International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 11 PAGES: 31-35
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ijmscr

Research Article

GAMMA THERAPEUTIC DEVICES

Submission Date: November 01, 2022, Accepted Date: November 08, 2022,
Published Date: November 16, 2022
Crossref doi: https://doi.org/10.37547/ijmscr/Volume02Issue11-06

Elmurotova Dilnoza Baxtiyorovna
D.F.F.-M.Sc. Phd Tashev Bekjigit Jonanbek O'g'li, Assistant, Uzbekistan

Rakhimov Ilyos To'ramurodovich
Assistant Tashkent State Technical University, Uzbekistan

Bozorov Erkin Xojievich
D.Ph.-M.Sc. Prof. Mussayeva Malika Anvarovna Муссаева D.Ph.-M.Sc. Ds. Institute Of Nuclear Physics Of The Academy Of Sciences Of Uzbekistan

ABSTRACT

The paper considers the use of gamma therapy in medicine. It has been shown that intracavitary gamma therapy is prescribed in the treatment of the resistant part of the tumor. Explained what remote gamma therapy is and the Theratron Equinox device used. The principle of operation of the SagiNova gamma-therapy apparatus for contact irradiation is also shown.

KEYWORDS

Gamma therapy, intracavitary, resistant part, remote, contact irradiation.

INTRODUCTION

Radiation therapy is one of the most widely used therapies for cancer treatment. Its principle of operation is that ionizing radiation in various forms (X-ray, gamma radiation, particles) is used to destroy and destroy the tumor, alone or in combination with surgery or chemotherapy. Radiation therapy is either

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external (remote therapy) or internal (brachytherapy). Gamma therapy or curie therapy uses gamma radiation of radioactive isotopes and other radioactive materials, the effect of gamma radiation on the patient's body is directly proportional to the amount of radiation absorbed by him. The distribution of absorbed energy in the patient's body depends on a number of key factors, the energy of gamma radiation, beam geometry, and sometimes on the method of the procedure. A huge plus of gamma radiation is that it is possible to deliver high energy to deeply located neoplasms, while using significantly larger doses than with x-ray therapy. At the same time, tissues and organs located away from the area affected by the tumor suffer much less.

Intracavitary gamma therapy is a radiation therapy method used primarily for the treatment of small malignant tumors. This method is suitable for the treatment of tumors with different localization. It is used to remove small exophytic tumors. In the treatment of certain types of cancer (cancer of the bladder, esophagus, cervix, rectum, nasopharynx), the method is used exclusively in combination with external irradiation. Otherwise, it will not be possible to achieve positive results of treatment. This method of radiation therapy is prescribed if, in order to increase the effectiveness of treatment, it is necessary to increase the focal dose in the most resistant part of the tumor. At the same time, healthy tissues that surround the formation are almost not affected due to the rapid drop in the radiation dose rate when it is distributed in the tissues.

It is known that gamma radiation generated during the passage of fast charged particles through matter is caused by their deceleration in the Coulomb field of atomic nuclei of matter and is called bremsstrahlung, which is characterized by continuous spectra. Gamma radiation has a high penetrating power, i.e., it can penetrate through large thicknesses of matter without noticeable weakening. The main processes that occur when interacting with matter are photoelectric absorption (photoelectric effect), Compton scattering (Compton effect) and the formation of electron-positron pairs. With the photoelectric effect, the g-quantum is absorbed by one of the electrons of the atom, and the energy of the g-quantum is converted (minus the binding energy of the electron in the atom) into the kinetic energy of the electron flying out of the atom. The probability of the photoelectric effect is directly proportional to the 5th power of the atomic number of the element and inversely proportional to the 3rd power of the energy. Gamma radiation and prevails in the region of low energies of gamma rays (100 keV) on heavy elements (Pb, U).

External beam radiation therapy is radiation therapy received from an external source of radiation located at some distance from the human body. This is the most common type of radiation therapy used in the treatment of cancer. Typically, treatment is carried out with a cobalt unit, which provides high energy gamma radiation, or a linear accelerator, which can produce high energy X-rays or electrons. When using the most common regimen, treatment is carried out daily for 4-8 weeks [5-8].

To uniformly deliver the radiation dose to the target, which may be several centimeters thick, the radiation source is placed at some distance from the patient (usually 80-150 cm). Healthy tissue in the beam path, including skin, may also be exposed to radiation. To reduce this exposure, higher energy beams are used for deeper tumors and radiation is directed at multiple angles, maximizing the dose at beam intersections. The dose rate is selected by the doctor individually for each patient. The radiation dose depends on many

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factors: the size of the formation, the type and nature of the tumor, the growth rate of the neoplasm, the presence of concomitant diseases, the age of the patient, and others. If high-power irradiation is necessary, then it is carried out from 30 minutes to 1 hour. After that, a break is made for one week, and then the procedure is repeated. At low doses, the duration of exposure increases, and the intervals between exposure sessions are reduced. The duration of the course of treatment depends on the power of dosages. As a rule, two to six radiation sessions are prescribed. The presented gamma therapeutic apparatus for contact irradiation is used for treatment by high-dose brachytherapy. The method is based on the introduction of a source with high dose rate into the tumor. With the help of applicators and catheters, a very small radiation source is driven from a shielded safe - located inside the source remote control unit - directly into or near the tumor [7].

Gamma radiation is used in medicine for the treatment of tumors, for sterilization of premises, equipment and drugs.

Remote gamma therapy apparatus Theratron Equinox

Gamma-ray machines are used around the world to provide radiation therapy treatments that use Cobalt-60. Today, these devices perform 45,000 irradiations daily. Theratron® Equinox™ is a new addition to the Theratron® product line. Possessing unique parameters, this device allows remote therapy procedures to be carried out at a qualitatively new level [3, 4].

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Gamma therapy device for contact irradiation SagiNova

A radiotherapy technique in which a radioactive source sealed in a sealed capsule is used over short distances for interstitial, intracavitary, and surface irradiation. The advantage of this method is to receive high doses locally in the tumor volume with a rapid dose decline in the surrounding normal tissues. The SagiNova device is a representative of a new, truly "smart" medical equipment. Its convenient control system with a modern user interface and advanced functionality is optimal for brachytherapy of oncological diseases of various localizations [7-8]. The 3D dosimetry planning system makes it possible to calculate exposure plans based on the real anatomy of the patient. A huge selection of applicators allows you to effectively implement all modern schemes of intracavitary, interstitial and intraluminal irradiation in the high dose rate mode on the device. Key advantages of use include: the ability to choose between an Ir-192 or Co-60 source; exclusive integrated In-Vivo dosimetry for real-time dose monitoring; QAssist™ - quality assurance system; unique opportunities to ensure patient safety; optimized user-friendly GUI and intuitive design for a streamlined workflow

All of the above features of the SagiNova contact irradiation gamma therapy device allow urologists, oncologists and brachytherapy specialists to provide better and safer treatment of oncological diseases of different localizations. The new device SagiNova represents advanced German technology and high-quality treatment [8].

REFERENCES

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1. А. П. Черняев, Е. Н. Лыкова, А. И. Поподько. Медицинское оборудование в современной лучевой терапии. Учебное пособие МГУ Москва 2019
2. Л. А. Жук, Г. Е. Тур. Дистанционные методы лучевой терапии БГУ г. Минск, С.5212-216. https://elib.bsu.by/bitstream/123456789/231263/1/212-216.pdf
3. https://mnmedical.ru/napravlenija-raboty/luchevaja-terapija/
4. http://www.theratronics.ca/product_equinox.html
5. А. П. Черняев и др. Медицинское оборудование в современной лучевой терапии. Учебное пособие МГУ Москва 2019
6. Л. А. Жук, Г. Е. Тур. БГУ г. Минск, С.5212-216.
7. https://www.gukrod.ru/luchevayaterapia/
8. https://www.saginova.ru/