

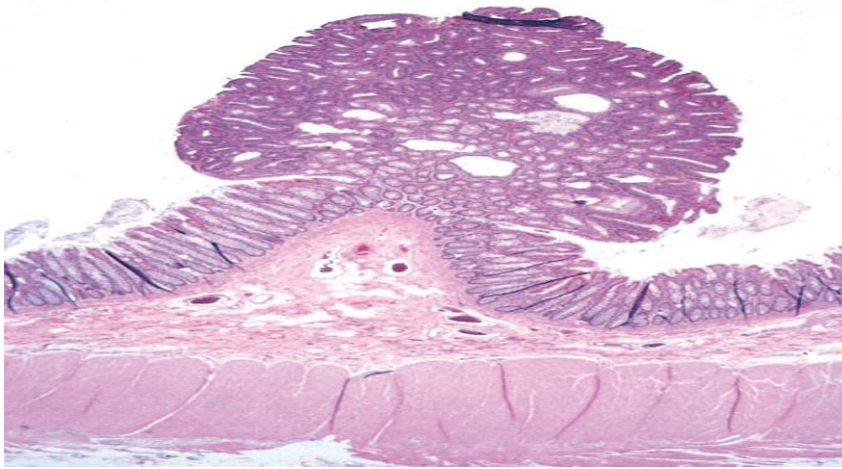
Neoplasia

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Neoplasm' or 'tumor': new growth



Neoplasm or tumor is 'a mass of tissue formed as a result of abnormal, excessive, uncoordinated and purposeless proliferation of cells even after cessation of stimulus for growth which caused it'.

The branch of science dealing with the study of neoplasms or tumors is called oncology (oncos=tumor, logos=study).



- ▶ **Benign tumor:** it is innocent neoplasm on microscopic and gross characteristics , it will remain localized and is amenable to local surgical removal; the patient generally survives.
- ▶ **Malignant tumor:** it is referred to as *cancers* derived from the Latin word for “crab”—. *Malignan tumor: it is a* neoplasm that can invade and destroy adjacent structures and spread to distant sites (metastasize) to cause death.

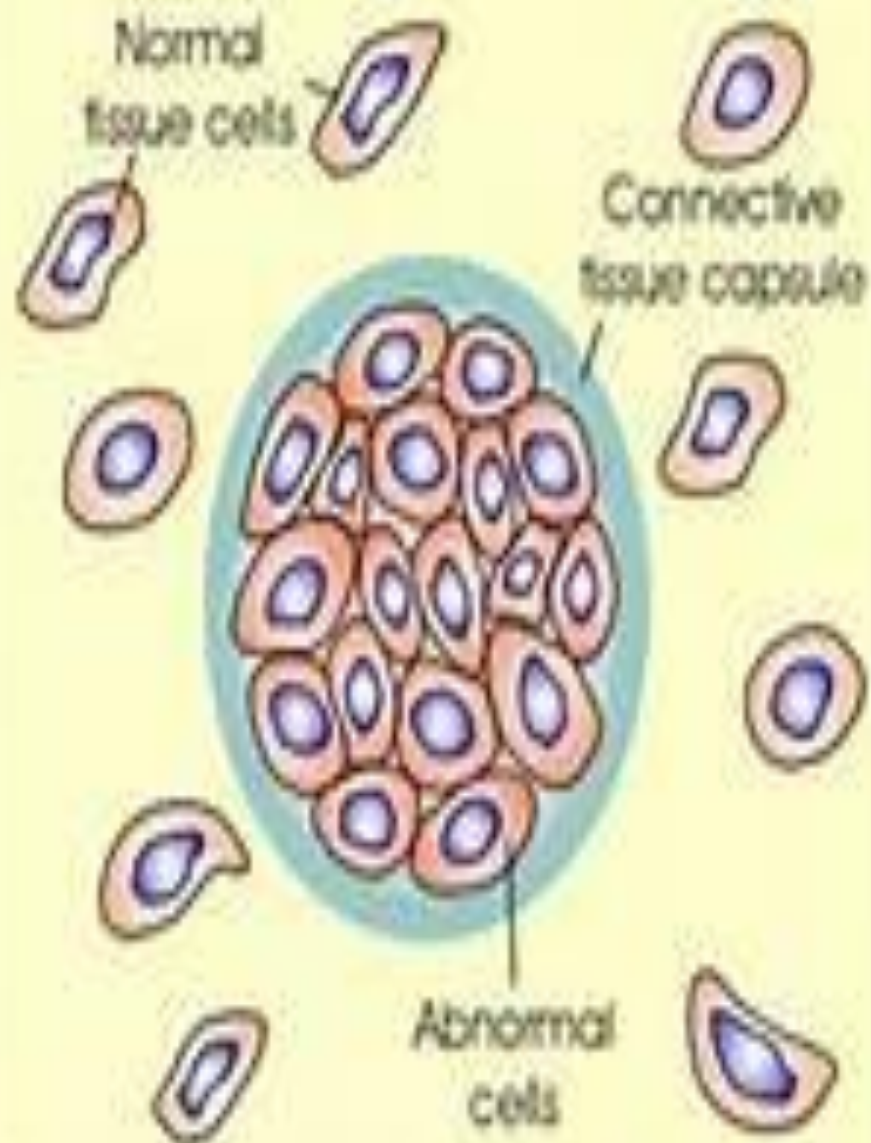
- ▶ **Benign and malignant tumors can be distinguished from one another based on the degree of differentiation, rate of growth, local invasiveness, and distant spread.**
- ▶ **Benign tumors resemble the tissue of origin and are well differentiated; malignant tumors are poorly or completely undifferentiated (anaplastic).**
- ▶ **Benign tumors are slow-growing, whereas malignant tumors generally grow faster.**

- ▶ **Benign tumors are well circumscribed and have a capsule; malignant tumors are poorly circumscribed and invade the surrounding normal tissues.**
- ▶ **Benign tumors remain localized to the site of origin, whereas malignant tumors are locally invasive and metastasize to distant sites.**

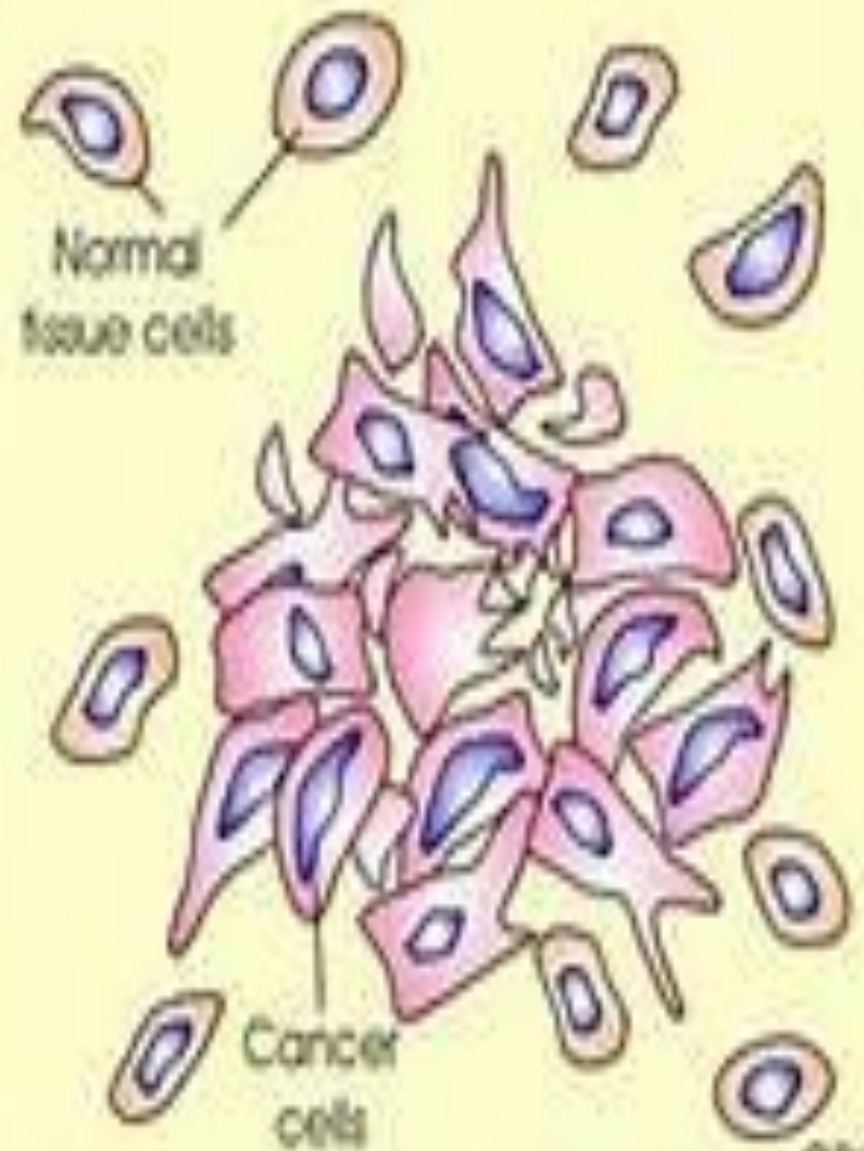
Benign vs. Malignant Tumors

Benign	Malignant
Grow slowly	Grow rapidly
Well-defined capsule	Not encapsulated
Not invasive	Invasive
Well differentiated	Poorly differentiated
Low mitotic index	High mitotic index
Do not metastasize	Can spread distantly (metastasis)

Benign Growth



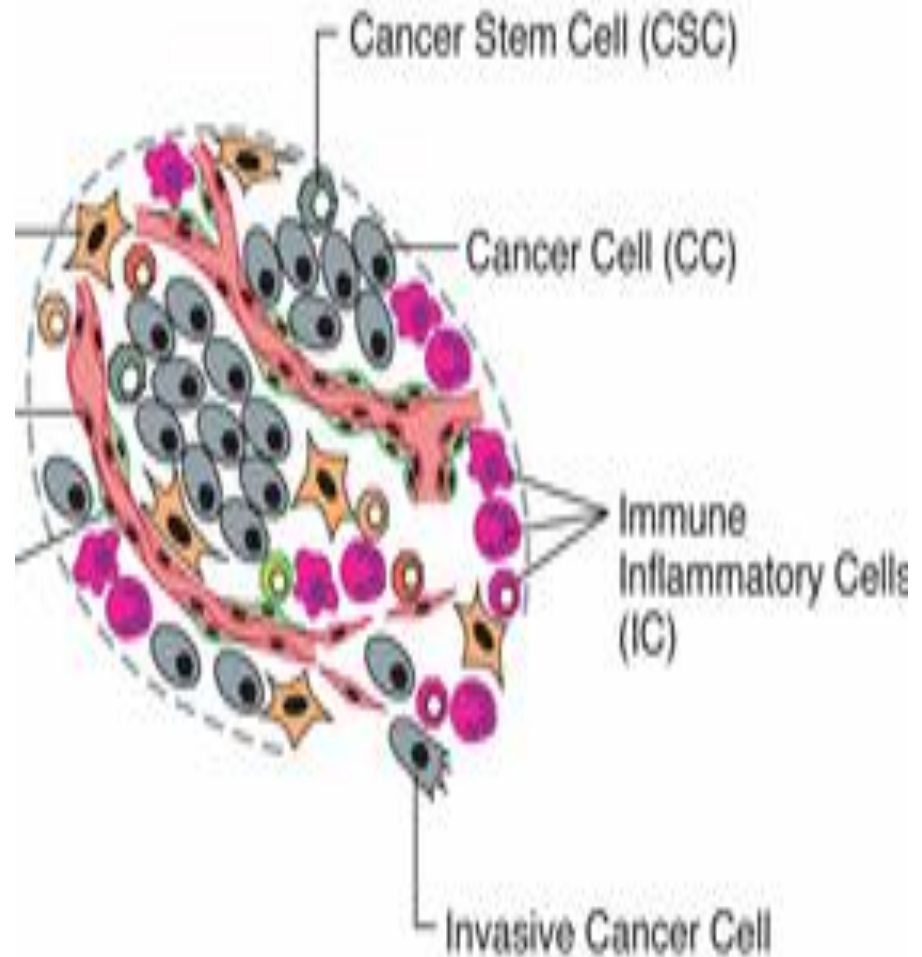
Malignant Tumor



All tumors, benign as well as malignant, have 2 basic components:

‘Parenchyma’ comprised by proliferating tumor cells; parenchyma determines the nature and evolution of the tumor.

‘Supportive stroma’ composed of fibrous connective tissue and blood vessels; it provides the framework on which the parenchymal tumor cells grow.



Benign tumors

- ▶ **Fibroma: benign tumor arising in fibrous tissue.**
- ▶ **Chondroma: a benign cartilaginous tumor.**
- ▶ **Adenoma: is benign epithelial neoplasms derived from glands**
- ▶ **Papillomas: are benign epithelial neoplasms, growing on any surface, that produce microscopic or macroscopic finger-like projections.**



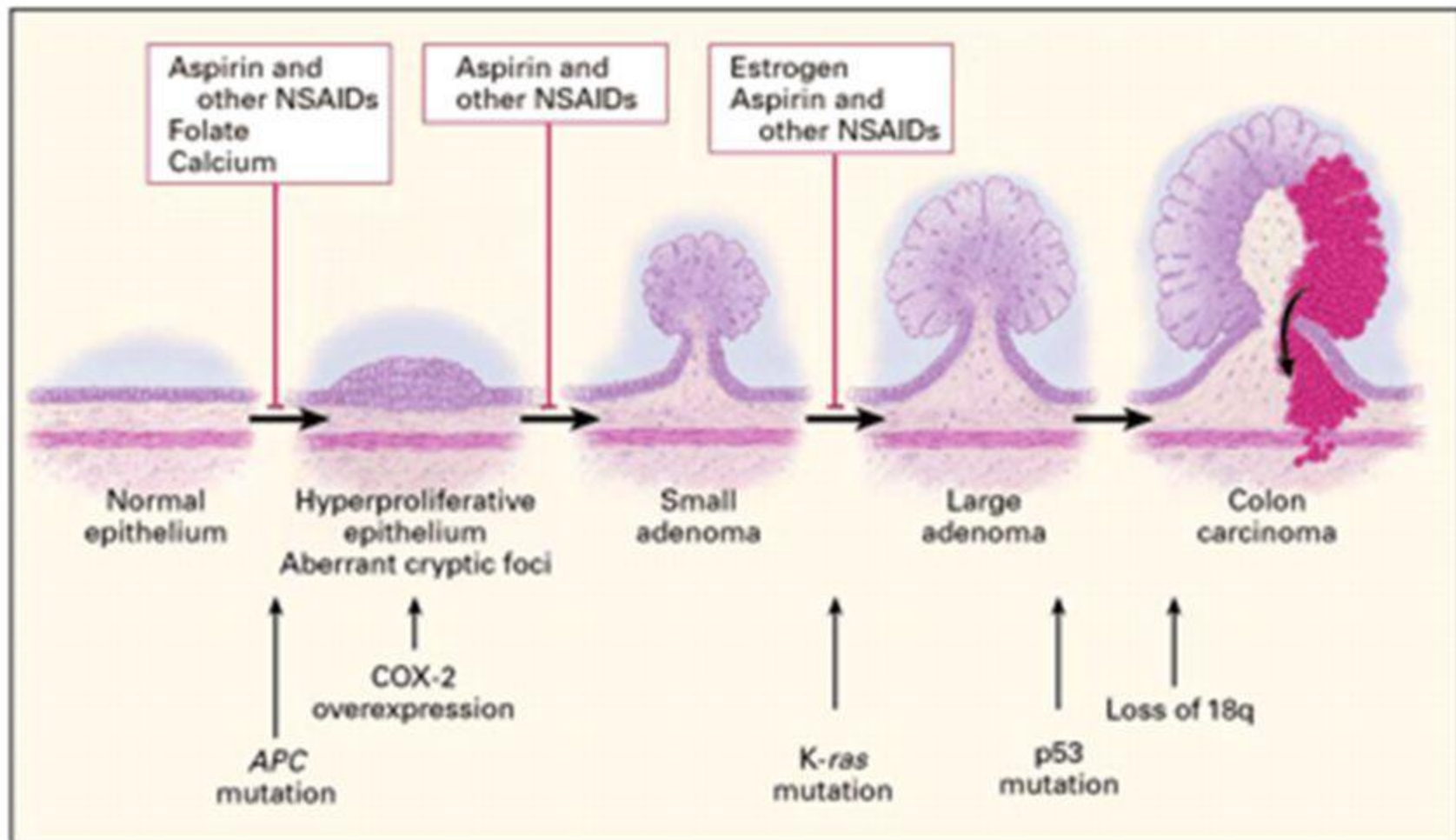
Fibroma



Chondroma

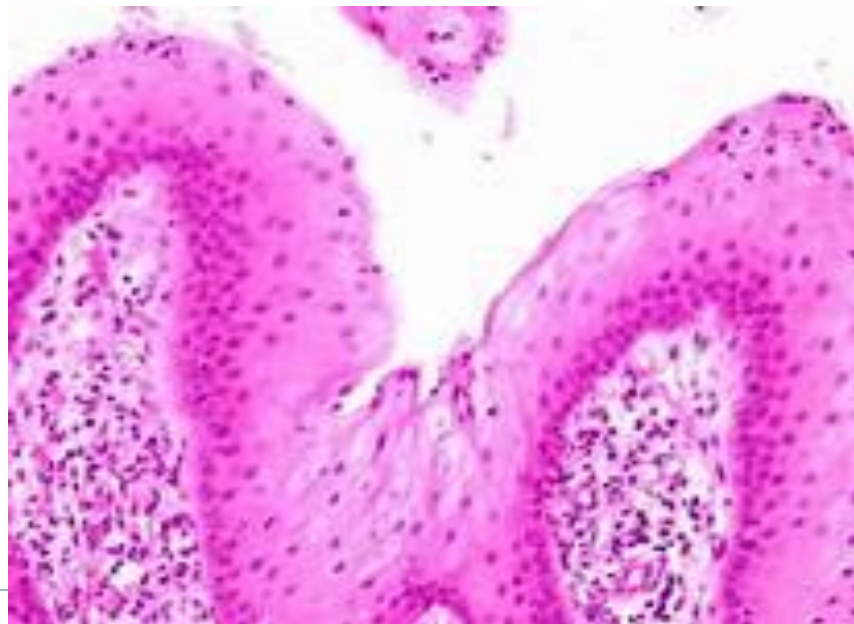
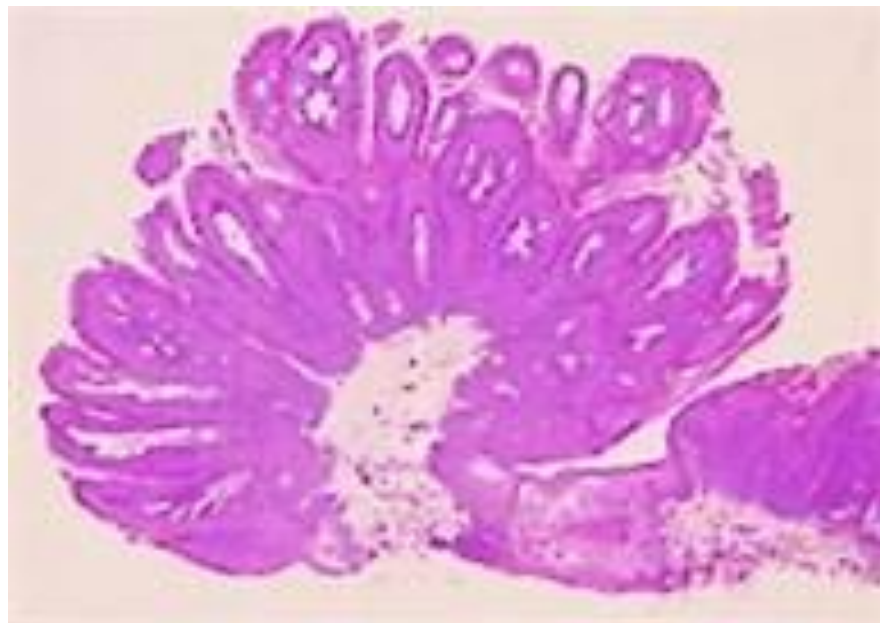
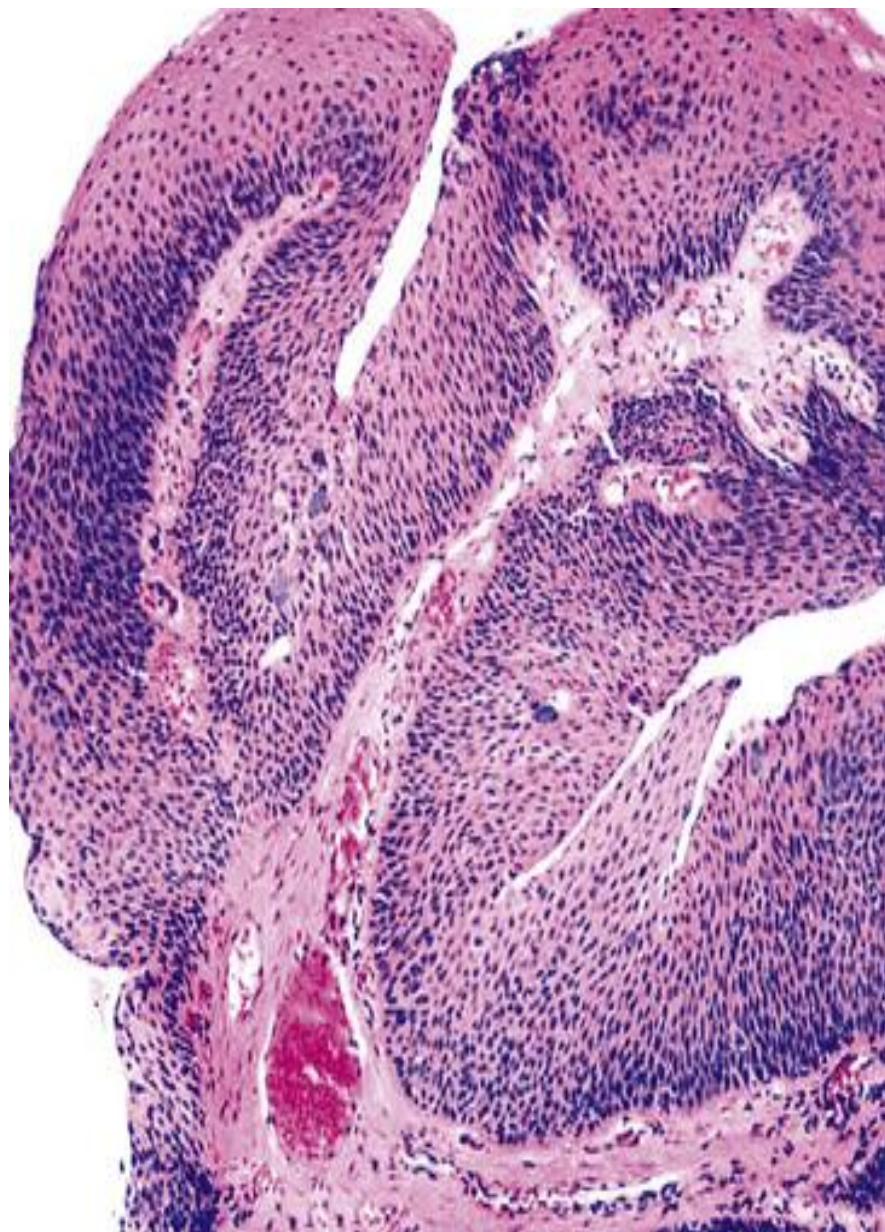


Adenoma carcinoma sequence



Papilloma







Malignant tumor

- ▶ **Sarcomas:** it is a malignant neoplasms arising in mesenchymal tissues
 - ▶ **leukemias or lymphomas :** are malignancy arising from the mesenchymal cells of the blood.
 - ▶ **Fibrosarcoma:** cancer of fibrous tissue origin
 - ▶ **Chondrosarcoma:** malignant neoplasm composed of chondrocytes
 - ▶ **Carcinomas:** a malignant neoplasms of epithelial cells .
 - ▶ **Adenocarcinomas :** Carcinomas that grow in a glandular tissues
 - ▶ **Squamous cell carcinomas:** malignant neoplasm of squamous epithelial cells
-



Carcinomas vs Sarcomas

Carcinomas: Solid tumors

- Epithelial tissue
 - ▣ Lining of external & internal body surfaces
 - ▣ Skin
 - ▣ Glands
 - ▣ Digestive, urinary
 - ▣ Reproductive
- 50% of tumors in women are carcinomas

Sarcomas

- Supportive & connective tissue
 - ▣ Bone
 - ▣ Adipose
 - ▣ Muscle
 - ▣ Cartilage
 - ▣ Bone marrow
 - ▣ Lymphatic/immune
- Rare form of cancer
- Is increasing

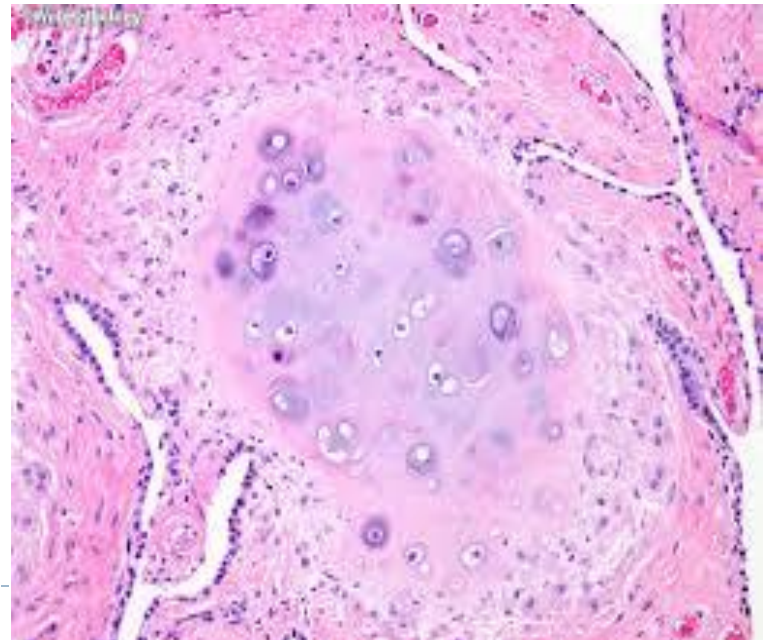
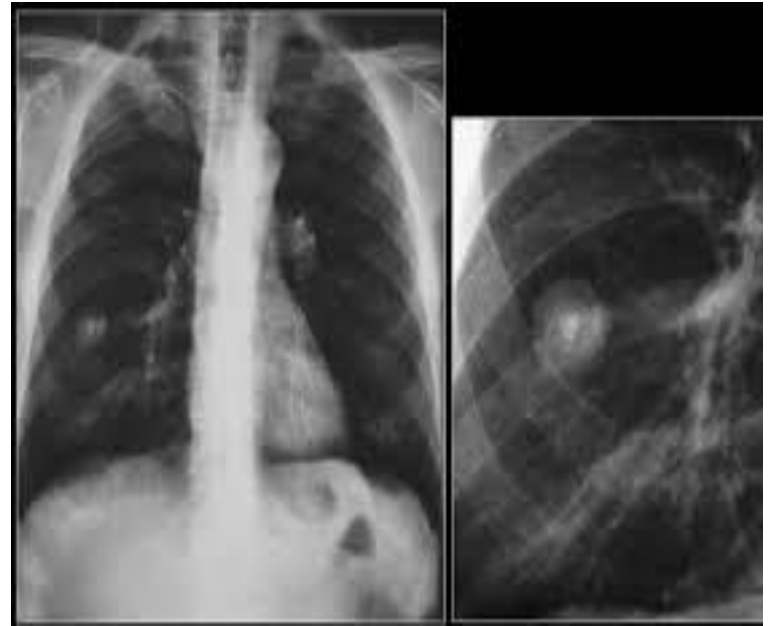
- ▶ **:Mixed tumors** *When two types of tumors are combined in the same tumor, it is called a mixed tumor. For example:*
- ▶ **Adenosquamous carcinoma** is the combination of adenocarcinoma and squamous cell carcinoma in the endometrium.
- ▶ **Mixed tumor of the salivary gland (or pleomorphic adenoma)** is the term used for benign tumor having combination of both epithelial and mesenchymal tissue elements.



- ✂ **Teratomas** tumors made up of a mixture of various tissue types arising from totipotent cells derived from the three germ cell layers—ectoderm, mesoderm and endoderm.
- ✂ Most common sites for teratomas are ovaries and testis (gonadal teratomas).
- ✂ Teratomas may be benign or mature(most of the ovarian teratomas) or malignant or immature(most of the testicular teratomas).



↳ **Hamartoma is a mass of disorganized tissue indigenous to the particular site.**
Histopathologic examination may show a mass of mature but disorganized hepatic cells, blood vessels, and possibly bile ducts within the liver, or a nodule in the lung containing islands of cartilage, bronchi, and blood vessels.



✂ **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 is heterotopia but is not a true tumor.



There are four fundamental features by which benign and malignant tumors can be distinguished:

- & Differentiation and anaplasia.**
- & Rate of growth.**
- & Local invasion.**
- & Distant metastasis.**



Differentiation and anaplasia.

- & The differentiation of parenchymal tumor cells refers to the extent to which they resemble their normal forebears morphologically and functionally.*
- & Very well differentiated.*
- & Well differentiated.*
- & Moderately differentiated.*
- & Poorly differentiated.*
- & Undifferentiated. (Anaplastic)*



Anaplastic

↳ loss of the structural and functional differentiation of normal cells. “backward formation”

Morphological and functional alterations in anaplastic cells

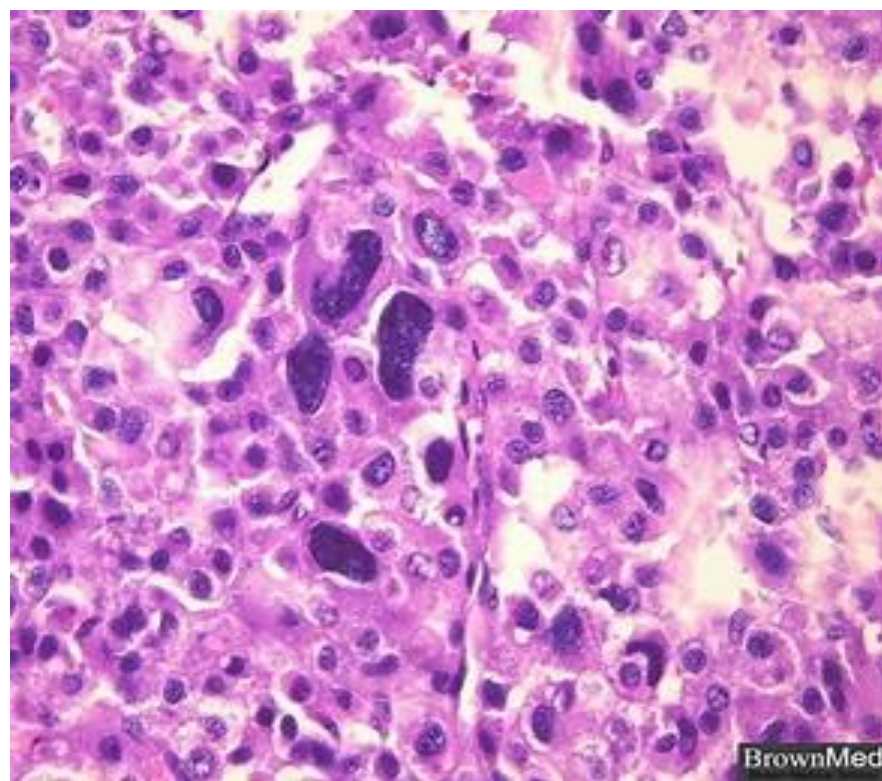
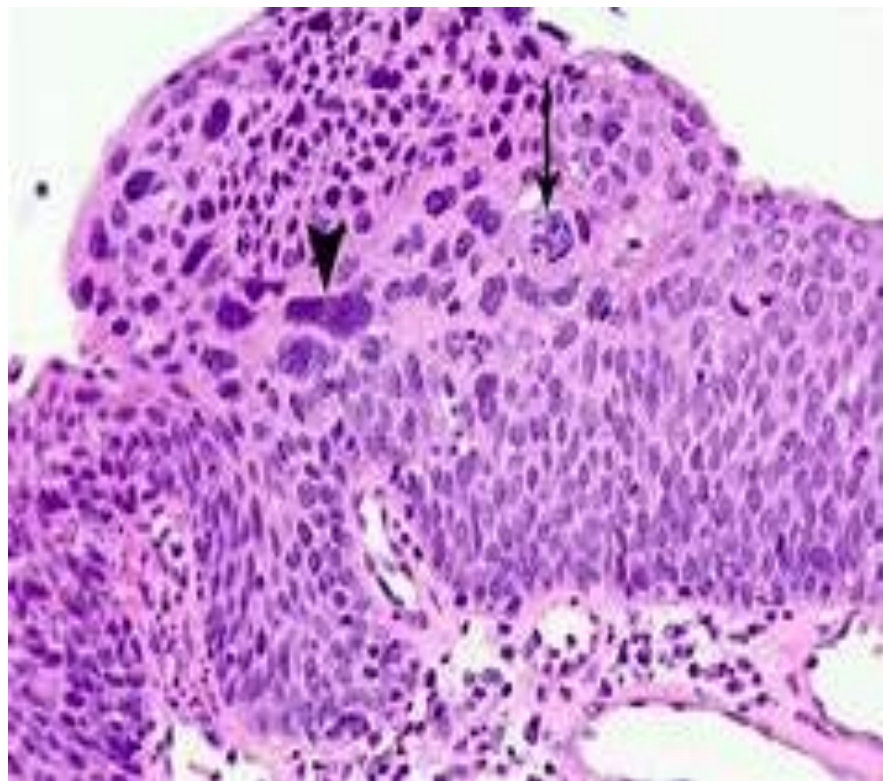
↳ **Dysplasia: loss in uniformity of individual cell in their architectural orientation. There are three types: mild dys. Moderate dys. And sever dys.**



Characteristic of anaplastic cell

- ▶ Lack of differentiation, “backward formation” or dedifferentiation, or loss of the structural and functional differentiation of normal cells.
- ▶ *Mitoses often are numerous and atypical*; may produce tripolar or quadripolar mitotic Figures
- ▶ anaplastic cells usually fail to develop normal tissue orientation

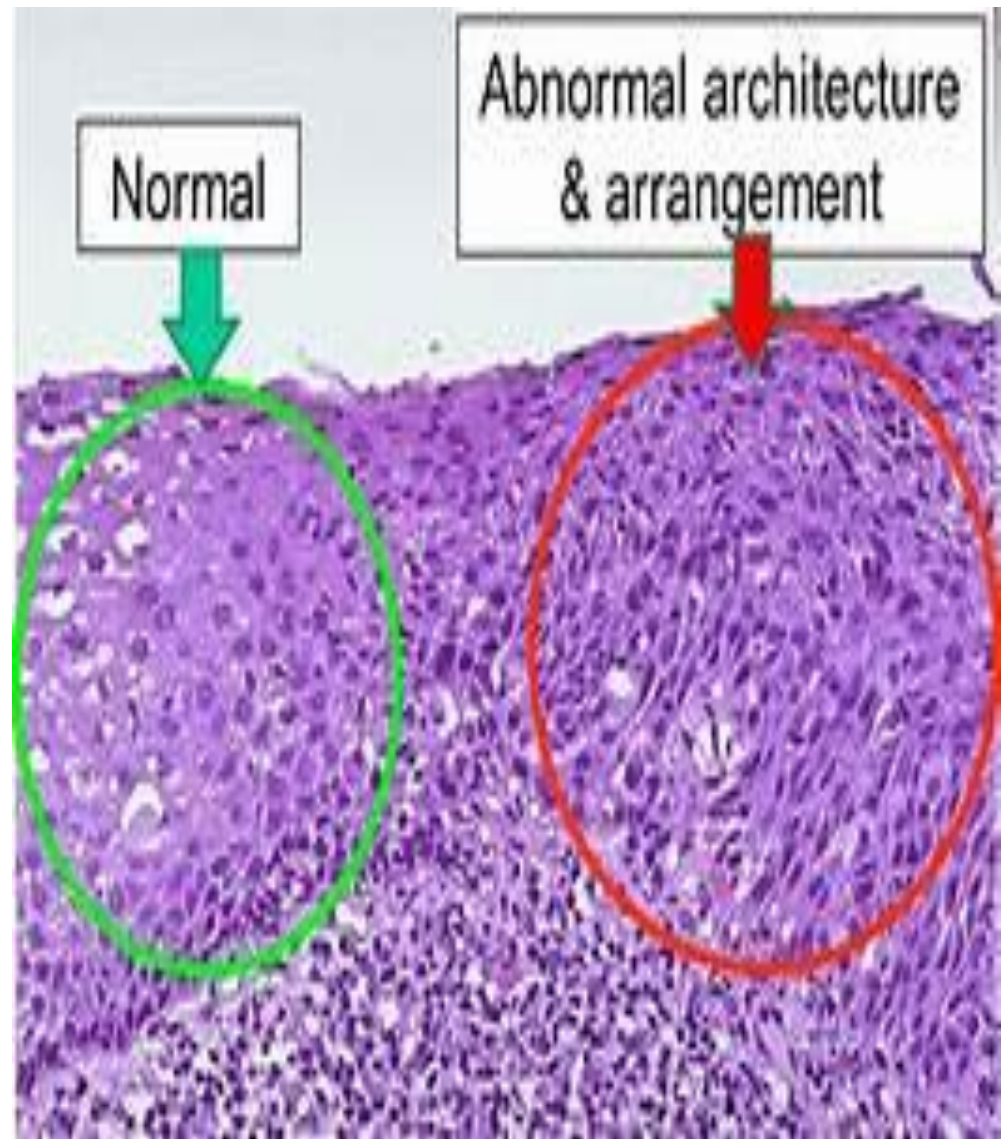
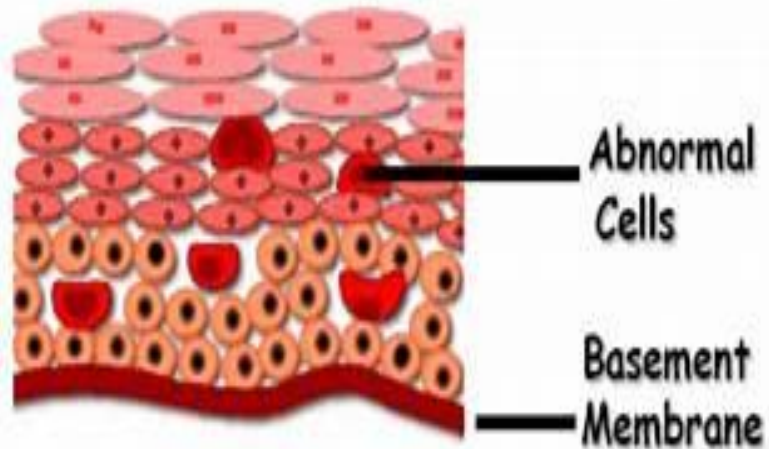


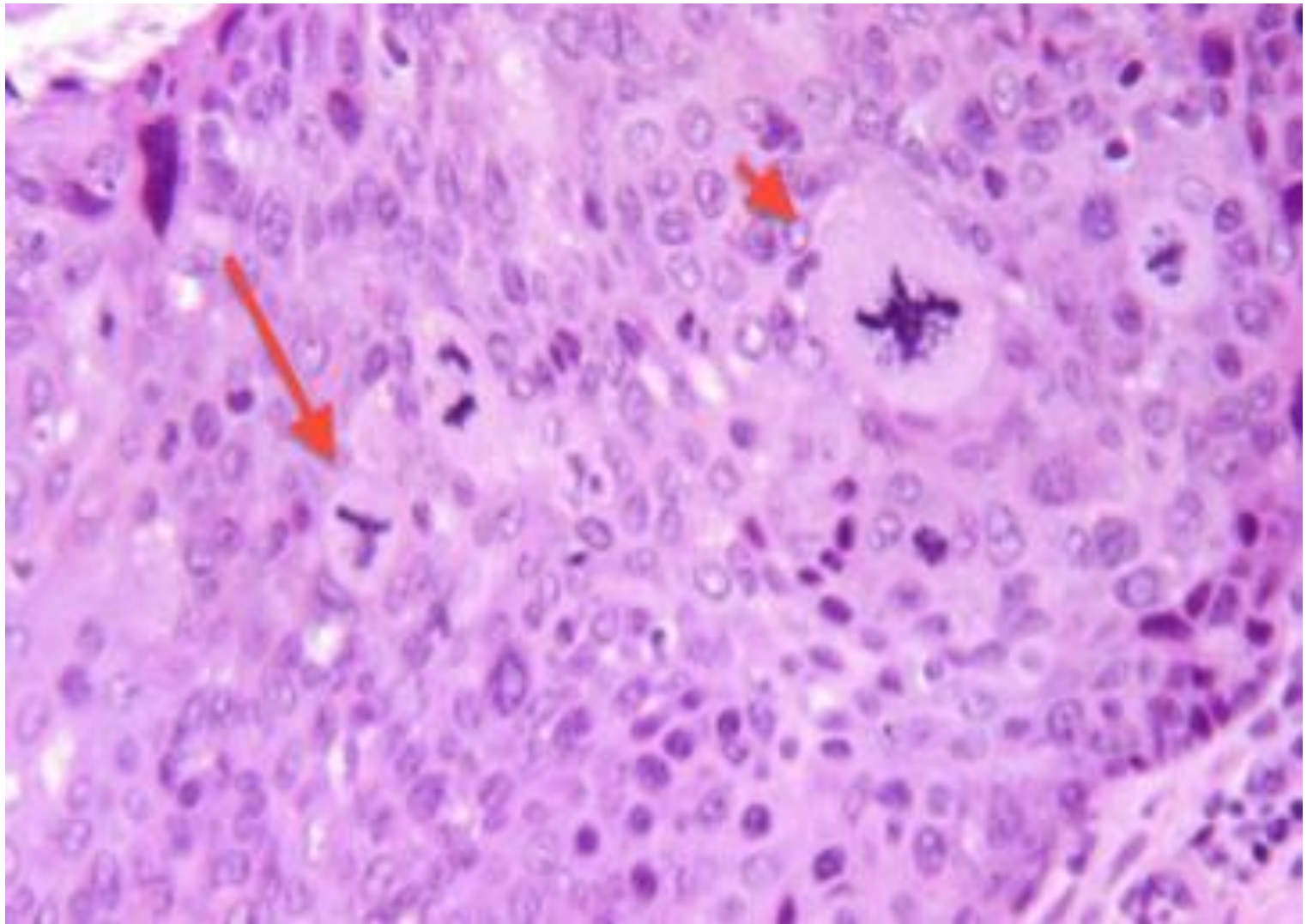


BrownMed



Mild Dysplasia



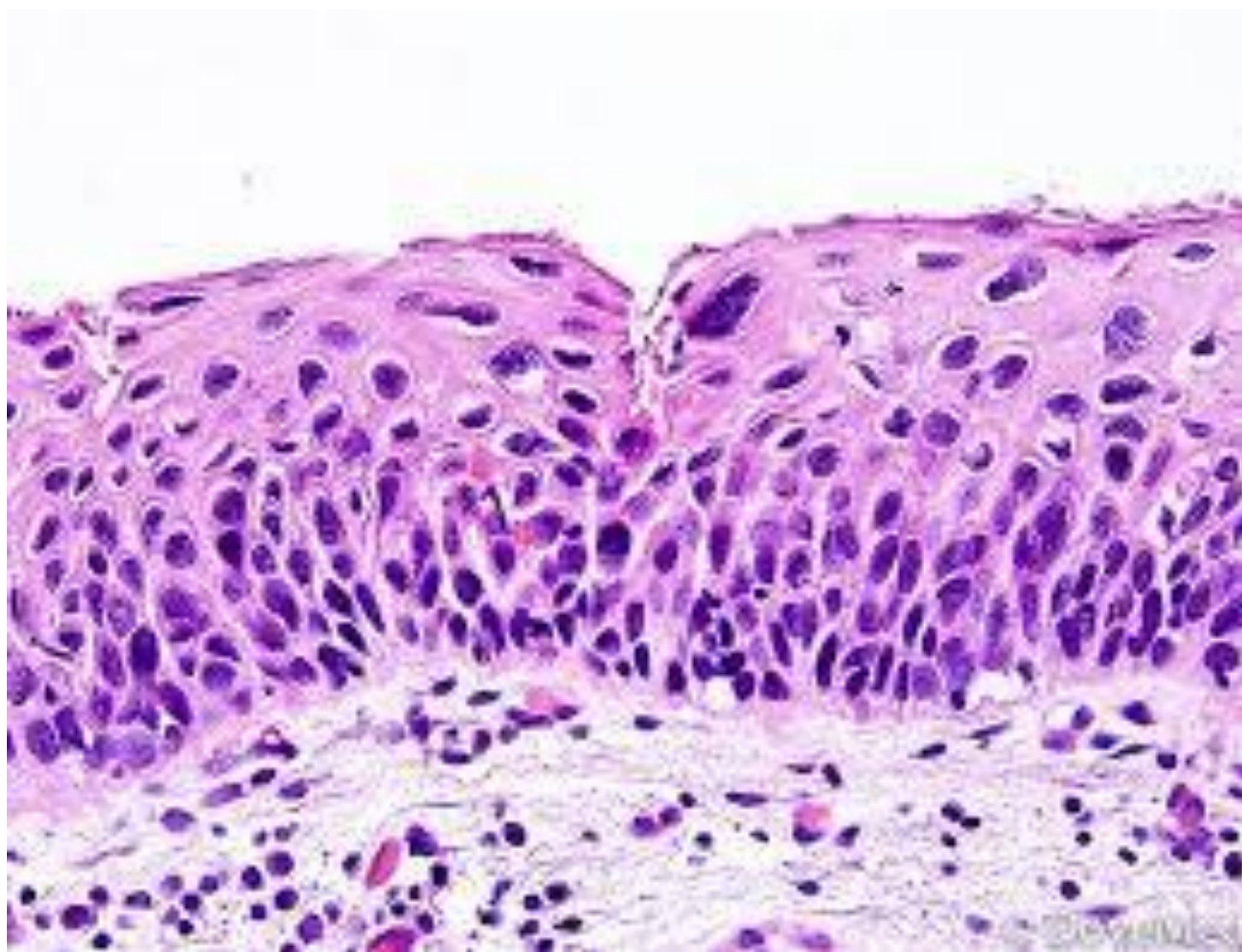


- ▶ ***pleomorphism*** (i.e., variation in size and shape)
- ▶ ***nuclei are extremely hyperchromatic*** (dark-staining) and large resulting in an increased nuclear-to-cytoplasmic ratio that may approach 1 : 1 instead of the normal 1 : 4 or 1 : 6. ***Anaplastic nuclei are variable and bizarre in size and shape.***

Malignant neoplasms

- **Well-differentiated cancer** look more like normal cells and tend to grow and spread slowly.
- **Poorly differentiated neoplasms** cells are difficult to recognize as to their cell of origin.
- **The moderately-differentiated** They are a category between Well-differentiated neoplasms & poorly differentiated.
- **Undifferentiated cancer** cells are very immature and primitive. Anaplastic neoplasm





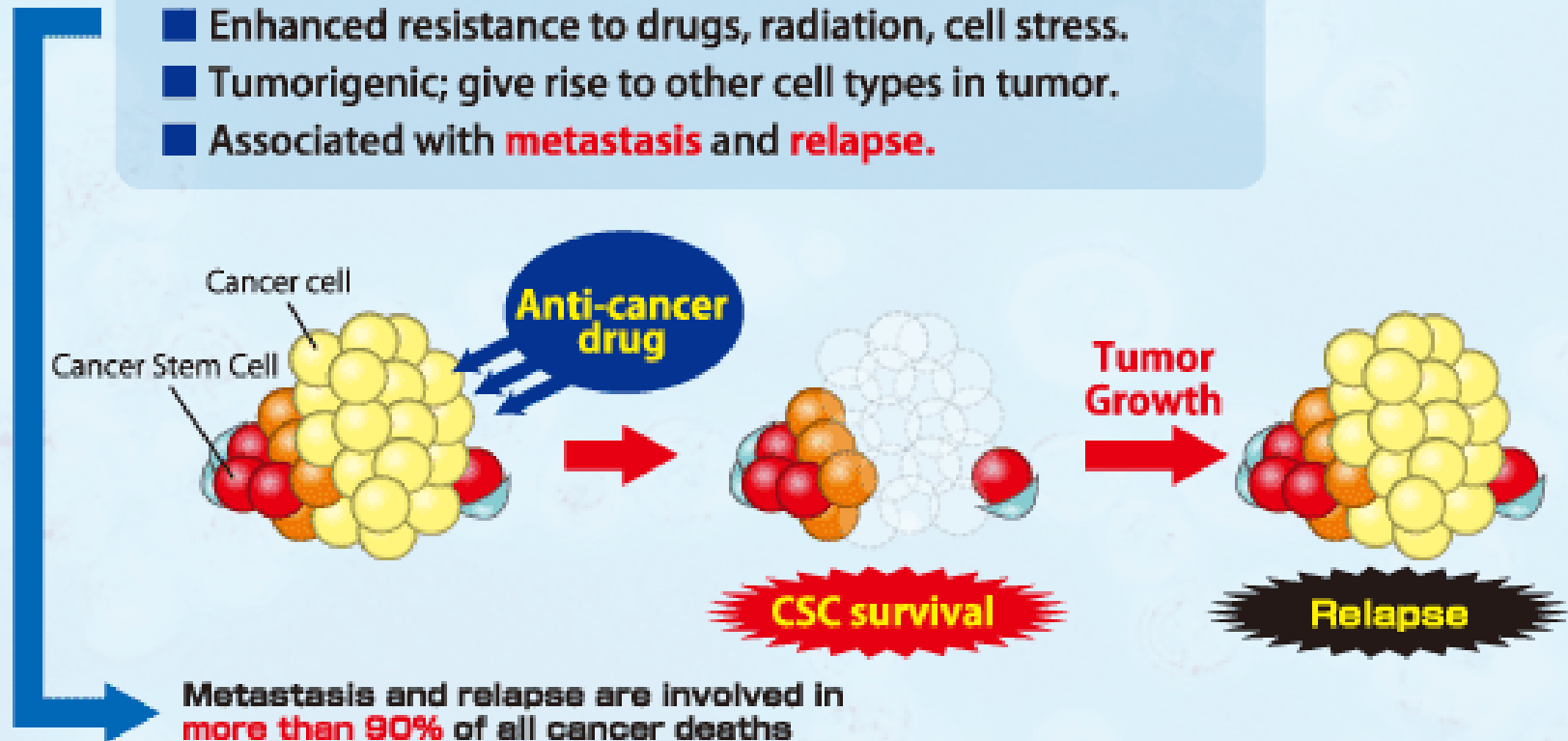
Rate of Growth

- & Most benign tumors grow slowly, are affected by blood supply, hormonal effects and location. There are, however, many exceptions. Some benign tumors have a higher growth rate than malignant tumors.**
- & Most cancers grow much faster, eventually spreading locally and to distant sites (metastasizing) and causing death.**
- & The rate of growth of malignant tumors usually correlates inversely with their level of differentiation.**



Cancer Stem Cell [CSC] Characteristics

- Minor population in tumor : 0.1 - a few percent
- Self-renewing; infinite proliferative potential.
- Enhanced resistance to drugs, radiation, cell stress.
- Tumorigenic; give rise to other cell types in tumor.
- Associated with **metastasis** and **relapse**.



Strategies to eradicate CSCs are an urgent topic in cancer research

Local invasion.

- & Most benign tumors form encapsulated or circumscribed masses that expand and push aside the surrounding normal tissues without actually invading, infiltrating or metastasizing.**
- & A few benign tumors are neither encapsulated nor discretely defined; such lack of demarcation is particularly likely to be seen in some benign vascular neoplasms of the dermis.**



These exceptions are pointed out only to emphasize that although encapsulation is the rule in benign tumors, the lack of a capsule does not mean that a tumor is malignant.

Malignant tumors are distinguished from benign tumors by invasion, infiltration and destruction of the surrounding tissue, besides spread to distant sites or metastasis



4. Metastasis

⌘ (meta = transformation, stasis = residence)
is defined as spread of tumor by invasion in such a way that discontinuous secondary tumor mass/masses are formed.

Benign tumors do not metastasize while all the malignant tumors can metastasize, barring a few exceptions like gliomas of the central nervous system and basal cell carcinoma of the skin. Generally, larger, more aggressive and rapidly growing tumors are more likely to metastasize



Malignant neoplasms disseminate by one of three pathways:

&(1) seeding within body cavities and natural passages.

&(2) lymphatic spread.

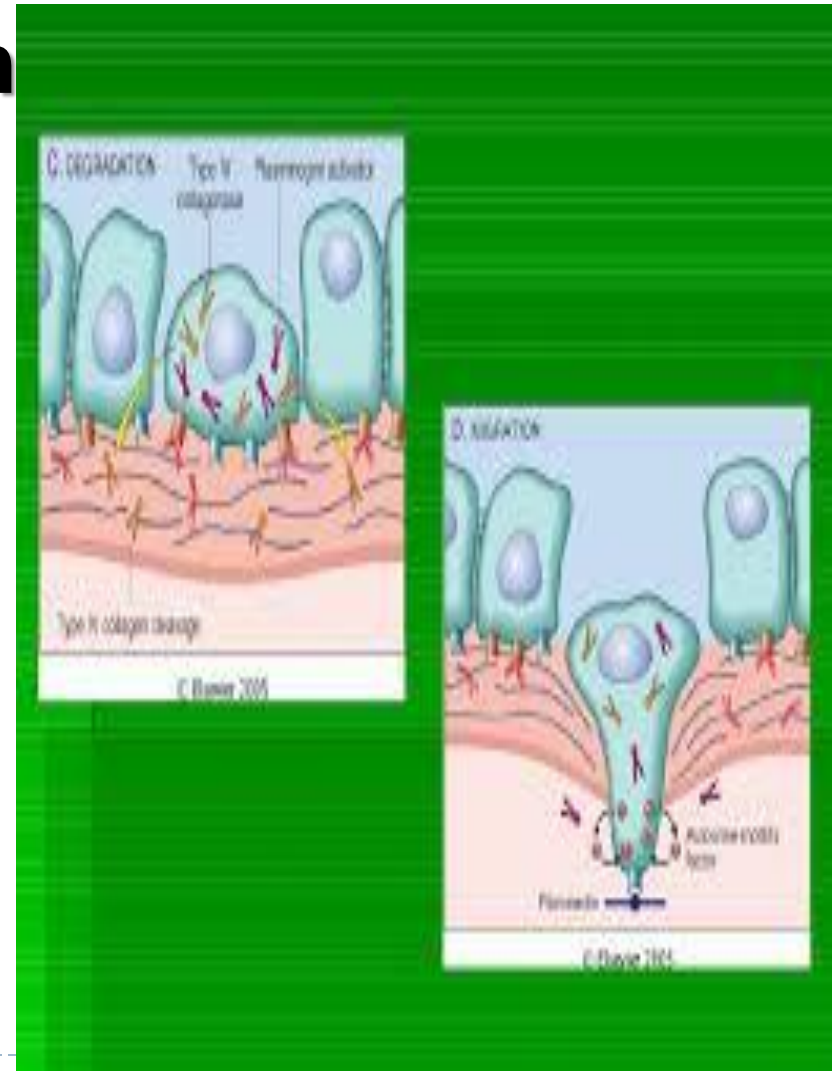
&(3) hematogenous spread.

&**Note:** in general carcinomas metastasis by lymphatic route while sarcomas favors hematogenous route.



(1) Spread by seeding

& occurs when neoplasm invade a natural body cavity. This mode of dissemination is particularly characteristic of cancers of the ovary, which often cover the peritoneal surfaces widely.

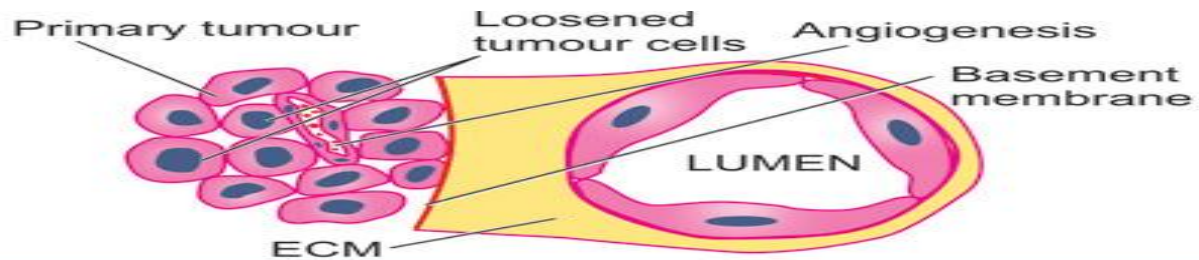


Spread along epithelium-lined surfaces

Spread via cerebrospinal fluid

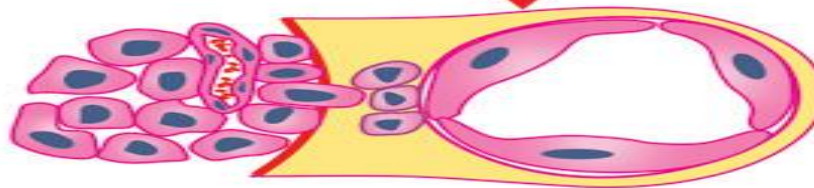
Implantation There are isolated and rare case reports of spread of some cancers by implantation by surgeon's scalpel, needles, sutures, and direct prolonged contact of cancer of the lower lip causing its implantation to the opposing upper lip.





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AGGRESSIVE CLONE WITH ANGIOGENESIS,
LOOSENING OF TUMOUR CELLS



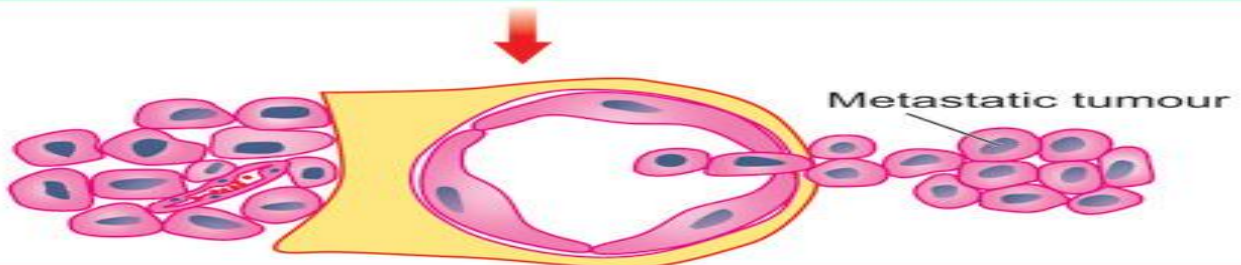
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TUMOUR CELL-ECM INTERACTION,
DEGRADATION OF ECM



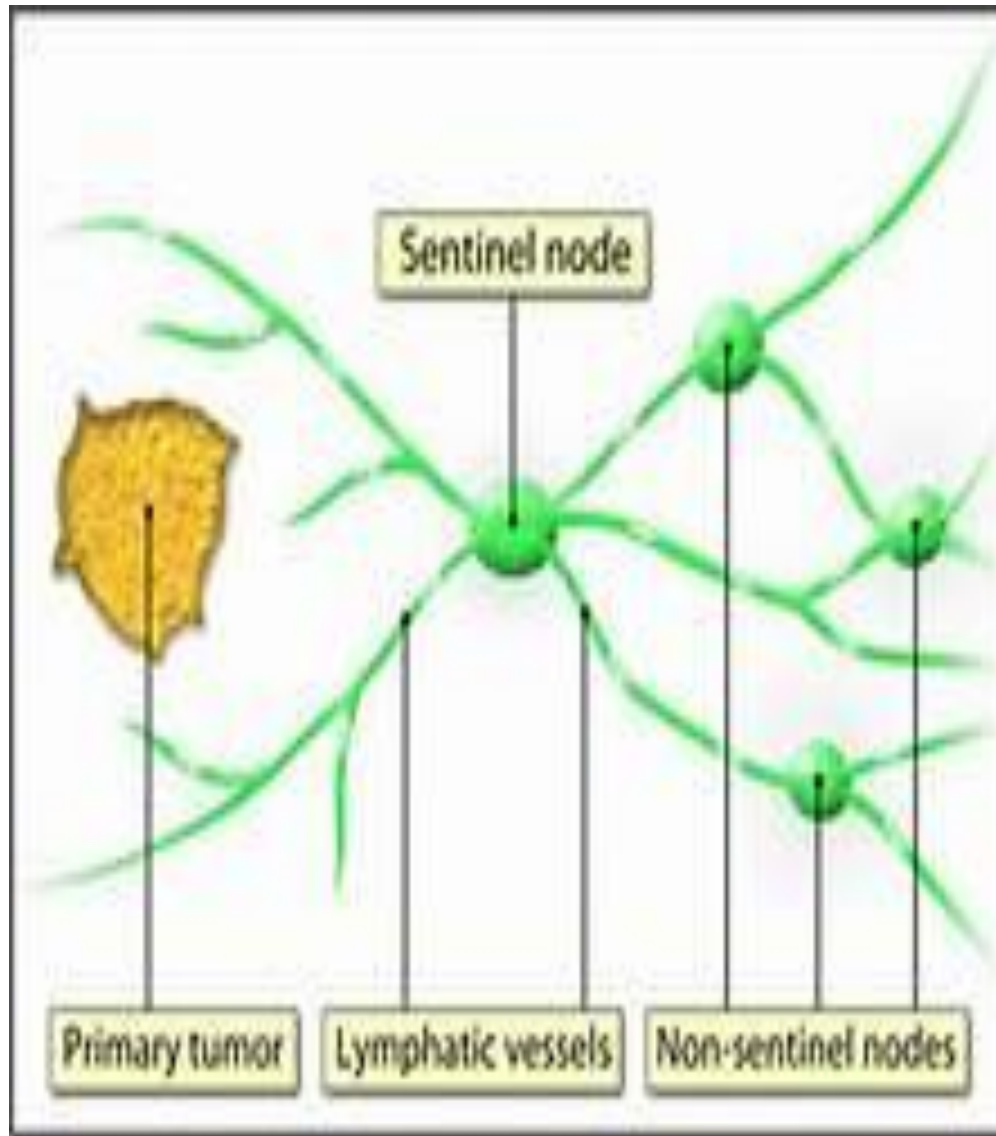
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ENTRY OF TUMOUR CELLS IN LUMEN,
THROMBUS FORMATION

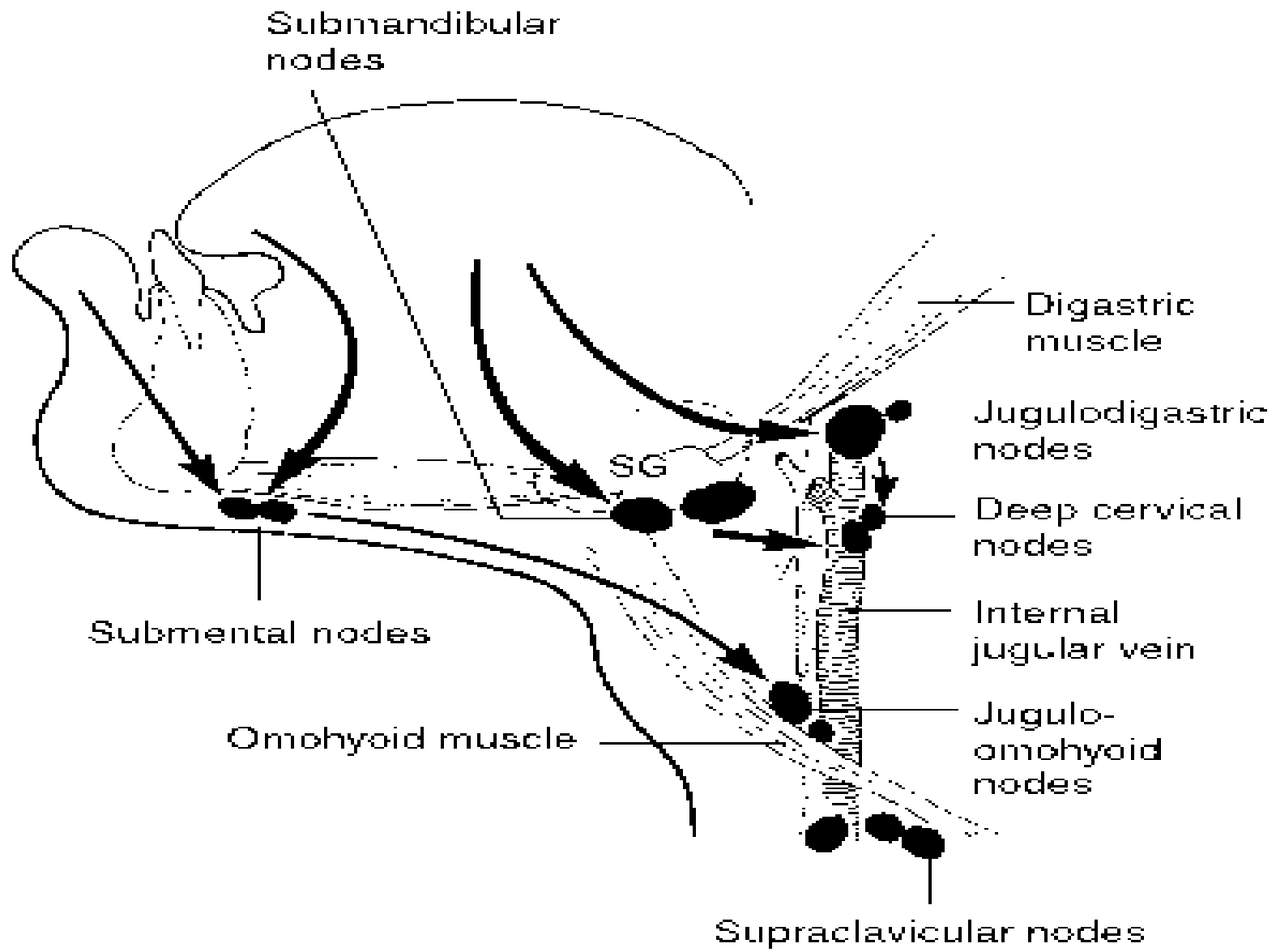


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EXTRAVASATION OF TUMOUR CELLS,
FORMATION OF METASTASIS



- ▶ A “sentinel lymph node” is the first regional lymph
- ▶ node that receives lymph flow from a primary tumor.



Suggestive Reading

**Vinay Kumer, Apul L. Abbass, Jon C.
Aster. Rubbin Basic pathology, Elsevier,
9th edition, 2013**



THANK YOU

