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National Centre for Synchrotron Science

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Contribution ID : **200** Type : **Oral**

Breast cancer rotational radiotherapy with synchrotron radiation

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In 2012, J. Boone proposed the external-beam kilovoltage radiotherapy of the breast cancer with a dedicated setup adopting an orthovoltage X-ray tube [1] rotating in full circles around the breast, with the woman in prone position. For comparison, conventional radiotherapy for breast cancer adopts a medical linac irradiating the breast with tangential beams, in supine position: the megavoltage X-ray beam produces a buildup effect for skin tissue sparing. We propose a new technique for image guided rotational radiotherapy of breast cancer for the pendant breast (SR-EBRT), using a synchrotron radiation (SR) collimated beam [2,3]. The use of the high-flux monoenergetic SR beam permits to obtain dose delivery times comparable to the one of conventional radiotherapy, and to select the optimal photon energy, in a parallel beam geometry. The same setup may produce breast CT scans for tumor 3D localization and beam centering. We carried out a proof-of-principle study of the SR-EBRT technique at the Imaging and Medical Beamline (IMBL) of the Australian Synchrotron (AS). The experimental plan included dose distribution measurements with TLDs, radiochromic films and ionization chambers in cylindrical PMMA and PE phantoms, at 60 keV. This study showed a 7:1 tumor-to-skin ratio and the possibility of realizing dose-painting by multiple rotations. SR-EBRT with SR beam could be adopted for partial irradiation, dose painting, and whole breast irradiation with a skin sparing effect close to that of orthovoltage EBRT at 320 kVp and the potential for high-resolution image-guided radiotherapy. A further investigative goal is SR-EBRT at low energy (60-100 keV) coupled to gold nanoparticles or iodine contrast agent for dose-enhanced breast SR-EBRT.

References

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[2] F. Di Lillo, G. Mettivier, A. Sarno, P. Russo, “Towards breast cancer rotational radiotherapy with synchrotron radiation”, Phys. Medica 32 (2016), 253-254

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Keywords or phrases (comma separated)

Radiotheraphy, Breast Cancer, Synchrotron Radiation

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Yes

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Yes

Are you an ECR? (<5 yrs</br>since PhD/Masters)

No

What is your gender?

Female

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