Journal of Applied Health Management and Technology Vol 3, No 2 (2021) 46-49

Journal of Applied Health Management and Technology
p-ISSN: 2715-3061
e-ISSN: 2715-307X

http://ejournal.poltekkes-smg.ac.id/ojs/index.php/JAHMT

ANALYSIS OF LINEAR ACCELERATOR (LINAC) AS CANCER TREATMENT IN KEN SARAS HOSPITAL, SEMARANG

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ABSTRACT

Based on riskesdas data in 2013, the prevalence of cancer in Indonesia reached 1.4% or around 347,792 people. The technique used at Kensaras Hospital for the use of Electa linac for IMRT engineering and Linac Siemens for 3D engineering with energies of 5 mV, 7 mV, 8 mV, 10 mV, 12 mV, 14 mV. Radiotherapy simulation using the GE 16 slice CT Simulator with adequate space, thermoplast masks, individual blocks and universal blocks, and bolus. Constraints that occur in the use of blocks for Siemens linac which still use manual blocks do not use MLC. With the aim of using MLC more effectively and more precisely according to the shape and thickness of the target so as to minimize OAR exposure to radiation rays. Research analysis using SRL PICO method seeks clinical information in scientific evidence-based health science practices. The results of literature search show that the goal of radiotherapy is to provide the maximum radiation needed to kill cancer, while the minimum to the surrounding healthy tissue. The static MLC method is a method in which the MLC moves to form a segment when the radiation stops and MLC stops as long as the radiation lasts for each gantry angle and MLC stops for radiation and so on for each gantry angle. Meanwhile, the kensaras hospital for Linac Siemens still uses a manual block made from a chimney and is attached to the linac gantry which is prone to falling and having to replace the block every corner. Radiation therapy with a linear electron accelerator is experiencing rapid development and is a cancer therapy that is relatively inexpensive and does not provide radioactive waste. The use of MLC is safer and can move to form segments when radiation stops and MLC stops during radiation for each angle of the gantry.

Keyword: Cancer; Lineaar Accelerator; Block; MLC

Introduction

Radiotherapy or radiation therapy is a treatment using ionizing rays. Ionizing rays can be in the form of x rays and gamma rays, or from several groups of alpha, beta, and neutron particles.[1] The ionizing rays will be generated by an electron accelerator (Linear Accelerator = Linac) which has been used to treat various types of tumors. The linac plane has been designed to produce both a photon beam and an electron beam.[2,3]

One types of block made of a mixture of various types of materials, Lipowitz metal or better known as cerrobend which has a dentistry of 9.4 g/cm^3 at 20^oC 83% of the density of the Pb block). Cerrobend consists of 50% bismuth, 26.7% lead, 13.3% lead, 10% cadmium. MLC has movable leaves, or shields, that can block a fraction of the radiation emission, typical MLC has 20 to 80 leaves, arranged in pairs. The use of computers and carried out by medical physicists in arranging the existing leaves on the MLS so that it forms according to the target and the right target thickness. Given the adequate reliability of hardware and software, the use of forming MLC fields tends to save time and incur lower operating costs when compared to the use of beam beams; fabrication facilities and costs will be reduced.

The patient's preparation time during treatment can also be reduced, allowing for more patient outcomes. Adjustments in the form of fields can be done quickly and easily by modifying the computer file containing the leaf arrangement rather than having to rearrange new cerrobend blocks. These factors are becoming more and more important in today's health care industry. However, to substitute a cerrobend block for fields that have complex outlines, more than one leaf arrangement is required, leading to the need for a more sophisticated control system and expanded dosimetry computation. Constraints that occur in the use of blocks for linac that still use manual blocks have not used MLC for both linacs. With the aim of using MLC more effectively and more precisely according to the shape and thickness of the target so as to minimize OAR exposure to radiation rays.

Methods

The results of literature search show that the goal of radiotherapy is to provide the maximum radiation needed to kill cancer, while the minimum to the surrounding healthy tissue. The ionizing rays produced by the radiotherapy device will be generated by an electron accelerator (Linear Accelerator = Linac) which has been used to treat various types of tumors.

The block (cutout) serves to limit the area of the irradiation field in accordance with the target organ being targeted according to the shape of the field. And the goal of MLC is to further

optimize the radiation beam towards the target more precisely and according to the thickness of the target so as to protect the surrounding OAR.

Results and Discussion

Research shows that one type of block that is widely used in radiotherapy is a block made of a mixture of various types of materials, Lipowitz metal or better known as cerobend which has a density of 9.4 g/cm^3 at 20^OC (~83% of the density of the Pb block). Cerrobend consists of 50% bismuth, 26.7% lead, 13.3% lead, 10% cadmium.[5,12] These blocks in radiation therapy to limit exposure of healthy tissue to damaging radiation while still allowing radiation to kill cancerous tissue.

The static MLC method is a method where MLC moves to form a segment when the radiation stops and MLC stops as long as the radiation lasts for each gantry angle and MLC stops for radiation and so on for each gantry angle. Meanwhile, the kensaras hospital for Linac Siemens still uses a manual block made from a chimney and is attached to the linac gantry which is prone to falling and having to replace the block every corner.

However, for Linac Electa already using MLC which is used only for photons when using electrons RS Kensaras uses individual blocks made of cerrobend. Linac electa uses the IMRT technique.

Conclusion

Radiation therapy with linear accelerators is experiencing rapid development and is a cancer therapy that is relatively inexpensive and does not provide radioactive waste. The use of MLC is safer and can move to form segments when radiation stops and MLC stops during radiation for each gantry angle. The use of MLC will also be more appropriate because it is in accordance with the original form of the cancer thus protecting OAR.

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