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Tumour: any swelling (first described by Celsus)

Neoplasia: any new growth (which is independent of growth factor stimulation)
↳ abnormal mass of tissue which exceeds & is uncoordinated with that of normal tissue & persists

BENIGN (not-cancerous) (-oma)

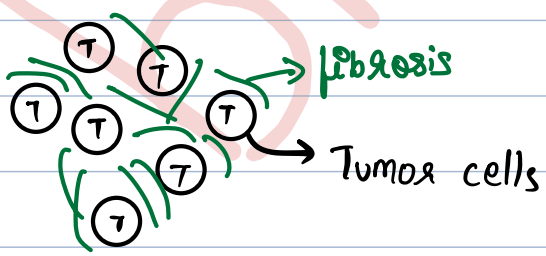
- **Epithelial**
  - papilloma
- **Mesenchymal**
  - lipoma
  - osteoma
  - chondroma

Malignant (cancerous)

- **Epithelial**
  - Squamous cell carcinoma
  - Transitional cell carcinoma
  - Adeno carcinoma
- **Mesenchymal**
  - Sarcoma (osteosarcoma, chondrosarcoma, fibrosarcoma, leiomyosarcoma)

Exceptions of malignancies which end with oma:

- Melanoma
- Chloroma (a.k.a granulocytic sarcoma)
- seminoma
- lymphoma
- teratoma



∴ soft swellings are usually benign
Hard tumors ⇒ malignancy

Extreme fibrosis makes the tumor hard ⇒ **DESMOPLASIA**

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Mixed Tumors: derived from more than one germ layer

- **Teratoma:** derivatives of ≥ 2 germ layers

Benign	Malignant
• mature	• immature

- when bening teratoma becomes cystic ⇒ DERMOID CYST

- Teratoma with single germ layer ⇒ MONODERMAL TERRATOMA
  eg: Struma ovarii

- **Pleomorphic Adenoma:** usually affects salivary gland
  ↳ biphasic tumor — epithelial component
  — mesenchymal component

- **Wilm's Tumor:**
  ↳ Triphasic tumor < epithelial, mesenchymal, blastemal

[Tumour ≈ Allograft]

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Choriostoma	Hamartoma
→ ectopic rest of normal tissue → normal tissue in abnormal location • Pancreatic tissue in stomach	→ haphazard / abnormal / disorganised proliferation of tissue indegenous to the site of origin • Pulmonary hamartoma → some rearrangements in chromosome 12 have been identified ∴ benign tumor

Tumor Antigens:

- TSTA (tumor specific transplantation antigens)
- TATA (tumor associated transplantation antigens)
  - ↳ expressed in normal cells also; increased exponentially in tumor cells

Tumor Marker	Tumor Type
Oncofetal proteins	
• AFP	• Hepatoma • Testicular cancer
• Carcinoembryonic antigens [CEA]	• GI cancers, Lung, ovarian cancers
• Secreted tumor antigens	
• CA 125	• Ovarian Cancers
• CA 129	• Various carcinomas
• PSA	• Prostate Cancer
• β2 microglobulin	• Multiple myeloma
• Hormones	
• β subunit of chorionic gonadotropin	• Hyaditiform mole Choriocarcinoma, testicular cancers

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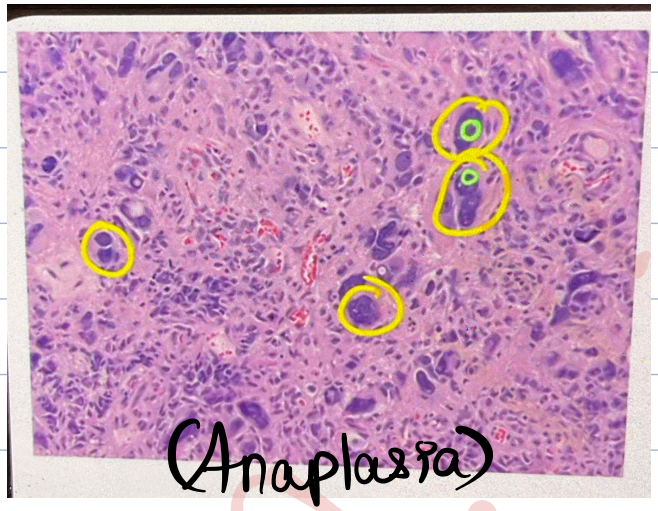
Properties of a Tumor:

i. Anaplasia
ii. Rate of growth
iii. Local invasion
iv. Metastasis

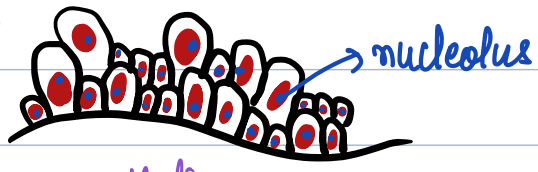

(Anaplasia)

Anaplasia:

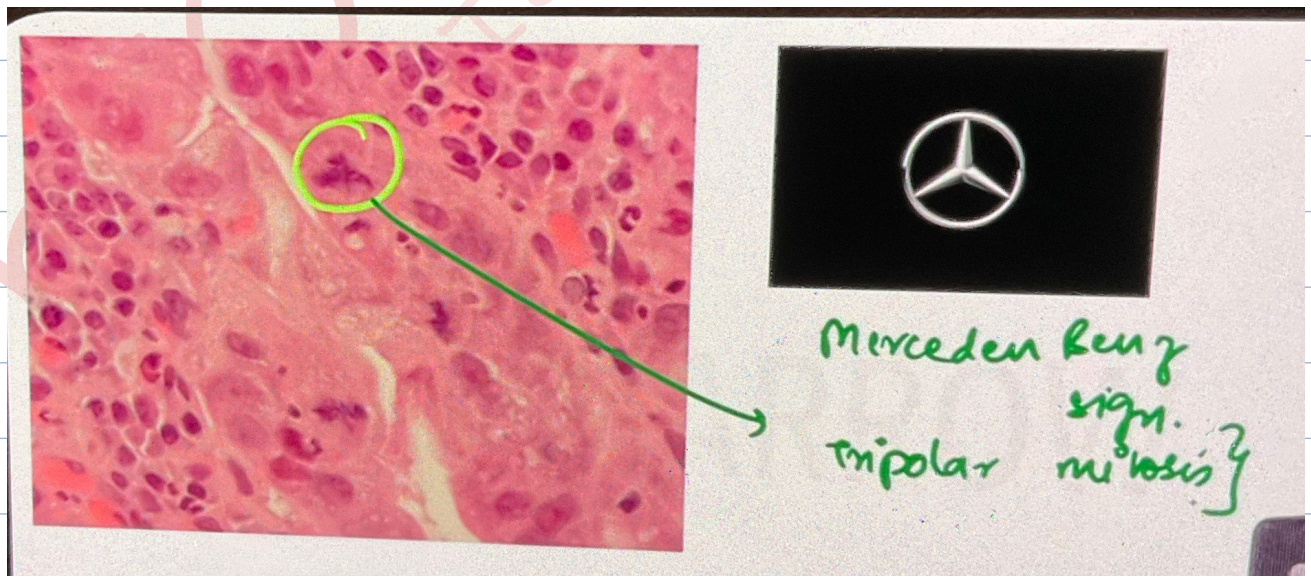
→ lack of differentiation (structural & functional similarity to the original cell)

- Pleomorphism: variation in size & shape of cells
- High N/C Ratio: normal nucleus/cytoplasm ratio = 1:4 to 1:6
  - ↳ in malignancy ⇒ ≈ 1:1
- Hyperchromatic Nuclei
- Prominent nucleoli
- Loss of polarity: irregularly placed nuclei
- Abnormal mitosis: atypical mitosis (tripolar mitosis)


Normal epithelium



Malignancy



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Rate of Growth:

→ Benign tumours: usually slowly growing
Malignant tumours: " rapidly "

→ Minimum tumor weight which can be clinically detected: 1g (10^9 cells)
→ maximum " " " is usually compatible with life: 1 kg (10^{12} cells)

Local Invasion: (Invasion of neighbouring structures)

→ Benign tumors are generally encapsulated ∴ cannot cause local invasion
→ Malignant " " " not " ∴ they cause local invasion.

Metastasis: distant spread of tumor (not local)

→ most important property to differentiate benign & malignant tumors.

[BENIGN TUMORS NEVER METASTATIZE]

→ Hallmark of malignancy: Anaplasia.

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	Benign	Malignant
① Anaplasia	—	+
② Rate of growth	slowly growing	rapidly growing
③ Local invasion	—	+
④ Metastasis	—	+

• 2 malignancies which do not metastasize – Basal cell carcinoma (Rodent ulcer)
– glioma

Metastasis :

(Routes)

LYMPHATIC	HAEMATOLOGIC (mostly veins)	DIRECT SEEDING OF BODY CAVITIES	TRANS-COELOMIC SPREAD
→ most carcinomas Except – Follicular carcinoma of thyroid – Choriocarcinoma – Hepatic cell carcinoma – Renal cell carcinoma	→ most sarcomas Except – Synovial sarcoma – Rhabdomyosarcoma	→ Mucinous carcinoma of ovary / appendix goes to peritoneum ⇒ Pseudomyxoma Peritonii	→ Krukenberg's tumour

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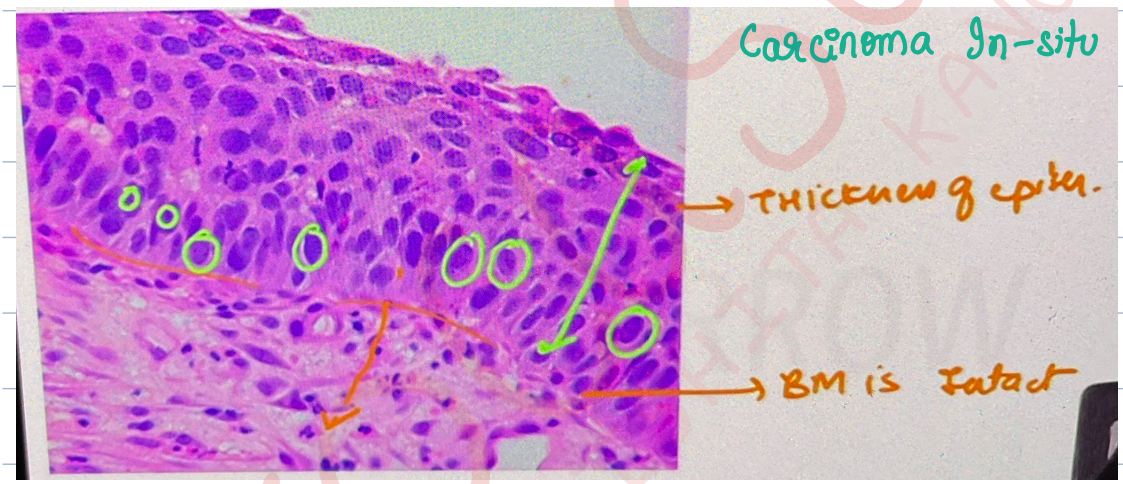
Metaplasia	Desmoplasia	Anaplasia	Dysplasia
→ reversible change → one differentiated cell type is converted to another diff. cell type Ex: in cigarette smokers : Barrett's esophagus : Myositic ossificans : vit. A deficiency	→ abundant fibrosis in a tumor making it hard	→ lack of differentiation → irreversible → basement membrane is invaded	→ disordered growth/ proliferation → presence of anaplastic cells → partially reversible → a.k.a Carcinoma in situ ⇒ ∵ basement membrane is intact



PAS stain: highlights basement membrane
∴ used to differentiate b/w Invasive tumor & Carcinoma in-situ.

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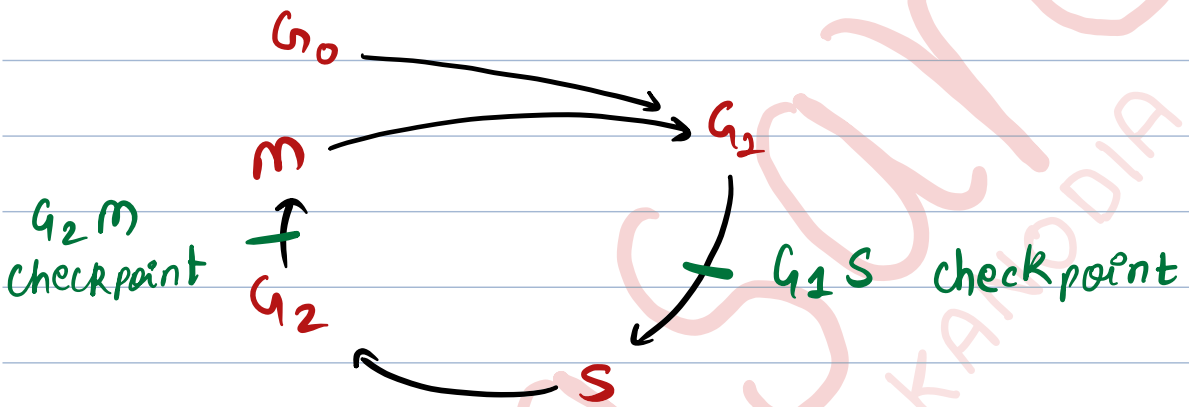
Cell Cycle:

G_0 : resting phase (quiscent)
G_1 : Gap 1 (prepares itself for DNA replication)
} variable duration

S : synthetic (DNA replication) (6 hrs)
G_2 : Gap 2 (cell prepares for mitosis) (4 hrs)
M : Mitotic (2 hrs)



- Stage of no return : S phase
- Most radiosensitive phase of cell cycle : M
  G_2
- Most radio resitant " " " " : S

- Most radiosensitive cell: lymphocyte
- Most radioresitant cell: platelet
- most radiosensitive tumor: Ewing's Sarcoma.

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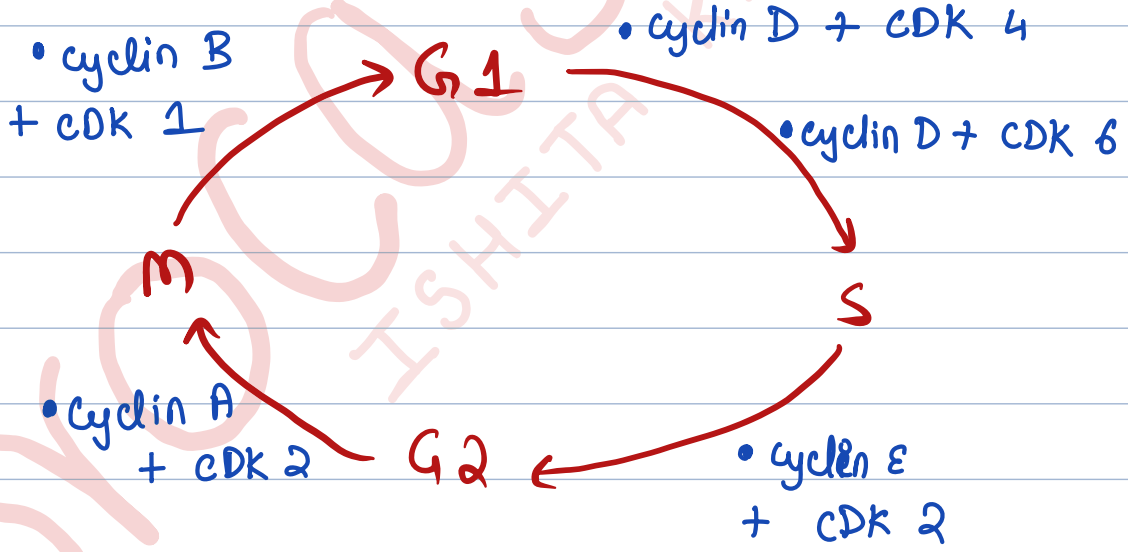
Regulation of Cell cycle: Cyclins & CDKs [cyclin-dependent Kinase]

Cyclins - D (first to increase)
- E
- A
- B (last to increase)

CDK's:		Cyclins
4, 6	+	D
2	+	E
2	+	A
1	+	B

} lead to progression of cell cycle



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Cell Cycle Inhibitors:

Cip/kip family

- p 21
- p 27
- p 57

INK 4A / ARF family

- p16
- p14
- p15

⇒ usually inhibit cyclin D - CDK 4 complex.

- Cyclin D ⇒ associated with Mantle Cell Lymphoma.
- Cyclin E ⇒ Breast cancer.

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Types of Carcinogenesis: — radiation, microbial, chemical

Radiation Carcinogenesis:

ULTRAVIOLET RADIATIONS (NON-IONIZING)

- UV-A
- UV-B ⇒ most carcinogenic UV spectrum
- UV-C

IONIZING RADIATIONS

more carcinogenic than UV

- Most common cancer caused by ionizing radiation: AML (Acute myeloid leukemia)
- Leukemia which is never caused by radiation: CLL

OTHER CANCERS ASSOCIATED WITH RADIATION:

- Papillary Carcinoma thyroid
- CA breast
- CA Lung

- Organ most resistant to radiation: Bone & Gut.

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Chemical Carcinogenesis: [CC]

Chemical	Cancer
(1) Polycyclic Aromatic hydrocarbon (PAH)	• Lung CA
(2) Arsenic	• Skin CA • Hepatic Angiosarcoma
(3) Asbestos	• Lung adeno CA • Malig. mesothelioma
(4) Aflatoxin	• HCC
(5) β naphthylamine / azo dyes	• Bladder CA
(6) Benzene	• Leukemia, AML
(7) Diethylstilbestrol	• Clear cell CA vagina
(8) PVC	• Hepatic angiosarcoma
(9) Cadmium	• Prostate Ca

Directly Acting CC

→ doesn't require any conversion in the body

→ less potent

Eg: – chemotherapeutic drugs
– alkylating agents

Indirectly acting CC

→ they require conversion to active metabolites by P450 enzyme

→ much more potent

Eg: – PAH

Lung adenocarcinoma ⇒ most common malignancy caused by asbestos

Malignant Mesothelioma ⇒ most specific malignancy caused by asbestos

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Microbial Carcinogenesis:

PARASITES

- Schistosoma [Bladder Ca]

Trans. epi → (META-PLASIA) → Squamous epi. → Squamous cell CA in bladder

- Clonorchis, Opisthorchis → cholangiocarcinoma

VIRUSES

BACTERIA

- Helicobacter pylori

FUNGI

- Aspergillus → Aflatoxin → Hepatocellular CA

Helicobacter Pylori:

- gastric adenoca
- maltoma

↓

gram -ve bacilli

Pathogenesis:

→ H. pylori produces 2 toxins (Cag A, Vac A) ⇒ cause cancers

→ H. pylori mostly affects pyloric antrum (∴ do antral biopsy)

→ H. pylori doesn't penetrate the mucosa ∴ it is seen floating over the mucosa

→ **Special Stains for H. pylori:**
- Warthin Starry Silver Stain
- Modified Geimsa stain
- Steiner Stain.

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VIRAL CARCINOGENESIS:

- Hep. B
- Hep. C

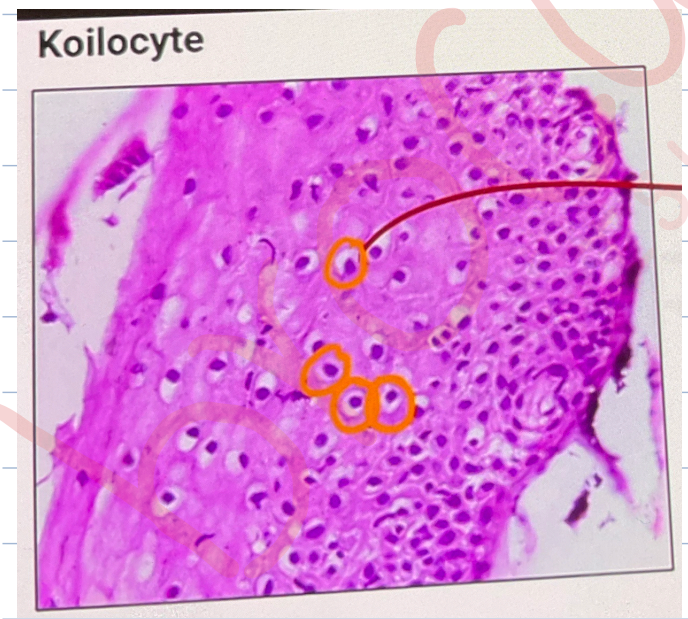
} hepatocellular carcinoma

- HTLV-1 (human T-cell leukemia virus) ⇒ adult T-cell leukemia
  - [pathogenic factor: TAX gene]
  - clover leaf cells

- HHV-8 (human herpes virus)
  - Primary effusion lymphoma
  - KAPOSI's sarcoma *
  - Castleman's disease

* seen in HIV +ve patients due to immunodeficiency.

- Epstein Barr Virus (EBV) → affects B-lymphocytes
  - Infectious mononucleosis (kissing disease) DOWNY CELLS
  - Hodgkin's lymphoma
  - B cell lymphoma
  - Burkitt's lymphoma (translocation of chr. 8 & 14)
    MARKER: BCL-6 [starry sky appearance]
  - Leiomyosarcoma
  - Post transplant lymphoproliferative disorder
  - Nasopharyngeal carcinoma



Pathogenesis:

- EBV produces
  - LMP-1 (Latent membrane protein)
  - EBNA-2
  - IL-10

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LMP 1: causes increased activation of NF k β pathway

↓

increased growth signalling

↓

increased cell proliferation

- **HPV (human papilloma virus)**

LOW RISK HPV

→ HPV 6, 11
- genital warts
- cervical intraepithelial nucleus – 1 [CIN I]

HIGH RISK HPV

→ HPV 16, 18
- CIN II, III
- cervical cancer
- penile cancer
- laryngeal cancer

Pathogenesis of HPV:

→ HPV produces 2 proteins [P_{53}, Rb ⇒ tumor suppresor genes]

- E6 + P_{53} ⇒ degradation of p53
- E7 + Rb ⇒ degradation of Rb

* leads to increased cell proliferation

H&E of HPV:

↳ **KOILOCYTE:** large cell, thick membrane, resin-like (shrinked) nucleus, perinuclear halo
↳ produced by E4 protein.

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Microbial Carcinogenesis :

Microbial carcinogenesis

Microbe	Cancer
H. Pylori	Gastric adenoca MALTOMA
HPV	Cervical ca Anogenital ca Laryngeal ca
HTLV 1	Adult T cell leukemia
HBV	Hepatitis
HHV 8	Kaposi's sarcoma Primary effusion lymphoma Multicentric castleman disease
EBV	HL NHL Burkitts lymphoma Nasopharyngeal ca PTLD

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Hallmarks of Neoplasm:

1. Self sufficiency in growth signals
2. Insensitivity to growth inhibitory signals
3. Limitless replicative potential
4. Evasion of Apoptosis
5. Sustained angiogenesis
6. Altered cellular metabolism
7. Invasion & metastasis
8. Escape of immune recognition

Self Sufficiency in Growth Signals:

→ cell becomes independent of growth signals

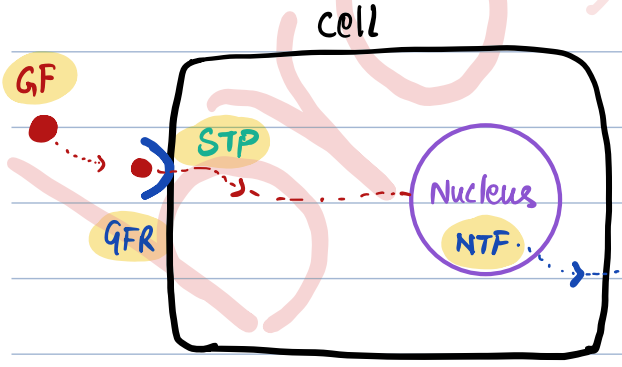
PROTOONCOGENES: normal genes required for cell proliferation

↓

mutation (gain of function mutation)

↓

ONCOGENES: production of cancer



GF = growth factor
GFR = growth factor receptor
STP = signal transduction proteins
NTF = nuclear transcription factor

cell proliferation by activating cyclins & cyclin dependant kinases

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Growth Factors:

① Hepatocyte growth Factor (HGF)	Hepatocellular cancer [HCC]
② HST - 1	Osteosarcoma
③ PDGF - β / sis	Astrocytoma

Growth Factor Receptors:

① Epidermal growth factor receptor [EGFR]
- 1 (ERB 1) → lung adenocarcinoma
- 2 (ERB 2) or Her2new → Breast cancer & ovarian cancer

② ALK gene (on chromosome 2)
- → ALCL (anaplastic large cell lymphoma)
- → inflammatory myofibroblastic tumour
- → adenocarcinoma of lung

③ C-KIT
- → GI stromal tumor
- → Seminoma

④ RET (on chromosome 10)
- → medullary carcinoma of thyroid
- → MEN II syndrome.

} gain of function mutation

- Loss of function mutation in RET ⇒ Hirschsprung disease

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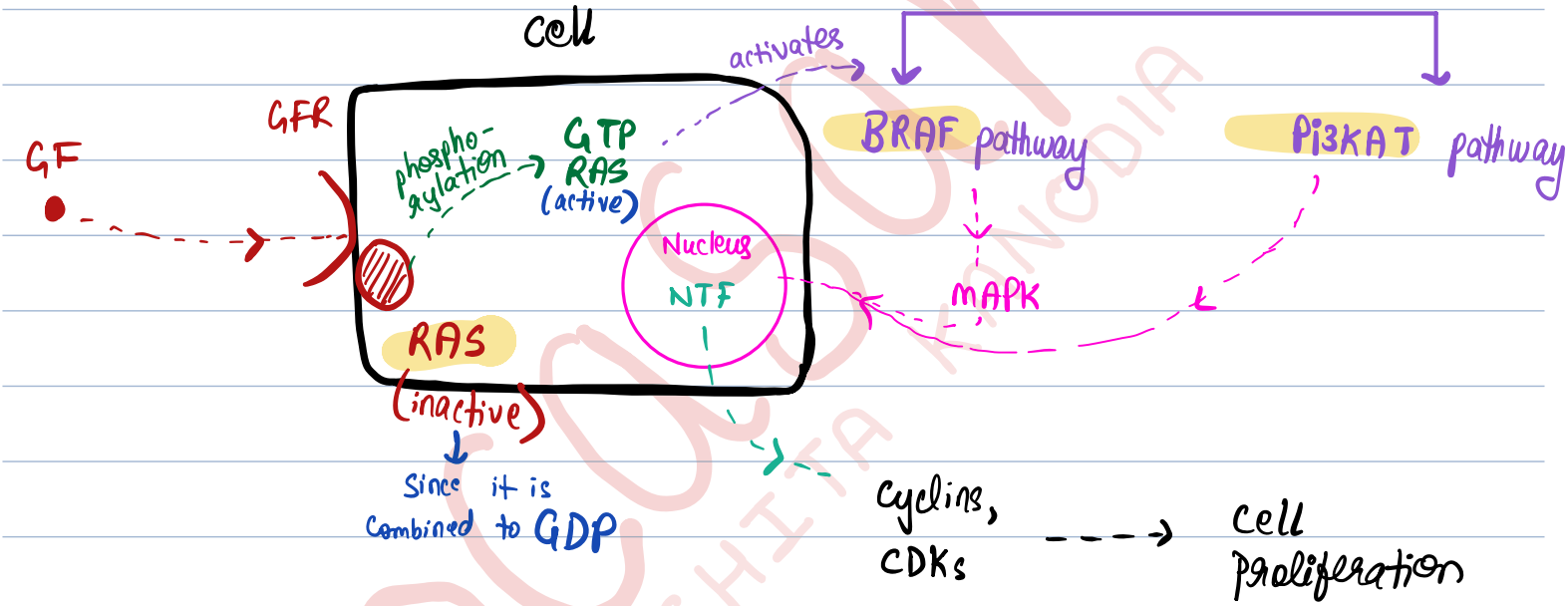
Signal Transduction Proteins:

① RAS → most common oncogene affected in human malignancy

K-RAS	H-RAS	N-RAS
• colon cancer	• Bladder cancer	• melanoma
• pancreatic cancer		
• lung cancer		



- BRAF → affected in — Hairy cell leukemia (HCL)
  - Langerhans cell histiocytosis (LCH)
  - Melanoma
  - Pilocytic astrocytoma
  - Papillary CA of thyroid.
  - Colon cancer

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② NOTCH → T-ALL (T-cell ALL.)

③ ABL → t(9:22)

↓

210 Kda: CML (chronic myeloid leukemia)

190 Kda: ALL (acute lymphoblastic leukemia)

Nuclear Transcription Factors:

① myc
- N-myc → Neuroblastoma
- L-myc → lung cancer (small cell)
- c-myc → Burkitt's lymphoma.

② MYB

③ JUN

④ FOS

Cyclins & CDKs:

t(11:14) → Mantle cell lymphoma

(11: cyclin D1; 14: IgH locus)

on translocation ⇒ increased expression of cyclin D1

↓

increased cell proliferation.

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Tumor Suppressor Genes (TSGs): normal cells that decrease cell proliferation

- Loss of function mutation in TSG ⇒ increased cell proliferation

① Rb: gene on chromosome 13 q 14

→ Mutation :- Retinoblastoma
- Osteosarcoma

→ a.k.a Governor of Genome

→ Rb hypophosphorylated : active
Rb hyperphosphorylated : inactive

{ Rb regulates G1S checkpoint of cell cycle } ∴

Role of Rb in Cell Cycle:

Rb (active, hypophosphorylated) → E2F

Signal: increased D/CDK4

Rb hypophosphorylated → Rb hyperphosphorylated

Rb hyperphosphorylated → E2F released (transcription factor required for cell cycle)

E2F released → cell proliferation

Knudson's Two Hit Hypothesis: first given for Rb

⇓ both alleles are defective

→ For retinoblastoma to develop → both Rb alleles need to be mutated

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Loss of Heterozygosity: [LOH]

Rr ⇒ 1st mutation occurs by birth (heterozygous when born)

LOH ↓ and mutation acquired later on

RR ⟶ Retinoblastoma ✓

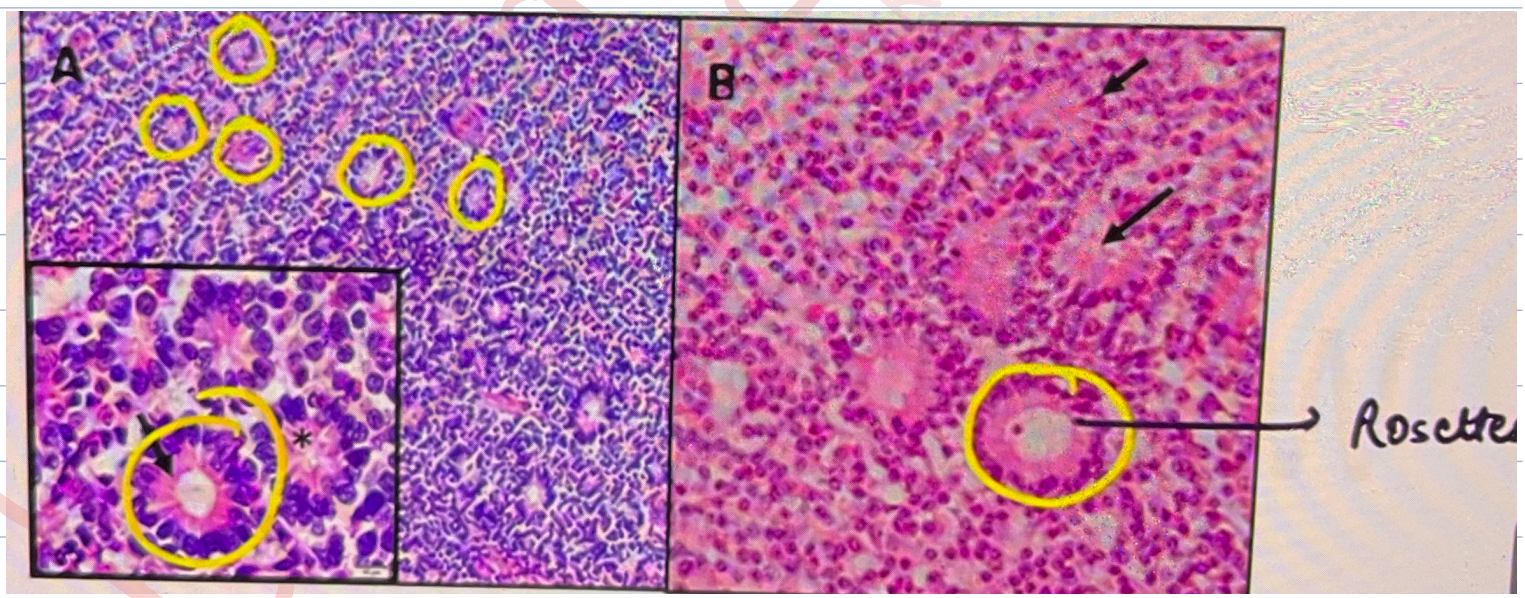
H n E:

→ small round blue cells with scanty cytoplasm

→ Flexner Wintersteiner Rosette (True rosette)

→ Fleurette

{ Rosette: tumor cells around a central space
- if central space is empty ⇒ true rosette
- central space not empty ⇒ pseudorosette }



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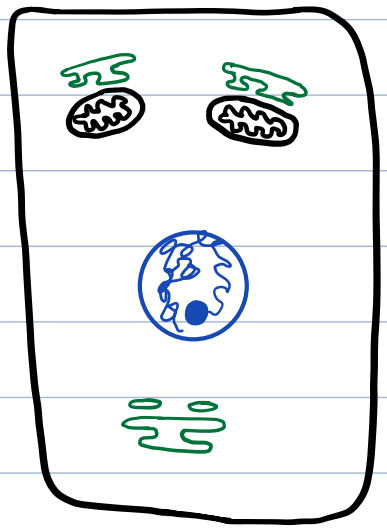
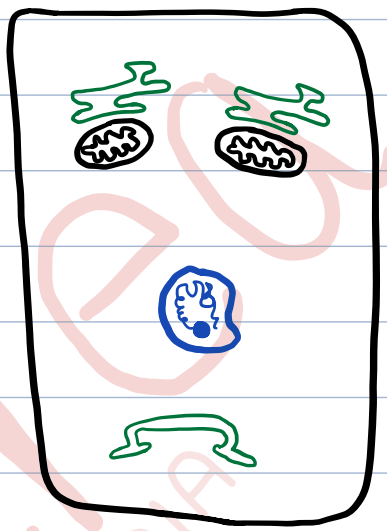
② p53 : Guardian of genome / Molecular policeman of cells

→ chromosome 17p

→ most commonly affected gene in human malignancies



Normal cell (p53 normal)



Cell with mutations or loss of p53

Ionising radiation
Carcinogen
Mutagens

DNA damage

p53 activated

p21 (CDK inhibitor)

GADD 45 (DNA repair)

BAX (apoptotic gene)

Successful Repair

Normal cell

Repair fails

Apoptosis

DNA damage

p53 not activated

no cell cycle arrest

no repair, no senescence

Mutant cells

Malignant tumor

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Congenital Mutation of p53 : Li Fraumeni Syndrome

- Bone cancer
- Breast cancer
- Blood cancer
- Brain cancer

} 4 B's

p63 : helps in squamous cell differentiation

		Chromosome	
(3)	NF 1	17	• Neurofibromas • Meningeomas
(4)	NF 2	22	Schwannomma
(5)	BRCA 1	17	• Breast cancer • ovarian cancer
(6)	BRCA 2	13	• Male breast • female breast • prostate CA
(7)	WT 1	11	Wilms tumor
(8)	WT 2	11	Wilms tumor
(9)	PTEN	10	• Endometrial CA • Prostrate Cancer
(10)	VHL	3	• Clear cell RCC • Cerebellar hemangioblastoma
(11)	APC	5	• FAP

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Telomerase:

→ increased telomerase activity → limitless replicative potential.

→ increased synthesis of anti-apoptotic factors → follicular lymphoma

t (14 : 18)

14 → IgH locus

18 → BCL 2

translocation ⇒ increased activity of BCL 2 (anti-apoptotic gene)

↓

decreased apoptosis

↓

cell proliferation

Sustained Angiogenesis:

Pro-angiogenic Factors

- VEGF
- PDGF
- FGF

(Cancer cells increase pro-angiogenic factors)

Anti-angiogenic factors

- Vasculostatin
- Endostatin
- Angiostatin
- Thrombospondin

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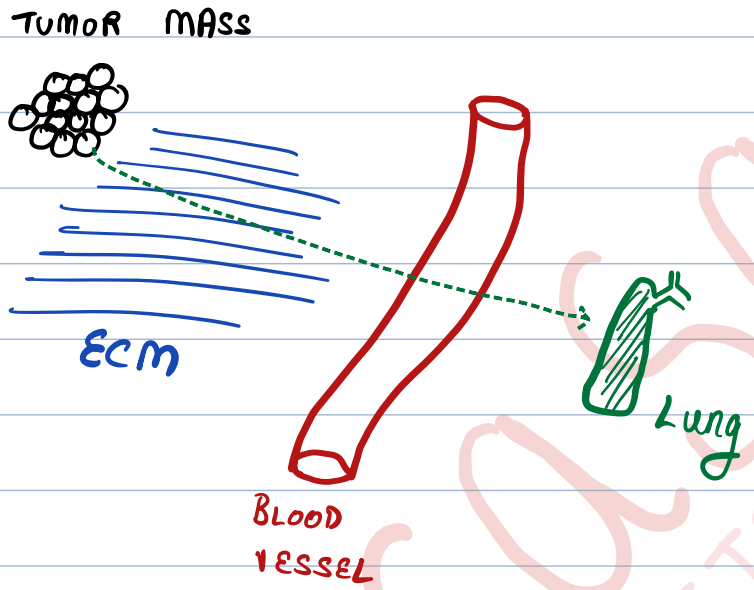
Warburg Effect: Otto Warburg

→ Cancer cells always require more glycogen & very often undergo aerobic glycolysis

→ PET Scan

[positron emission tomography]

Invasion & Metastasis:



* Other Enzymes For Degradation:
  - Type IV collagenase
  - Cathepsins
  - Urokinase

Detachment of a few neoplastic cells from the tumor by loss of E-cadherin (NC) → binds 2 cells together

↓

Atachment of NC to ECM by the expression of Integrins

↓

Degradation of ECM due to expression of MMPs [matrix metalloproteinases] [mmp-2,9] *

↓

Epithelial to mesenchymal Transition (EMT) done in some NC

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(∵ mesenchymal cells can pass through blood vessels faster than epithelial cells)

- Mediated by – SNAIL
  – TWIST

↓

cell enters blood vessels

↓

Tumor cells join with platelets to form tumor emboli

travel to

↓ LYMPHATICS

↓ ORGANS

Escape of Immune Recognition:

Mechanism:

1. Decreased expression of MHC antigens
2. Selective outgrowth of antigen negative variants

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Repair Pathway Defects:

Defect in nucleotide excision repair

- Xerodeama pigmentosum

Defect in Mismatch Repair

- Hereditary non-polyposis colorectal Cancer [HNPCC]

Defect in homologous recombination

- fanconi's anemia
- Bloom's syndrome
- Ataxia telangiectasia

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Lab Diagnosis of Cancer/Tumors:

Investigations

- FNAC
- Biopsy
- Tumor markers
- Frozen section
- Immunohisto-chemistry

Fine Needle Aspiration Cytology [FNAC]:

→ diameter of needle : 25-30 G small bore needle

→ can only be done for easily accessible organs

Eg: – lymph node
– breast
– thyroid

Advantage: → less invasive

Disadvantage: → missing the target leads to false negative cases.

Thyroid FNAC Disadvantage: thyroid being a very vascular organ, aspirate which is drawn out is infected by blood & has few cells.

∴ we do FN non-AC [FNNAC] for thyroid.

- FNNAC
- PAP Smears / Exfoliative Cytology
- Image guided FNAC

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- All carcinomas of thyroid can be diagnosed in FNAC except – Follicular Carcinoma of Thyroid ∵ FNAC does not differentiate between follicular adenoma & a follicular carcinoma.

Biopsy: (Bx)

Incisional Biopsy

→ some part of the tissue is left behind

- TRUCUT Bx

Excisional Biopsy

→ entire tissue is excised

→ Fluid Medium ⇒ 10% Neutral Buffered Formalin (Fixative)

⇓

most common fixative used in histopathology

→ For electron microscopy : Fixative ⇒ 2.5 % glutaraldehyde

→ For testicular Bx : Bouin's fluid.

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Cell Condition	Stain
• most common stain in histopathology	• Haematoxylin & Eosin
• most common in haemat	• Romanowsky like Leishman, Giemsa
• Reticulocyte	• supravital
• Lymphoblast	• PAS
• Myeloblast	• NSE, SBB, Oil red O
• Monoblast	• NSE
• Hairy cell	• TRAP
• Lipid	• Oil red O, Sudan black
• Iron	• Prussian blue
• Calcium	• Von Kossa, alzarine red S
• Glycogen	• PAS
• Copper	• Rhoamine, rubeanic acid
• Mast cell	• Toluidine blue
• Mucin	• Mucicarmine ; Alcian blue
• Reticulin fibres	• Silver
• Elastin fibres	• Van geison
• Collagen	• Masson trichrome
• Melanin	• Masson fontanna
• H. pylori	• Warthin starry silver
• Cryptococcus	• India ink
• Fungi	• Silver methanamine ; PAS
• Amyloid	• Congo red

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Immunohistochemistry [IHC]:

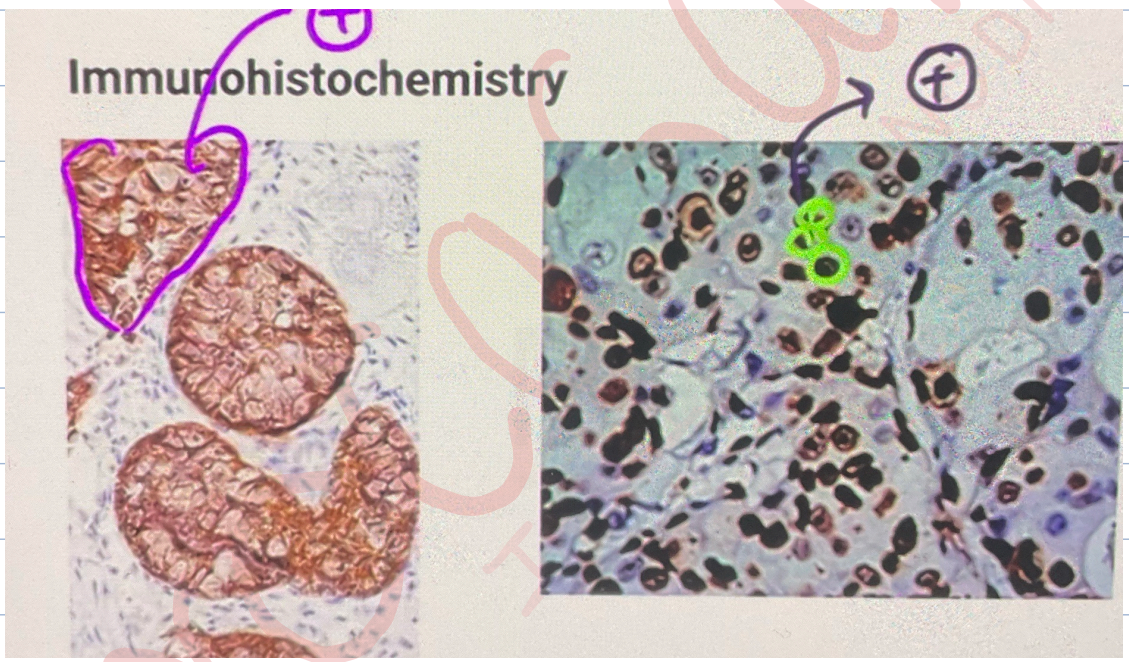
Ag-Ab rxn Bx

Uses:

1. Origin of tumors
2. Diagnosis of unknown primary
3. Prognostic & therapeutic significance (specially in Breast Cancer)

Markers for CA Breast:
- ER (estrogen receptor)
- PR (progesterone receptor)
- Her2new

→ Brown colour ⇒ +ve.



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Cell of Origin / Tumor	Marker
• Epithelial origin	• Cytokeratin
• Mesenchymal "	• Vimentin
• Glial	• GFAP
• Smooth muscle	• SMA
• Skeletal "	• Desmin, myogenin, myo D1
• Vascular	• Vwf, CD31, VEGF
• Neuroendocrine	• NSE ; Chromogranin ; Synaptophysin
• Hepatic	• Hep par 1, arginase 3
• GIST	• DOG1, CD 34, CD117
• Malig. melanoma	• Hmb 45, S 100
• malig. mesothelioma	• Calretinin, CK 5/6
• Ewings sarcoma	• CD 99, MIC 2
• Osteosa	• Osteopontin, osteonectin, osteocalcin

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Markers in Blood	Condition
• PSA	• Prostate CA
• PAP	• Prostate CA
• CALCITONIN	• Medullary CA thyroid
• CEA	• Colon CA, pancreatic CA
• HCG	• Chorio CA
• AFP	• Hepatocellular CA, NSGCT like yolk sac tumor
• IMMUNOGLOBULINS	• Multiple myeloma
• CA 19-9	• Colon Ca, Pancreatic Ca
• CA 125	• Ovarian Ca
• CA 15-3	• Breast CA
• CATECHOLAMINES	• Phaeochromocytoma

Markers for Unknown Primary: CK 7 / CK 20 profile

- CK 7 + / CK 20 + : Bladder Ca, stomach, pancreas
- CK 7 − / CK 20 − : HCC, RCC
- CK 7 + / CK 20 − : FGT, Breast, Cervical, Endometrium, lung, thyroid
- CK 7 − / CK 20 + : colorectal cancer

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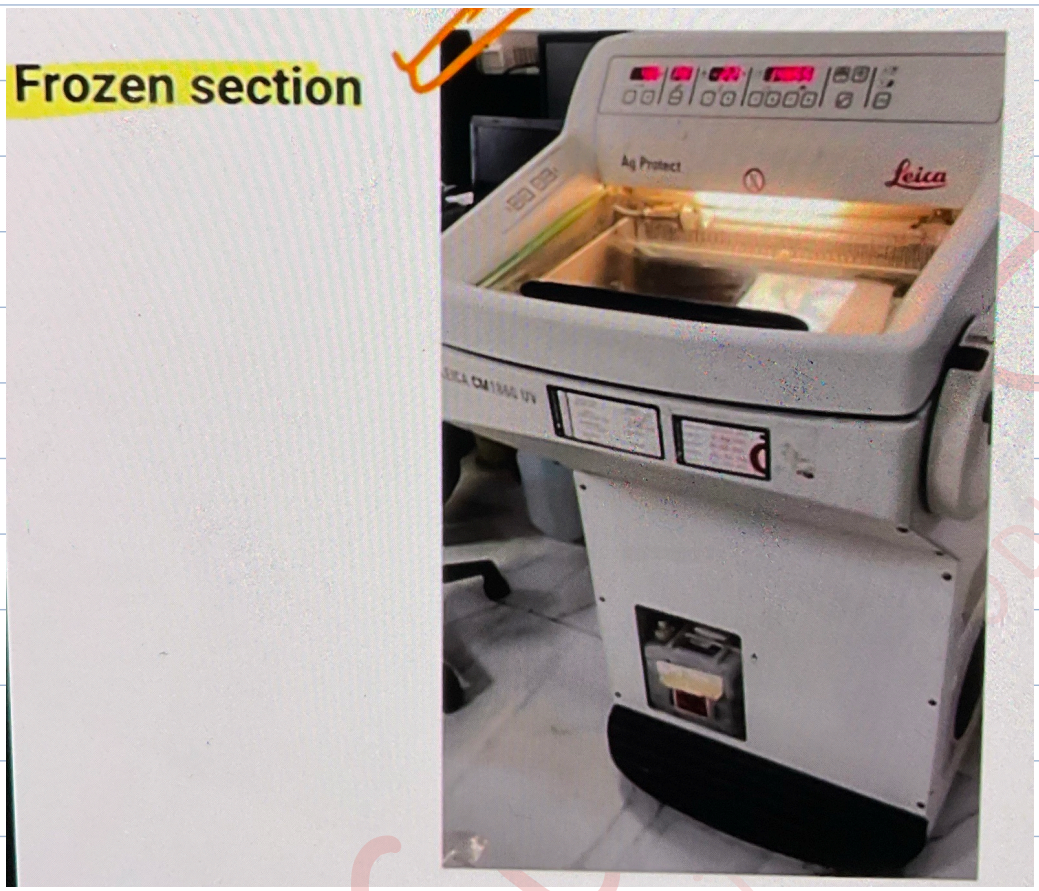
Frozen Section: done during a surgical procedure (intra-operative)

→ quick procedure.

→ **Stain:** Oil Red O.



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Paraneoplastic Syndromes:

SYNDROME	TUMOR	SUBSTANCE
• SIADH	• Small cell Ca lung	• ADH
• Cushing's syndrome	• Small cell Ca lung	• ACTH
• Hypercalcemia	• SCC lung, Breast CA	• PTHrP
• Polycythemia	• RCC	• Erythropoietin
• Migratory thrombophlebitis	• Ca pancreas, CA colon	
• Hypertrophic plum osteoarthropathy	• Small cell Ca lung	
• Acanthosis nigricans	• Ca stomach, CA colon	• epidermal growth factor
• Myasthenia gravis	• Thymoma, C lung	

Paraneoplastic Syndromes: Symptom complexes in cancer patients which cannot be explained by local / indigenous spread of humans.

Cancer Cachexia:

→ TNF - α causes cachexia (no muscle, no fat, lean)

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Tumor Lysis Syndrome:

[Burkitt's lymphoma]

- Hyperuricemia
- Hyperkalemia
- Hypocalcemia

News Updates:

→ Oncogenic miRNA – 155 - 209

⇓ lead to increased risk of B-cell lymphoma

→ Tumor suppressor miRNA ⇒ 15, 16 → mutation: CLL

→ DICER : seen in FGT cancers.

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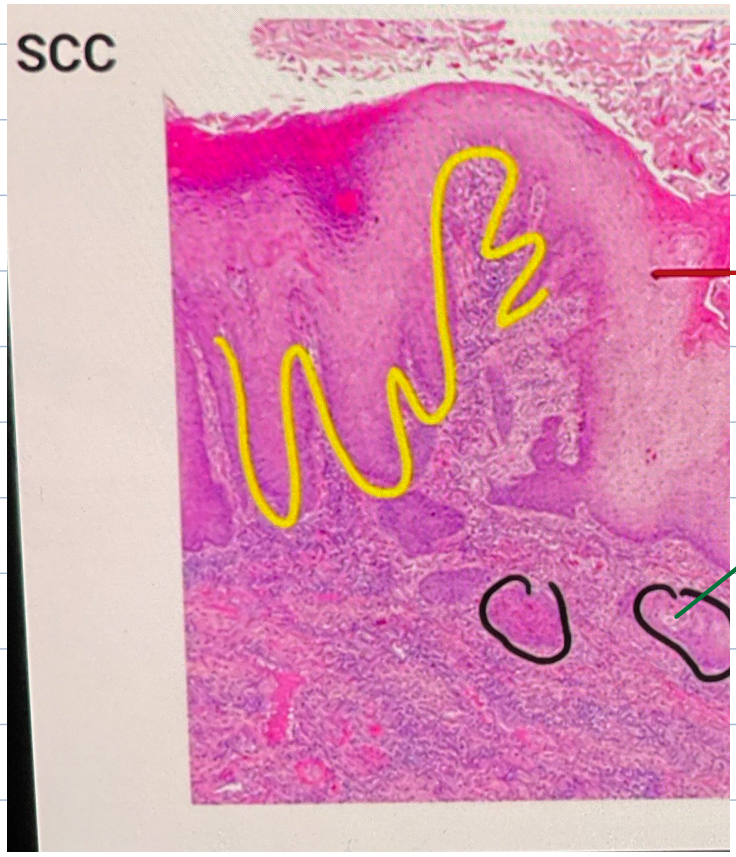
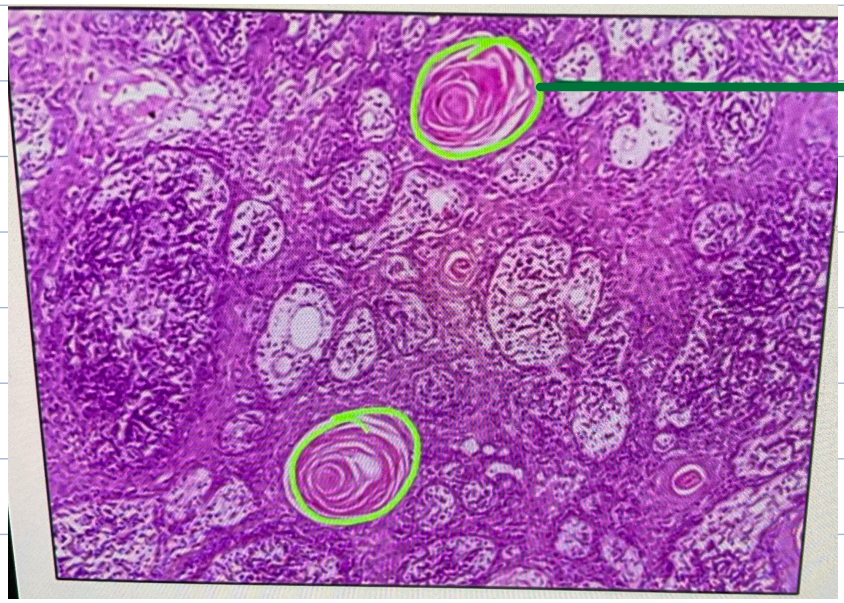


→ stratified squamous epithelium

→ SCC

Two features of SCC (anywhere in the body):

- keratin pearls
- desmosomes



→ keratin pearls

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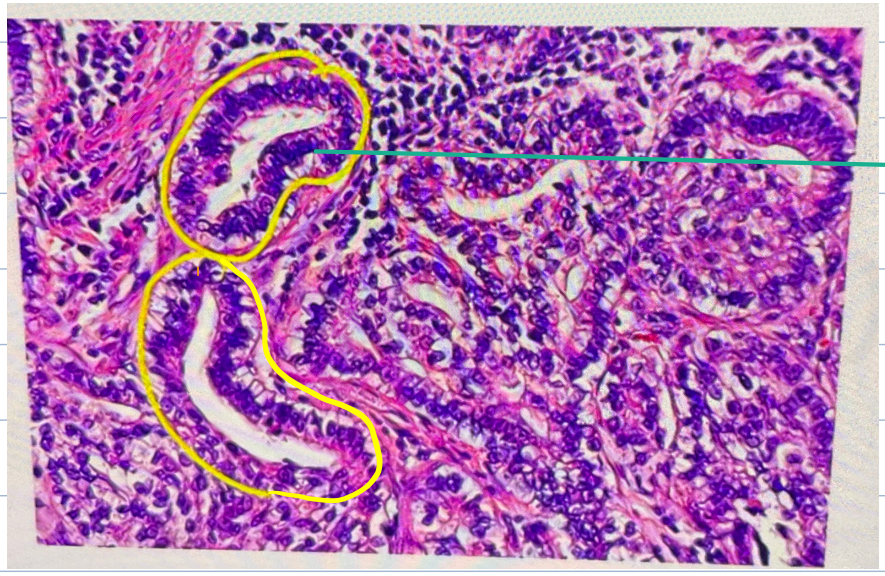
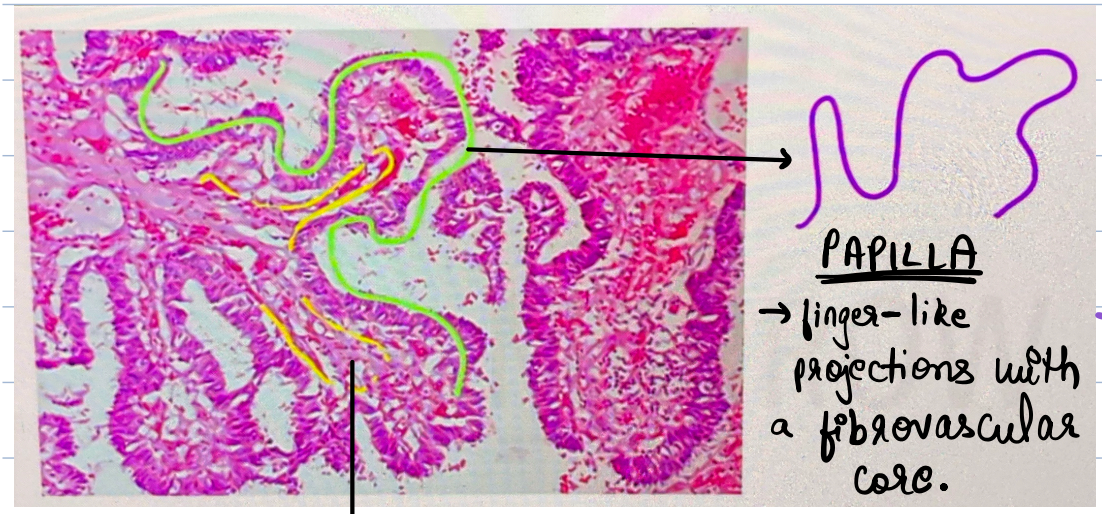
ADENOCARCINOMA:



→ glands with lumen



PAPILLA
→ finger-like projections with a fibrovascular core.

core of blood vessels

EXCEPTION:

→ In papillary RCC, core is of foamy histiocytes

→ In thyroid papillary cancer, papillae are lined by Orphan anni eye nuclei [optically clear nuclei]

Papillary Tumors

↓ always show

PSAMMOMA BODIES.

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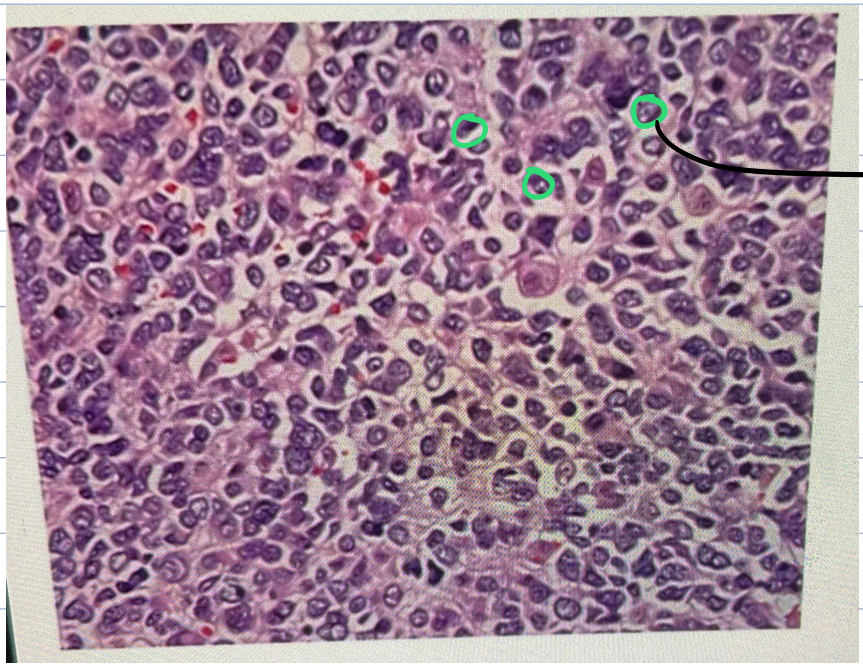
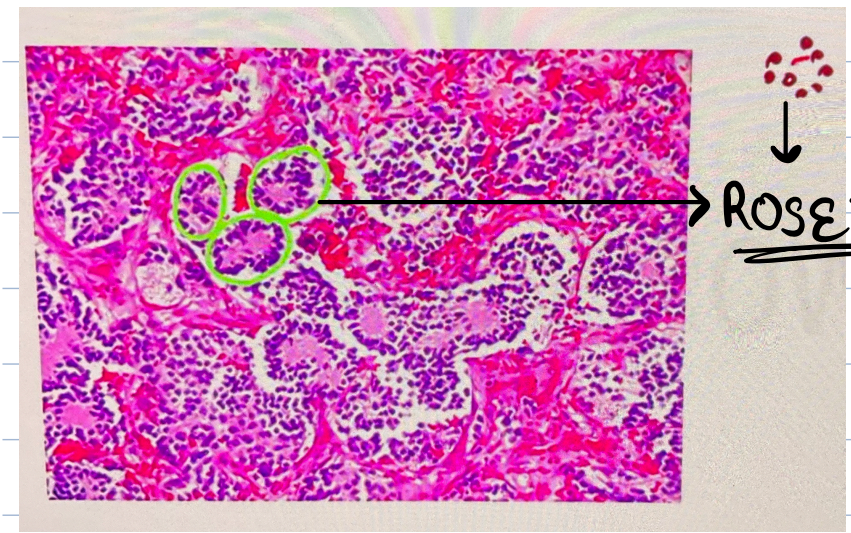
Neuroendocrine Tumor



→ cells with 'salt & pepper' chromatin



↓

ROSETTES

↳ seen in all Small Round Blue cell Tumours [SRBCT]

- Neuroblastoma
- Retinoblastoma
- Hepatoblastoma
- Nephroblastoma / Wilm's tumor
- Medulloblastoma
- Ewing's sarcoma / Peripheral neuroectodermal tumors
- Rhabdomyosarcoma
- Lymphoma

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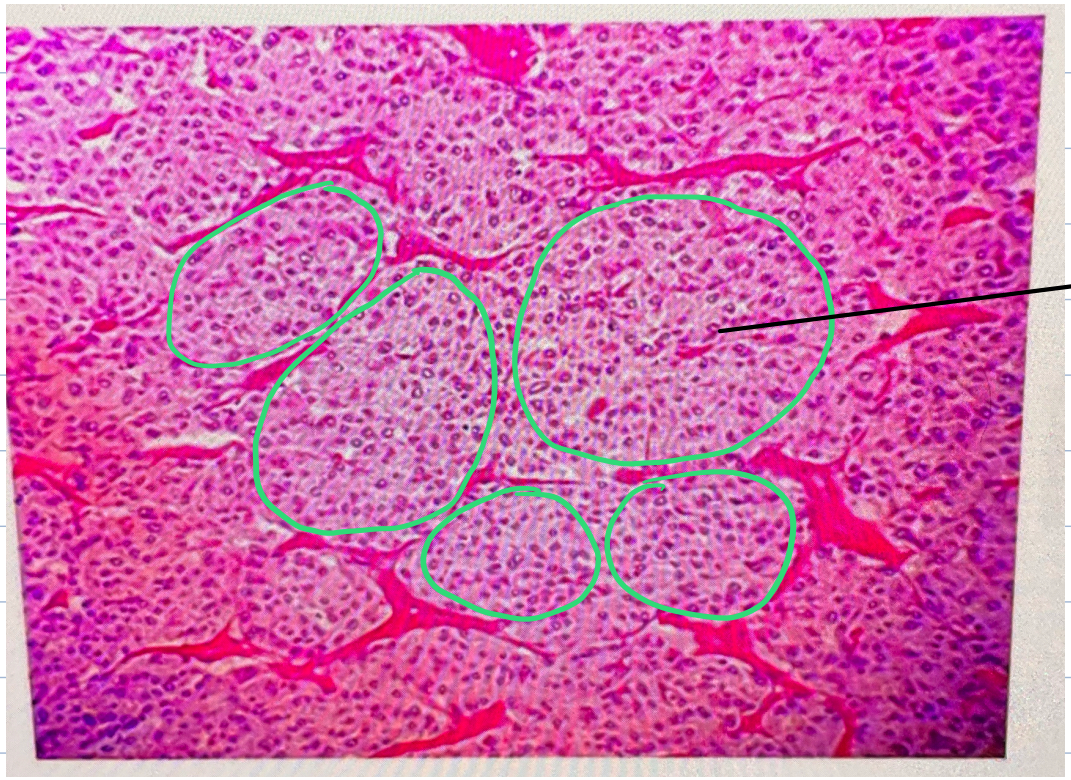
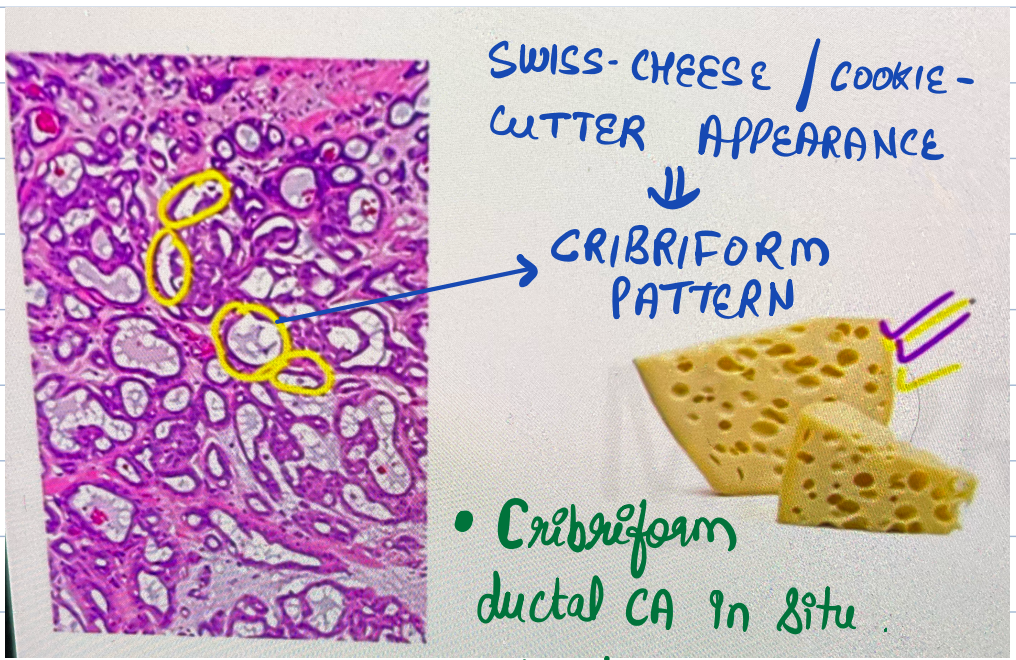


→ Zell Ballen Pattern

Phaeochromo-cytoma



- Cribriform ductal CA in Situ.
- Adenoid cystic CA of salivary gland

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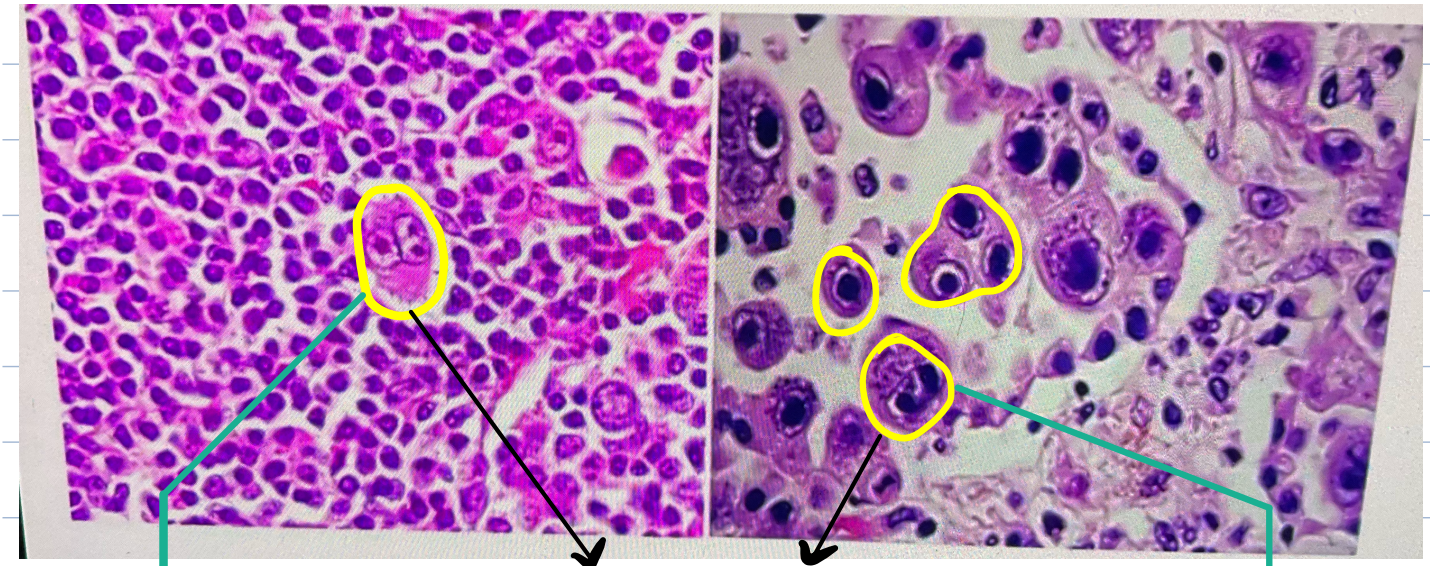
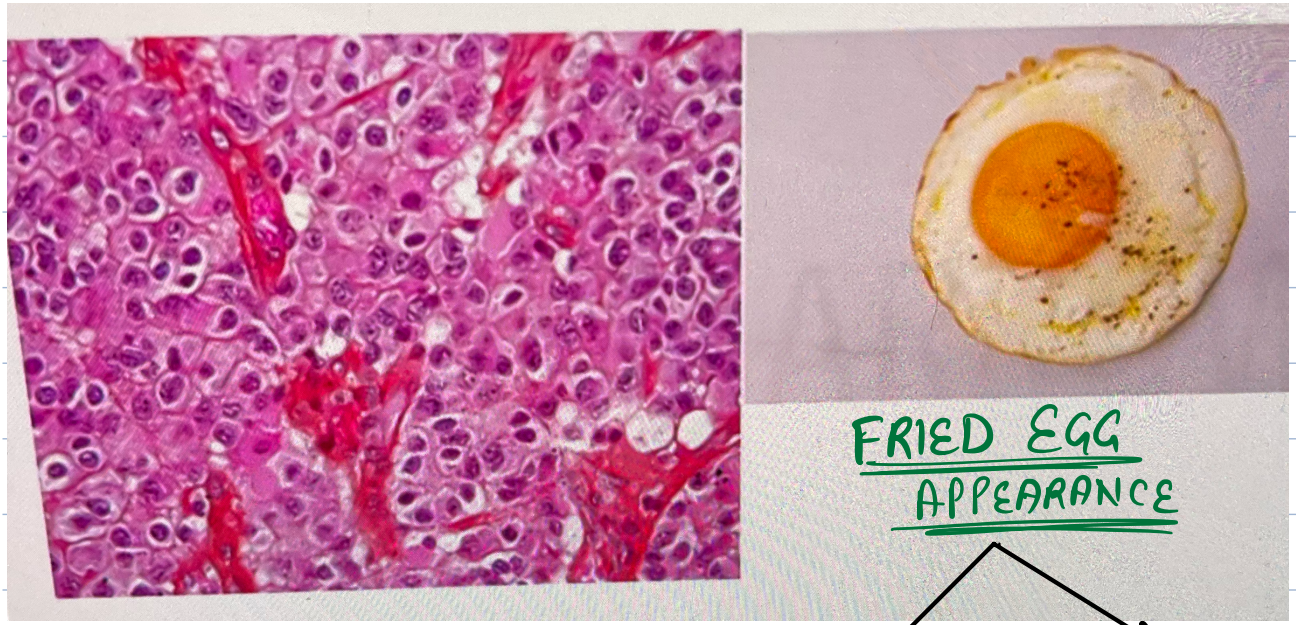


OWL'S EYE APPEARANCE

Reid-Steanberg Cell seen in Hodgkin's Lymphoma

CMV Inclusions



FRIED EGG APPEARANCE

oligodendro-glioma

Bone marrow Bx of Hairy Cell Leukemia

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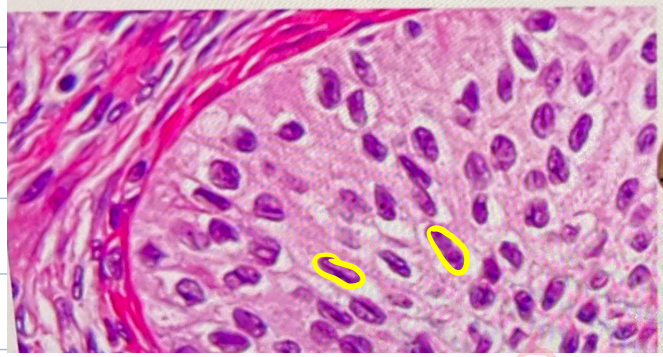
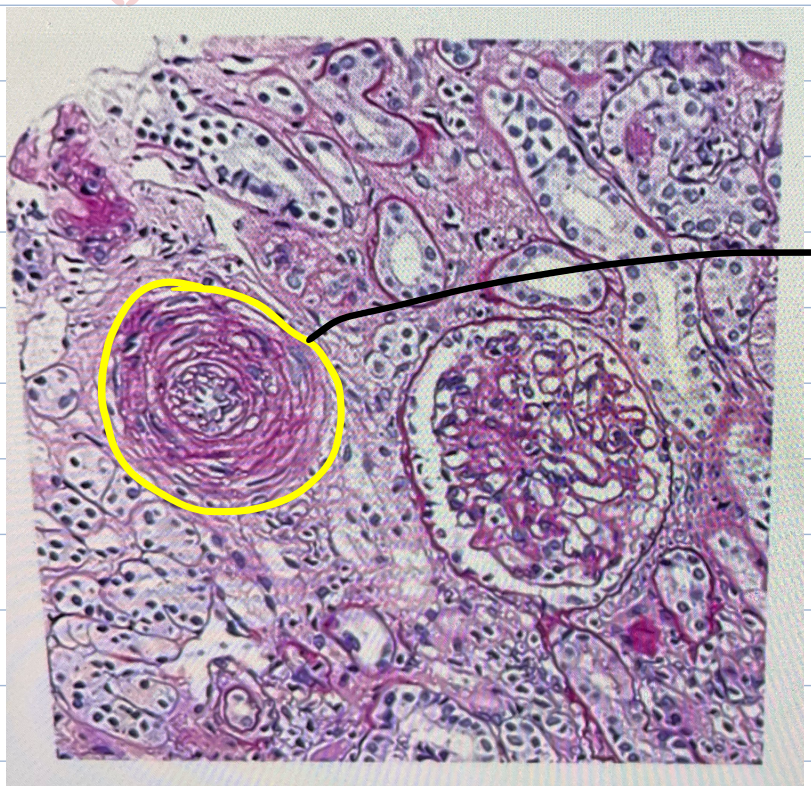


COFFEE BEAN APPEARANCE
(Longitudinal grooves are seen)

Coffee Bean Nuclei:

- Papillary CA Thyroid
- Langerhans cell histiocytosis
- Brenner's tumor
- Chondroblastoma
- Granulosa cell tumor



ONION SKIN APPEARANCE

- Malignant hypertension Bx
- Primary sclerosis cholangitis Bx
- SLE, spleen – gross
- Ewing's sarcoma X-ray
- Tay Sach's disease electron microscopy

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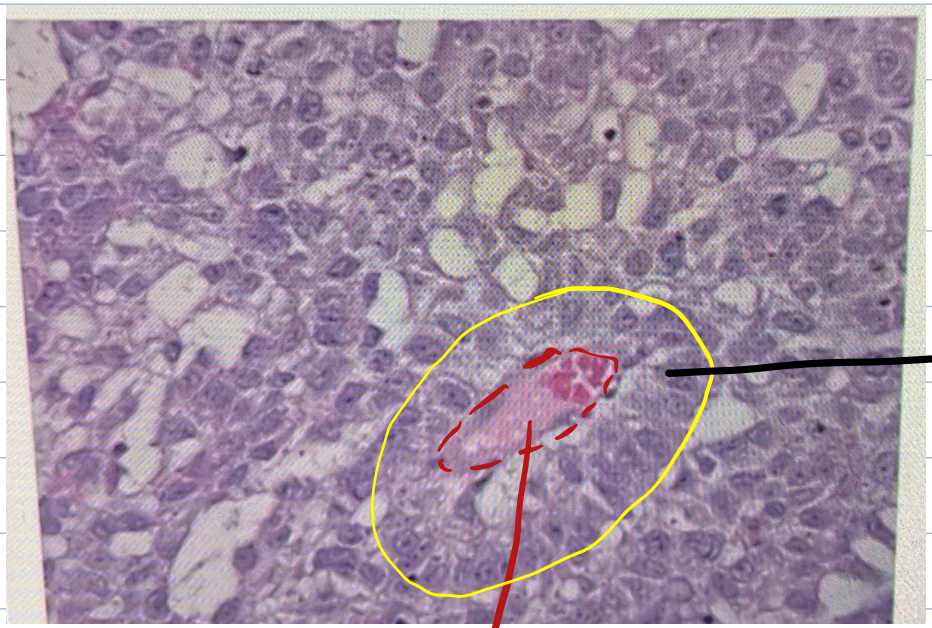
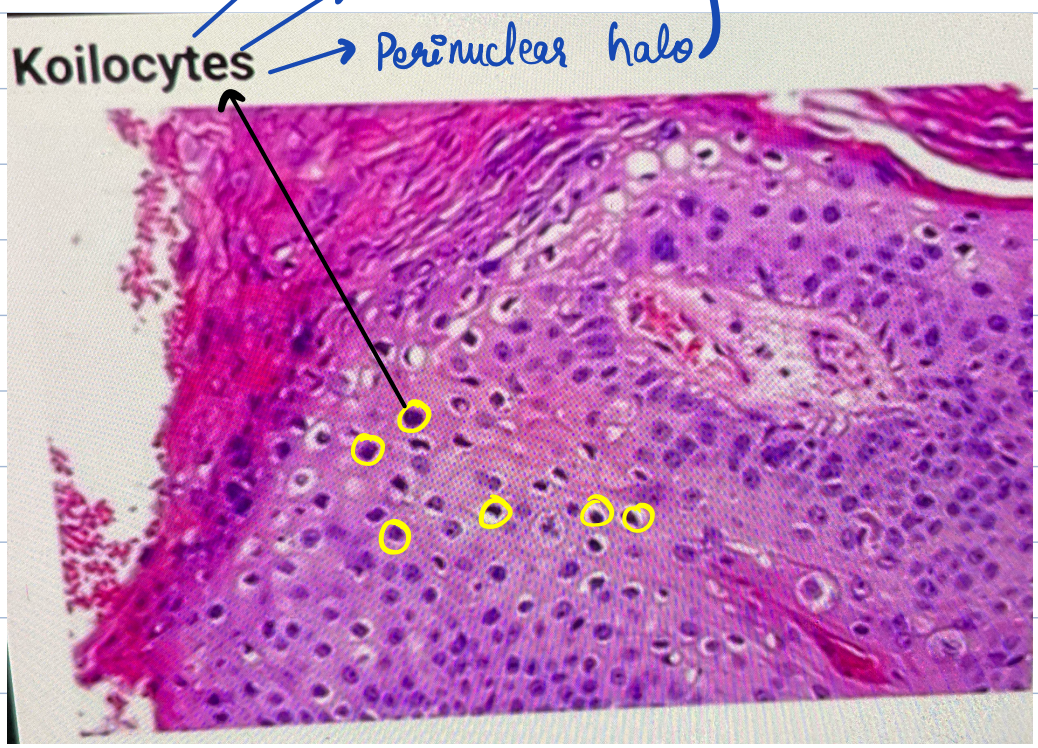


GLOMERULOID BODY / SCHILLER DUVAL BODY

- Yolk sac tumor
- Glioblastoma multiforme (GBM)

Blood vessel



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