

## **Characteristics of tumours**

- Majority of neoplasms can be categorized clinically and morphological into **benign and malignant** on the basis of certain characteristics listed bellow
  - Rate of growth
  - Cancer phenotype and stem cells
  - Clinical and gross features
  - Microscopic features
  - Local invasion (direct spread)
  - Metastasis (distant spread)

# Characteristics of tumours

- Rate of growth

- The tumour cell proliferate more rapidly than the normal cells.
- The tumour enlarge rate is depends upon

1. Rate of cell production, growth fraction and rate of cell loss
2. Degree of differentiation of the tumour

1. *Rate of growth of a tumour depends upon*

- Doubling time (mitotic rate) of tumour cells
- Number of cells remaining in preoperative pool (growth fraction)
- Rate of loss of tumour cells by cell shedding

Cancer cell do not follow the normal cell controls in cells, and are immortal. The cell division rate is high and center of tumor do not receive adequate nourishment and undergo ischemic necrosis, loss shedding.

Death tumour cells appear as apoptotic figures and dividing tumours are seen as normal/ abnormal mitotic figure → ultimately tumour grow in size.

# **Characteristics of tumours**

- **Rate of growth**

- **2. Degree of differentiation**

- Rate of growth of malignant tumour is directly proportionate to the degree of differentiation.
    - Poorly differentiated tumours show aggressive growth pattern compare to better differentiated tumours.
    - Rarely, a malignant tumour may disappear spontaneously from the primary site, due to good host immune attack.

## Characteristics of tumours

- Cancer phenotype and stem cells

Cancer cells

1. disobey the growth control – *proliferate rapidly*
2. escape from death signals – *immortality*
3. imbalance between cell proliferation and cell death – *excessive growth*
4. lose differentiation properties – *no function*
5. are unstable – *newer mutations*
6. overrun their neighboring tissue – *invade locally*
7. have the ability to travel from the site of origin to other part of body – *distant metastasis*

Cancer stem cells/ tumour-initiating cells have the properties of self-renewal, asymmetric replication and transdifferentiation (i.e. plasticity).

## Characteristics of tumours

- Clinical and gross features

- Benign tumour are generally slow growing and depending upon location remains asymptomatic (**subcutaneous lipoma**) or may cause serious symptoms (**meningioma in the nervous system**). **Benign tumours are generally spherical or ovoid shape.**
- Malignant tumor grow rapidly, invade locally into deeper tissue and spread to distant sites (**metastasis**). **Malignant tumours are usually irregular in shape, poor-circumscribed and extend into adjacent tissues.**

## **Characteristics of tumours**

- **Microscopic features**
  - Microscopic pattern
  - Cytomorphology of neoplastic cells
  - Tumor angiogenesis and stroma
  - Inflammatory reaction

## **Characteristics of tumours**

- **Local invasion (direct spread)**
  - Benign: expand and push aside without invading, infiltrating or metastasising.
  - Malignant: expand, invasion, infiltration and destruction of the surrounding tissue.
- **Metastasis (distant spread)**
  - Metastasis (meta= transformation, stasis= residence): spread of tumour by invasion.
  - **Routes of metastasis**
    - **Lymphatic spread**
    - **Haematogenous spread**
    - **Spread along body cavities and natural passages**