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The development of multi-channel dosimetry system For radiation therapy

B.G.Kim, J.K.Kang1), J.K.Kim2)

Dept. of Biomedical Eng. Chonbuk Nati. Univ.,
1)Dept. of Radiation Oncology Chonju Jesus Hosp.,
2)Dept. of Radiation Oncology Chonbuk Nati. Univ. Hosp.
Chonju, Chonbuk 561-712, Korea

INTRODUCTION

The purpose of this study was for development of the partly multi-channel d osimetry system for radiation therapy. Recently MLC, virtual wedge technique and wedge fraction methods are available through the computer controlle d asymmetric collimator, the independent jaw and multileaf collimator. The wedge filter is the most commonly used beam modifying device during radiation therapy. But the dosimetric characteristics of new technique and methods are no t well known. Therefore we develop the multichannel dosimetry system for radia tion therapy, and evaluate the dosimetric characteristics of the virtual wedge com pared to the conventional fixed wedge.

MATERIALS and METHODS

Multi-channel dosimetry system was consists of the electrometer and the solid detector array phantom. The solid detectors were constructed using commercially diodes for the assessment of quality assurance(QA) in radiotherapy. The current of each semiconductor detector was amplified by MOS-FET Op-Amp and conver ted into digital data by an 8 bit multi-channel A/D converter. The digital data w as interfaced to computer and processed by our data processing program. We ev aluate the dosimetric characteristics of the virtual wedge and the fixed wedge by the multi-channel solid detector, ion chamber and film dosimeter in phantom. 6 MV and 10MV x-rays are used in 10x10, 20x20cm2 field sizes with 15, 30, 45 and 60 degree wedges of virtual and fixed wedge system. Dosimetric characteri stics are interpreted by Therados RFA system .

RESULTS

In our analysis for the 6 and 10 MV photon beams with SSD 90 cm, the m aximum virtual and the fixed wedge factors of dose vary from 1.2 % to 1.6 %, for square collimator setting ranging from 10 to 20 cm. No major difference w as found between the virtual and fixed wedge angles and the difference was wit hin 0.8 degree. The virtual wedge technique and the wedge fraction method wer e able to make any wedge angle on any depth and field size by open dose wei ght. The percent depth dose of photon beams of medical linac was measured in 10x10, 20x20 field sizes using multi-channel detector system. This value at dma x can reach to 1.1 % and 1.4 % for 6 and 10 MV, respectively. Our multi-chan nel detector system was useful in QA of virtual wedge method. The virtual wed ge technique was superior to fixed wedge technique in the dosimetric characterist ics and may be more useful in the future.

CONCLUSIONS

We construct a multi-channel dosimetry system for radiation therapy. It w as to improve on the analytical expressions used to describe dose distribu tions for the virtual wedge and the wedge fraction method in 6 and 10 MV clinical photon beams.