Pathology of Neoplasia

INTRODUCTION

Inflammatory, Degenerative & Neoplastic

Growth – Increase in size due to synthesis of tissue components.

Proliferatation- Cell division.

Differentiation: functional and structural maturity of cells.

Tumor – Swelling / new growth / mass

CONTROLS OF GROWTH

- Cytokines: Cyclins, Cyclin dependent kinases (CDK).
- Growth factors – PDGF, FGF
- Growth Inhibitors.
- Cancer suppressor genes – p53
- Oncogenes – c-onc, p-onc, v-onc etc.

Non-Neoplastic Proliferation:

*Controlled & Reversible

- **Hypertrophy** – Size
- **Hyperplasia** – Number
- **Metaplasia** – Change
- **Dysplasia** – Disordered

Neoplastic Proliferation:

Uncontrolled & Irreversible*

- **Benign**
  - **Localized, non-invasive.**
- **Malignant (Cancer)**
  - **Spreading, Invasive.**

Neoplasia:

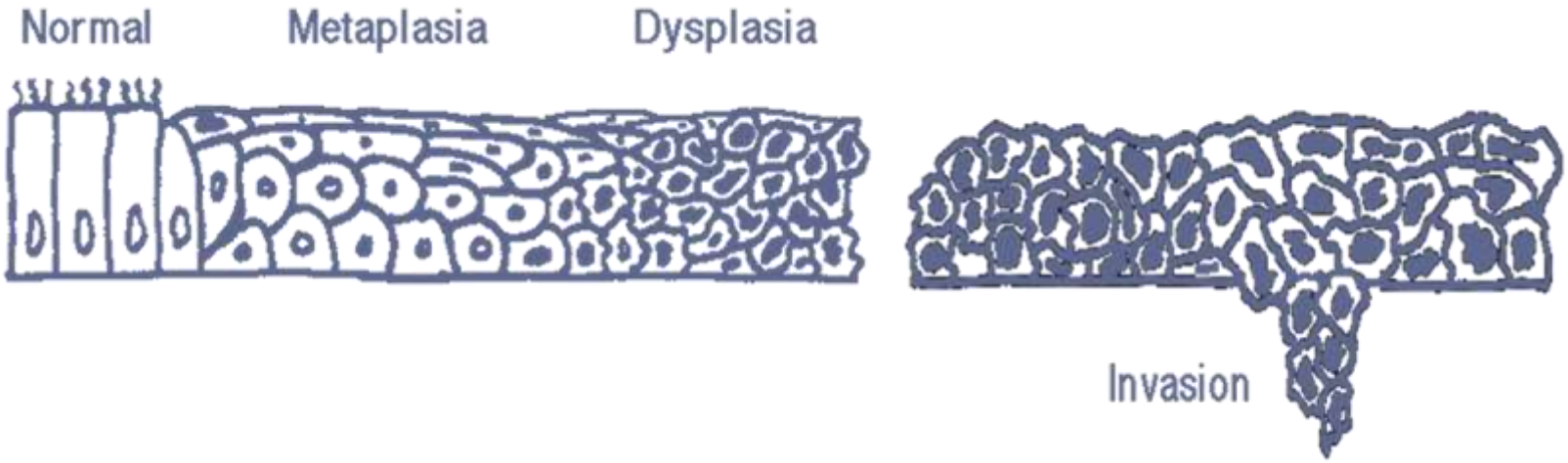
- **Progressive, Purposeless, Pathologic, Proliferation** of cells characterized by **loss of control** over cell division.
- DNA damage at growth control genes is central to development of neoplasm.
- Carcinogens – Chemical, physical & genetic → DNA damage → Neoplasm.

Willis Definition:

- Neoplasm is an abnormal mass of tissue the growth of which exceeds and is uncoordinated with that of normal tissue and persists in the same excessive manner after cessation of the stimuli which evoked the change

Pathogenesis of Neoplasia:

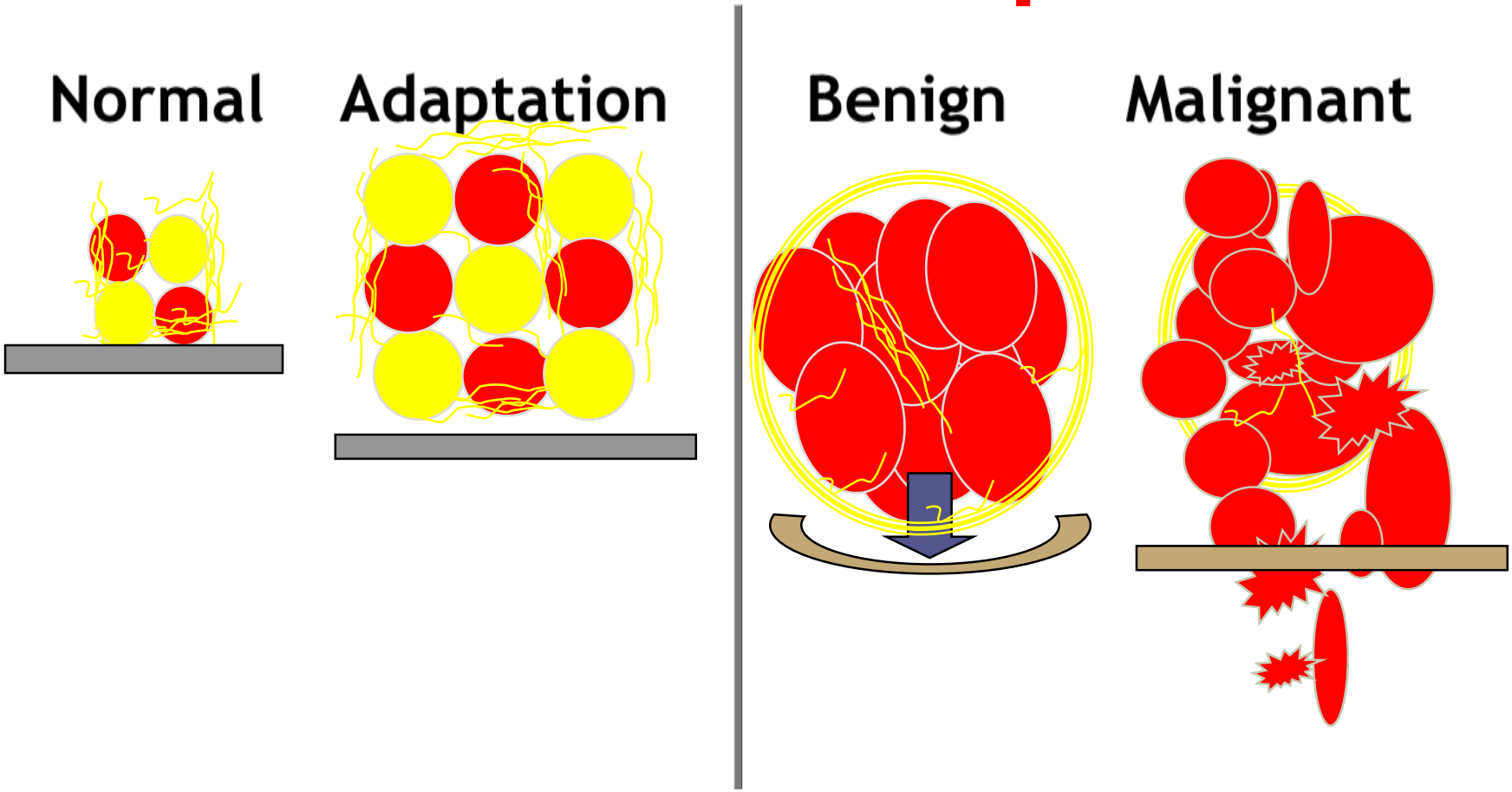
- Normal → Hyperplasia → Metaplasia → (DNA damage) → Dysplasia → (DNA damage) → (DNA damage) Anaplasia → (DNA damage) Infiltration → (DNA damage) → Metastasis....
- Progressive DNA Damage – features of neoplasia.



Pathogenesis of Neoplasia:

Non lethal DNA Damage leading to uncontrolled cell division.

Mechanism of Neoplams



STRUCTURE OF NEOPLASM:

Neoplastic cells parenchyma.
Non-neoplastic - stroma
(Connective tissue & BV)

Fast growth → less stroma
Less stroma → more necrosis,

Malignant:

Slow growing,

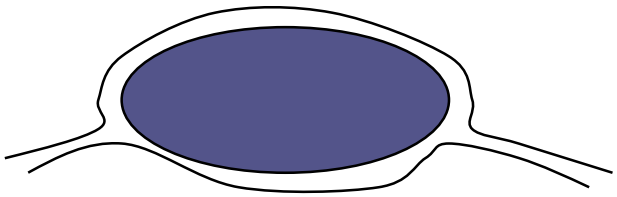
capsulated,

Non-invasive

do not metastasize,

well differentiated,

suffix “oma” eg. Fibroma.



Benign

Fast growing,

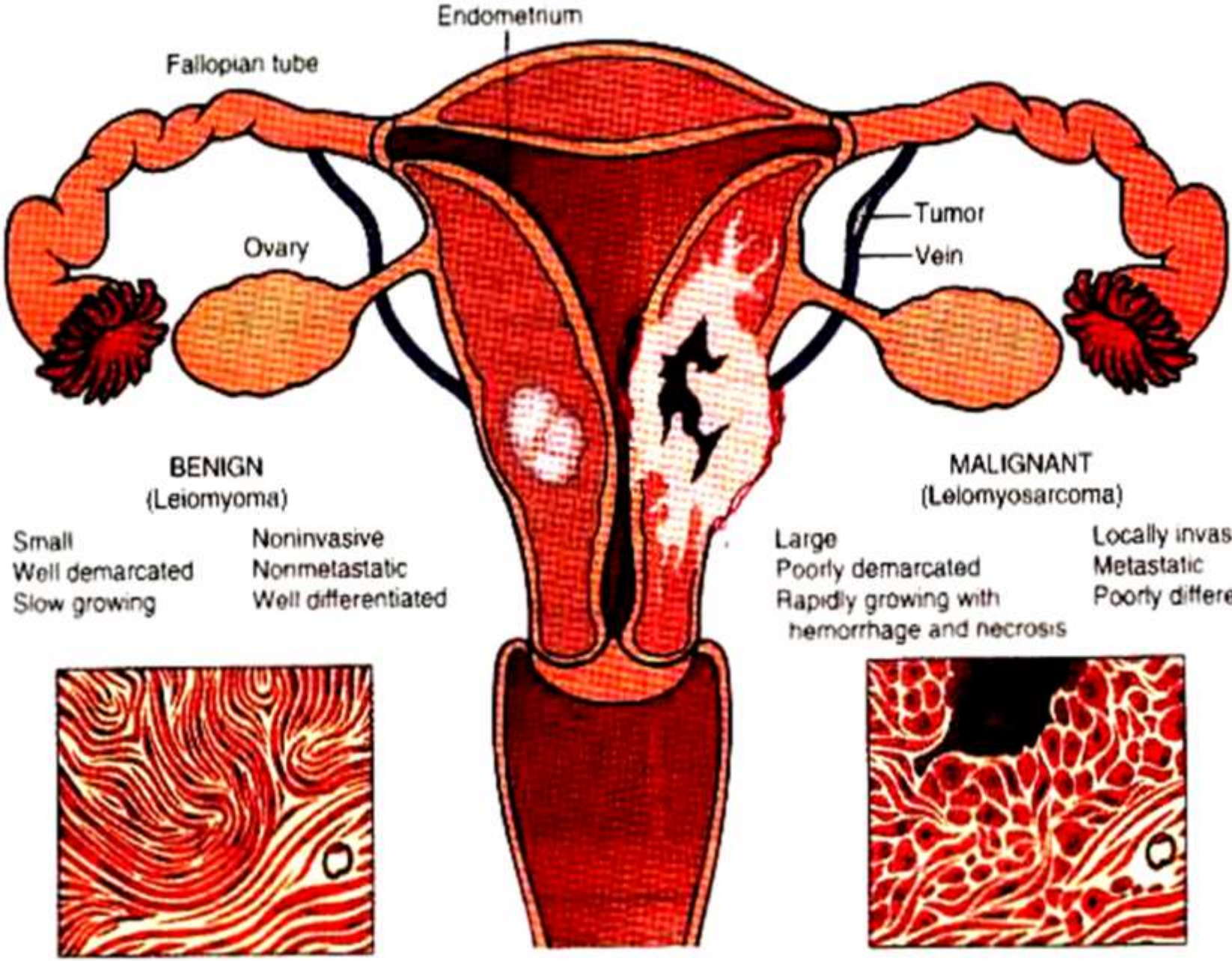
non capsulated,

Invasive & Infiltrate

Metastasize.

poorly differentiated,

Suffix “Carcinoma” or “Sarcoma”


Endometrium
Fallopian tube
Ovary
Tumor
Vein
BENIGN
(Leiomyoma)
Small
Well demarcated
Slow growing
Noninvasive
Nonmetastatic
Well differentiated
MALIGNANT
(Leiomyosarcoma)
Large
Poorly demarcated
Rapidly growing with hemorrhage and necrosis
Locally invasive
Metastatic
Poorly differentiate

Nomenclature: Cell of origin + Suffix

Suffix - oma

Fibroma

Osteoma

Adenoma

Papilloma

Chondroma

Carcinoma / Sarcoma

Fibrosarcoma

Osteosarcoma

Adencarcinoma

Squamous cell carcinoma

Chondrosarcoma

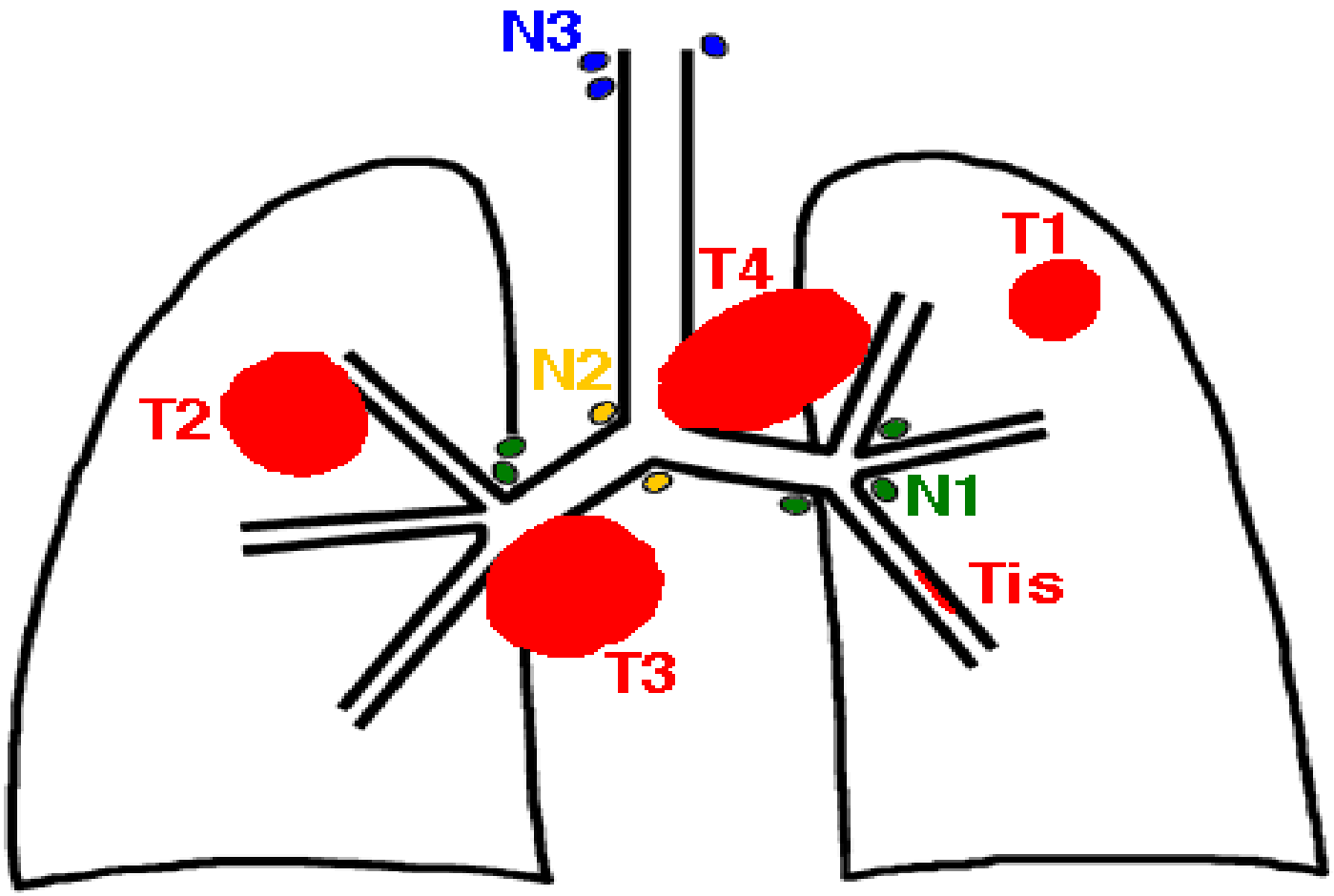
Exceptions: **Leukemia, Lymphoma, Glioma,**

GRADING & STAGING OF TUMOR

Grading – Cellular Differentiation (Microscopic)

Staging – Progression or Spread (clinical)

TNM: STAGING OF TUMOR:



PATHWAYS OF SPREAD:

Direct Spread

Body cavities

Blood vessels

Lymphatic vessels

Lungs – Systemic Venous blood

Liver – GIT venous return, nutrition.

Brain – End arteries.

TUMOR DIAGNOSIS:

History and Clinical examination

Imaging - X-Ray, US, CT, MRI

Tumor markers Laboratory analysis

Cytology –Pap smear, FNAB

Biopsy - Histopathology, markers.

Molecular Tech – Gene detection.

CLINICAL FEATURES.

Tumor Impingement on nearby structures

- **Pancreatic ca on bile duct → Obst. Jaund.**

Ulceration/bleeding

- **Colon, Gastric, and Renal cell carcinomas**

Infection (often due to obstruction)

- **Pneumonia, Urinary inf.**

Rupture or Infarction

- **Ovarian, Bladder, colon,**

CANCER CACHEXIA

Progressive weakness, loss of appetite, anemia and profound weight loss (>20%)

Often correlates with tumor mass & spread

Etiology includes a generalized increase in metabolism and central effects of tumor on hypothalamus

Probably related to macrophage production of TNF-a

PARANEOPLASTIC SYNDROMES

Due to Products released by tumor

Cushing's Syndrome

Adrenal, Lung Ca – ACTH

Inappropriate ADH syndrome (Hyponatremia) – lung ca

Hypothalamic tumors (vasopressin)

Hypercalcemia – Ca is the common cause. – lung.

Hypoglycemia - insulin or insulin like activities Fibrosarcoma, Cerebellar hemangioma.

SUMMARY

neoplasia- uncontrolled cell division non responsive to growth controls.

Benign and Malignant

Naming – Cell of origin + Suffix

Oma, Carcinoma, Sarcoma

benign → slow-growing, well-differentiated, localized, do not metastasize, amenable to surgery.

malignant neoplasms tend to be fast-growing lesions which invade normal structures

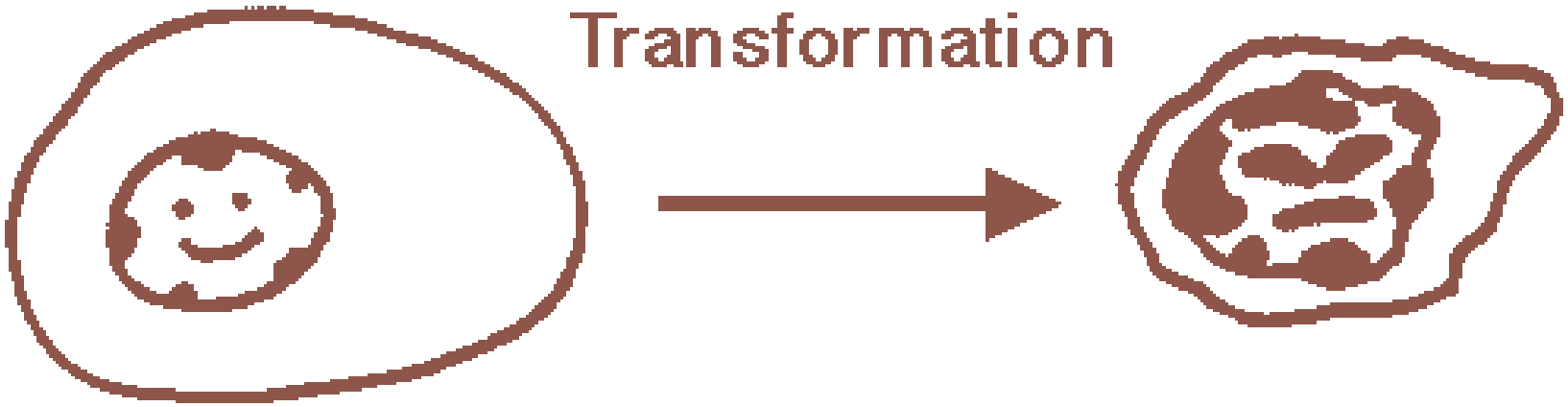
malignant neoplasms vary in the degree of differentiation and some show anaplasia.

malignant neoplasms are capable of infiltration, invasion &metastasis.

The prognosis of a patient with any type of neoplasm depends on a number of factors including: the rate of growth of the tumor, the size of the tumor, the tumor site, the cell type and degree of differentiation, the presence of metastasis, responsiveness to therapy, and the general health of the patient.

NEOPLASM

Uncontrolled cell Division



(DNA abnormality)