Introduction to oncology

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Note: Doctor said that the slide is more than enough for exam!

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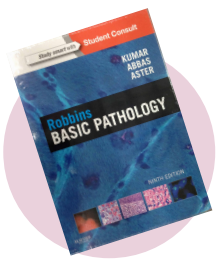
Objectives:

- **Definition of cancer.**
- **Etiology of cancer.**
- **Staging of malignant diseases.**
- **Principles of pathological classification of malignant Diseases.**
- **General symptoms and signs of malignancy.**
- **Principals of cancer management.**

  (Curative Vs Palliative concept)

Refrences:
Slides - Black
Doctor's notes - Red
Step up / dividson - Blue
Extra explanation - Grey

Optional:



Editing file

P260 to 271

P177 to 185

Recall

Neoplasia is new tissue growth that is unregulated,irreversible and usually monoclonal
"meaning that it comes from one cell in origin"
there are two types of Neoplasia: either Benign OR Malignant
in case of Benign the new tissue growth will be confined to limited area (local)
but if it's a cancer it would be sent distally (metastasis) or have the potential to invade
Now, in our lecture we will focus about the malignant type of neoplasm (cancer)
Cancer is basically initiated by damage to DNA of stem cells and that damage would overcome the normal mechanism of DNA repair which will lead to unstoppable divisions of the cells making cancer.
there are 3 mechanism well known triggering cancer:

- Oncogenes → Ex: PDGFB, HER2/neu
- Tumor suppressor genes → Ex: p53 (Garden of the genome)
- Regulator of apoptosis → Ex: Bcl2

Any defect of them or overexpression (in case of oncogenes) would eventually lead to cancer.

- **Oncology:** the science of treating tumors
- **Definition:** Neo=New, Plasm= Mass.

Cancer: is a term describe a group of diseases in which the cells gain the ability of indefinite division and they escape the body control.

- **These cells are able to:**

Not any abnormal proliferation is cancer!! (Ex: Granuloma), Cancer has to be an invading and proliferative cycle.

Invade surrounding tissues

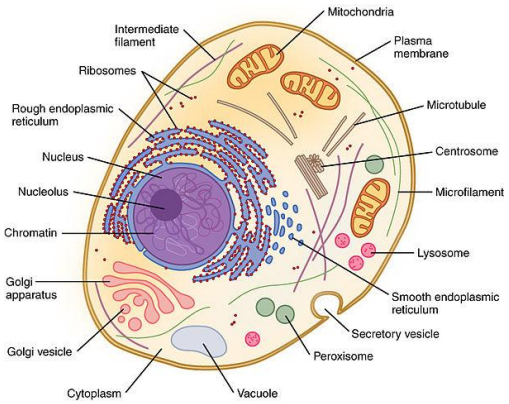
Send distant metastases **Lost their Functions**

Ex: The normal function of neutrophils is to fight Bacteria, in leukemia patients it will lose that function even though they have a large numbers of neutrophils, they will have recurrent infections because they are not functioning neutrophils.

- **Causes of Cancer:**

  How the body can control proliferation? by enzymes, cytokines and growth factors..

- **Homeostasis mechanism:**
  - **Excessive inhibition = autoimmune diseases.**
  - **Excessive stimulation = cancer.**
- **The epigenetic defects = problem between the nucleus and cytoplasm (The order is correct but the processing is wrong).**



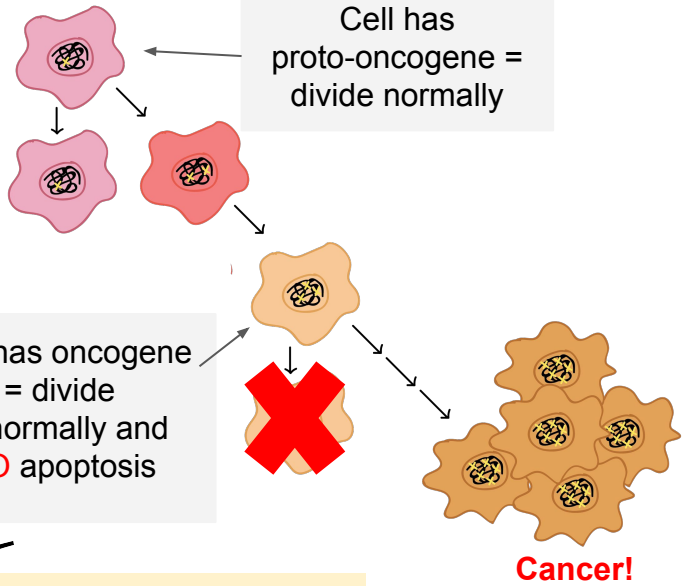
(Nucleus is the brain of the cell)

The nucleus is having chromosomes which are carrying the genes which made of DNA

DNA controls cell functions

Cell division

- **Development of malignant diseases:**



explanation: Normally in our body each stem cells has the ability to divide through a control process according to body needs and when it completes its job it must be stopped. However, if there is any mutation in the stem cells that are going to divide this process would be unstoppable leading to unregulated cell growth which in turn forming a mass.

proto-oncogenes: are genes responsible for promoting cell growth and divisions in our body which are normally found and necessary. However, if these genes get mutated, it will be converted to oncogenes and now it's becoming a pre-cancer.

Every human cell has proto-oncogene, Not oncogene.

Cancer arises from the mutation of a normal gene: if proto-oncogene Mutated genes that cause cancer are called oncogenes

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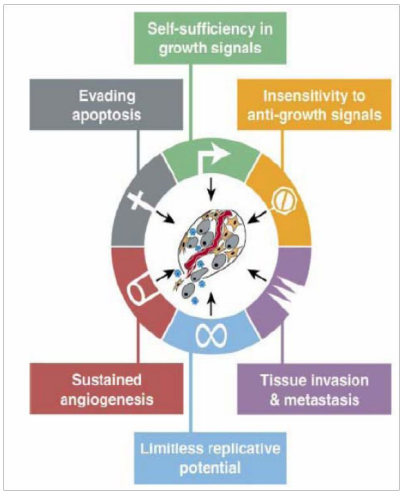
BASIC STRUCTURE OF HUMAN BODY
the body is made of different systems >
the systems are made of organs >
the organs are made of tissues >
the tissues are made of cells >
the cell is made of cytoplasm + nucleus.

DNA Mutations	Genetic Predispostion	Infectious agents
Radiation – and other environmental factors (Tobacco, Alcohol, Radon, Asbestos, etc) **chemical >** factory workers **Random somatic mutations** **Inherited germline mutations -** from parents	**Mutation in Tumor suppressor genes** Ex: Rb, p53, APC, CDKN2A, • BRCA1, BRCA2 if we inhibit the tumor suppressor gene this will cause a cancer!	**Viral** HPV* > Cervical cancer Hepatitis > liver cancer **by DNA mutation** **Bacterial** H.pylori > stomach cancer EBV > lymphoma **by decreasing the immunity**
Rb = Retinoblastoma protien, APC = Adenomatous polyposis coli, CDKN2A = cyclin-dependent kinase Inhibitor 2A, BRCA1/BRCA 2= Breast Cancer 1/2 mutation, *HPV = Human papilloma virus, EBV* = Epstein barr virus		

- **Hallmarks of Cancer:** Summarized by Hanahan and Weinberg (2000)
  Six changes for cancer – found in most, if not all.

  - **Self- sufficiency in growth signals.**
  - **Insensitivity to growth-inhibitory signals.**
  - **Absence of apoptosis.**
  - **Limitless proliferative capacity.**
  - **Sustained angiogenesis.**
  - **Tissue invasion and metastasis.**
  - **Genome instability and mutation.**
  - **reprogramming energy metabolism.**
  - **Tumor- promoting inflammation.**
  - **Evading immune destruction.**



- **Cancer signs and symptoms:**

  .**Cancer gives no exclusive symptoms or signs that indicate the disease**

  Unfortunately every complaint or symptom of cancer can be explained by a more common less harmful condition :(

- **4 clues to know if the symptoms associated with cancer or not?**

1. **Persistent** Never disappear.
2. **Progressive.**
3. **Disabling** Changes the patient life.
4. **Changes according** to the site of origin:
   Think about the pathology and site of mass (Ex: lump, can make pressure on vital organs, Obstructions of lumen) or can able to invade through:

- Blood vessels → bleeding.
- Nerves → pain.

locally and spread distantly (THINK 2L,2B = lung, liver, brain, bone).

! Don't forget the **Constitutional Symptoms**: **Fatigue**, **Fever** ,**Night Sweating**, **Weight Loss, decreased appetite.**
As it's a part of symptoms that cancer patient may have !

- **Cancer Diagnosis:**
  It is a **Pathological** and **tissue** Diagnosis. **NOT** clinical, radiological or serological (**Gross and microscopically) except two, Beta HCG and alpha fetoprotein which are diagnosed by serological marker.**

Primary tumors	Metastatic Tumors
Represent de novo (a new) tumors in their initial site **Ex: Lining of the gastric mucosa = gastric cancer, colon cancer, thyroid cancer...**	**These are cell colonies that has been sent by the primary tumor**

- **Categories of malignant disorders:**

A) Liquid malignancies (Blood malignancies) — **Treat it with systemic therapy**
1- Myeloproliferative disorders = Leukemia
2- Lymphoproliferative disorders = Leukemia

B) Solid malignancies — Treat it according to the stage			
Epithelial Tissues		Connective Tissues	
Surface	Glandular	Bone	Soft Ex: blood vessels, cartilage
Carcinoma	Adenocarcinoma	Sarcoma	

- **Essential work up for staging: TNM staging system:**

T= Tumor , N=Node , M= Metastasis

- **Clinical TNM**
  - **by: physical examination**
- **Radiological TNM**
  - **by: X-Ray, MRI, CT,US**
- **Pathological TNM**
- **Surgical staging**

- **Screening:**

- **Goal of screening is to catch dysplasia "*precancerous changes*" early before it becomes cancer or detect cancer before any clinical symptoms arise.**
- **If cancer are detected late that is mean more mutation of genes and poor prognosis.**
- **Common screening methods used for detecting cancer include:**

1. **Pap smear → Cervical cancer.**
2. **Mammography → Breast cancer.**
3. **Prostate specific antigen (PSA) & digital rectal exam → Prostate cancer.**
4. **Hemoccult test & colonoscopy → Colon cancer.**

How to treat Cancer?

Types of oncology problems

Patient with suspected cancer diagnosis

Patient with established cancer diagnosis

- Does the patient have cancer?
- what type?
- what stage?

Determine the treatment objective

Curative

Palliative

- **Therapy:** Aggressive, Expensive, Recent, Updated, Complex
- **Toxicity:** Long Term, Irreversible

- **Treatment:** Simplest, Avoid hospitalization, Availability, Least Toxic
- **Toxicity:** Short term, Acute, Quality of life

- **Different Treatment Modalities:**
  Local therapy= Surgery and Radiological therapy.
  Systemic Therapy = Chemotherapy, Hormones and Biologicals.

General staging of solid malignancies	**Early**	**local +/- systemic**
	Locally advanced	**local AND systemic**
	Metastatic	**systemic +/- Local**

- **Finally, The Prognosis:**
  It depends upon:
- Stage and extent of the cancer.
- The host factors (age, sex and comorbidities).
- The available tools.

Tumors can be cured	Tumors can have prolonged survival	Tumors that can be palliated
Lymphomas Leukemia Early solid tumors	**Locally advanced and some of the metastatic tumors**	**Metastatic solid tumors**

MCQ's

Q1: Which one of the following tumors can be cured medically?

A. Breast cancer
B. Leukemia
C. Colon cancer
D. Kaposi sarcoma

Q2: On which chromosome the p53 lies?

A. Chromosome 17
B. Chromosome 9
C. Chromosome 3
D. Chromosome 6

Q3: which one of the following is considered as an oncogene?

A. Bcl2
B. p53
C. HER2/neu
D. Retinoblastoma

Q4: which one of the following can cause cervical cancer?

A. HIV
B. EBV
C. Helicobacter pylori
D. HPV

Answers: 1.B, 2.A, 3.C, 4.D

Thank you

If you have any question please contact with us at:
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