

Neoplasia

Lecture 1

Abdulmalik Alsheikh, MD, FRCPC

Neoplasia

Upon completion of these lectures, the student should:

- Define a neoplasm. Contrast neoplastic growth with hyperplasia, metaplasia, and dysplasia.
- Know the basic principles of the nomenclature of benign and malignant processes.
- Define and use in the proper context:
 - Adenoma.
 - Papilloma.
 - Polyp.
 - Cystadenoma.
 - Carcinoma.
 - Adenocarcinoma.
 - Sarcoma.
 - Teratoma.
 - Blastoma.
 - Hamartoma.

Neoplasia

- 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

- Neoplasia = new growth
- Neoplasm = tumor
- Tumor = swelling
- The study of tumors = Oncology
 - Oncos = tumor + ology = study of

Neoplasia

■ Definition:

- is an abnormal mass of tissue,
- the growth of which is uncoordinated with that of normal tissues,
- and that persists in the same excessive manner after the cessation of the stimulus which evoked the change
- With the loss of responsiveness to normal growth controls
- Different from hyperplasia, metaplasia and dysplasia.

Neoplasia

- Classification
 - Benign
 - malignant

Neoplasia

- Benign tumors :
 - Will remain localized
 - Cannot spread to distant sites
 - Generally can be locally excised
 - Patient generally survives

Neoplasia

- Malignant neoplasms:
 - Can invade and destroy adjacent structure
 - Can spread to distant sites
 - Cause death (if not treated)

Neoplasia

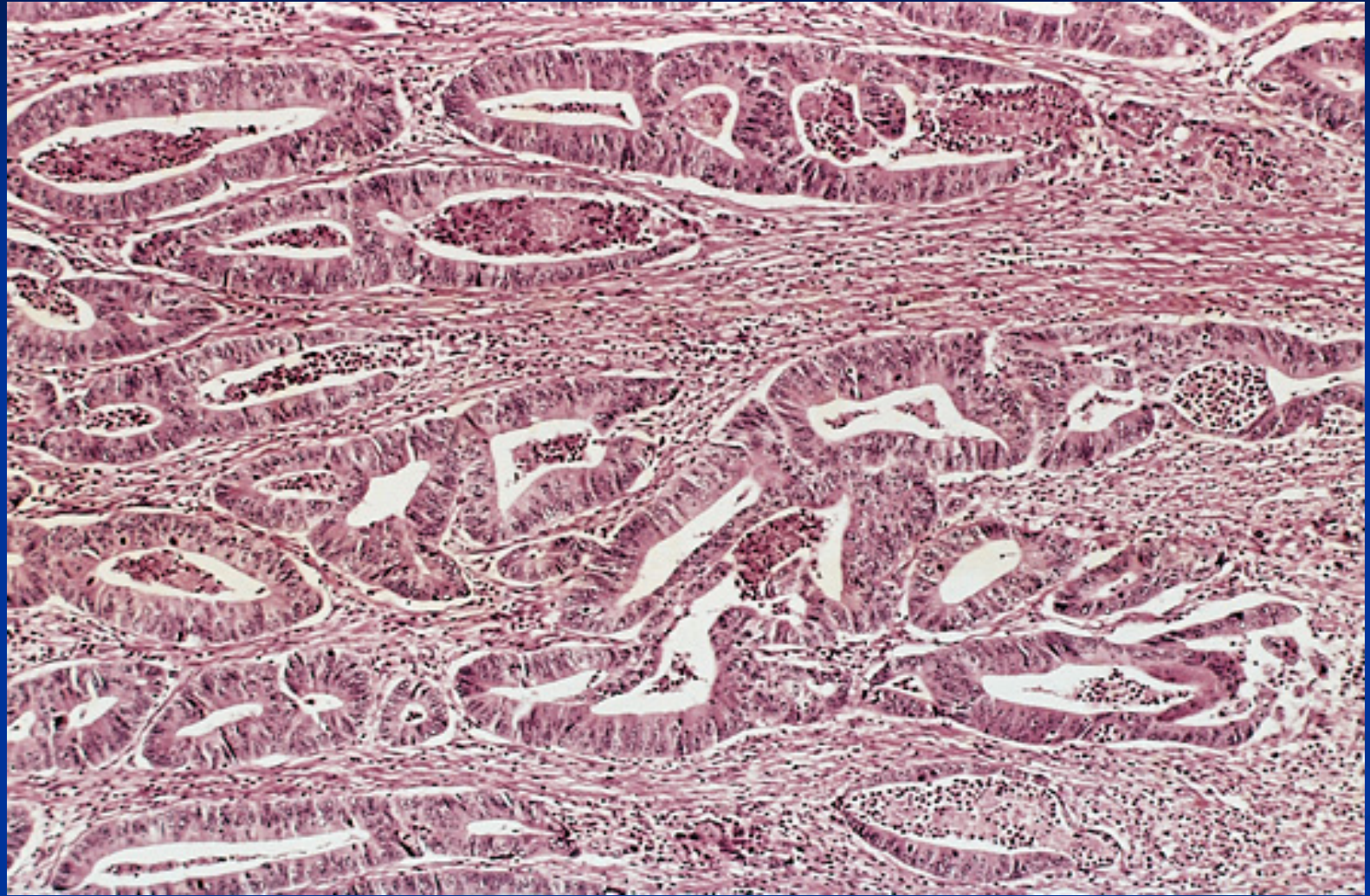
- All tumors have two basic components:
 - **Parenchyma:** made up of neoplastic cells
 - **Stroma:** made up of non-neoplastic, host-derived connective tissue and blood vessels

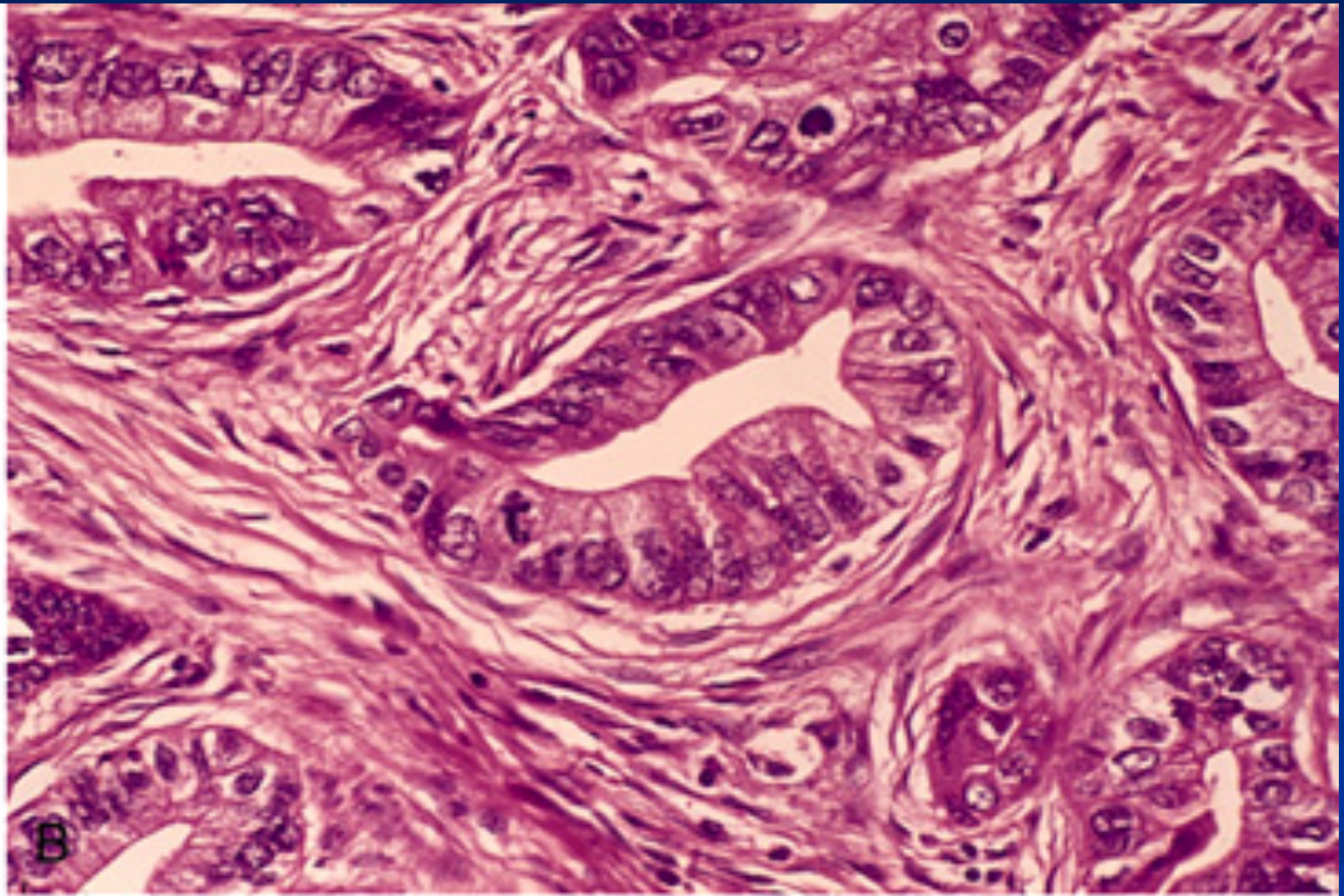
The parenchyma:

Determines the biological behavior of the tumor
From which the tumor derives its name

The stroma:

Carries the blood supply
Provides support for the growth of the parenchyma





Neoplasia

■ Nomenclature

- Benign tumors :
 - prefix + suffix
 - Type of cell + (-oma)

Neoplasia

- Examples:

- Benign tumor arising in fibrous tissue:

Fibro + oma = Fibroma

Benign tumor arising in fatty tissue:

Lipo + oma = lipoma

Neoplasia

- Benign tumor arising in cartilage
chondro + oma = chondroma
- Benign tumor arising in smooth muscle
Leiomyo + oma = leiomyoma
- Benign tumor arising in skeletal muscle
Rhabdomyo + oma = rhabdomyoma

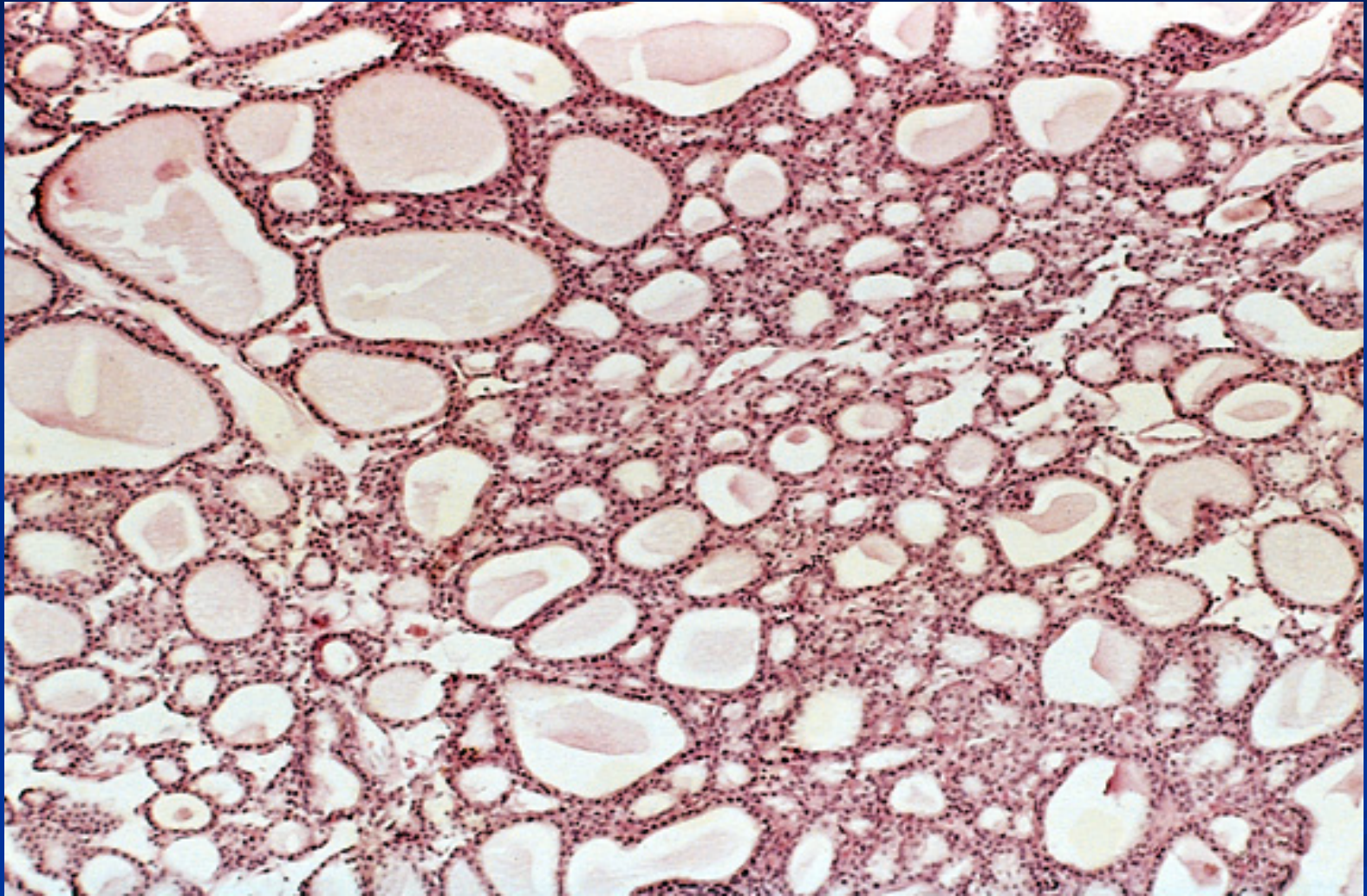
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- epithelial benign tumors are classified on the basis of :
 - The cell of origin
 - Microscopic pattern
 - Macroscopic pattern

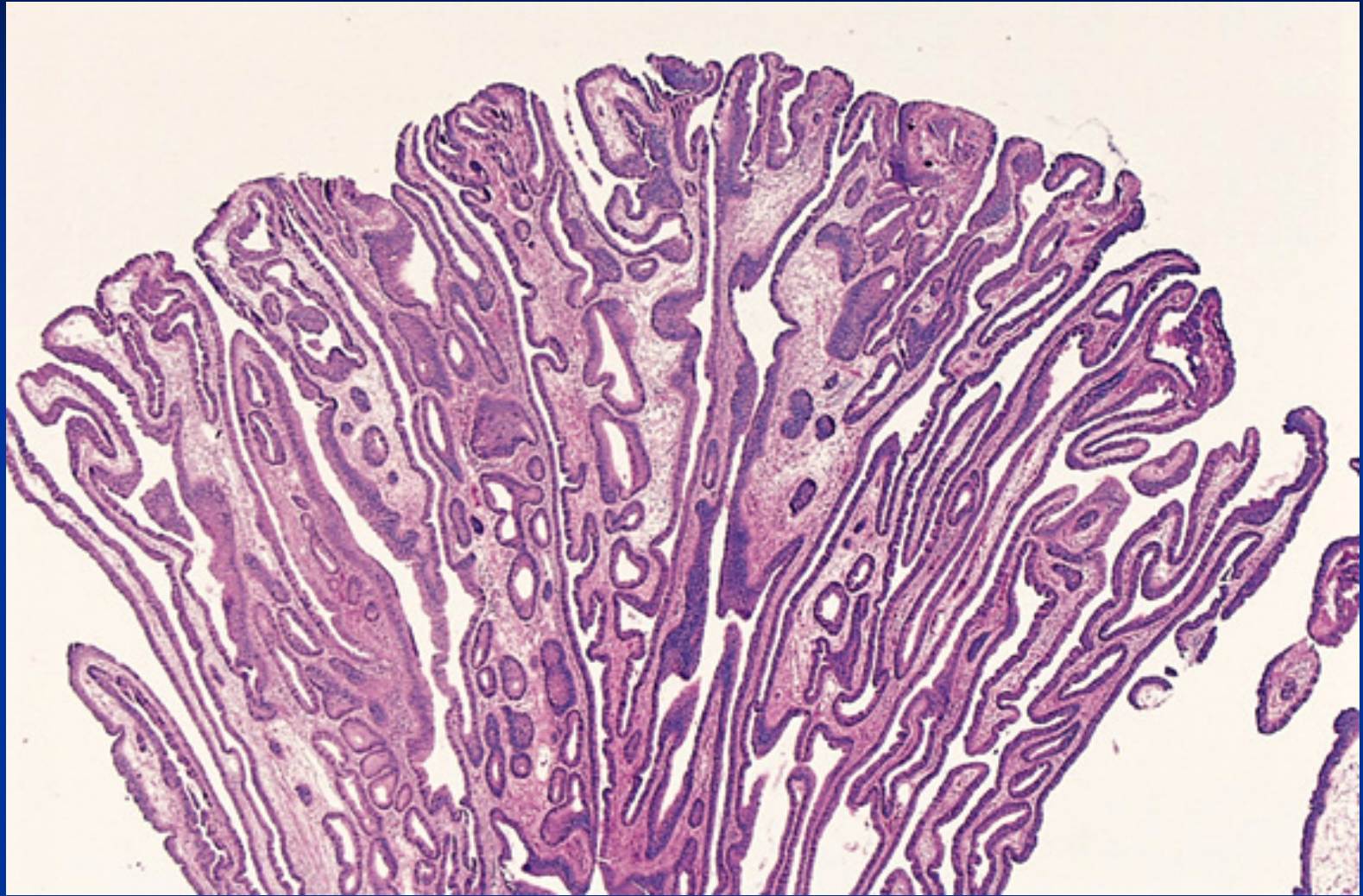
Neoplasia

- **Adenoma** : benign epithelial neoplasms producing gland pattern....OR ... derived from glands but not necessarily exhibiting gland pattern
- **Papilloma** : benign epithelial neoplasms growing on any surface that produce microscopic or macroscopic finger-like pattern

Adenoma



Papilloma



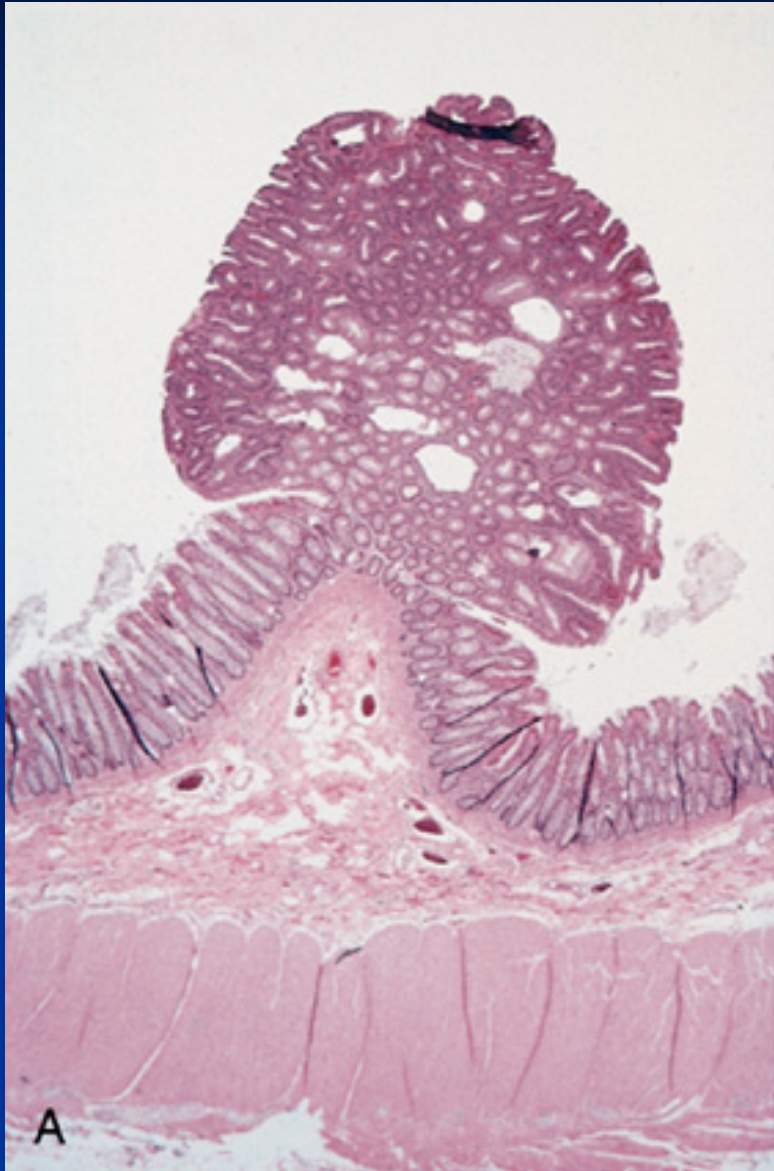
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- **Polyp** : a mass that projects above a mucosal surface to form a macroscopically visible structure.

e.g. - colonic polyp

- nasal polyp

Polyp



Neoplasia

- Examples :
 - Respiratory airways: Bronchial adenoma
 - Renal epithelium: Renal tubular adenoma
 - Liver cell : Liver cell adenoma
 - Squamous epithelium: squamous papilloma

Neoplasia

- Malignant tumors:
 - Malignant tumor arising in mesenchymal tissue :
SARCOMA
 - From fibrous tissue: Fibrosarcoma
 - From bone : Osteosarcoma
 - From cartilage : chondrosarcoma



Osteosarcoma



Neoplasia

- Malignant tumors arising from epithelial origin :
CARCINOMA
 - Squamous cell carcinoma
 - Renal cell adenocarcinoma
 - cholangiocarcinoma

Carcinomas arising from any epithelium of the body that exhibit squamous differentiation are termed squamous cell carcinoma.



Nomenclature

other descriptive terms may be added such as:

Papillary Cystadenocarcinoma of the Ovary



Neoplasia

Exceptions

- Melanoma (skin)
- Mesothelioma (mesothelium)
- Seminoma (testis)
- Lymphoma (lymphoid tissue)

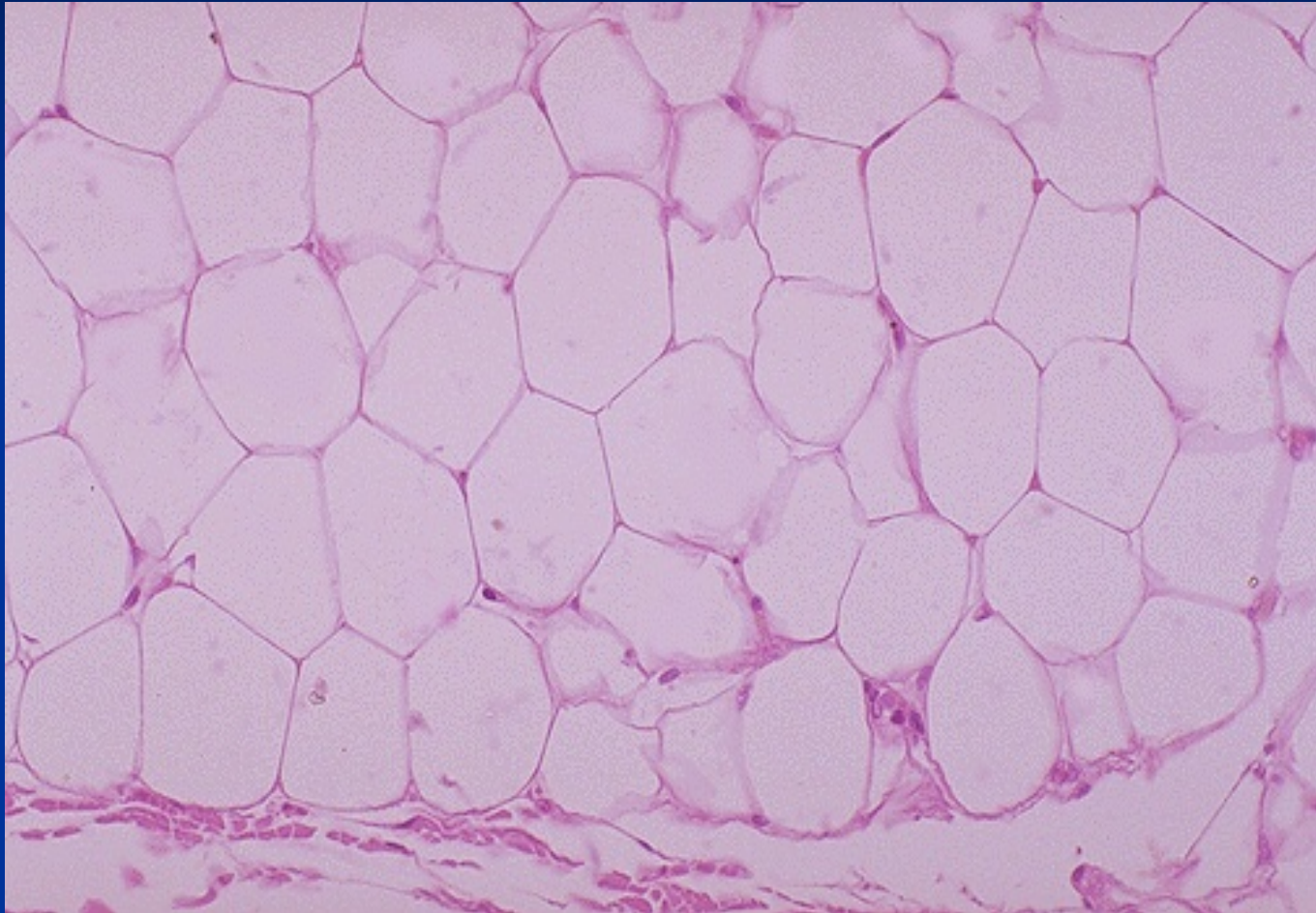
See table 6 – 1 page 168 (Robbin's)

Neoplasia

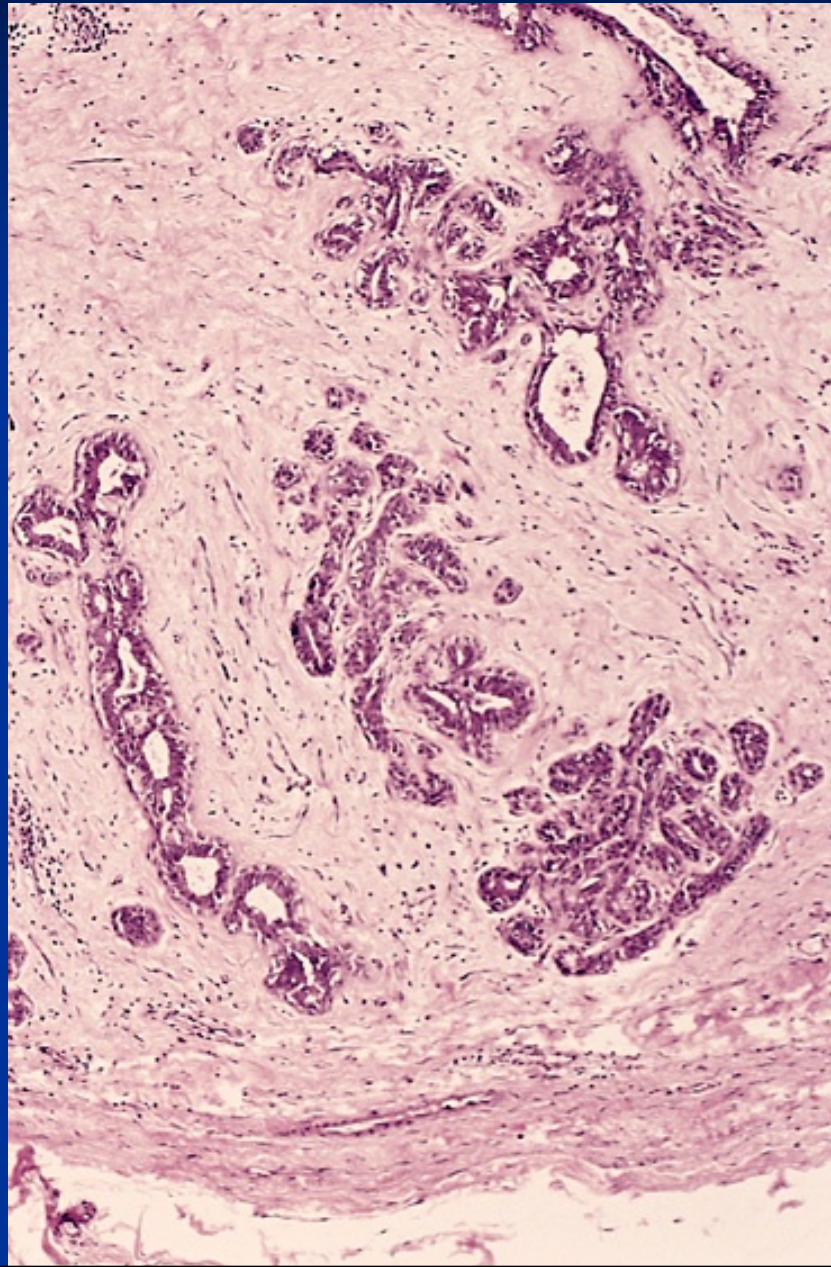
- Based on the biological behavior :
 - Benign and malignant

- 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)

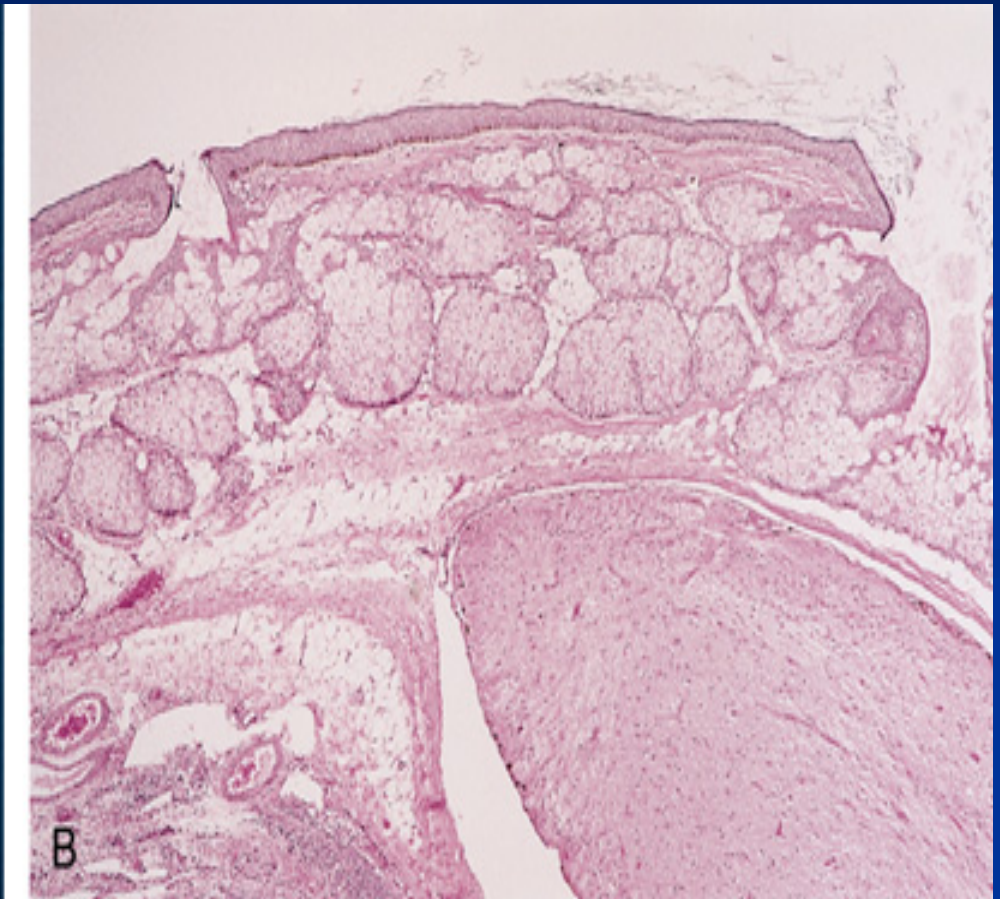
Lipoma



Fibroadenoma



Teratoma



Neoplasia

- Teratoma:

- Teratoma contains recognizable mature or immature cells or tissues representative of more than one germ-cell layer and some times all three.
- Teratomas originate from totipotential cells such as those normally present in the ovary and testis.

Neoplasia

- Such cells have the capacity to differentiate into any of the cell types found in the adult body. So they may give rise to neoplasms that mimic bone, epithelium, muscle, fat, nerve and other tissues.
- Most common sites are: ovary & testis

Neoplasia

- If all the components parts are well differentiated, it is a benign (mature) teratoma.
- If less well differentiated, it is an immature (malignant) teratoma.

Neoplasia nomenclature
- historic eponyms – “first described by...”

Hodgkin's disease	Malignant lymphoma (HL) of B Ly cell origin
Burkitt tumor	NHL – B Lymphocytes 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

WHAT ARE HAMARTOMAS AND CHORISTOMA?

Hamartoma: a mass composed of cells native to the organ

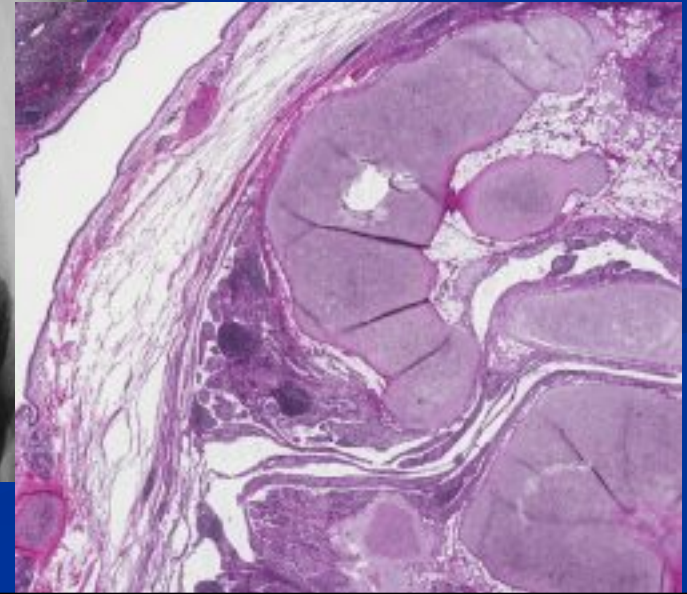
e.g. pulmonary hamartoma.

Choristoma: a mass composed of normal cells in a wrong location

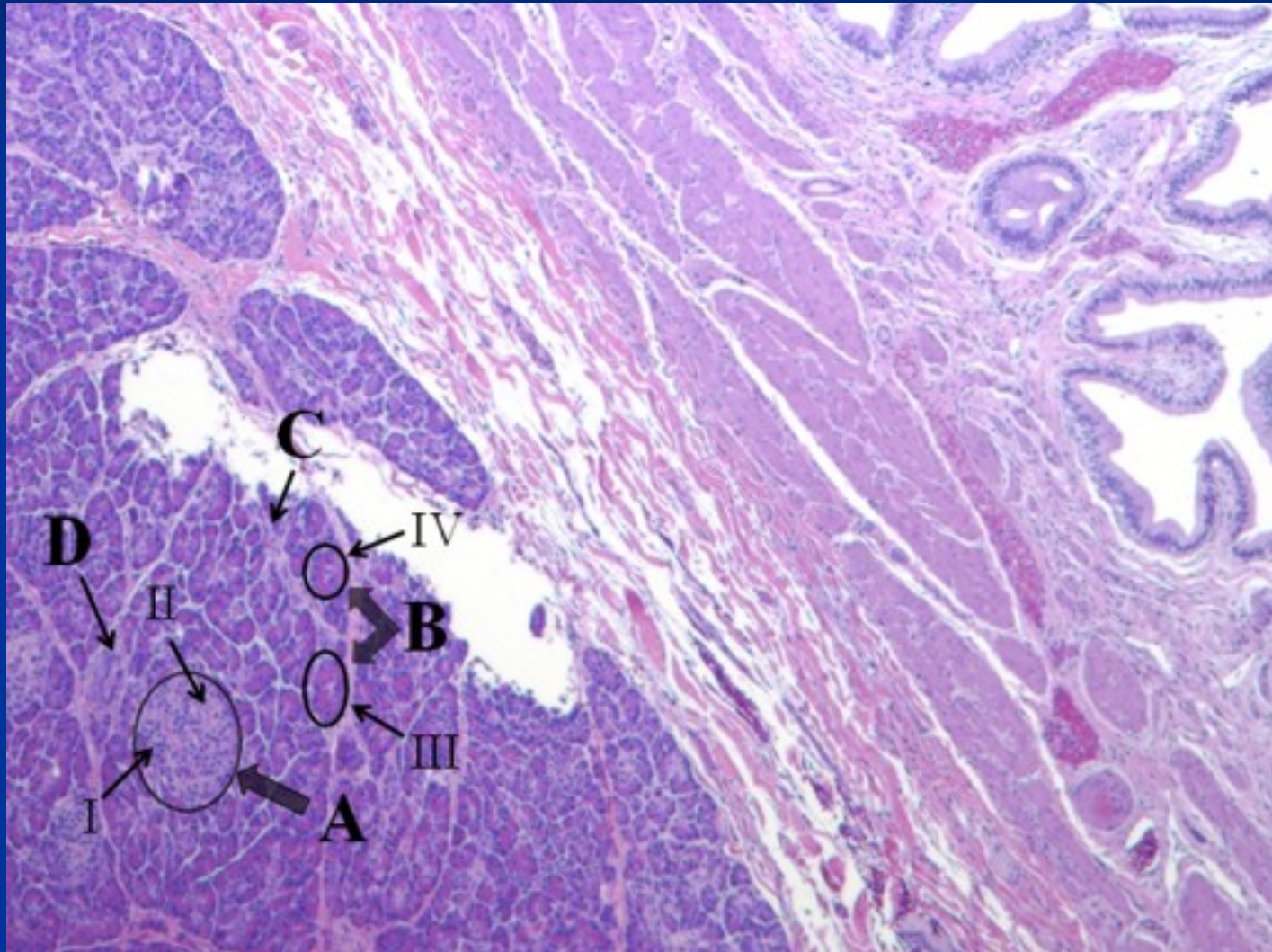
e.g. pancreatic choristoma in liver or stomach.

- Malformation and not neoplasm.

Pulmonary Hamartoma



Pancreatic choristoma in gall bladder



Neoplasia

Hamartoma and Choristoma

- 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

Neoplasia

Lecture 2

Abdulmalik Alsheikh, MD, FRCPC

Objectives

- Compare and contrast benign and malignant tumors with respect to:
 - demarcation from surrounding tissue (capsule, local invasiveness).
 - rate of growth
 - degree of differentiation (Explain the meaning of differentiation).
 - distant spread (metastases).
- Describe the morphologic changes associated with poorly differentiated tumors; define and understand the usage of the terms anaplasia, pleomorphism, nuclear atypia, abnormal mitoses and tumor giant cells.
- Understand the clinical significance of invasiveness and metastasis.
- Describe the anatomic pathways utilized by tumors in metastatic spread. Know which pathways are commonly used by carcinomas versus sarcomas.
- List some common sites of distant metastases.
- Recognize the epidemiologic data of cancer distribution in regard to age, race, geographic factors, and genetic backgrounds.
- List some inherited syndromes with a genetic predisposition to cancer.

Neoplasia

Characteristics of benign and malignant neoplasms

- **Differentiation and anaplasia**
- Rate of growth
- Local invasion
- metastasis

Neoplasia

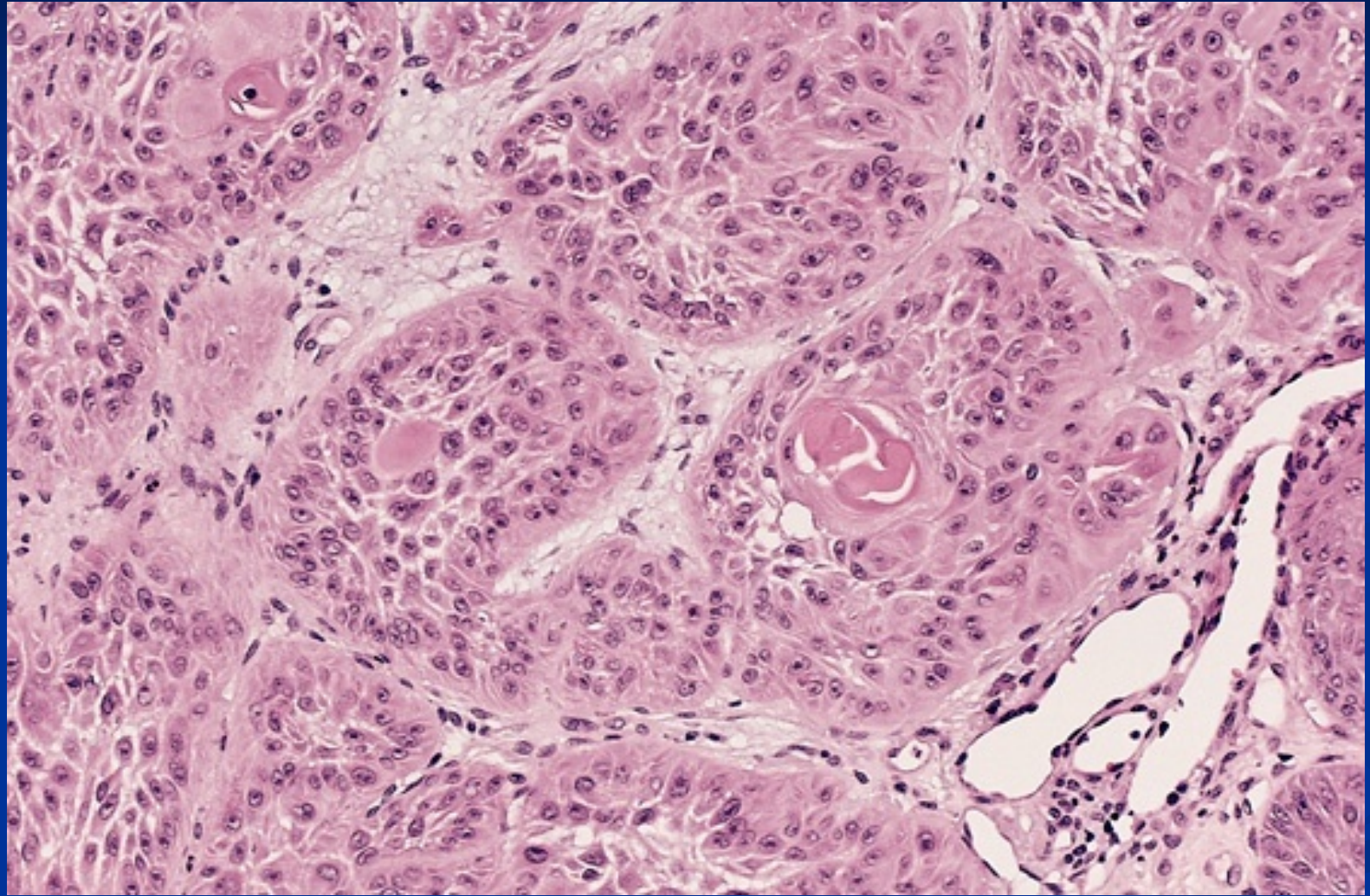
1. Differentiation and anaplasia:
 - Differentiation means : the extent to which the parenchymal cells of the tumor resemble their normal counterparts morphologically and functionally

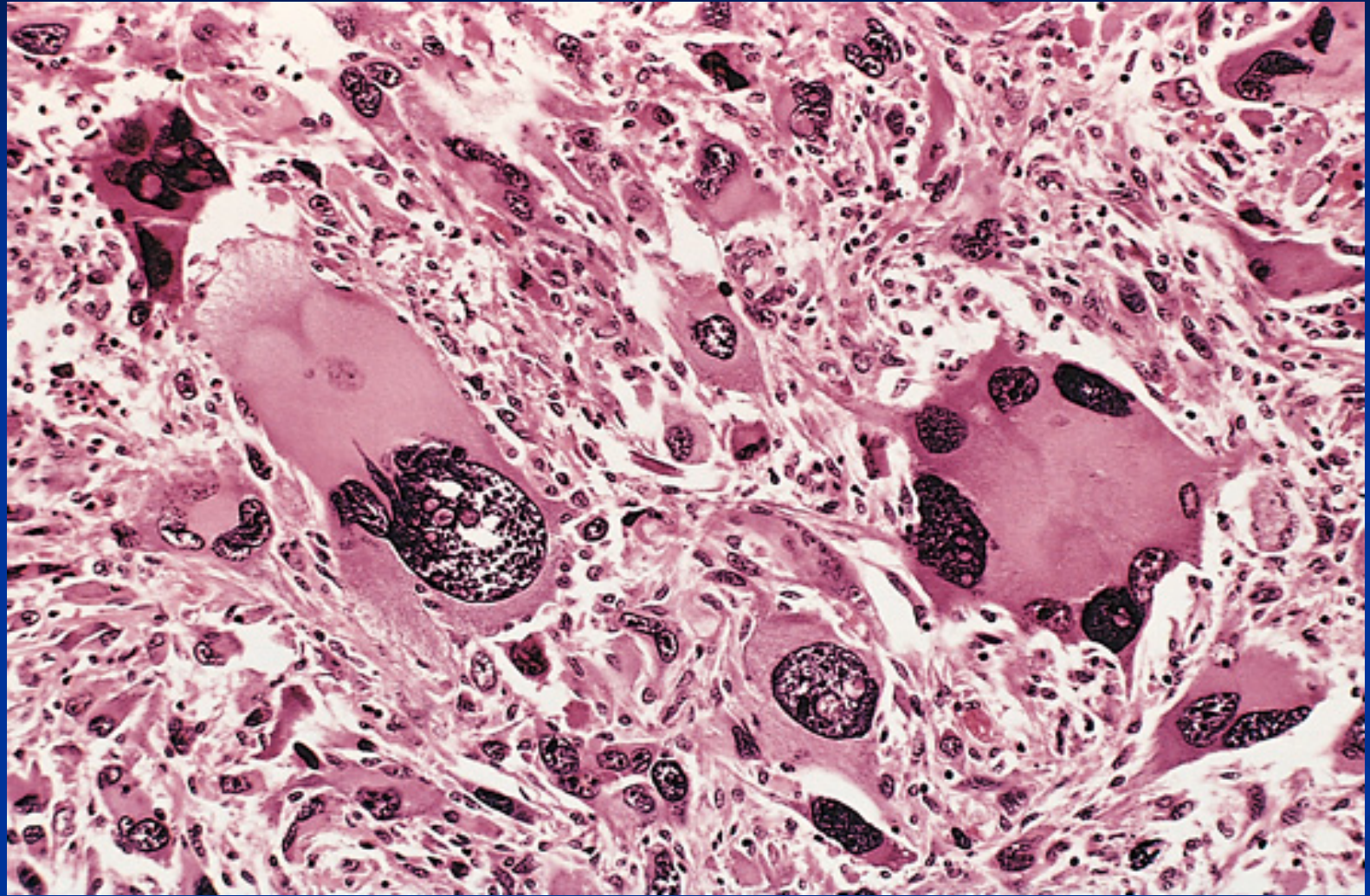
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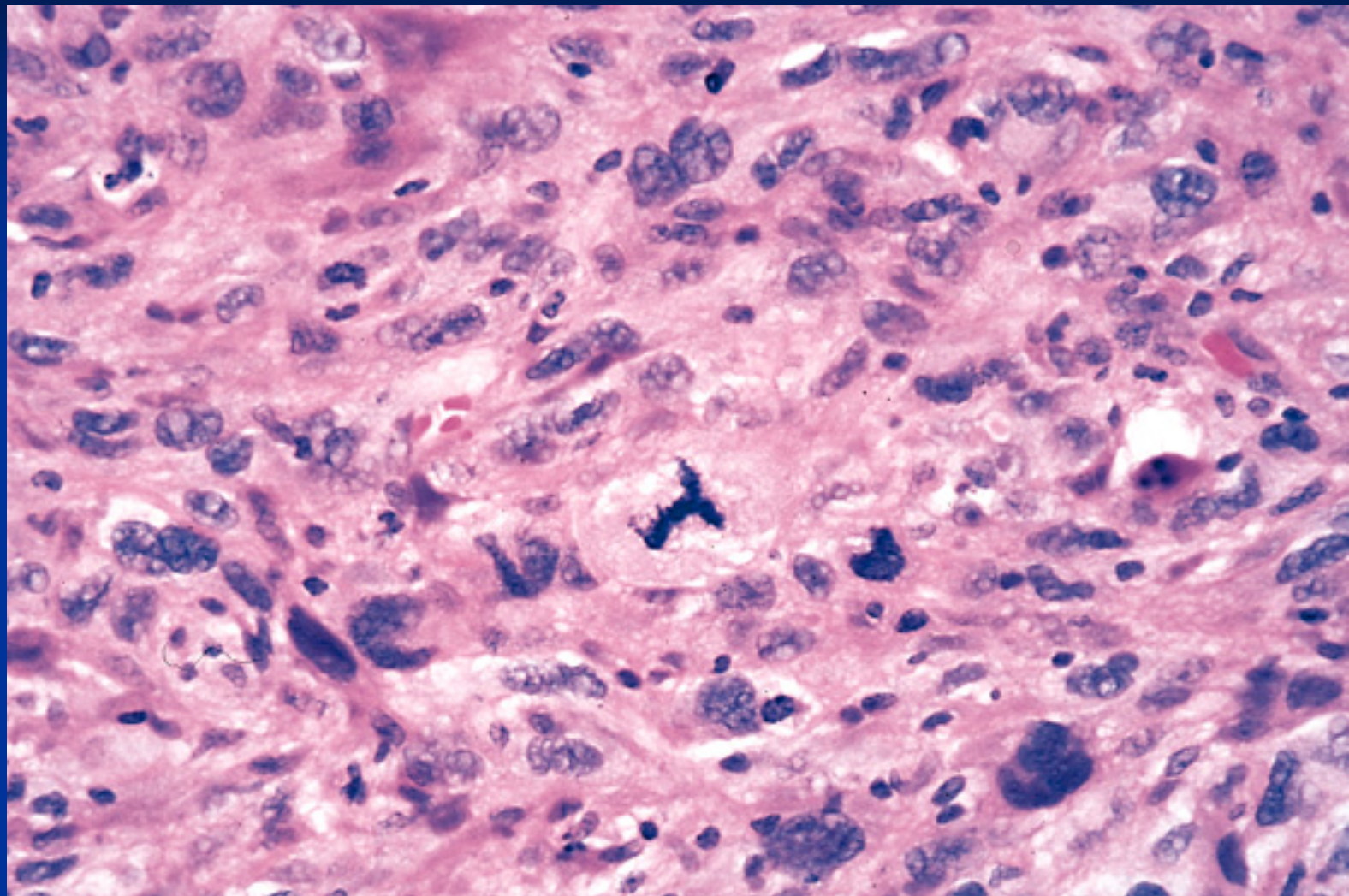
- well differentiated = closely resemble their normal counterparts
- Moderately differentiated
- Poorly differentiated
- Undifferentiated (Anaplasia)

Neoplasia

- Benign tumors = well differentiated
- Malignant tumors =
well differentiated -----> anaplastic







Neoplasia

- In the histological examination of a tumor you should look for :
 - Pleomorphism : variation in size
 - High nuclear/ cytoplasm ratio (N/C ratio)
 - Hyperchromasia (dark cell)
 - Mitosis?abnormal one

Neoplasia

Characteristics of benign and malignant neoplasms

- Differentiation and anaplasia
- **Rate of growth**
- Local invasion
- metastasis

Neoplasia

- Rate of growth:
 - Benign tumors:
 - grows slowly
 - are affected by blood supply, hormonal effects , location
 - Malignant tumors :
 - grows faster
 - Correlate with the level of differentiation

Neoplasia

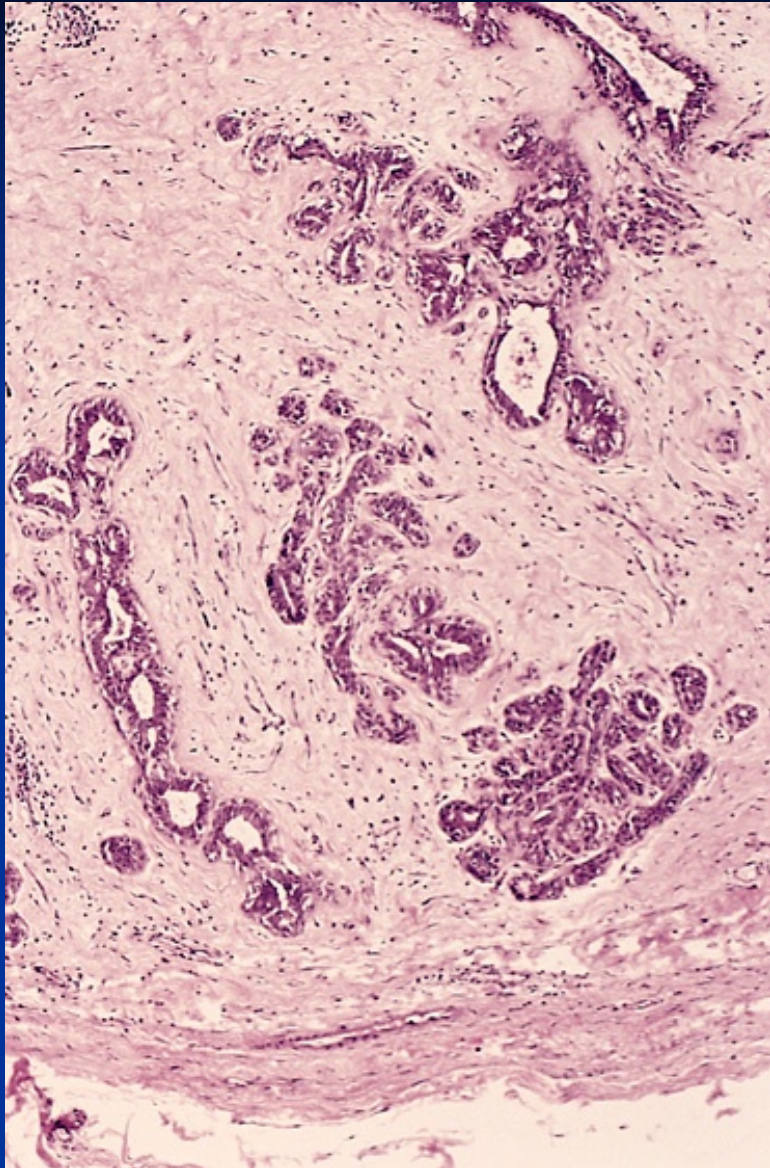
Characteristics of benign and malignant neoplasms

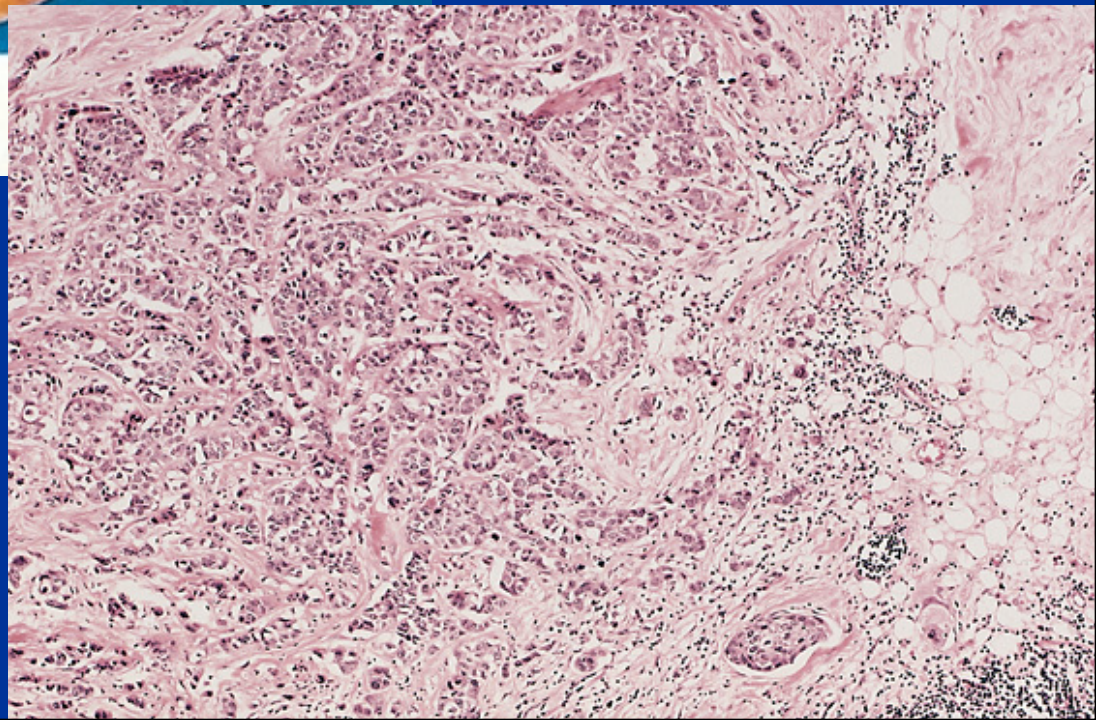
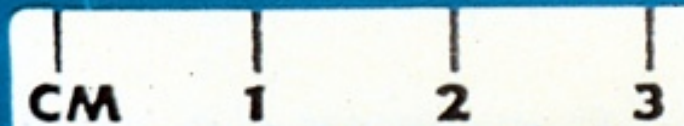
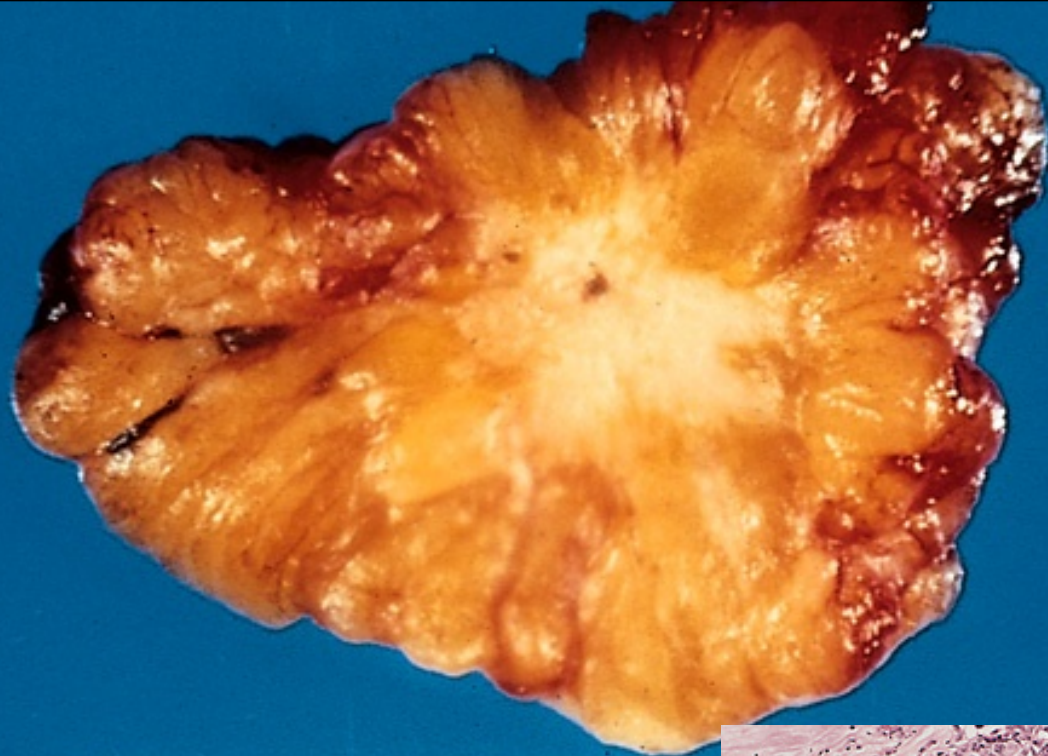
- Differentiation and anaplasia
- Rate of growth
- **Local invasion**
- metastasis

Neoplasia

- Local invasion :
 - Benign tumors :
 - Remain localized
 - Cannot invade
 - Usually capsulated
 - Malignant tumors :
 - Progressive invasion
 - Destruction
 - Usually not capsulated

CM
1
2
3
4
5





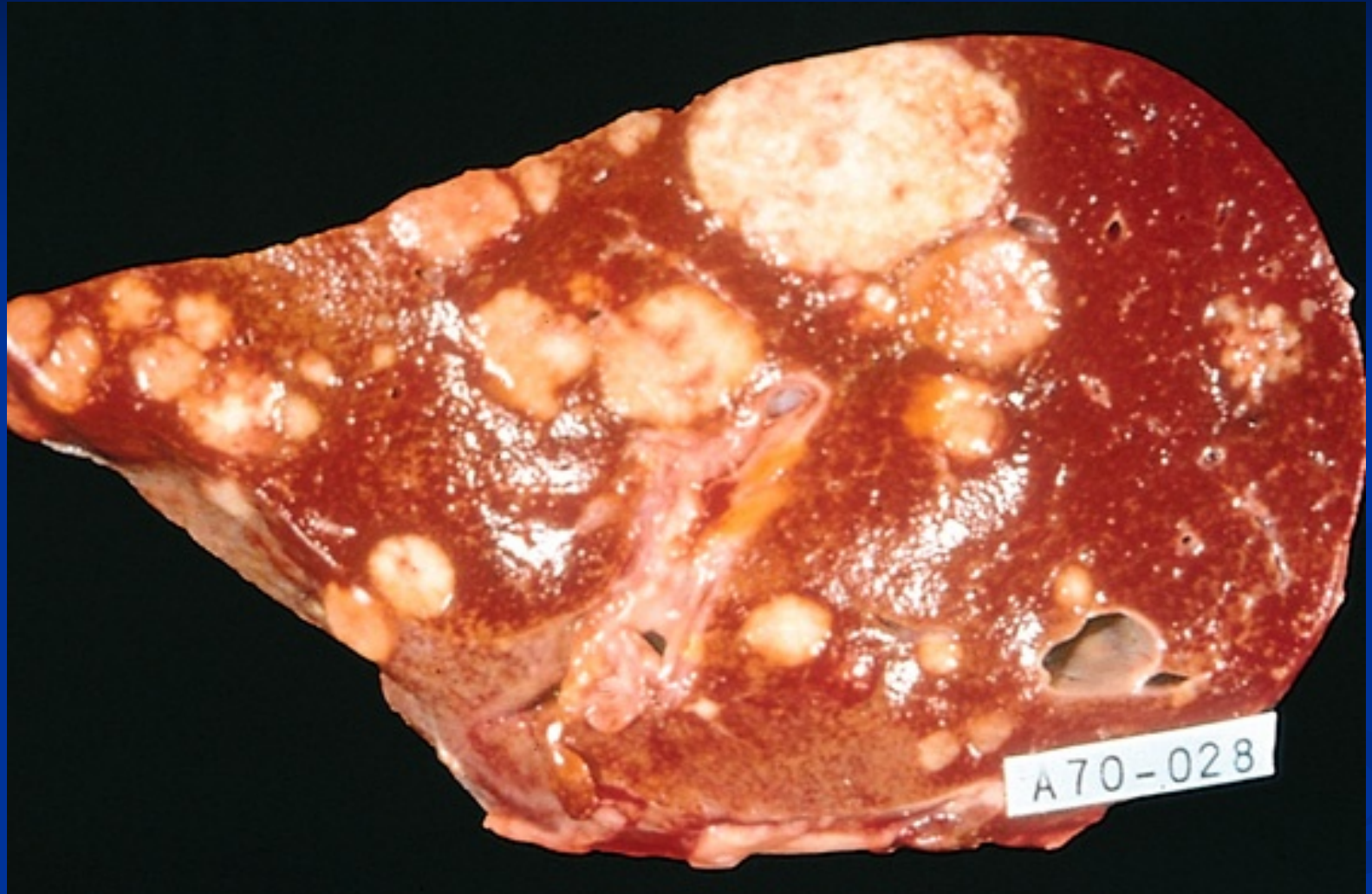
Neoplasia

Characteristics of benign and malignant neoplasms

- Differentiation and anaplasia
- Rate of growth
- Local invasion
- **Metastasis**

Neoplasia

- Metastasis :
 - Definition : the development of secondary implants discontinuous with the primary tumor, possibly in remote tissues



Neoplasia

- Metastasis :
 - Cancers have different ability to metastasize
 - Approximately 30% patients present with clinically evident metastases.
 - Generally, the more anaplastic and the larger the primary tumor, the more likely is metastasis

Neoplasia

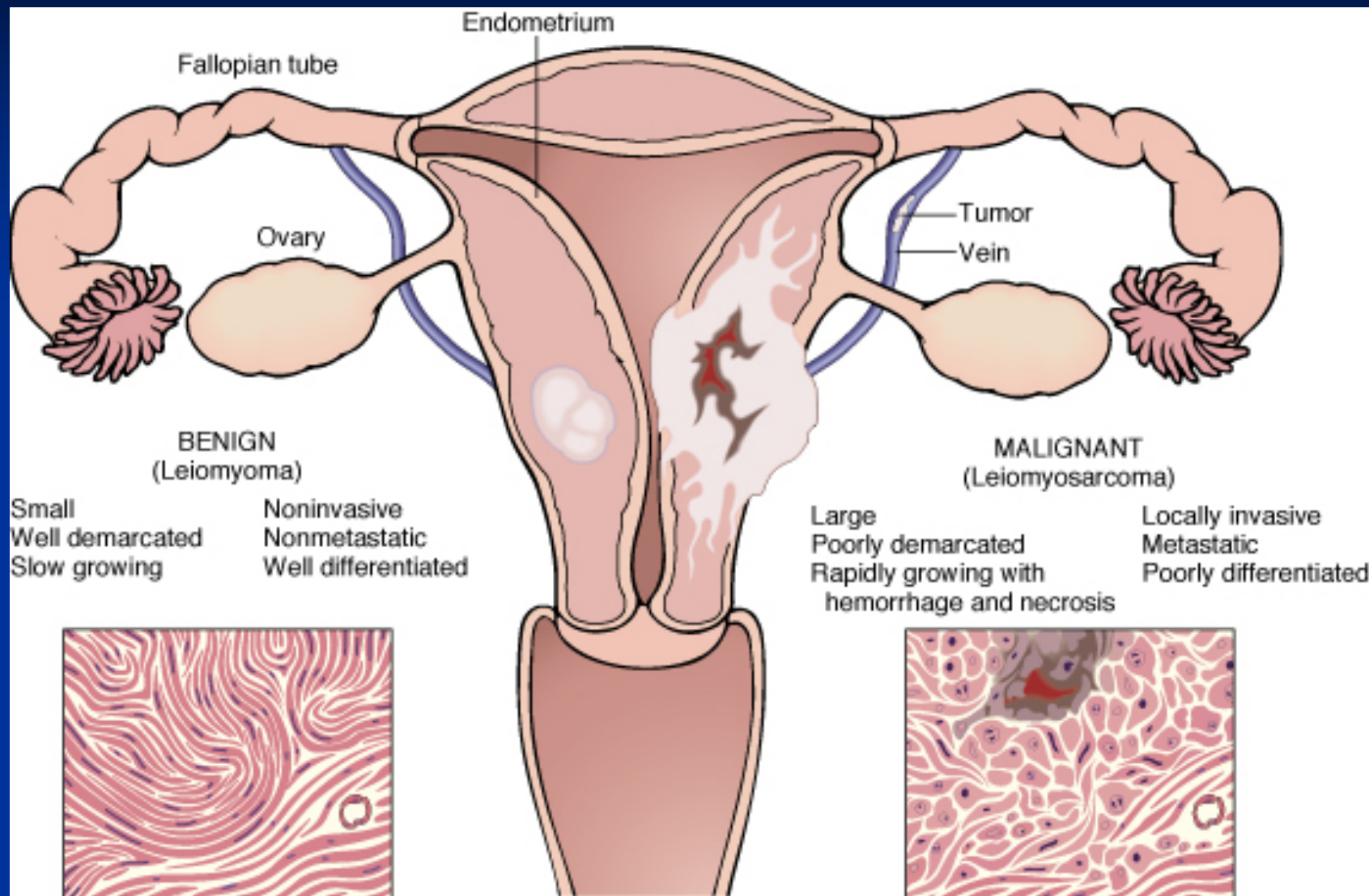
- Metastasis : three pathways
 - **Lymphatic** spread :
 - **Hematogenous** spread :
 - Seeding of the **body cavities**: pleural, peritoneal cavities and cerebral ventricles

Neoplasia

- **Lymphatic spread :**
 - favored by carcinomas
 - Breast carcinoma → axillary lymph nodes
 - Lung carcinomas → bronchial lymph nodes

Neoplasia

- Hematogenous spread :
- favored by sarcomas
- Also used by carcinomas
- Veins are more commonly invaded
- The liver and lungs are the most frequently involved secondary sites



Neoplasia

- In the histological examination of a tumor you should look for :
 - Pleomorphism : variation in size
 - High nuclear/ cytoplasm ratio (N/C ratio)
 - Hyperchromasia (dark cell)
 - Mitosis?abnormal one

Neoplasia

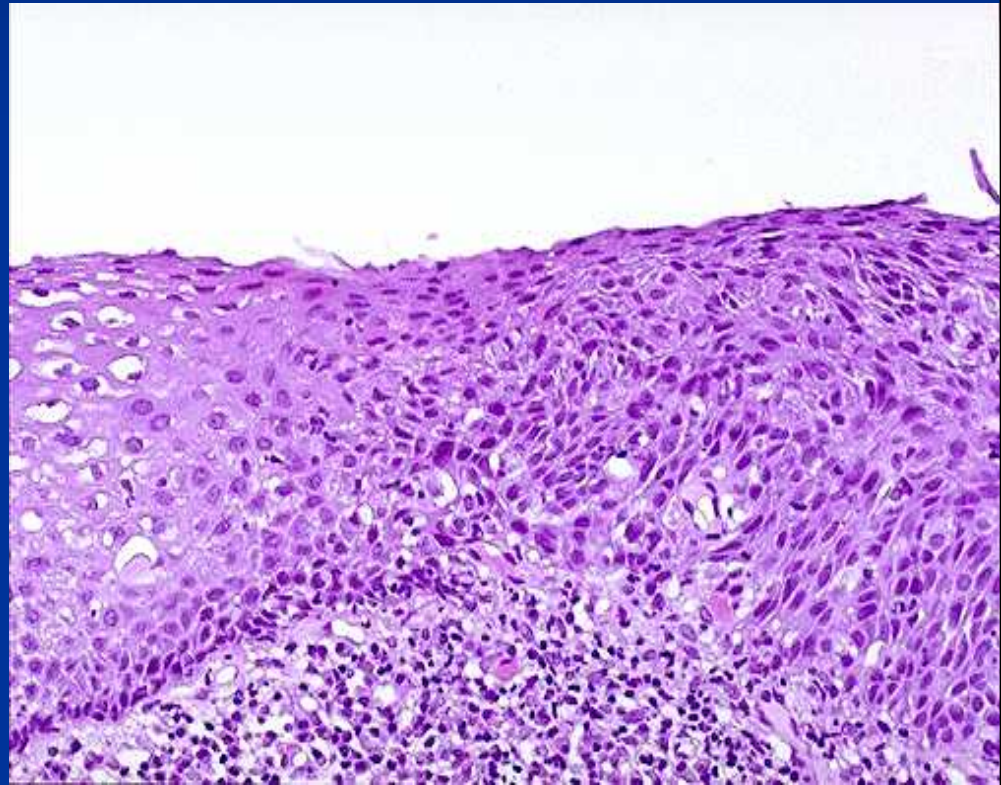
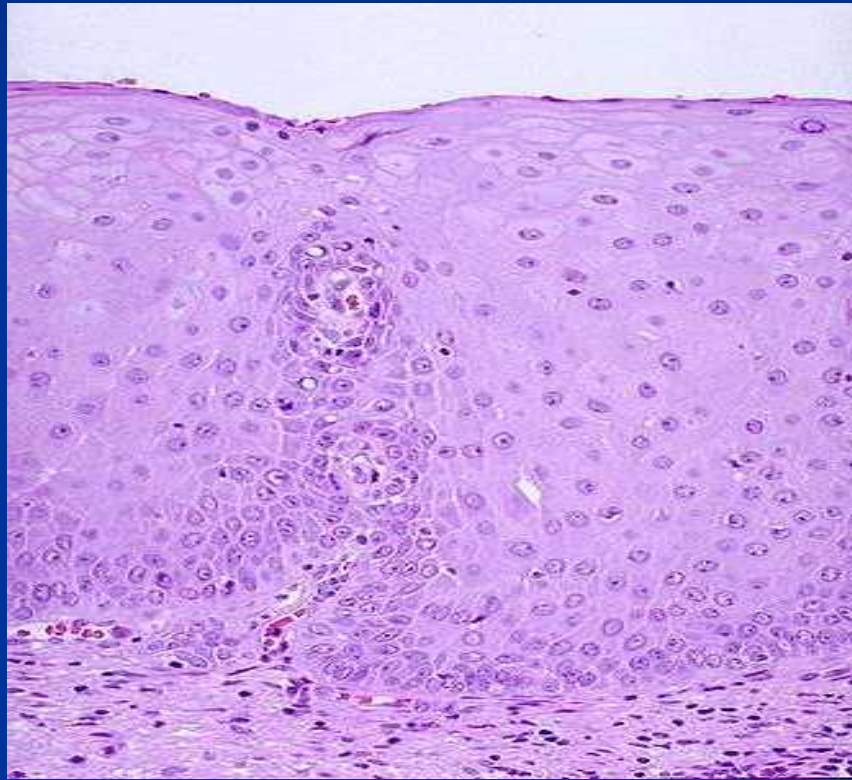
■ Dysplasia :

- Definiton: a loss in the uniformity of the individual cells and a loss in their architectural orientation.
- Non-neoplastic
- Occurs mainly in the epithelia
- Dysplastic cells shows a degree of : pleomorphism, hyperchrmasia,increased mitosis and loss of polarity.

Neoplasia

- Dysplasia does not mean cancer
- Dysplasia does not necessarily progress to cancer
- Dysplasia may be reversible
- If dysplastic changes involve the entire thickness of the epithelium it is called :

CARCINOMA IN-SITU

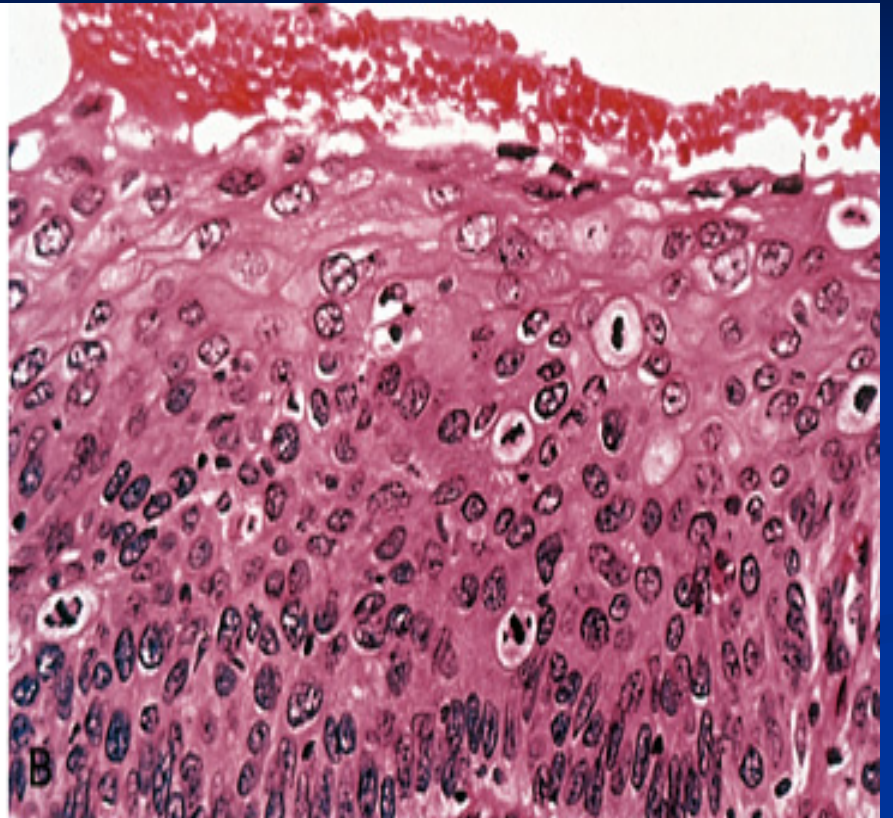
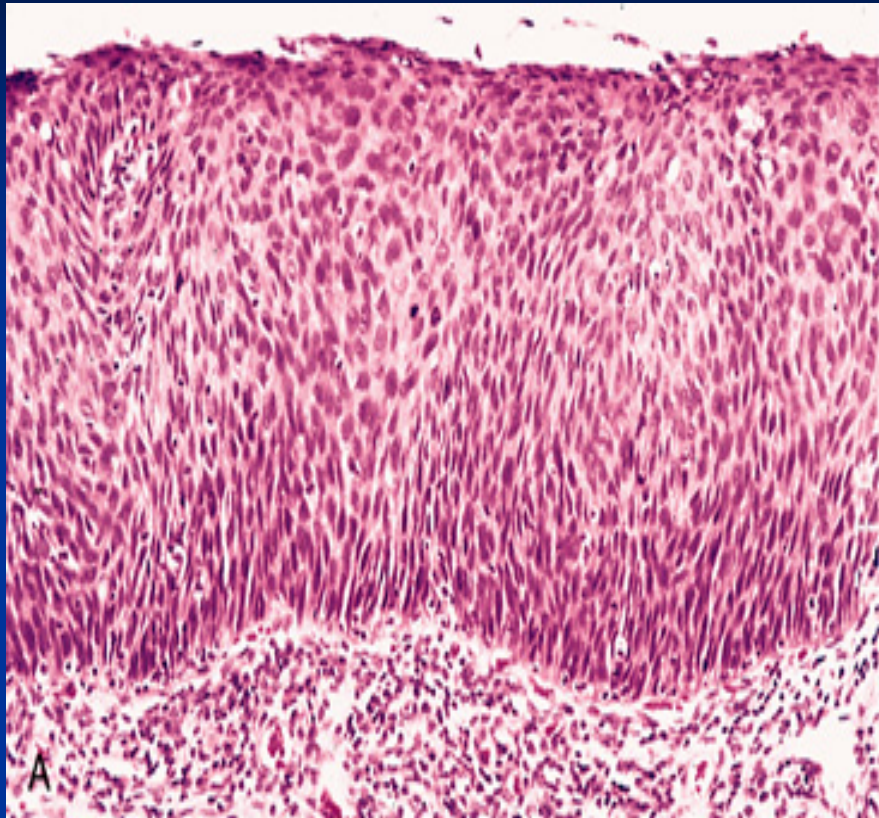


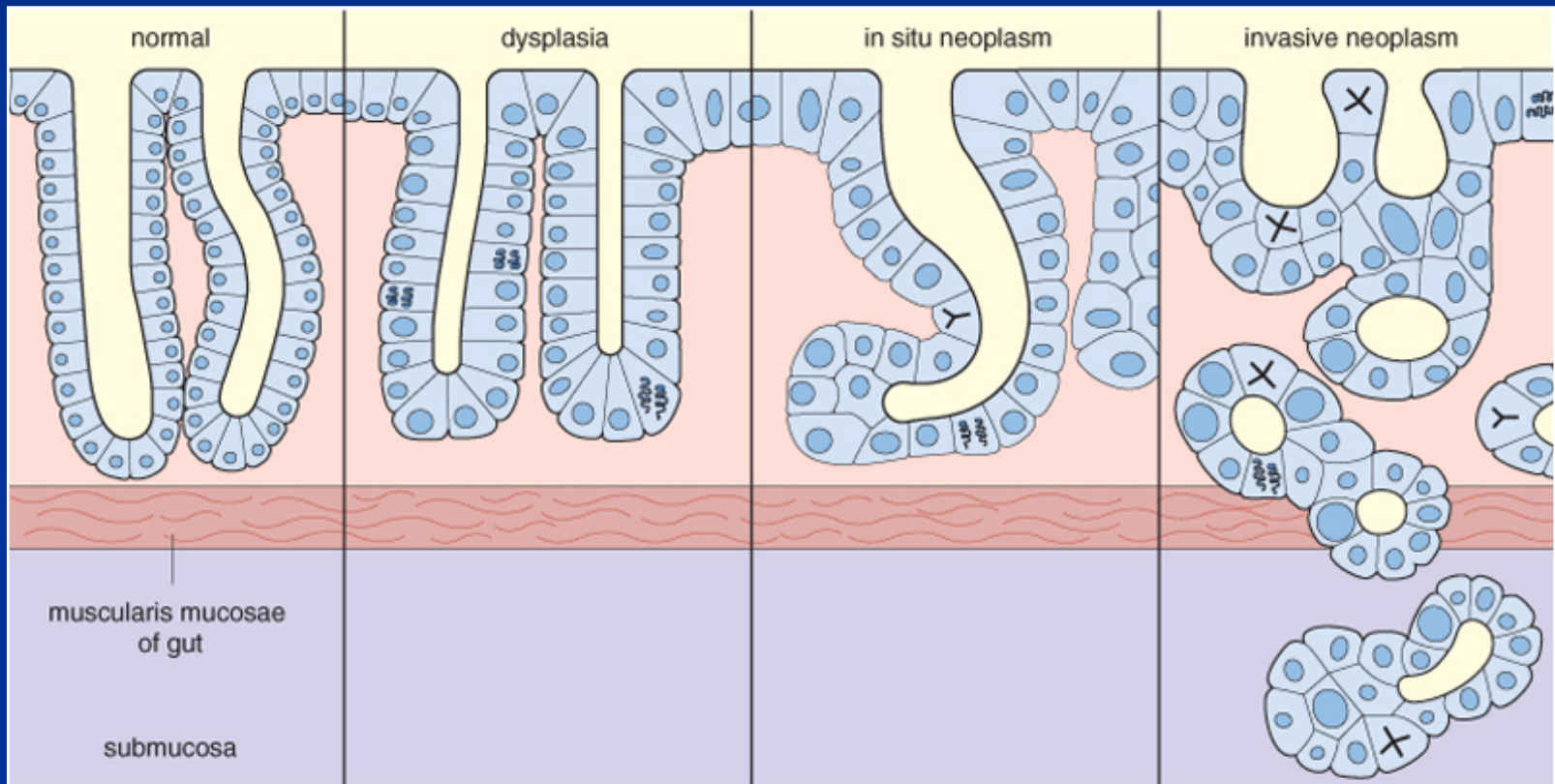
Neoplasia

- Carcinoma in-situ

- Definition: an intraepithelial malignancy in which malignant cells involve the entire thickness of the epithelium without penetration of the basement membrane.

- Applicable only to epithelial neoplasms.





Stevens et al: Core Pathology, 3rd Edition.
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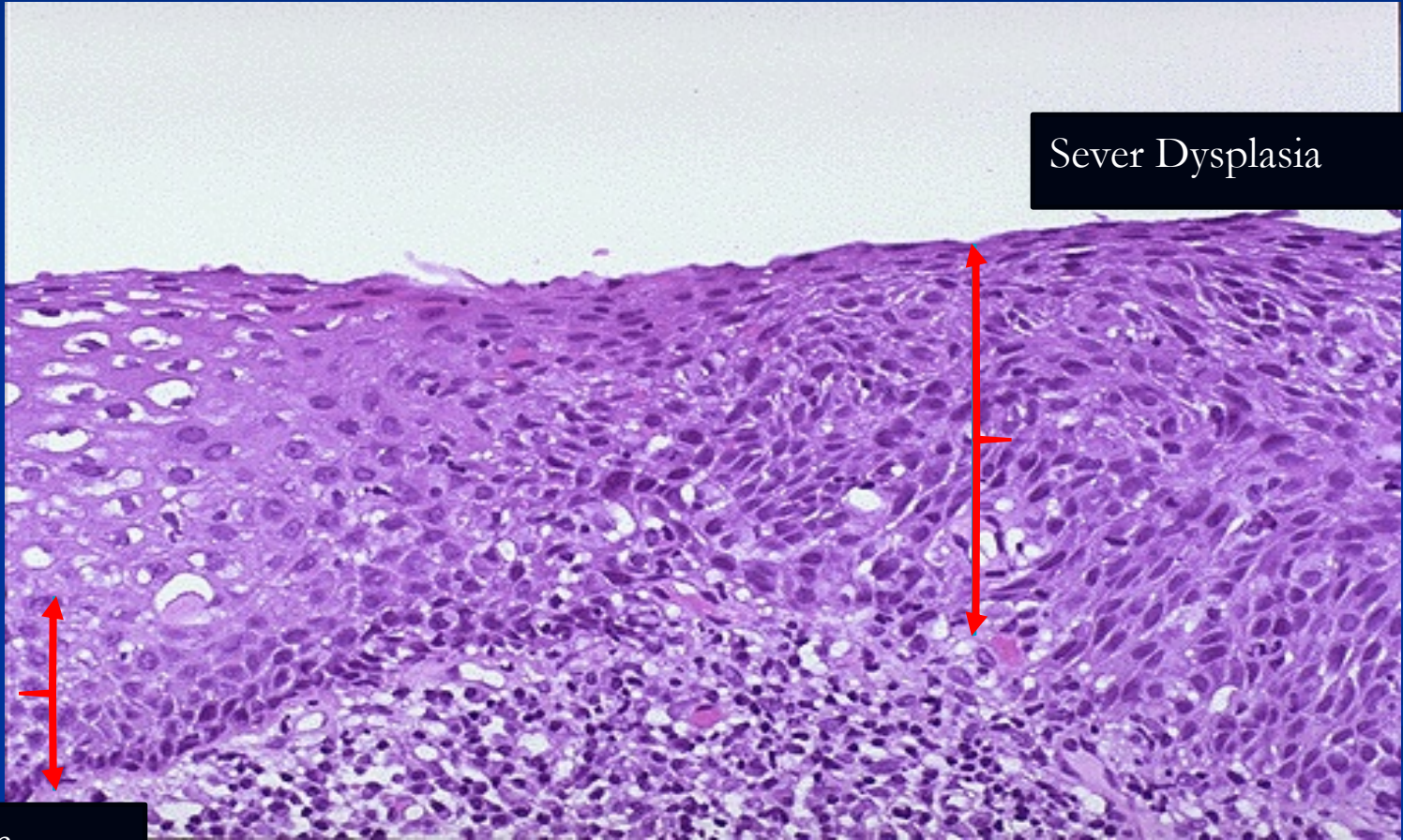
Dysplasia Features:

- Increased rate of multiplication.
- Disordered maturation.

- Nuclear abnormality
 - Increased N/C ratio
 - Irregular nuclear membrane
 - Increased chromatin content
- Cytoplasmic abnormalities due to failure of normal maturation

Dysplasia

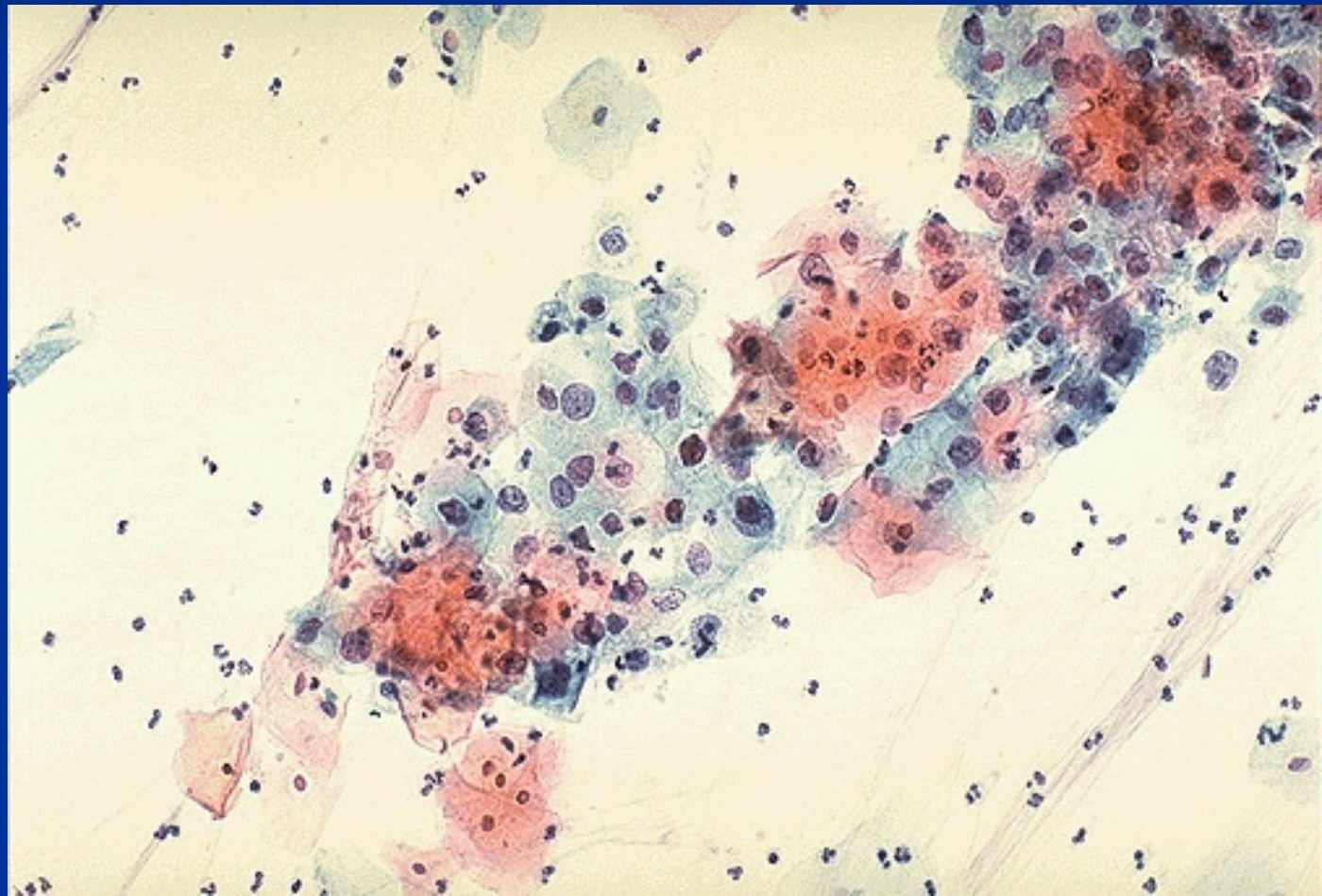
Uterine cervix



Sever Dysplasia

Mild Dysplasia

Dysplasia (cervical pap smear)



Dysplasia

- Clinical significance:
 - It is a premalignant condition.
 - The risk of invasive cancer varies with:
 - ✓ grade of dysplasia (mild, moderate, severe)
 - ✓ duration of dysplasia
 - ✓ site of dysplasia

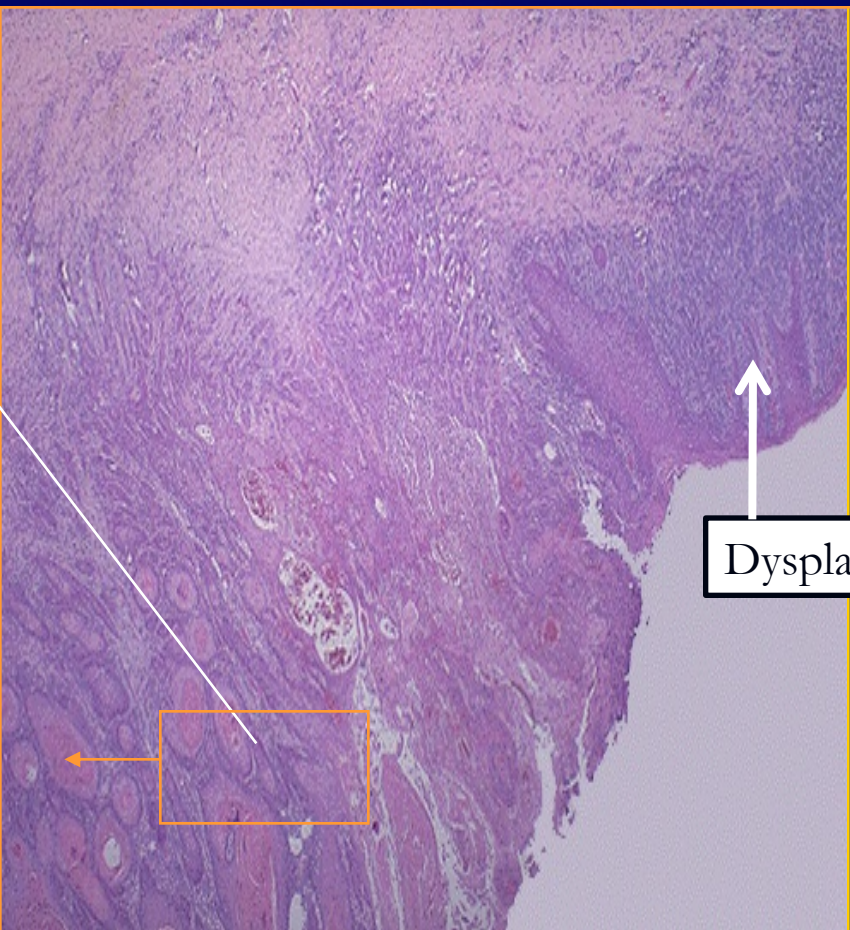
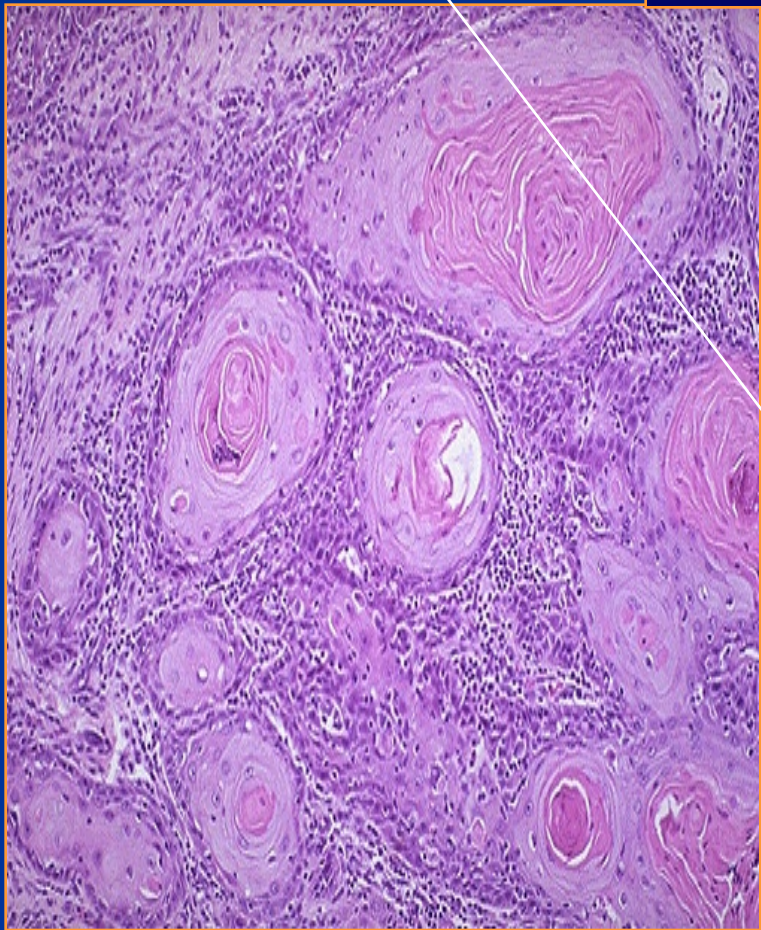
Dysplasia

- Differences between dysplasia and cancer.
 - *lack of invasiveness.
 - *Reversibility

Carcinoma in situ

- A true neoplasm with all of the features of malignant neoplasm except invasiveness
- Displays the cytological features of malignancy without invasion of the basement membrane.

Squamous cell Carcinoma Uterine Cervix



Dysplasia