

# **BASICS OF RADIATION BIOLOGY (RADIOBIOLOGY)**

**206 BIOCHEM**

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# Interactions of Radiation and Tissues

## Repopulation and accelerated repopulation

- ▣ In a given enough overall treatment time, cell in the irradiated tissue can proliferate and repopulate known as **repopulation**.
- ▣ It has been observed that any cytotoxic agent, including radiation, can trigger colonogenic surviving cells to divide faster than before. This is called **accelerated repopulation**.
- ▣ Estimated to occur about **4 weeks** after the initiation of the treatment.
- ▣ Thus in order to keep pace with the more rapid growth of tumor cell, a **more rapid delivery of treatment** may be needed.

# Radiation therapy FRACTIONATION effects on Interactions of Radiation and Tissues

## Advantages:

- ▣ Allows regular reoxygenation of the tumor during the course of treatment, making it more radiosensitive.
- ▣ Offers radiation to effect more tumor cells during the radiosensitive phase of their cell cycle.
- ▣ Normal cell seems to recover more completely between fractions from sublethal damage than do tumor cells.

# BRACYTHERAPY

## as a highly fractionated form of irradiation

- ▣ One type of internal radiation therapy is **Brachytherapy** involves inserting a radioactive implant in or close to the cancerous tissue. The implant may be temporary or permanent.
- ▣ **Brachytherapy** is a method of radiation treatment in which **sealed (closed) radioactive source is used to deliver the dose** to a short distance by interstitial (direct insertion into tissue), intracavitary (placement within a cavity) or surface application (molds).
- ▣ **Helping hand for advanced tumors or primarily for small lesions)**
- ▣ Most commonly used radioisotope in head and neck regions are **iridium 192, cesium137 and radium 226**.
- ▣ Radiation sources may be form of needles, narrow tubes, wires or small beads.

# BRACYTHERAPY

## as a highly fractionated form of irradiation

### BRACYTHERAPY Advantages are:

- ▣ The dose rate is low relative to external beam therapy, so it can be considered a highly fractionated form of irradiation
- ▣ Rapid decrease in dose with distance from radiation source.
- ▣ Thus a high radiation dose can be given to the tumor while sparing surrounding normal tissues.
- ▣ Thus continuous low dose irradiation tends to synchronize (coordinate) the cell cycle and allows sublethal damage repair.

# BRACYTHERAPY

## as a highly fractionated form of irradiation

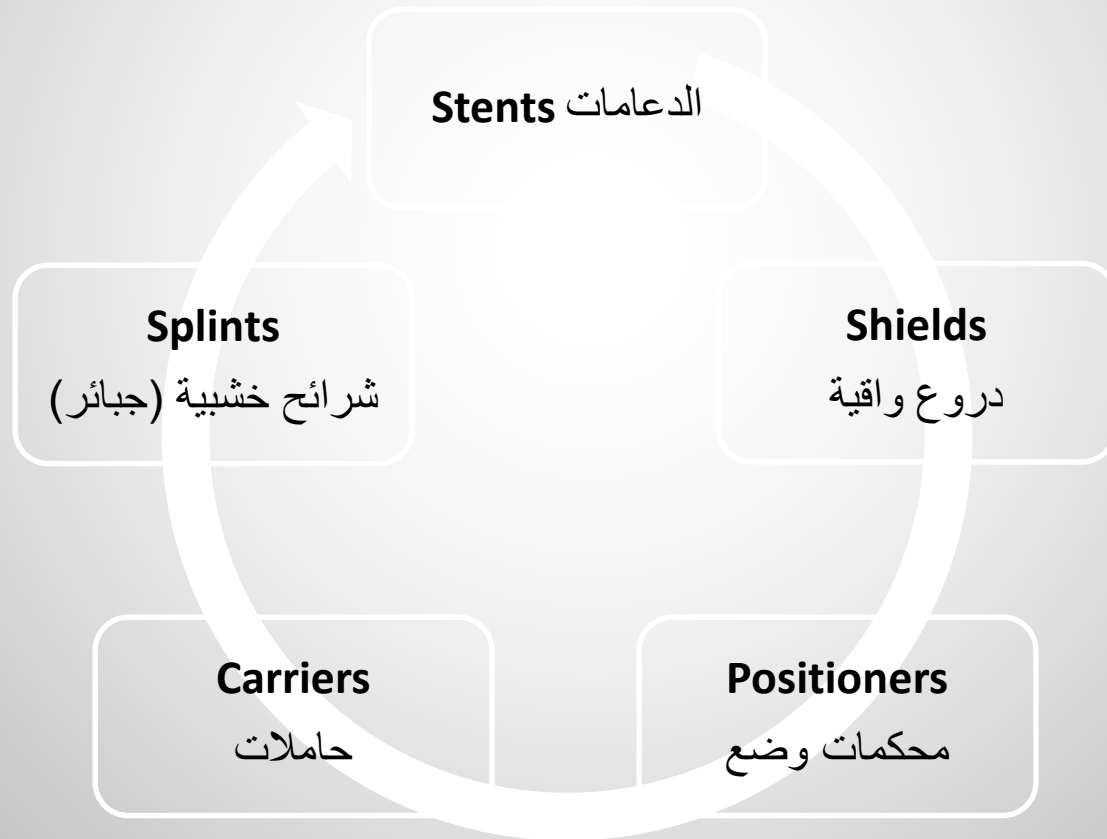
### BRACYTHERAPY Disadvantages are:

- ▣ Inhomogeneity.
- ▣ Requires the operator to have adequate technical and conceptual skills to achieve good dose distribution.
- ▣ Exposure risk to room personnel and to therapist موظفي المعالجة specially with the use of radium needles.



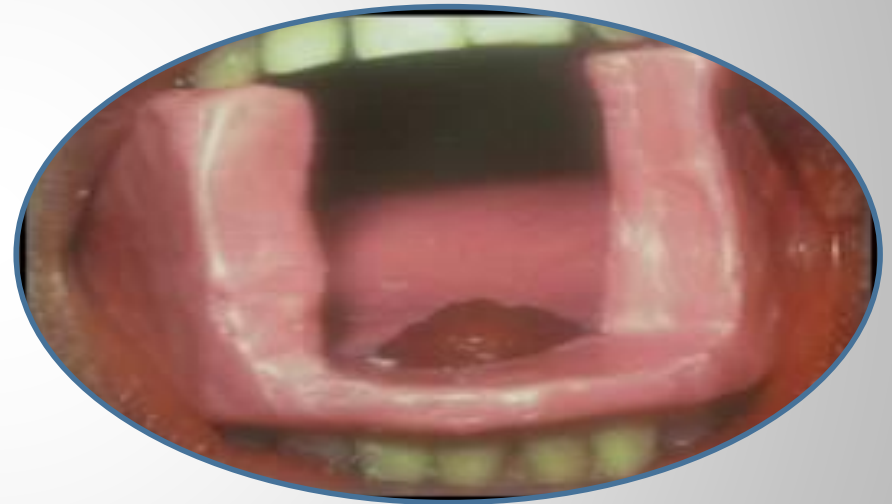
# Prosthetic devices in Radiation Therapy

These are used to optimize the delivery of radiation while reducing the associated morbidity.



# Positioning stents

- ▣ Used to rearrange tissue topography within the radiation field and displace normal tissues outside the radiation field.



## Useful in;

- ▣ tongue and floor of the mouth lesions.
- ▣ Inferior أدنى positioning of tongue and jaw bone enabling to lower the radiation field.

(sparing to parotid gland تجنب الغدة النكفية – more salivary output )



# Per oral cone positioning device

- ▣ use to boost radiation over Small superficial lesions (T1 or T2 in sizes) in accessible locations in the oral cavity.
- ▣ The tumor site > adjacent vital structures
- ▣ **useful in;**
- ▣ lesions like floor of mouth, hard palate, soft palate, or tongue.

**(Spare vital adjacent tissues such as mandible, teeth and salivary gland.)**

