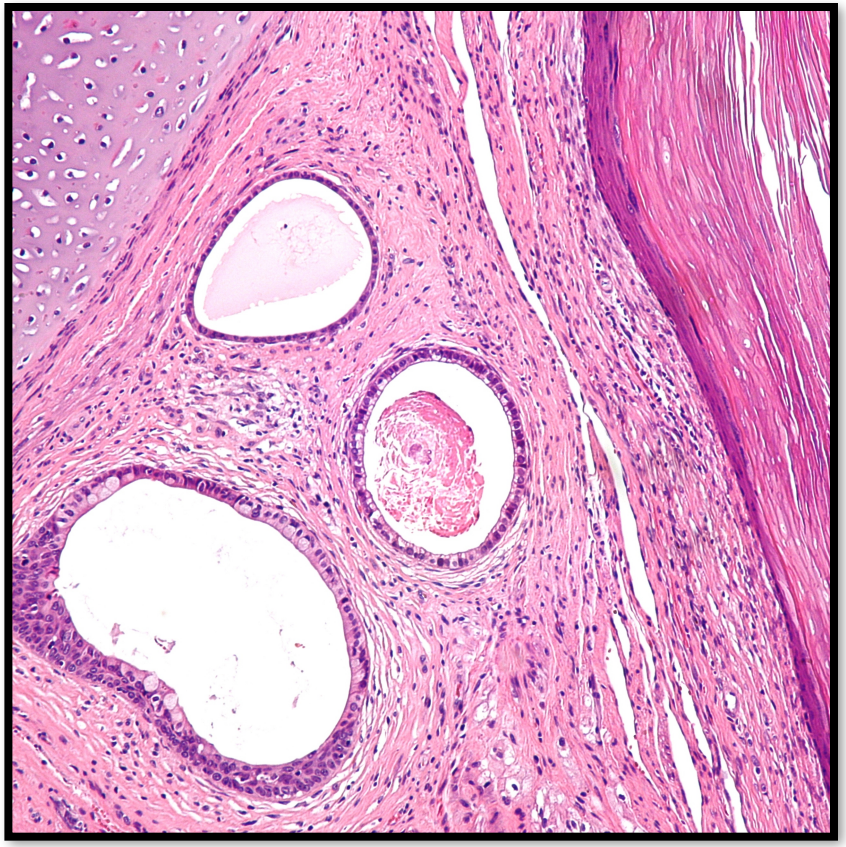
- When all the components within the teratoma are well differentiated, it is a *benign (mature) teratoma.*

- However, when they are less differentiated, it is an immature, potentially or overtly, *malignant teratoma.*

Teratoma

Macroscopically

Microscopically



Hamartoma

- *Hamartoma* is a mass of disorganized benign-looking tissue indigenous to the particular site.
- For example, *pulmonary chondroid hamartoma,* which contains islands of disorganized, but histologically normal cartilage, bronchi, and vessels.
- Hamartomas have traditionally been considered developmental malformations, but some genetic studies have shown the presence of acquired translocations, suggesting a neoplastic origin.

Choristoma

- *Choristoma* is a congenital anomaly consisting of a heterotopic rest of cells.
- For example, a small nodule of well-developed and normally organized pancreatic tissue may be found in the submucosa of the stomach, duodenum, or small intestine.
- Choristoma has usual trivial significance.

Summary

- Although the terminology of neoplasms is regrettably not simple, a firm grasp of the nomenclature is important because it is the language by which the nature and significance of tumors are categorized.

Summary

Tissue of Origin	Benign	Malignant
Composed of One Parenchymal Cell Type		
Connective tissue and derivatives	Fibroma	Fibrosarcoma
	Lipoma	Liposarcoma
	Chondroma	Chondrosarcoma
	Osteoma	Osteogenic sarcoma
Endothelial and related tissues		
Blood vessels	Hemangioma	Angiosarcoma
Lymph vessels	Lymphangioma	Lymphangiosarcoma
Mesothelium		Mesothelioma
Brain coverings	Meningioma	Invasive meningioma
Blood cells and related cells		
Hematopoietic cells		Leukemias
Lymphoid tissue		Lymphomas

Summary

Tissue of Origin	Benign	Malignant
Muscle		
Smooth	Leiomyoma	Leiomyosarcoma
Striated	Rhabdomyoma	Rhabdomyosarcoma
Tumors of epithelial origin		
Stratified squamous	Squamous cell papilloma	Squamous cell or epidermoid carcinoma
Basal cells of skin or adnexa		Basal cell carcinoma
Epithelial lining of glands or ducts	Adenoma	Adenocarcinoma
	Papilloma	Papillary carcinomas
	Cystadenoma	Cystadenocarcinoma
Respiratory passages	Bronchial adenoma	Bronchogenic carcinoma
Renal epithelium	Renal tubular adenoma	Renal cell carcinoma
Liver cells	Liver cell adenoma	Hepatocellular carcinoma
Urinary tract epithelium (transitional)	Urothelial papilloma	Urothelial carcinoma
Placental epithelium	Hydatidiform mole	Choriocarcinoma
Testicular epithelium (germ cells)		Seminoma
		Embryonal carcinoma

Summary

Tissue of Origin	Benign	Malignant
Tumors of melanocytes	Nevus	Malignant melanoma
More Than One Neoplastic Cell Type—Mixed Tumors, Usually Derived from One Germ Cell Layer		
Salivary glands	Pleomorphic adenoma (mixed tumor of salivary gland)	Malignant mixed tumor of salivary gland
Renal anlage		Wilms tumor
More Than One Neoplastic Cell Type Derived from More Than One Germ Cell Layer—Teratogenous		
Totipotential cells in gonads or in embryonic rests	Mature teratoma, dermoid cyst	Immature teratoma, teratocarcinoma

Reference

- Kumar V, Abbas AK, Aster JC. Robbins Basic Pathology. 10th ed. Elsevier; 2018. Philadelphia, PA.

END OF LECTURE

Thank You