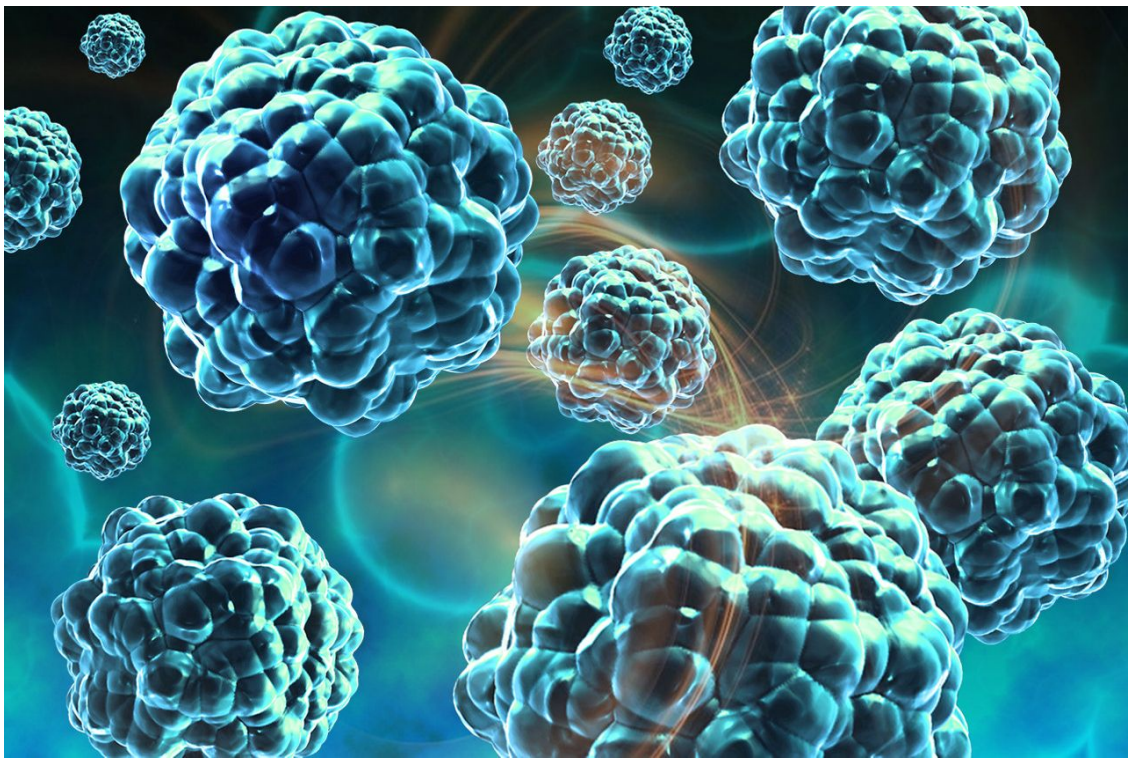

Principles of Surgical Oncology

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Color Index:

-Slides -Important -Doctor's Notes -Davidson's Notes -Surgery Recall
-Extra

Correction File

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Pathological cell changes:

Doctor Notes about this part

This is the transmission of cell to difference shape

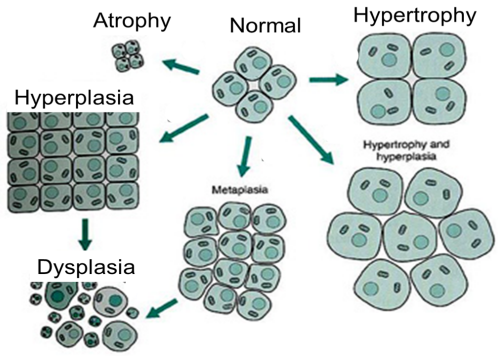
hypertrophy = increase in cells size .

atrophy = decrease in cells size .

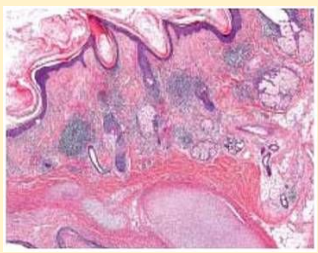
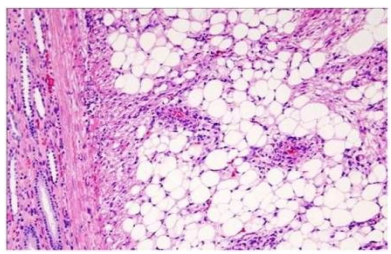
hyperplasia = increase in cells number .

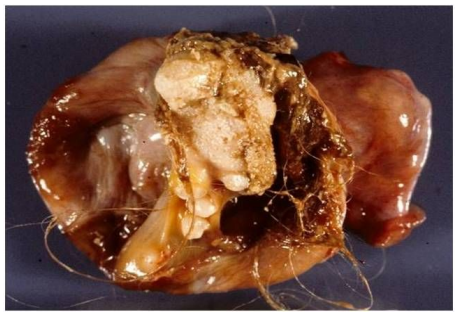
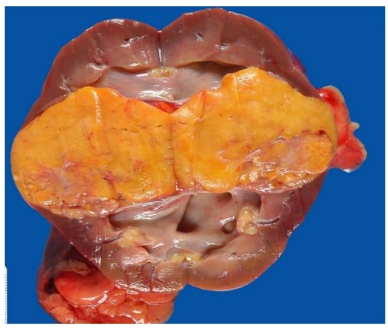
metaplasia =is the reversible transformation a type of tissue to another tissue that can tolerate to irritant

dysplasia = is considered pre -cancer mixed between cells (atrophy and hyperplasia).

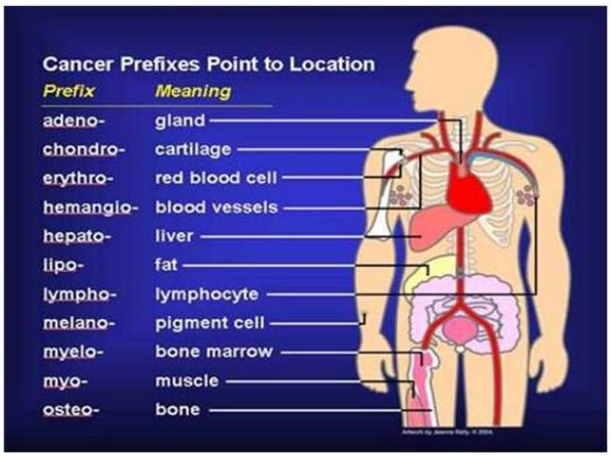


Types of Tumors:

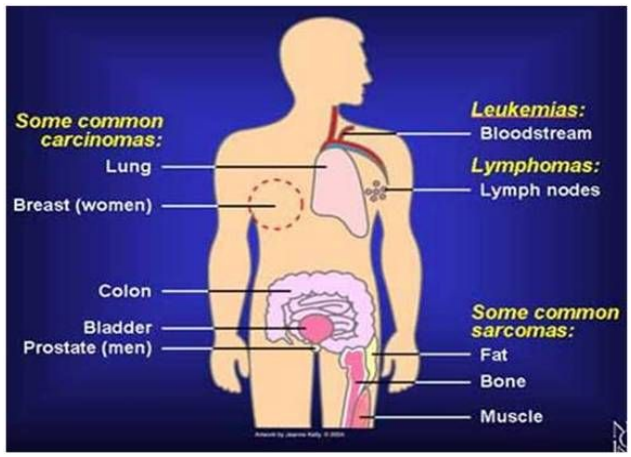
Benign	Malignant	Teratoma	Hamartoma
	•Carcinoma : is a type of cancer that develops from epithelial cells. Carcinoma is more aggressive than sarcoma include cancers of the:breast, lung, kidney, thyroid,colon, prostate, stomach and many others. •Sarcoma : is a type of cancer that develops from connective tissue.. include cancers of the:bone, cartilage, fat, nerves, muscle, vascular ,fibrous tissue, such as ligaments and connective tissue. **Blood cancers:** •Leukemia,lymphoma,Myeloma 		

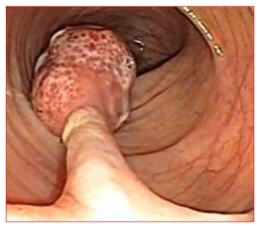
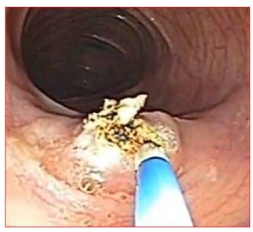
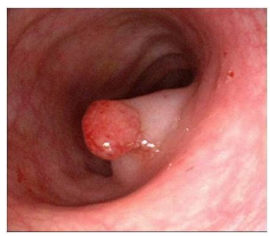
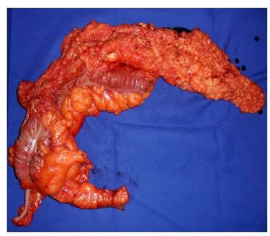
Teratoma	Hamartoma
• Type of germ cell tumor that may contain several different types of tissue such as hair, muscle, and bone. **(is type of a tumor which occurs due present of tissues that should not present in affected organ).** • Teratomas occur most often in germ cell areas (ovaries and testes_. • Arises from the embryonic "totipotential cells", which are capable of developing into any variety of cells. • Could be benign or malignant • Has the potential to produce new tissues in the organ affected • Ex: Dermoid ovarian cyst→ is one of the benign tumor of the ovaries which is a cystic teratoma that contains developmentally mature skin, complete with hair follicles, sweat glands, bone and cartilage, which are not normally found in the ovary. 	• Benign tumor composed of an overgrowth of mature cells and tissues normally present in the affected part.(Collection of tissues that are present in same organ.) • Abnormal arrangement of normal tissue, "haphazardly arranged tissue" that resembles a neoplasm. • Benign but capable of producing complications • Ex: Angiomyolipoma of the kidney, composed of blood vessels, smooth muscle cells and fat (which normally found in kidney calyces) 

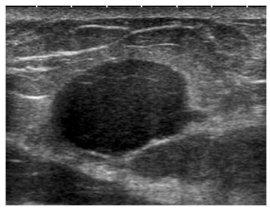
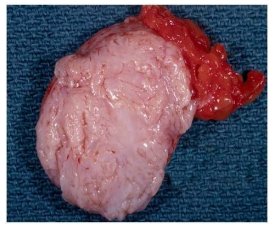
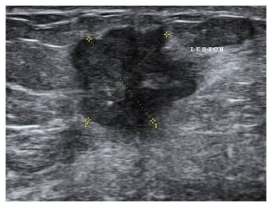
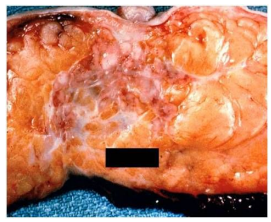
Cancer Nomenclature: dr: we will not focus on it



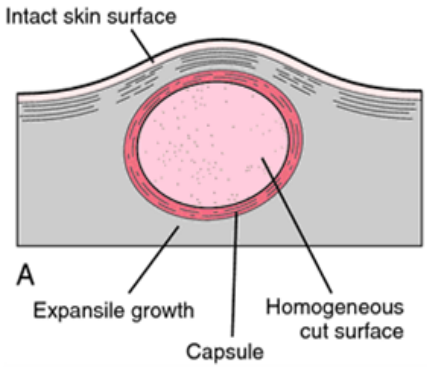
Types of Malignancies:

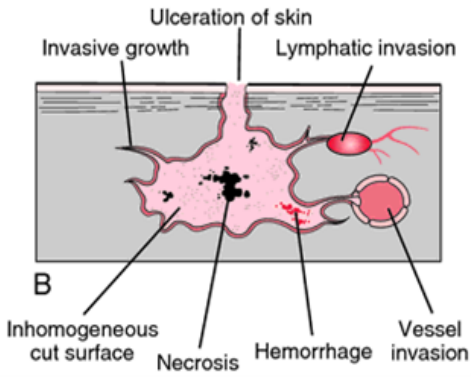


feature	Benign	Malignant
Capsule	Encapsulated	Non encapsulated Sometimes, there is a capsule but it's a "false capsule" is called pseudocapsule, meaning it's a fibrous capsule from the same tissue
Invasion	No invasion	Usually invade
Metastasis	No metastasis	Metastasis For metastases to occur it would appear that further mutations need to occur in the cancer cells (Metastatic Signature)
Treatment	Local excision of benign  	Radical excision -safety margin:tumor exceed the margin so we do excision the surrounding tissue. -free margin: tumor does not exceed the margin of the specimen. (excision with the organ or adjacent organ and surrounding lymph nodes) +\- Chemotherapy or Radiotherapy or both.  This is right hemicolectomy of malignant tumor B/C it have the susceptibility to invade blood vessels 

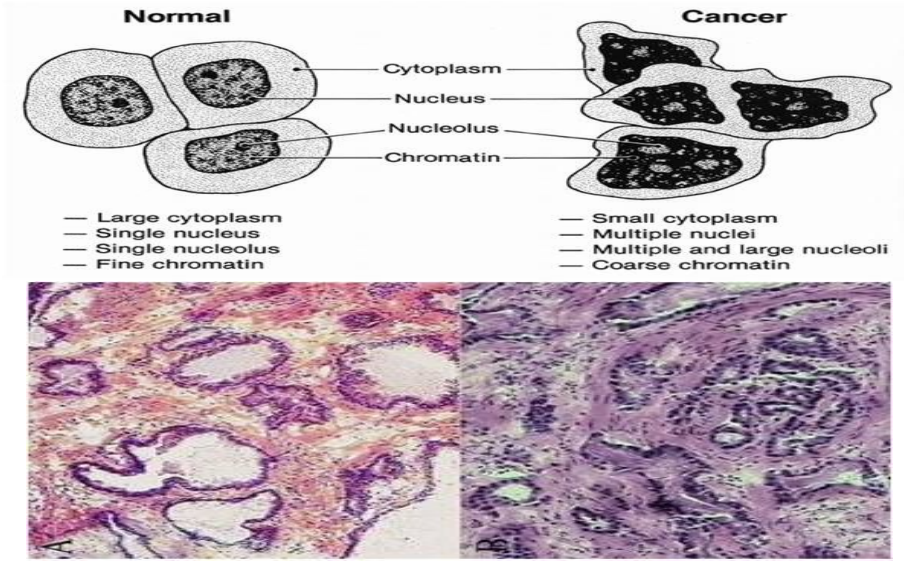
PIC	  excision of lump only (Lumpectomy)	  Radical excision of the whole breast

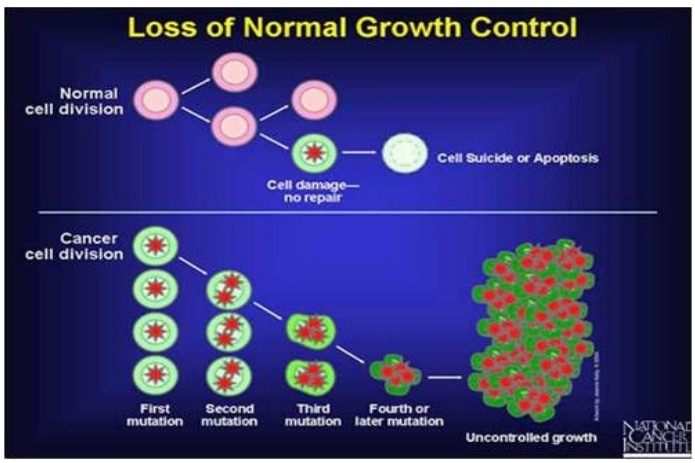
Extra notes:
Benign growth is controlled whereas malignant growth is not. That's why it: - can invade the same organ (nonencapsulated), go to adjacent organs, or go to lymph or blood - can metastasize e.g. Cancer in lung goes to brain; cancer of colon goes to lung, cancer of prostate goes to vertebral column.
breast cancer go to:lung,bone,liver
GIT cancer go to :liver





	Normal cell	Malignant cell
Characteristics	It has controlled growth, contact phenomena, and whenever it gains unrepaired damage it will suicide "apoptosis"	Uncontrolled growth and **loss of contact phenomena(what cause suppression of further growth).**
Cytology	• Large cytoplasm • Single and regular Nucleus • Single Nucleolus • Fine chromatin	• Small cytoplasm (because of the large nucleus) • Multiple, irregular shape, dark stained • Nuclei → (lot of mitotic figures) • Multiple and large Nucleoli • Coarse chromatin



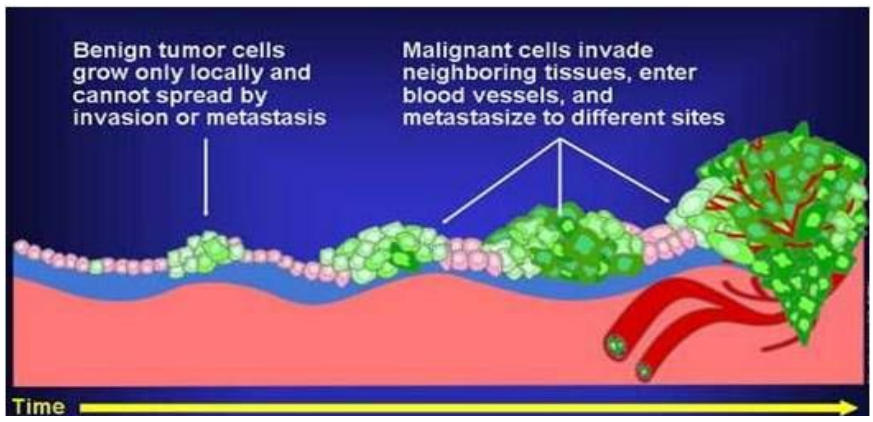


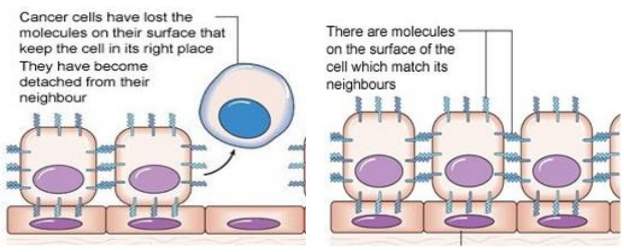
Extra notes:

Cancer arises from a loss of normal growth control. In normal tissues, the rates of new cell growth and old cell death are kept in balance. In cancer, this balance is disrupted. This disruption can result from uncontrolled cell growth or loss of a cell's ability to go into apoptosis, which in turn will lead to abnormal shapes, numbers and non-uniformity of cells

Extra notes:

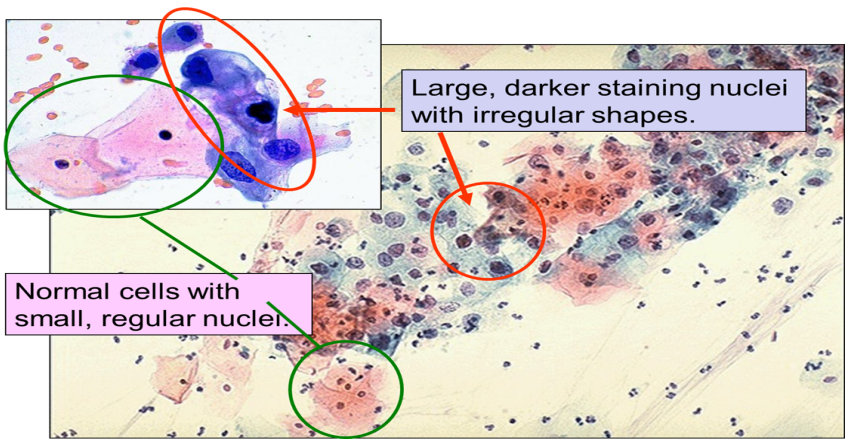
Normally, cells stop growing and reproducing once their plasma membrane comes into contact with another. Cancer cells lack this contact phenomenon. They continue to grow into other cells taking over and often destroying the other cells, creating a tumor





Malignant cell morphology:

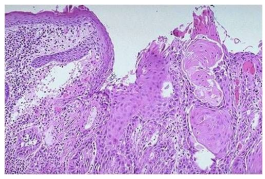
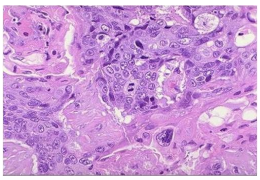
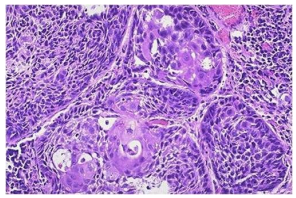
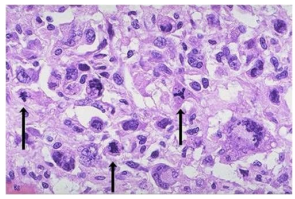
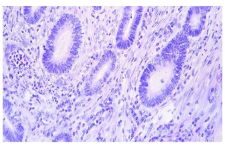
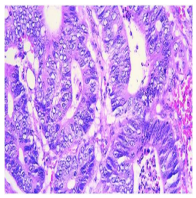
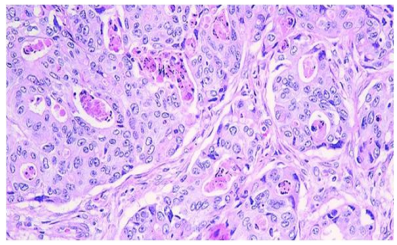
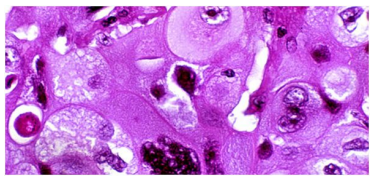
Extra notes:
The difference between benign and malignant cells: Malignant cells are characterized by deeply stained nuclei (darker), divided nuclei that are larger in size in comparison to the cytoplasm, and the shape of the cells are not identical (polymorphism, the cells in different stages of growth).



Tumor Grading & Differentiation:

Grading	Differentiation
Describes the histologic characteristics of cancer cells mainly talk about cell layers. (not described the range of spread of cancer) e.g. grade I, II, III.	Describes the characteristics of cancer cells in reference to their resemblance to the cell of origin. e.g. well differentiated , moderately differentiated, poorly differentiated, anaplastic.
Tumor grading & tumor differentiation both describe the histological features of the tumor and not the macroscopic features , invasion or metastasis	

Degree of differentiation provides information about cancer aggressiveness and progression			
Well differentiated	Moderately differentiated	Poorly differentiated	Anaplastic
Cancer cells look and behave like the normal cells in the tissue (slow growing and less aggressive).		1) Indicates that the cancer is rapidly growing with no time for the cells to be differentiated. 2) Most of them are more susceptible to chemotherapy agents b\c they are weak due to the rapid development and growth.	Cancer cells that divide rapidly and have little or no resemblance to normal cells. 1. if we found an enlarged lymph node but we did not know the origin, we send it to the lab. If it it's a well differentiated tumor, the pathologist will be able to identify the cell of origin. 2. However, in poorly differentiated or anaplastic tumors, the pathologist will not be able to identify the cell of origin, he will only be able to confirm the malignancy.

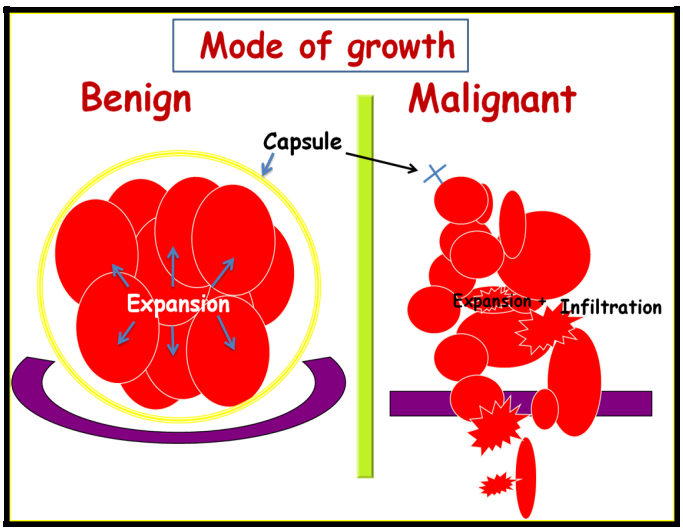









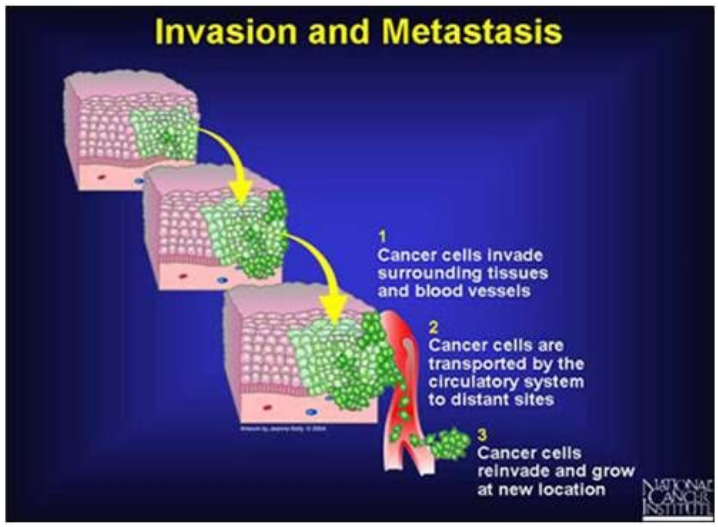
Local Effects of Tumors: dangerous:

Compress adjacent structures

Why malignant cells are

Invasion of basement membrane



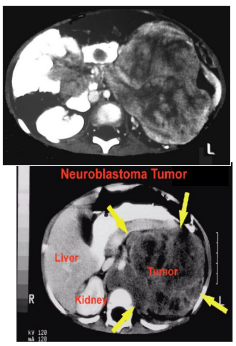


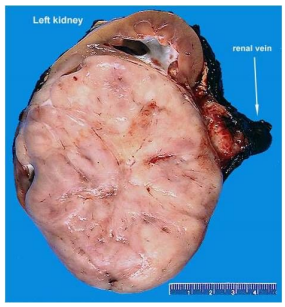
Dr Notes :

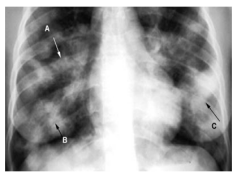
- Fibroma of the breast is called mouse of breast because it movers rapidly to the blood circulation
- Dormant cancer is cancer that appears again after sleep for several years
- Lymphatic drainage of testicular cancer is paraaortic lymph nodes

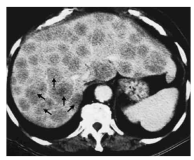
Spread of Malignant Tumours:

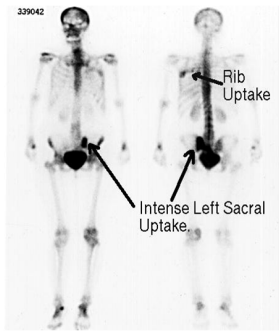
Local invasion	Metastasis
•**Within the organ** •**Adjacent organs** *Malignant cells secrete a number of factors that may determine their biological behaviour and promote growth at both primary and metastatic sites. **The matrix metalloproteinases** (MMPs) are endo-proteinases with enzymatic activity directed against components of the extracellular matrix. **Their action facilitates tumour cell invasion and metastasis by degrading extracellular collagens, laminins and proteoglycans**. Other proteases, such as **urokinase**, **plasminogen-activating factor** and the **cathepsins**, are also involved in metastasis formation.	•**Lymphatic :Regional & distant lymph nodes.** E.g. Colon cancer manifesting as a lump in the neck Lump in the neck > 1st sign of metastasis of cancer in the colon, stomach and testes •**Homogenous** : the most common sites are liver , lung and bone because they are rich in blood circulation where there is a fine capillary beds,that trap the circulating malignant cells which then develop into metastases, bones,due to the secretion of prostaglandins from cancer cells, which can induce osteolysis and may promote the development of skeletal deposits..Brain isn't a common target of metastasis because of the BBB that can block out the cancer cells. However, small-cell lung cancer ,bronchogenic carcinoma and bladder tumor can easily go to the brain. •Transcoelomic e.g peritoneal & pleural cavity. •Implantation e.g. needle tracks, wounds.



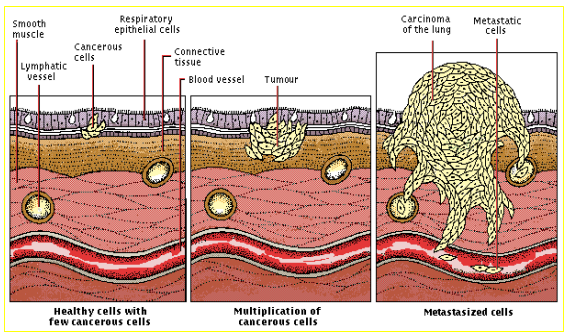


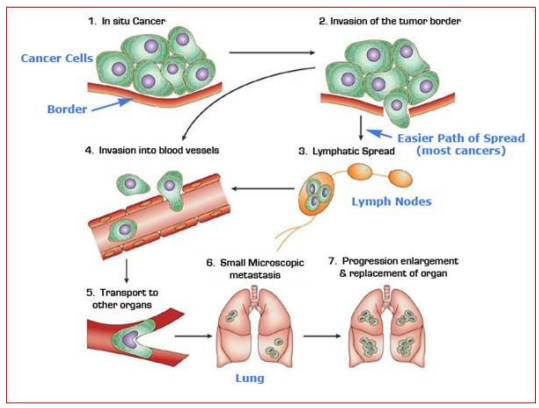




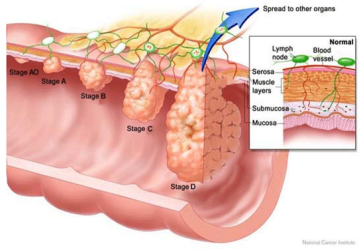


cannon ball



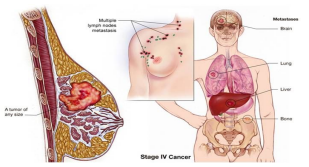


The difference between metastasis and direct invasion:

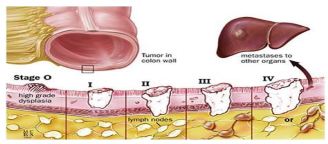


- **Direct invasion**: tumor enlarges to invade the adjacent organ with continuity of primary tumor. (e.g. bladder cancer goes to colon or uterus).
- **Metastasis**: tumor invades other organs with discontinuity of primary tumors. (Through blood)

STAGING OF MALIGNANT TUMORS:



Staging describes the primary tumor, its relation with the organ of origin ,adjacent and distant organs

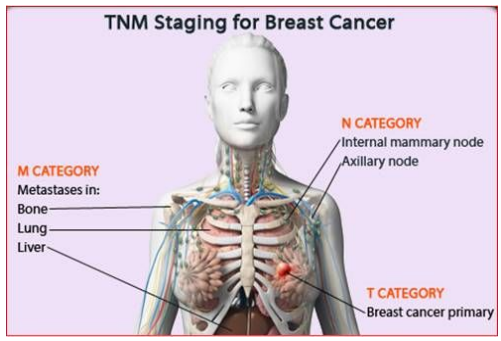


Types of Tumor Staging:

1-Classical:

stage I, II =confined to the organ.	stage III=direct invasion	stage IV=metastasis

2-TNM



T1, No, Mo

T – Tumor :T1,2,3,Tis,Ta,Tb (gross appearance of primary tumor)

N – Node : N0, 1, 2, 3 (lymph node)

M – Metastasis: M0,1,2,3 (distal metastasis)

Why Do We Stage Malignant Tumors?

- To decide the treatment
- Primary is different than secondary treatment
- To plan the treatment
- (Surgery, radiotherapy, chemotherapy) -To assess the prognosis
- To define the extent of disease

TNM Classification (American Joint Commission on Cancer)				Dukes' Classification
Stages	T	N	M	Stages
Stage 0	Tis	N0	M0	
Stage I	T1	N0	M0	A
	T2	N0	M0	B1
Stage II	T3	N0	M0	B2
	T4	N0	M0	B2
Stage III	T1, T2	N1 or N2	M0	C1
	T3, T4	N1 or N2	M0	C2
Stage IV	Any T	Any N	M1	D

***every organ has its own different staging For example : Duke classification for colon cancer**

Clinical presentation of Malignancy	
Asymptomatic	
Symptoms related to the primary	➢ **lies on the surface of the body:** 1-may become visible 2-change in shape or pigmentation 3-bleed, or discharge mucus or pus. ➢ **Obstruction of hollow viscus or duct:** 1-in a bronchus → pulmonary collapse 2-In a segment of bowel → intestinal obstruction 3-In bile duct or pancreatic duct > jaundice, or pancreatitis. ➢ **A tumour within a closed space:** may cause *pressure symptom*s. For example, increased intracranial pressure may complicate intracerebral tumours, and paraplegia may arise from a spinal cord tumour. ➢ **Invasion of an organ** :may compromise its normal functions and cause organ failure. Invasion of tissues such as the pancreas, bone or nerves can cause severe pain. A cancer can also mimic the pain of benign disease: for example, dyspeptic symptoms in stomach cancer. ➢ **Secretory tumours:** can produce characteristic clinical syndromes.**1-**These products may be **appropriate** to the organ of origin. E.g. tumour of the adrenal cortex > Cushing's syndrome, a parathyroid tumor >hypercalcaemia, an islet cell tumour of pancreas > hypoglycaemia. **2-**secretory products may be **inappropriate** to the site of a tumour. Such 'ectopic' secretion occurs predominantly in tumours of neuroendocrine origin, and produces a variety of endocrine syndromes. E.g. colon cancer commonly causes rupture of blood vessels which lead to bleeding per rectum, esophageal cancer could obstruct the esophagus leading to dysphagia, bladder tumor causes rupture of blood vessels hematuria, also ruptured blood vessels caused by lung cancer will present as hemoptysis.
symptoms related to the secondaries	○ E.g. 60 y/o female had sudden low back pain, after investigations, she was discovered to have breast cancer . Hemoptysis- patient might have cancer in the kidney and the patient doesn't have any problem in urination (secondaries) . Minimal fall > pathological fracture – discovered to have bone metastasis.
Incidental finding	

Weight loss and cachexia	➢ Weight loss and Cachexia are late manifestations of most malignant tumors except GI which affect the absorption and Lung cancer (bronchogenic carcinoma) ➢ In GIT cancers, as the cancers being in upper parts of alimentary tract, as faster in causing weight loss (esophageal cancer develops weight loss faster than gastric cancer Weight loss is often the key symptom that alerts both patients and their doctor to the possibility of malignant disease. A proportion of patients become so emaciated that they appear to die of starvation. This syndrome is known as **cancer cachexia**, and is clinically characterized by anorexia, severe weight loss, lethargy, anaemia and oedema.

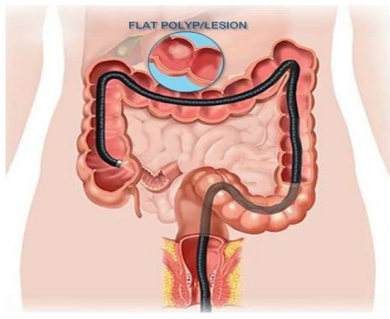
Investigation of Malignant Tumors:

Initial investigations to make the diagnosis should proceed in a logical order, **starting** with simple blood tests (e.g. tumour markers) and **progressing** through more complex imaging investigations.

Investigation for the primary (do biopsy for example by endoscopy for pt with bleeding per rectem then check if it malignant look for metastasis)	Investigate for the secondaries
-depend on the site -depend in the histology -define the local excision	•Look for metastasis Eg , by ct , chest x-ray….. •Usually liver, lung and bones. •Not All Tumors can cross BBB(blood brain barrier), that tumors that able are: scc=small cell carcinoma and breast cancer •Most of git tumors transmit to liver because of portal circulation

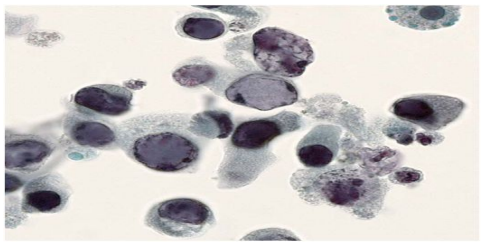
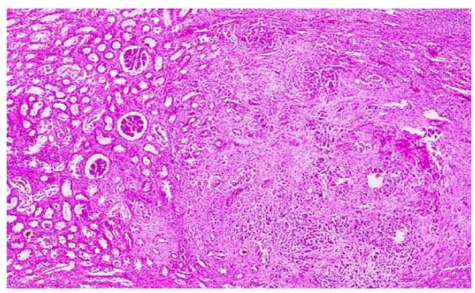
Both will define the diagnosis & stage.

Accordingly, the treatment plan will be determined .Treating Malignant tumors exposes the patient to major surgeries, dangerous chemotherapy or troublesome radiotherapy. So make sure that it is malignant then define the type of this tumor (each malignancy has a specific way of treatment)

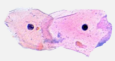
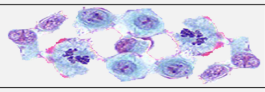
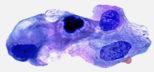
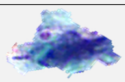


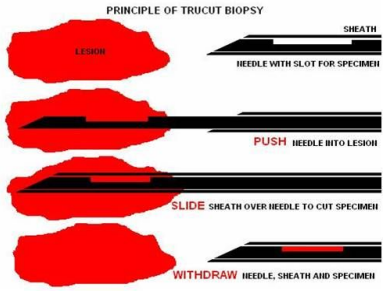
How we obtain material for histology:

Local Effects of Tumours:

cytology	biopsy
morphology of individual cells. ➢ Exfoliative (urine,sputum) the epithelial layer multiplies and the superficial cells fall down so try to collect & get benefit from it "without any effort from doctor "as in sputum or urine sample ➢ Fluid aspiration (ascitic fluid,pleural fluid) ➢ Fine needle aspiration (FNA) taking cells from solid tumors, Fine needle aspiration (FNA), very common nowadays: in solid tissue and draw out cells, then stain the cells on the slide and look under the microscope for any malignant cells.  The difference between benign and malignant cells: Malignant cells are characterized by deeply stained nuclei (darker), divided nuclei that are larger in size in comparison to the cytoplasm, and the shape of the cells is not identical (polymorphism, the cells in different stages of growth).	histological (tissue) characteristics. ➢ Fine-needle aspiration ➢ Core biopsy E.g. Tru-cut: core of tissue removed for histological examination ,Usually done if the lump is apparent and distinct and localized ,Commonly done through endoscope. ➢ Incisional biopsy removes a small accessible piece of the lesion for histological examination (open,forceps, needle...) ➢ Excisional biopsy Complete removal of a discrete lesion without a wide margin and without it being considered curative of the malignancy. E.g. Remove breast lump for histology Sometimes, this cannot be done because the tumor is disseminated or cannot be removed alone 

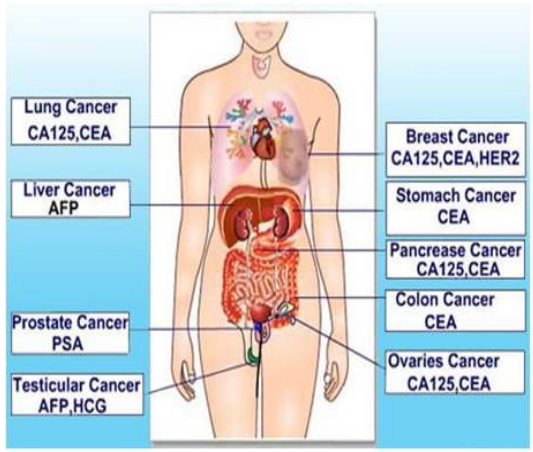
Principles of Cytology (Very important)

Normal	Cancer	
		Large, variably shaped nuclei
		Many dividing cells; Disorganized arrangement
		Variation in size and shape
		Loss of normal features

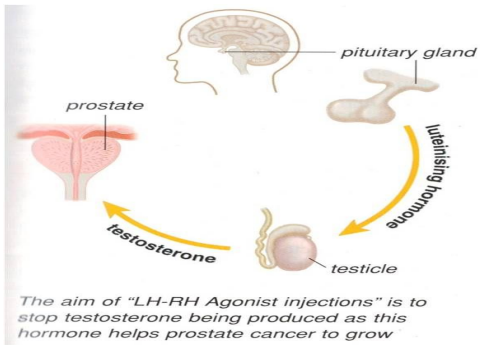


Tumor Markers: The concept is very important

- Substances which if present in the blood or tissues may indicate malignancy.
- There are many tumor markers
- Most are non-specific
- Important in diagnosis (general findings + tumor markers>> Dx) E.g. patient with testicular tumor "clinically" and was found to have a high level of the tumor marker>> the patient has teratoma not seminoma.
- Important for screening the early detection, incidence of disease . Males over 40 years old do PSA .Mammography for carcinoma of the breast, PAP smears for cervical carcinoma , Others: CEA, α-fetoprotein, HCG
- Important in follow up E.g. patient has testicular tumor and high α –fetoprotein after removing the tumor, α –fetoprotein is decreased. If after 6 months, the α –fetoprotein goes back up, that indicates recurrence of the tumor.



CEA is tumor marker associated with colon cancer
a-fetoprottein is tumor marker associated with Hepatoma and testicular cancer
CA 19-9 is tumor marker associated with Pancreatic carcinoma



Hormones & Cancer:

➢ Hormones related to tumor growth:

•Usually sex hormones (testosterone,estrogen)

•They may have a relation to tumor growth

•Hormone receptors

•The concept can be used in treatment

E.g. In breast cancer, ask the histologist to find any estrogen receptors. That will affect the treatment plan and prognosis. Also the prostate needs testosterone to live, so if we block the testosterone secretion by drugs, the tumor will stop growing .

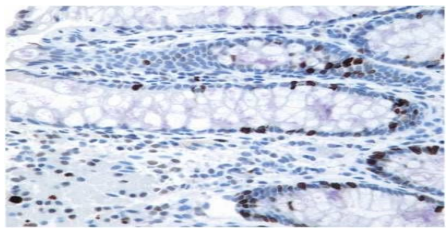
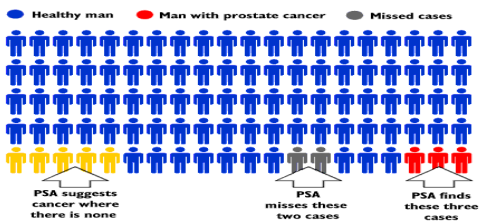
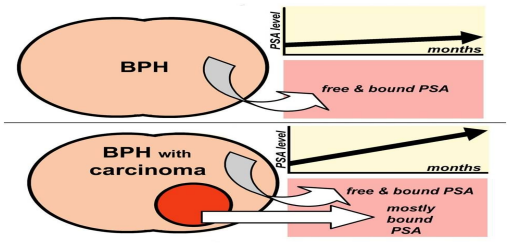
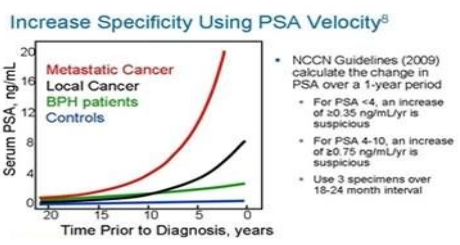
Growth of the prostate and the malignant cells are dependent on the testosterone. So we control the malignancy by either removing the primary producing organ of the tumor, which is the testes, or blocking one of these pathways.

When tissue is taken from a cancerous breast and gets sent into the lab, we may find estrogen receptors which could be treated with antiestrogen (Tamoxifen), thus decreasing the effect of estrogen on the breast. This way we're minimizing growth of the malignant cells.

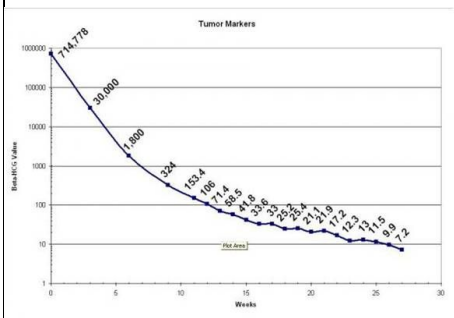
➢ Hormones may be produced by tumors:

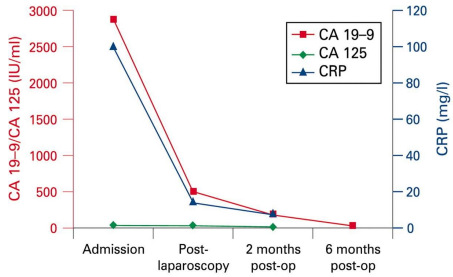
•Originally hormone producing organ e.g. adrenals

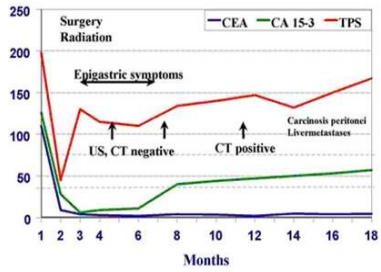
•Originally non hormone producing organ e.g. lung (bronchogenic carcinoma)

Tumor Markers in tissues	Tumor Markers-non specific
	
Tumor Markers-screening	**Tumor Markers-diagnosis**
	

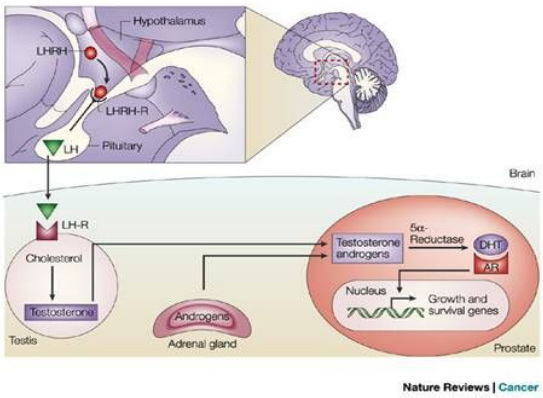
Tumor Markers-follow up

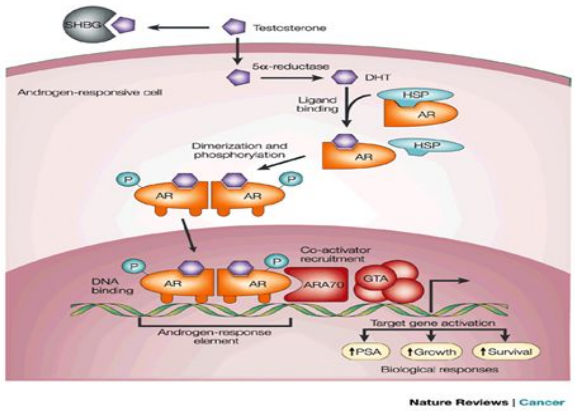




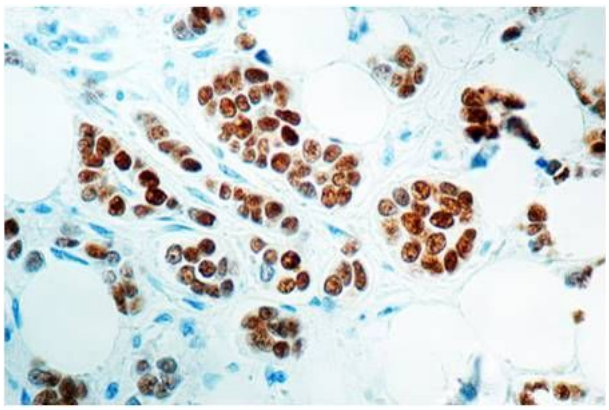


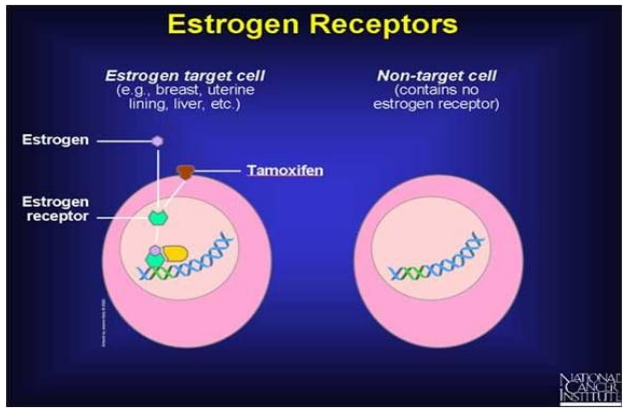
Testosterone and Prostate cancer





Estrogen receptors-breast cancer





Surgical Recall

1-Define :

Surgical oncology	surgical treatment of oncology .
XRT	radiation therapy .
in situ	not invading basement membrane .
benign	not malignant tumor -doesn't invade or metastasis
malignant	tumors with anaplasia that invade or metastasis.
adjuvant RX	treatment that aids or assist surgical treatment =chemo or XRT.
neoadjuvant RX	chemo ,XRT , or both before surgical resection .
brachytherapy:	XRT applied directly or very close to the target tissue (e.g. implantable radiative seeds).
metachronous tumors :	tumors occurring at different times .
synchronous tumors	tumors occurring at the same time .

2-what do the T,M,and N stand for in TMN staging ?
T-Tumor size . M-Mets(distant) N-Nodes .

3-what tumor marker is associated with colon cancer? CEA

4-what tumor marker is associated with hepatoma ? alpha -fetoprotein .

5-what tumor marker is associated with pancreatic carcinoma ? CA 19-9

6-what is paraneoplastic syndrome ?
syndrome of dysfunction not directly associated with tumor mass or mets (autoimmune or released substance).

7-what are the most common cancers in women ?
1-breast . 2- lung . 3-colorectal .
8-what are the most common cancers in men ?
1- skin cancer. 2- prostate . 3- lung . 4-colorectal .
9-what is the most common cancers causing death in both men and women ?
lung .

MCQs.

1-A patient comes with an enlarged cervical lymph node, which of the following is unlikely to be the primary site?
A. Bronchus
B. Stomach
C. Colon
D. Mouth
E. Laryngopharynx

2 -To detect hematogenous spread of a tumor, all the followings should be done EXCEPT:
A-Chest radiograph
B-Cystoscopy
C-Abdominal CT
D-Bone scan

3-Which of the following tumors has the least potential of malignant transformation?
A-Renal angiomyolipoma
B-Ovarian embryonic carcinoma
C-Osteosarcoma
D-Mesothelioma

Answers: 1;C , 2;B, 3;A