

Classification of Tumors

Objectives:

- Define neoplasm, **tumor and Oncology**. Contrast neoplastic growth with hyperplasia, metaplasia, and dysplasia.
- Classification of Tumors into benign and malignant
- Know the basic principles of the nomenclature of **benign and malignant processes**
- **Characteristic of benign and malignant tumors**
- Define and use in the proper context: Adenoma, Papilloma, Polyp, Cystadenoma, Carcinoma, Adenocarcinoma, Sarcoma, Teratoma, **Blastoma**, Hamartoma, and **Choristoma**.

Color Index:

Slides

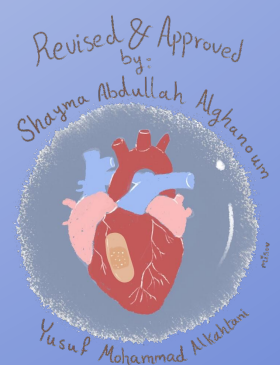
Important

Male's slides only

Female's slides only

Notes

Extra information



Neoplasia

Definition

Oncology:
The study of tumor

Neoplasia:
New growth

Neoplasm:
Tumor

Tumor:
Swelling

- Is abnormal mass of tissue;

Different from hyperplasia, metaplasia and dysplasia.

- The growth of which is uncoordinated with that of normal tissue,

Persist in the same excessive manner after the cessation of the stimulus which evoked change.

- Loss of responsiveness to normal growth.

- Cancer is one of the leading causes of death worldwide.
- Emotional and physical suffering by the patient.
- Different mortality rate:
 - Some are curable
 - Others are fatal

Neoplasia

★ Based on the biological behavior:

- Benign and malignant:

★ Based on the cell of origin:

- One neoplastic cell type: lipoma, adenocarcinoma
- More than one neoplastic cell type: fibroadenoma
- More than one neoplastic cell type derived from more than one germ-cell layer: teratoma
- Derived from embryonic tissue: blastoma (could be benign e.g. osteoblastoma, or malignant e.g. neuroblastoma)

Classification of Tumors

Based in their potential^{*}
clinical behavior

^{*}How it's expected to act

Tumor

Benign

- Will remain localized (don't metastasize).
- Cannot spread to distant sites.
- Generally can be locally excised/surgical removal.
- Patient generally survives.
- non-lethal.

Malignant

- Lesions can invade and destroy adjacent structure.
- Can spread to distant site (metastasize)
- Cause death (if not treated)

Tumors basic components

Stroma

^{*}هي الـ Background الـ Framework، هي البيئة اللي عايش فيها الورم.

- Made up of non-neoplastic, host-derived connective tissue and blood vessels. And host-derived inflammatory cells. - Carries the blood supply. Provides support for the growth of the parenchyma.
- The growth and evolution of Tumors is critically dependent on their stroma as an adequate stromal blood supply is requisite for the tumor cells to live and divide.

Parenchyma

^{*}هي الـ Neoplastics نفسها، هي اللي تعطي الـ Behaviour.

- Made up of transformed neoplastic cells.
- Determines the biological behavior of the tumor From which the tumor derives its name.
- The nomenclature of Tumors and their biologic behavior are based primarily on the parenchymal component.

Nomenclature Benign tumor

Benign tumors:

- Prefix + suffix
- Type of cell + (-oma)

Examples

1. Benign tumor arising in fibrous tissue:

Fibro + oma = Fibroma

2. Benign tumor arising in fatty tissue:

Lipo + oma = lipoma

3. Benign tumor arising in cartilage

chondro + oma = chondroma

4. Benign tumor arising in smooth muscle

Leiomyo + oma = leiomyoma

5. Benign tumor arising in skeletal muscle

Rhabdomyo + oma = rhabdomyoma

Epithelial benign tumors

are classified on the basis of:

- The cell of origin
- Microscopic pattern
- Macroscopic pattern

★ Adenoma:

- ★ benign epithelial neoplasms producing gland pattern...OR ... derived from glands but not necessarily exhibiting gland pattern.

Examples:

1. Respiratory airways:

Bronchial adenoma

2. Renal epithelium:

Renal tubular adenoma

3. Liver cell:

Liver cell adenoma

★ Papiloma:

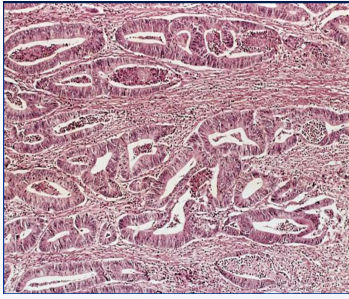
- ★ Benign epithelial neoplasms growing on any surface that produce microscopic or macroscopic finger-like pattern.

Example:

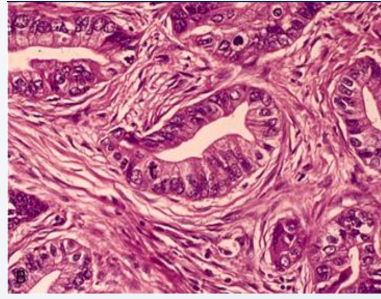
- Squamous epithelium:
squamous papilloma

- Transitional Ep. :
Transitional papilloma
(Urinary bladder)

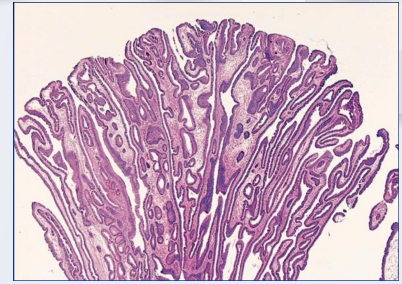
Pictures (male's slides)



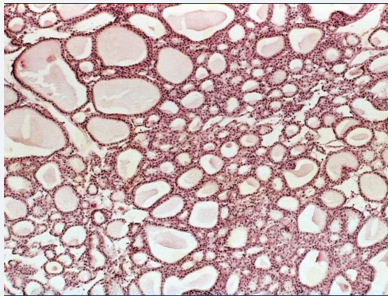
Parenchyma



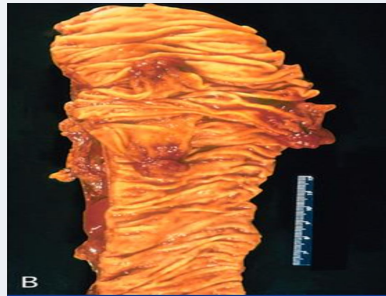
stroma



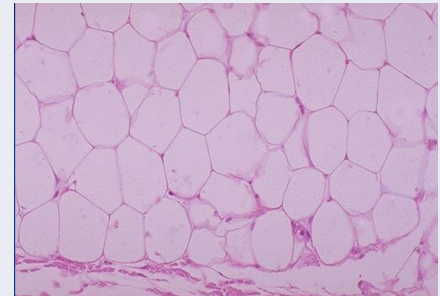
Papilloma



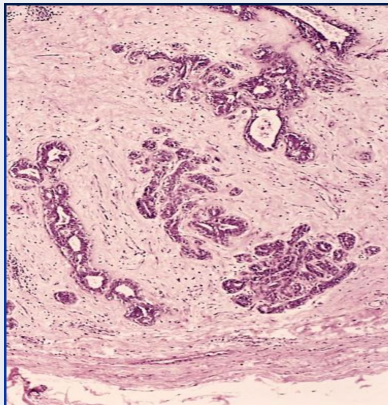
Adenoma



polyp



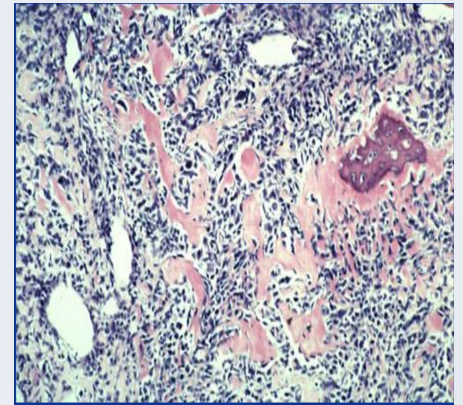
lipoma



fibroma



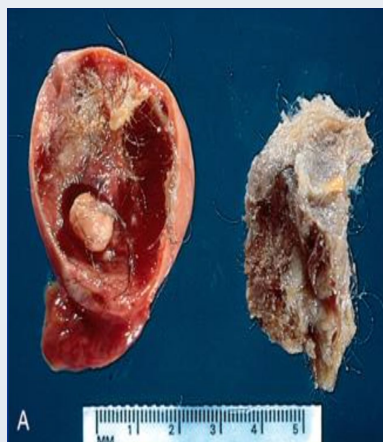
Osteosarcoma



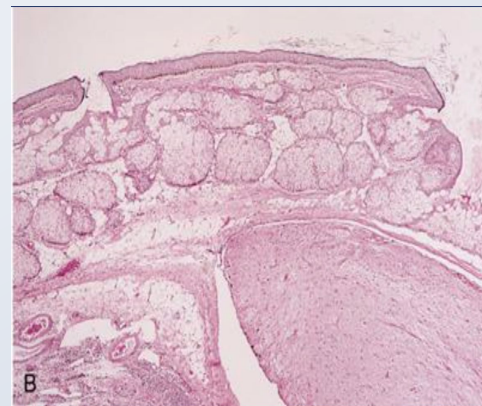
Osteosarcoma



Papillary
Cystadenocarcinoma
of the Ovary



Teratoma



Teratoma

Tumors

Epithelial

Mesenchymal

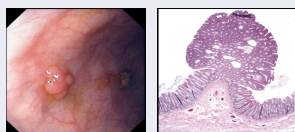
Benign

Malignant

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

Polyp*

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

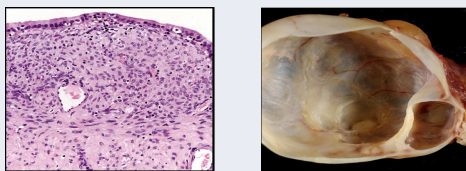


E.g. [Nasal polyp](#): an Inflammatory polyp (not a neoplasm).

[Colonic polyp](#): benign tumor.

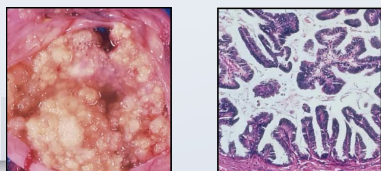
Cystadenomas

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



Papillary cystadenomas

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



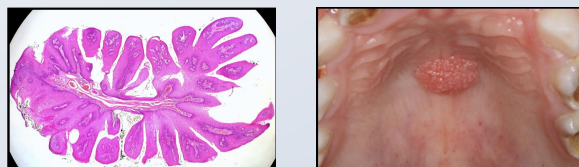
Adenoma

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

E.g. colon isn't a gland but exhibits glandular patterns under the microscope

Papillomas

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



Tumors

Epithelial

mesenchymal

Benign

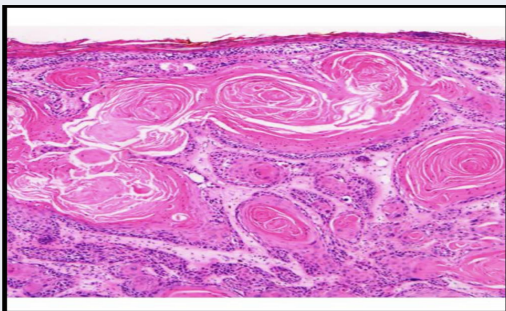
Malignant

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

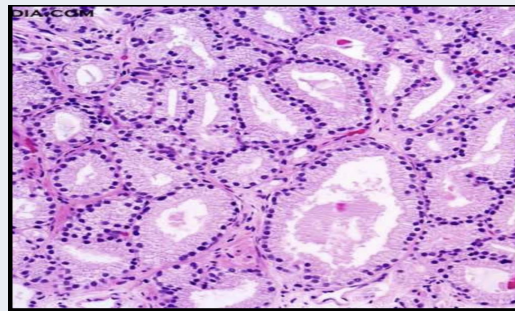
Carcinomas include:

- 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**.

E.g.: 1. Renal cell adenocarcinoma
2. cholangiocarcinoma

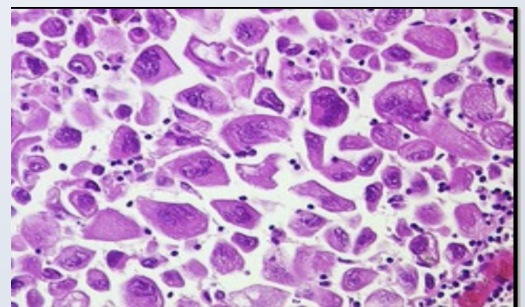


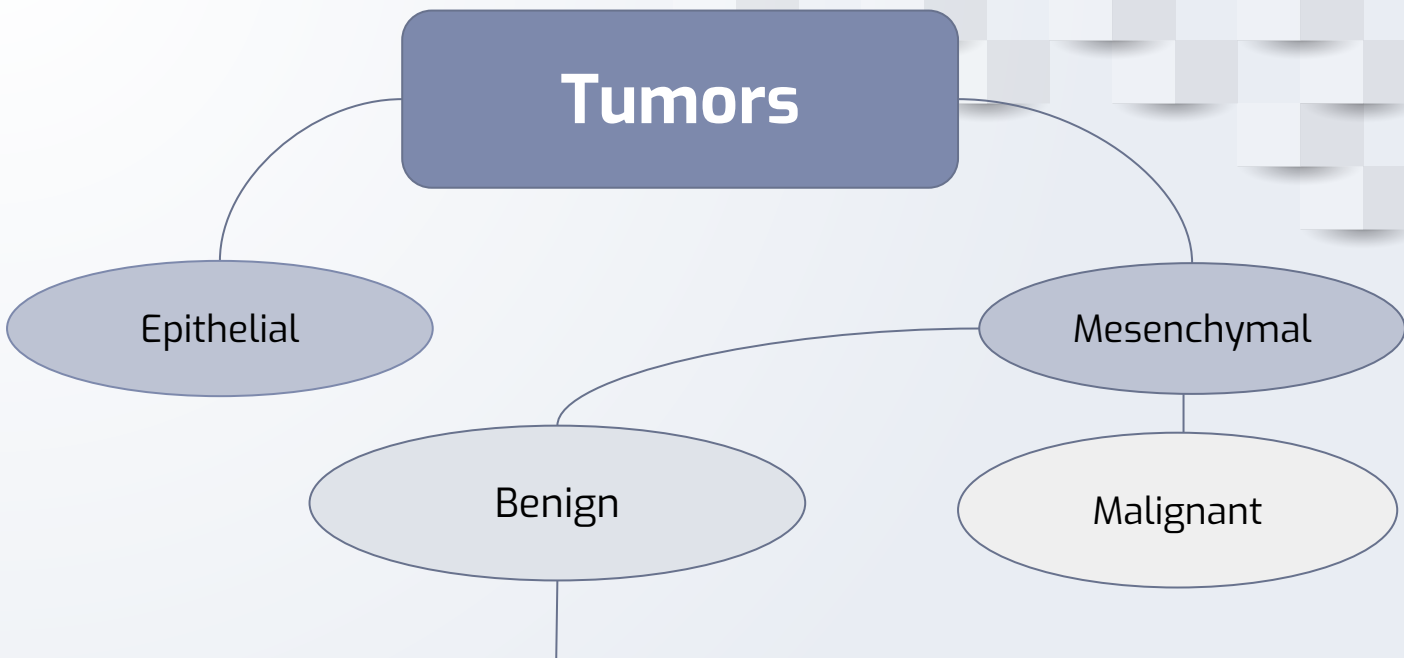
squamous cell carcinomas



adenocarcinomas

- Carcinomas that show little or no differentiation: **poorly differentiated or undifferentiated carcinoma**
- Not infrequently, however, a cancer is composed of undifferentiated cells of unknown tissue origin, and must be designated merely as an undifferentiated malignant tumor. (unknown if Epithelial or Mesenchymal)





The nomenclature of mesenchymal (connective tissue) benign tumors usually **apply this rule:** attaching the suffix **-oma** to the cell type from which the tumor arises. 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.

Exceptions

Some glaring inconsistencies may be noted. For example, the terms **lymphoma** (lymphoid tissue), **mesothelioma** (mesothelium), **melanoma** (skin), and **Seminoma** (Testis) are used for malignant neoplasms.

These Tumors end with -OMA but they are **malignant NOT benign**

Tumors



Malignant neoplasms (Tumor) 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.

No Exceptions

Neoplasia Nomenclature (named according to who discovered it):	
*Hodgkin's lymphoma (Hodgkin's category)	Malignant lymphoma (HL) of B Ly cell origin
*Burkitt tumor (<u>Non</u> - Hodgkin's category)	NHL – B Ly cell in children (jaw and GIT)
*Ewing tumor	Bone tumor (PNET)
Grawitz tumor	Kidney tumor - clear cell adenocarcinoma
*Kaposi sarcoma	Malignant tumor derived from vascular epithelium (AIDS)
Brenner tumor	Ovarian tumor derived from Brenner cells
Askin tumor	Malignant chest wall tumor of PNET
Merkel tumor	Skin tumor derived from Merkel cell

names with a (*) beside them are the most common and well known.

• The transformed cells in a neoplasm, whether benign or malignant, often resemble each other, as though all had been derived from a single **progenitor** (parent cell), consistent with the monoclonal (proliferation from the same cell) origin of tumors.

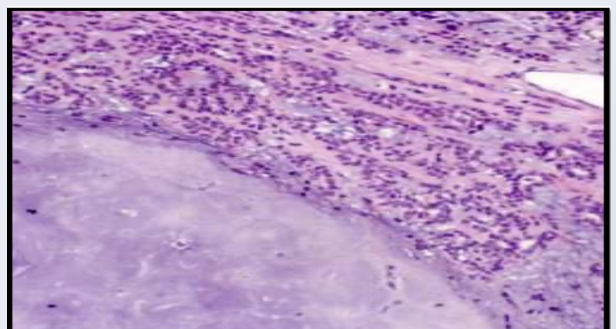
• In some unusual instances, however, divergent differentiation of a single neoplastic clone along two lineages occurs, creating the so-called **mixed tumors**.

• 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** (متعدد الأشكال).



Macroscopically



Microscopically

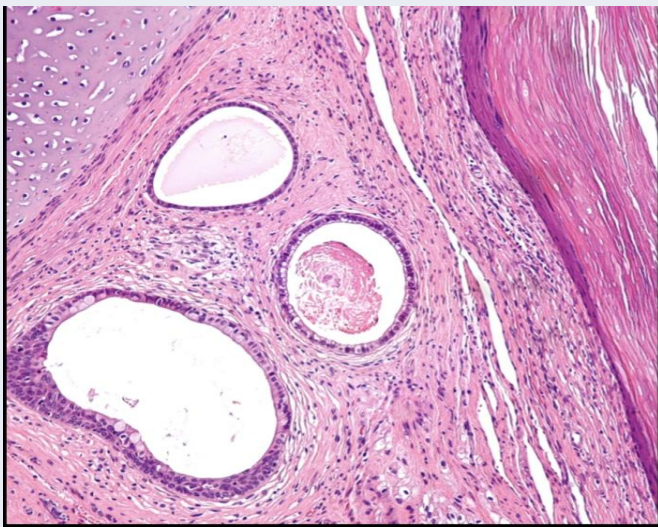
Teratoma

- 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 (**has the ability to differentiate into any type of tissue**) 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. **So they may give rise to neoplasms that mimic bone, epithelium, muscle, fat, nerve and other tissue.**
- Most common sites are: ovary & testis

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

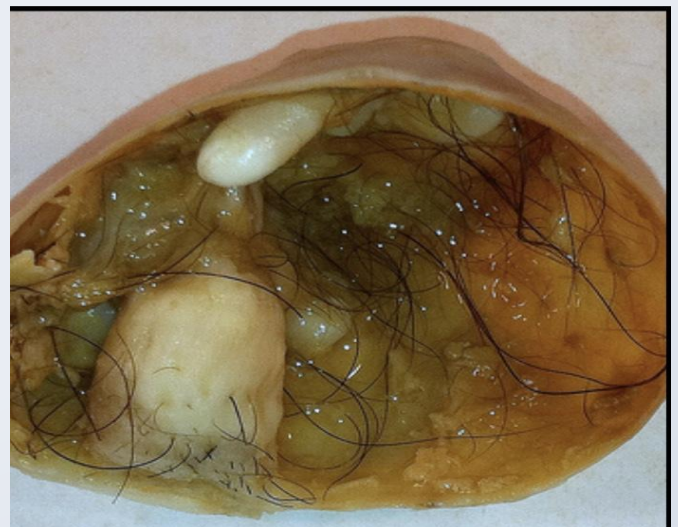
Teratoma

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



Microscopically

Teratomas in **female** patients are either mature (benign) or immature (malignant). Whereas in **male** patients if teratoma occurs before puberty it is benign, but if after it is malignant.

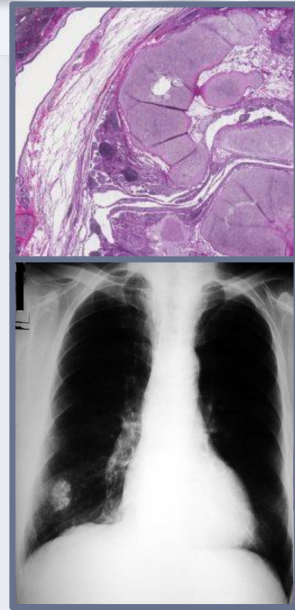


Macroscopically

Hamartoma

- A mass of **disorganized benign**-looking tissue indigenous to the particular site.
- A mass composed of cells native to the organ
- 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.

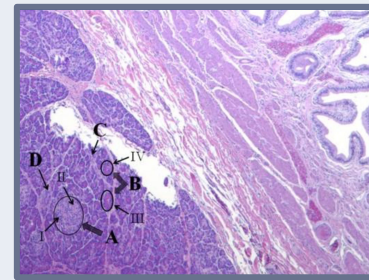


E.g. Pulmonary Hamartoma

★Choristoma

Choristoma is a **congenital anomaly** (not neoplastic) 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.** (no clinical significance)
- a mass composed of normal cells in a wrong location Choristoma e.g. pancreatic in liver or stomach.



E.g. Pancreatic choristoma in gallbladder

*Hamartoma and Choristoma are both tumor like, But they're not tumor

They are distinguished from neoplasms by the fact that they do not exhibit continued growth. They are group of tumor-like tissue masses which may be confused with neoplasms (Malformation and not neoplasm.)

Remember:-

Hamartoma: normal location but disorganized tissue (حوسة)

Choristoma: abnormal location but organized tissue

Summary

*Female's slides

Tissue of origin	Benign	Malignant
Composed of one parenchymal cell type		
Connective tissue and derivatives:	Fibroma Lipoma Chondroma Osteoma	Fibrosarcoma Liposarcoma Chondrosarcoma Osteogenic sarcoma
<u>Endothelial and related tissues</u> Blood vessels Lymph vessels Mesothelium Brain coverings	Hemangioma Lymphangioma - Meningioma	Angiosarcoma Lymphangiosarcoma Mesothelioma Invasive meningioma
<u>Blood cells and related cells</u> Hematopoietic cells Lymphoid tissue	-	Leukemia Lymphomas

Tissue of origin	Benign	Malignant
Tumors of melanocytes	Nevus	Malignant melanoma
More than one cell neoplastic cell type(mixed tumors) usually derived from one germ cell layer		
Salivary glands	Pleomorphic adenoma	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 embryonic rests	Mature teratoma, dermoid cyst	Immature teratoma, teratocarcinoma

Summary

*Female's slides

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

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.

MCQs

1.c , 2.b , 3.b , 4.a , 5.a , 6.d

1- The most common site for teratoma is

- | | | | |
|-----------|--------|----------|----------|
| a- muscle | b- fat | c- ovary | d- nerve |
|-----------|--------|----------|----------|

2- Bone tumor known as

- | | | | |
|------------------|----------------|-----------------------|-------------------|
| a- Burkitt tumor | b- Ewing tumor | c- Hodgkin's lymphoma | d- Kaposi sarcoma |
|------------------|----------------|-----------------------|-------------------|

3- Which one of these is malignant tumor?

- | | | | |
|------------|-------------|------------|--------------|
| a- adenoma | b- melanoma | c- fibroma | d- papilloma |
|------------|-------------|------------|--------------|

4- Benign tumor of melanocytes:

- | | | | |
|----------|-------------|-----------------------|------------|
| a- Nevus | b- melanoma | c- malignant melanoma | d- adenoma |
|----------|-------------|-----------------------|------------|

5- Choristoma is aconsisting of a heterotopic rest of cells.

- | | | | |
|-----------------------|---------------|-------------|---------|
| a- congenital anomaly | b- neoplastic | c- Both A&B | d- none |
|-----------------------|---------------|-------------|---------|

6- when they are less differentiated, it is teratoma.

- | | | | |
|----------------|-----------------------|----------------------|----------|
| a- an immature | b- mature potentially | C- overtly malignant | d- A & C |
|----------------|-----------------------|----------------------|----------|

SAQs

What is the difference between Hamartoma and Choristoma?

Hamartoma a mass composed of cells native to the organ, and Choristoma a mass composed of normal cells in a wrong location

Three example of Malignant tumors arising from epithelial origin?

Squamous cell carcinoma / Renal cell adenocarcinoma / cholangiocarcinoma

- | | |
|----------------------|------------------|
| ● هادي الحمصي | ● البندي العنزي |
| ● أحمد الخواشكي | ● بنان القاضي |
| ● بدر الريس | ● رعد خالد سويعد |
| ● حمد الربيعه | ● رعد العسيري |
| ● حمود القاضب | ● روان باقادر |
| ● سالم الشهري | ● ريناد الحميدي |
| ● عبد العزيز الكريدا | ● سارة العبيد |
| ● عبد اللطيف الشريمي | ● سارة القحطاني |
| ● فراس القايدى | ● ساره المقاطي |
| ● فيصل الفضل | ● سديم آل زايد |
| ● يزيد القحطاني | ● سمو عبدالرحمن |
| ● أسامة العقل | ● شذى الدوسري |
| ● بندر الحربي | ● شعاع خضري |
| ● حمد موسى | ● غادة العبدى |
| ● سعد الدحيم | ● غيداء العسيري |
| ● عبد الرحمن الروقي | ● غيداء المرشود |
| ● عبد الرحمن المبكي | ● فاطمة المعيدر |
| ● عبد العزيز العمري | ● فرح السيد |
| ● علي الماطري | ● منال التويم |
| ● محمد السندي | ● مها فهد |
| ● محمد السيارى | ● نورة بامرعي |
| ● محمد القهيدان | |
| ● محمد الوهبي | |
| ● مشعل الثنيان | |
| ● نايف آل الشيخ | |

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Editing File