Dosimetric Verification for Tangential Breast Irradiation in Commercial Treatment Planning System Using Indigenous Female Wax Torso

Kamlesh Rani Passi, Saran raj, Konthoujam Manimala, Ishu Sharma, Naveen Kanda, and Sandhya sood

Mohan Dai Oswal Hospital Department of radiation Oncology, Ludhiana (Punjab), India

I. Introduction

Accuracy of Clarkson algorithm employed in a commercial 3D TPS was evaluated for conditions simulating tangential breast treatment. A breast phantom was fabricated from machineable wax to examine the accuracy of tangential breast irradiation. This Paper specifically describes the use of unique self-designed wax breast phantom to validate the accuracy of three-dimensional dose calculations performed by Xio-CMS planning system for breast tangential irradiation. Steven et all(1)has done a related study using anthropomorphic breast phantom .In our study the accuracy of dose calculations has been verified using 0.6cc ionization chamber. The treatment plans has been generated using the combined 6 and 15 MV photon beams and field in field technique. Measured doses have been compared to those calculated from the treatment planning system and found to be in good agreement with previously published results. Our results indicates that the inexpensive wax phantom can be used for verification in absence of expensive anthropomorphic breast phantom which may be of great help for verification of 3D breast plans in developing countries.

II. Material and Method

A Wax phantom of size {33(l)*34(w)*29(h)} cm^3 was fabricated in the departmental mould room. An important consideration in the design of the phantom was the reproduction of a geometry that could realistically duplicate the female torso in treatment position was taken care. The ion chamber was positioned 4.5 cm below from the surface of the breast phantom. The medial, lateral, superior, and inferior field borders previously marked on the phantom, were delineated with fiducial marker. CT images of the phantom with 0.6cc chamber were taken with 3-mm slice thickness. The images were imported to Cms Xio TPS for planning via Focal system after contouring. A phantom plan was created taking the calculation point at centre of chamber cavity volume by superimposing each patient plan in the indigenous breast phantom. 20 patients were taken for this study & Measurements were performed using a 0.6cc ionization chamber.

III. Result and Discussion

Comparison was made between measured and calculated dose. We got good results for maximum number of patients within 1.5% and few patients above 3%. The dose-calculation verification measurements performed in this study utilizing a indigenous phantom clearly demonstrate absolute homogenous dose calculation accuracy even in case of tangential irradiation of the breast.

IV. Conclusion

A measurement of dose in the phantom shows good agreement in variety of treatment field configurations. This confirmed the utility of an indigenous breast phantom as a tool to assess accuracy of 3D tangential breast dose measurements for photon dose calculation.

Keywords— tangential breast irradiation, wax phantom, Cms Xio 3D TPS.

References

1. *Verification of the accuracy of 3D calculations of beast dose during tangential irradiation: measurements in a breast phantom.* JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 2, NUMBER 2, SPRING 2001. *Steven, M. Kirsner, Kari L. Prado, Ramesh C. Tailor, and Jose A Bencomo*
2. *Verification of tangential breast treatment dose calculations in a commercial 3D treatment planning system.* JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 2, NUMBER 3, SUMMER 2001.*Christopher T. Baird,1, George Starkschall,1, H. Helen Liu,1, Thomas A. Buchholz,2, and Kenneth R. Hogstrom1,*

D.A. Jaffray (ed.), *World Congress on Medical Physics and Biomedical Engineering, June 7-12, 2015, Toronto, Canada*,
IFMBE Proceedings 51, DOI: 10.1007/978-3-319-19387-8_162