NEOPLASIA

Classification and characters of benign and malignant tumors

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Outlines

By the end of this lecture; students should be able to learn the following:

- Classification of tumors
- Nominate a tumor
- Features of tumor growth (rate of growth and mode of growth)
- Difference of growth of benign and malignant tumors
- General tumor morphology (gross features and microscopic features)

CLASSIFICATION OF TUMORS

Classification

- ***According to behaviour:***

Benign
(Innocent-acting)

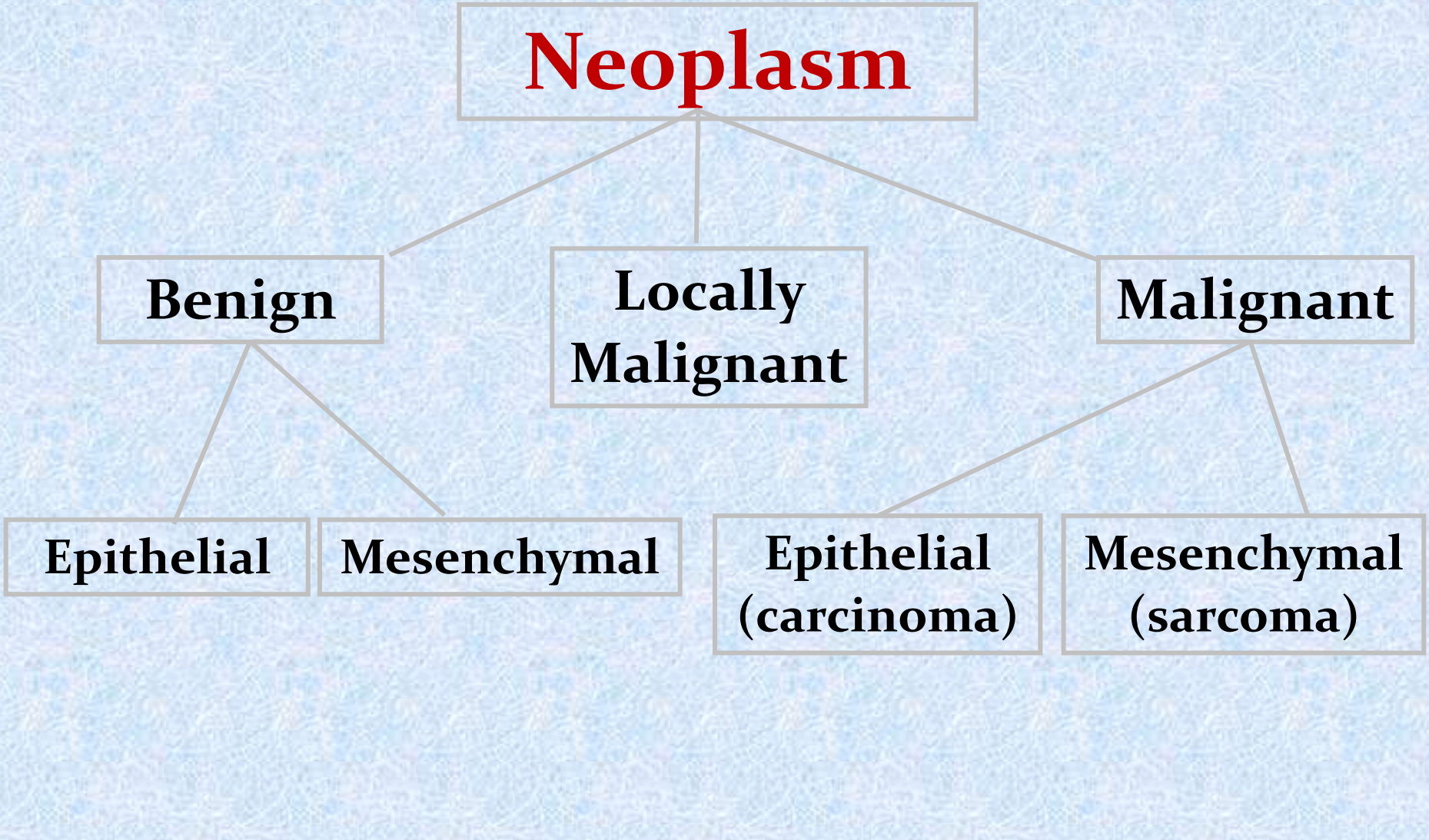
Malignant
(Evil-acting)

Locally Malignant

Classification

- ***According to cell of origin:***
  - Tumors of epithelial origin: epithelial cells
  - Tumors of mesenchymal origin: connective tissue.
  - Mixed tumors: Tumours that constitute both epithelial and mesenchymal components.

Classification



TUMOR NOMENCLATURE

Nomenclature

Benign tumors:

Benign mesenchymal:

The suffix "**-oma**" is added to the cell type

- Fibroblast: fibroma
- Chondrocyte: chondroma
- Osteocyte: osteoma
- Lipocyte: lipoma
- Smooth muscle: leiomyoma
- Skeletal muscle: rhabdomyoma
- Blood vessels: angioma or hemangioma

Benign Epithelial:

- Surface epithelium: called **Papilloma**: e.g.
  - Squamous: Squamous cell papilloma
  - Transitional: Transitional cell papilloma
- Glandular epithelium: called **Adenoma**: e.g. Thyroid or pituitary adenoma
- Glandular epithelium with cyst: called **Cystadenoma**: e.g. Cystadenoma of the ovary

Nomenclature

Malignant tumors:

Malignant mesenchymal: suffix - **sarcoma**

- Fibroblast: fibrosarcoma
- Chondrocyte: chondrosarcoma
- Osteocyte: osteosarcoma
- Lipocyte: liposarcoma
- Smooth muscle: leiomyosarcoma
- Skeletal muscle: rhabdomyosarcoma
- Blood vessels: angiosarcoma

Malignant Epithelial: suffix - **carcinoma**

- Surface epithelium:
  - Squamous: Squamous cell carcinoma
  - Transitional: Transitional cell carcinoma
- Glandular epithelium: called **adenocarcinoma**: e.g. Breast adenocarinoma or gastric adenocarinoma
- Glandular epithelium with cyst: called **Cystadenocarcioma**: e.g. Cystadenocarcinoma of the ovary.

Nomenclature

Origin	Benign	Malignant
• Surface epithelium • Glandular epithelium • Fibroblast • Chondrocyte • Osteocyte • Lipocyte (fat) • Smooth muscle • Skeletal muscle • Blood vessels	• Papilloma • Adenoma • Fibroma • Chondroma • Osteoma • Lipoma • Leiomoma • Rhabdomyoma • Hemangioma	• Carcinoma • Adenocarcinoma • Fibrosarcoma • Chondrosarcoma • Osteosarcoma • Liposarcoma • Leiomyosarcoma • Rhabdomyosarcoma • Hemangiosarcoma

Nomenclature

- **Mixed tumors:** tumors show mixed structures
  - Fibroadenoma of breast: contain glands + fibrous tissue
- **Blastomas (emberyonic tumours)**:
  - Tumors arising from emberyonic remnants.
  - Suffix **blastoma** is added to cell of origin: e.g. neuroblastoma, nephroblastoma, retinoblastoma and hepatoblastoma.
- **Exceptions**:
  - ***Malignant tumors that sound benign:***
    - Lymphoma
    - Mesothelioma
    - Melanoma
    - Seminoma
  - ***Non-tumorous lesions that sound like tumors:***
    - Hematoma: interstitial large amount of blood
    - Hamartoma: mass of disorganized **mature** tissues

Test yourself

Which of the following describes a benign tumor arising from skeletal muscle?

A. Leiomyoma
B. Papilloma
C. Rhabdomyoma
D. Leiomyosarcoma
E. Rhabdomyosarcoma

Which of the following describes a non-tumorous lesion?

A. Lipoma
B. Adenoma
C. Melanoma
D. Hamartoma
E. Osteoma

CHARACTERS OF BENIGN AND MALIGNANT TUMORS

Characters of benign & malignant tumors

I. Rate and mode of growth

a.Benign tumors:

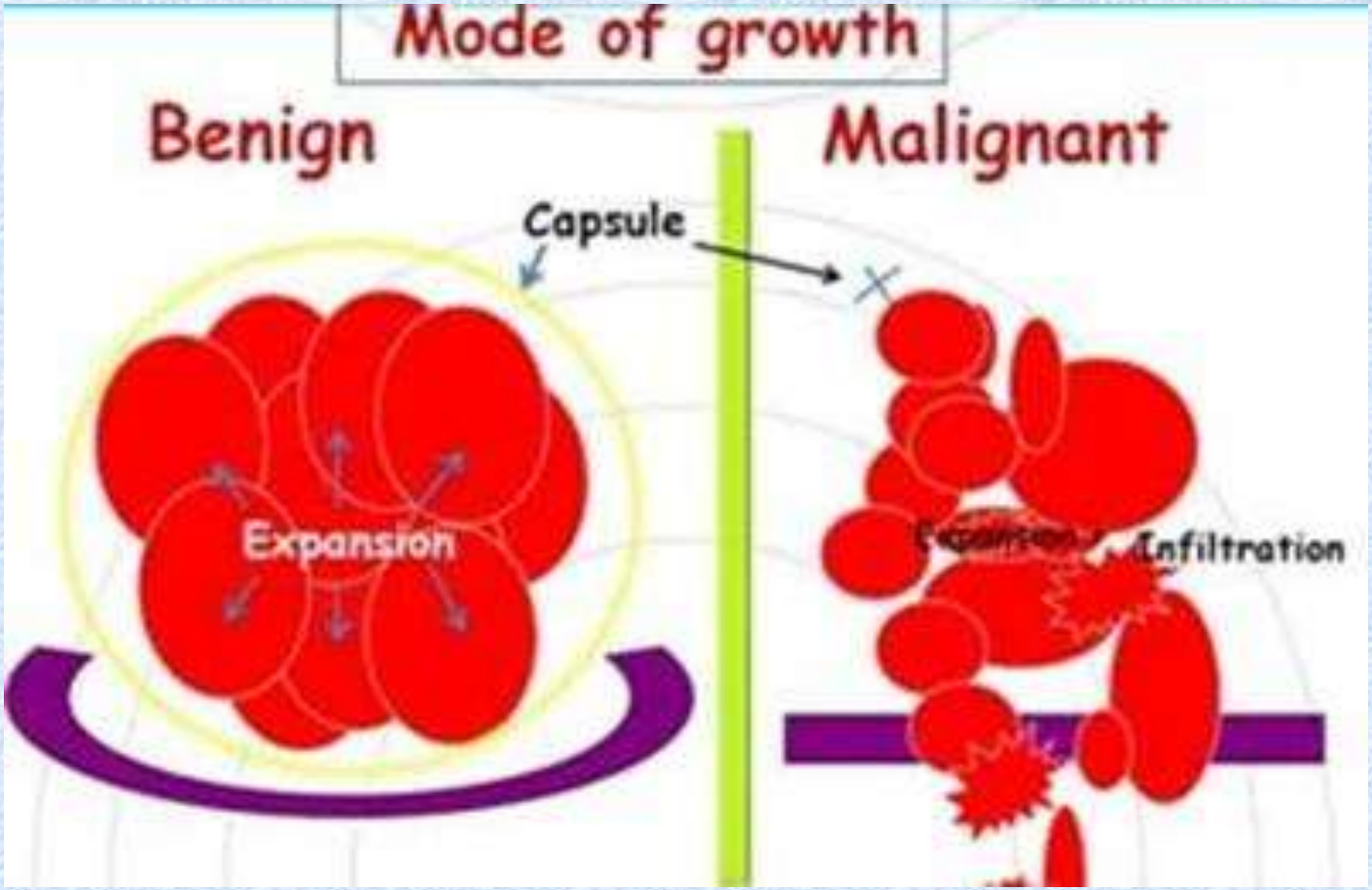
- Slow rate of growth
- Grow by expansion
- Some benign tumor are hormone dependent; so they can grow fast or regress based on hormone availability (as uterine leiomyoma)
- The tumor may regress due to insufficient vascular supply

b.Malignant tumors:

- Grow rapidly
- Grow by infiltration of surrounding tissues
- Growth rate may exceed blood supply; so tumor necrosis occurs
- Poorly differentiated tumor grow faster than better differentiated tumors

Characters of benign & malignant tumors

I. Rate and mode of growth



Characters of benign & malignant tumors

II. Local invasion (direct spread)

a.Benign tumors:

- Do not infiltrate adjacent tissues
- Usually has a capsule or a pseudo capsule separates it from surrounding tissues

b.Malignant tumors:

- Usually infiltrate surrounding tissues
- Non capsulated and have ill-defined infiltrative borders.
- Some tumors may look capsulated grossly; however invasion to adjacent tissues can be detected microscopically (e.g. follicular carcinoma of thyroid gland).

Characters of benign & malignant tumors

III. Distant spread (metastasis)

- **Means**: migration of tumour cells to organ or site away from primary site with formation of secondary tumour masses.
- ***It is the single sure sign of malignancy***
- **Benign tumors don`t metastasize** but **malignant tumors do**.
- Some malignant tumors infiltrate adjacent tissues but have no ability to metastasize (called locally malignant tumors).
- Poorly differentiated tumors are more likely to metastasize compared to well-differentiated tumours
- About 1/3 of the tumors are metastastic at time of diagnosis

MORPHOLOGY OF BENIGN and MALIGNANT TUMORS

Morphology of tumors

II. Gross appearance

- **Benign tumors:** commonly appears as
  - ***Mass***
  - ***Polyp***

  ⇨ **Describe** ***size, shape, surface and cut section***

- **Malignant tumors:** could appears as
  - ***Mass*** ⇨ **Describe** ***size , shape, surface and cut section***
  - ***Fungating (cauliflower)*** ⇨ **Describe** ***size , shape, surface and cut section***
  - ***Ulcer*** ⇨ **Describe** ***size, edge, base and floor***
  - ***Annular*** ⇨ ***In hollow organs: thick wall and narrow lumen***

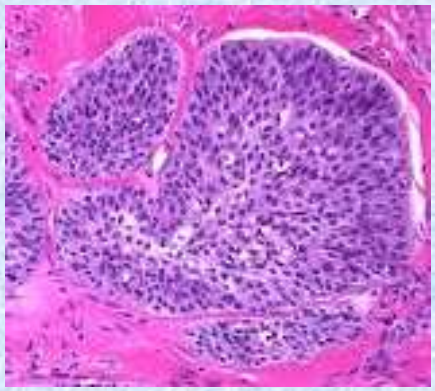
Morphology of tumors

II. Microscopic features

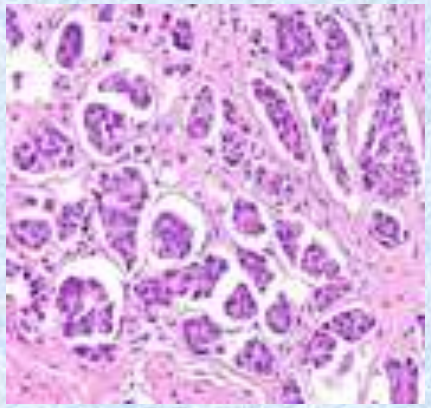
- **Tumor cells (parenchyma): The proliferating cells**

A. Growth pattern

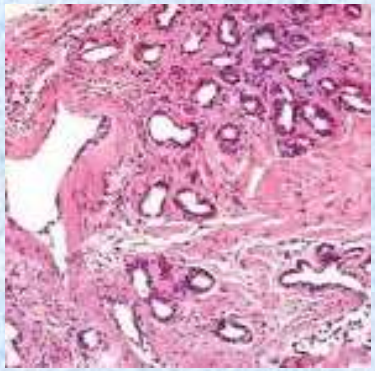
1. Epithelial tumors:



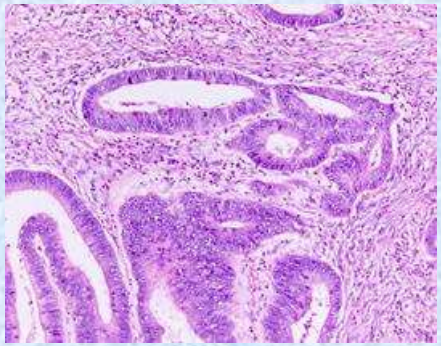
Sheets



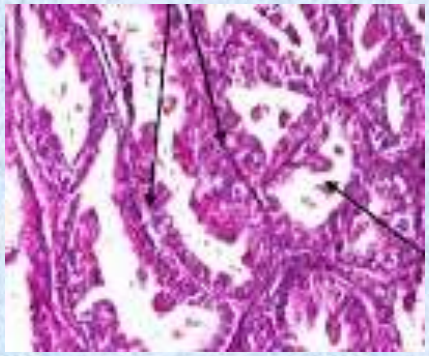
Nests



Acini



Glands



Papillae

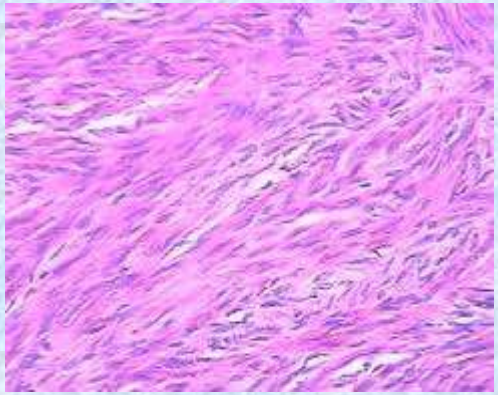
Morphology of tumors

II. Microscopic features

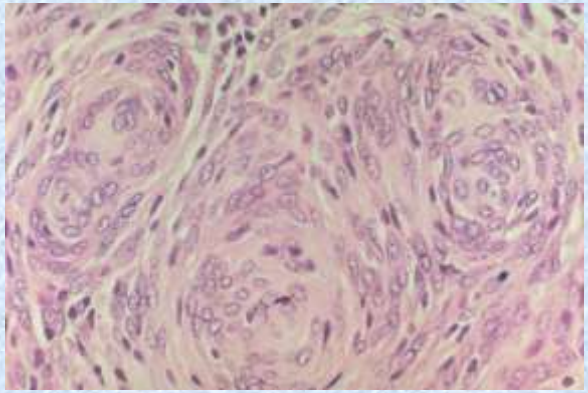
- **Tumor cells (parenchyma): The proliferating cells**

A. Growth pattern

2. Mesenchymal tumors:



Bundles



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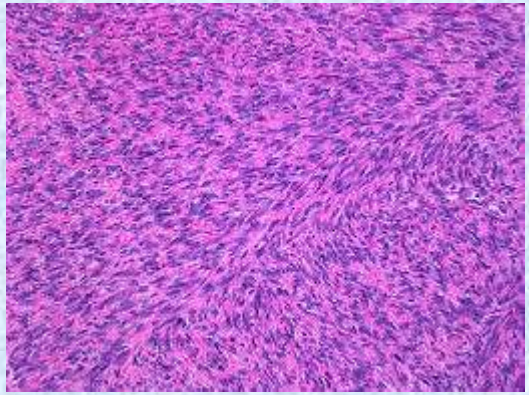


Diffuse

Morphology of tumors

II. Microscopic features

- **Tumor cells (parenchyma): The proliferating cells**

A. Growth pattern

B. Cellular features

a. Differentiation:

- To what extent the neoplastic cells resemble native cells
- In benign tumors; the neoplastic cells closely resemble the native cells (well-differentiated)
- In malignant tumors: the neoplastic cells have a wide range of differentiation from **well-differentiated** to **undifferentiated** cells (anaplastic).
- **Anaplasia**: Means complete loss of differentiation

Morphology of tumors

II. Microscopic features

- **Tumor cells (parenchyma): The proliferating cells**

A. Growth pattern

B. Cellular features

b. Cellular criteria of malignancy:

- ***Pleomorphism***: tumor cells are variable in size and shape
- ***Loss of polarity***: change orientation of tumor cells to each other.
- ***Hyperchromatic*** nuclei: the nuclei are deeply stained
- ***Increased nucleo-cytoplasmic ratio (N/C ratio):*** the nucleus become large
- ***Prominent nucleoli***: the nucleolus become large
- ***Frequent mitosis***
- ***Tumor giant cells***

Morphology of tumors

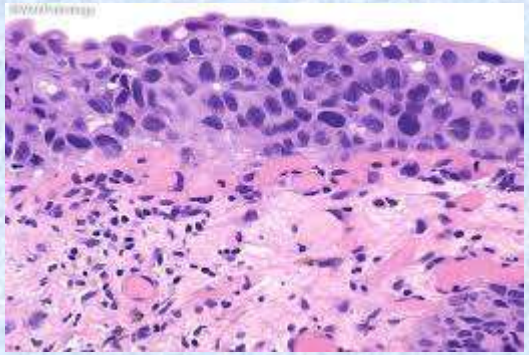
II. Microscopic features

- **Tumor cells (parenchyma): The proliferating cells**

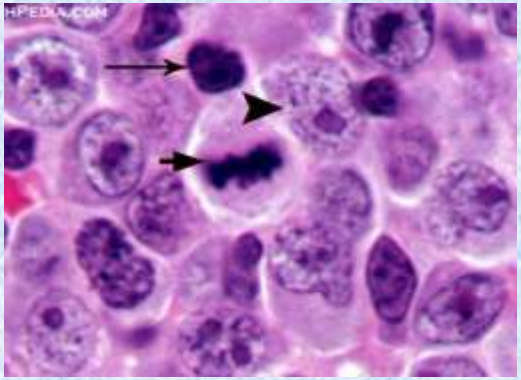
A. Growth pattern

B. Cellular features

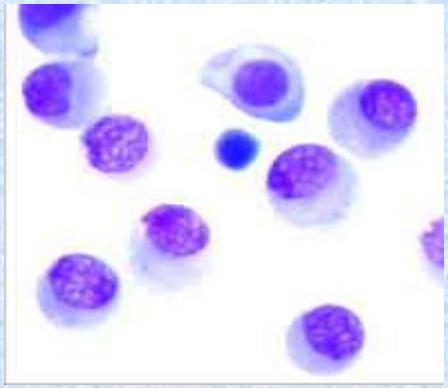
b. Cellular criteria of malignancy:



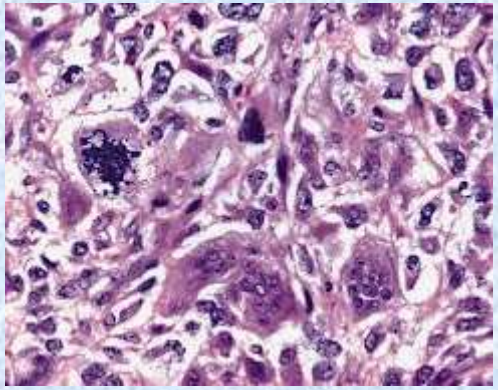
Loss of polarity



Mitosis &
prominent nucleoli



High N/C ratio



Tumor giant cells

Good luck

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