Lecture 6 / Therapeutic Radionuclides

1. Therapeutic radionuclides in nuclear medicine:

The potential use of radionuclides in therapy has been recognized for many decades. A number of radionuclides, such as iodine-131 (131I), phosphorous-32 (32P), strontium-90 (90Sr), and yttrium-90 (90Y), have been used successfully for the treatment of many benign and malignant disorders. Recently, the rapid growth of this branch of nuclear medicine has been stimulated by the introduction of a number of new radionuclides and radiopharmaceuticals for the treatment of metastatic bone pain and neuroendocrine and other malignant or non-malignant tumours. Today, the field of radionuclide therapy is enjoying an exciting phase and is poised for greater growth and development in the coming years. For example, in Asia, the high prevalence of thyroid and liver diseases has prompted many novel developments and clinical trials using targeted radionuclide therapy. This paper reviews the characteristics and clinical applications of the commonly available therapeutic radionuclides, as well as the problems and issues involved in translating novel radionuclides into clinical therapies.

In the last twenty years, radionuclide therapy has been widely used in various clinical malignant and pain

whole body irradiation using external beam radiotherapy is impossible. Since the administration of radionuclides is minimally invasive and the duration of treatment is shorter than chemotherapy, targeted radionuclide therapy has become one of the most preferred types of cancer therapy.

2.Basic Physics of Radiation Therapy

2.1 Radiation therapy

Radiation therapy (also called radiotherapy) is a cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumors. At low doses, radiation is used in x-rays to see inside your body, as with x-rays of your teeth or broken bones.

How Radiation Therapy Works against Cancer

At high doses, radiation therapy kills cancer cells or slows their growth by damaging their DNA. Cancer cells whose DNA is damaged beyond repair stop dividing or die. When the damaged cells die, they are broken down and removed by the body.

Radiation therapy does not kill cancer cells right away. It takes days or weeks of treatment before DNA is damaged enough for cancer cells to die. Then, cancer cells keep dying for weeks or months after radiation therapy ends.

3.Types of Radiation Therapy

The type of radiation therapy that you may have depends on many factors, including:

1-the type of cancer

2-the size of the tumor

3-the tumor's location in the body

4-how close the tumor is to normal tissues that are sensitive to radiation

your general health and medical history

whether you will have other types of cancer treatment

other factors, such as your age and other medical conditions

- ❖ External beam radiation therapy

is a local treatment, which means it treats a specific part of your body. For example, if you have cancer in your lung, you will have radiation only to your chest, not to your whole body.

- ❖ Internal radiation therapy

is a treatment in which a source of radiation is put inside your body. The radiation source can be solid or liqui

Internal radiation therapy with a liquid source is called systemic therapy. Systemic means that the treatment travels in the blood to tissues throughout your body, seeking out and killing cancer cells. You

receive systemic radiation therapy by swallowing, through a vein via an IV line, or through an injection.