USER MEETING 2016
24-25 NOVEMBER
National Centre for Synchrotron Science

Contribution ID : **191** Type : **Oral**

A pre-clinical sample positioning system for microbeam radiotherapy at the Australian Synchrotron

Friday, 25 November 2016 14:00 (15)

Microbeam radiation therapy (MRT), using X-rays from a synchrotron, is a novel, preclinical form of radiotherapy that shows promise of providing a major advance in cancer control if successfully translated to clinical practice (Brauer-Krisch et al, 2010; Crosbie et al, 2010). Clinical translation of MRT requires developing a protocol for a patient positioning system (PPS). Following recent developments in image-guided synchrotron MRT (Pelliccia et al, 2016a and 2016b), we present the implementation of a pre-clinical protocol at the Imaging and Medical Beamline of the Australian Synchrotron.

The synchrotron PPS will be composed of three key elements: 1) Treatment planning 2) Synchrotron imaging 3) Image registration and patient alignment. The treatment plan, available before the synchrotron session, is imported into the synchrotron control system. Imaging of the patient is done at the beam line, using either the synchrotron beam or a conventional x-ray tube unit. The images are registered with the existing treatment plan and the patient is aligned according to the registration. Verification is performed after alignment and before the treatment is initiated.

We have developed a functional positioning system protocol using a small animal phantom, namely a plastinated mouse. A CT of the phantom is taken using a medical CT machine and then imaged again at the beam line. The image is registered with a Digitally Reconstructed Radiography (DRR) from the CT and the registration prompts a sample alignment and image verification. The registration process allows for anatomical landmarks or fiducial markers to be used for alignment.

This preclinical sample positioning system protocol for synchrotron microbeam radiotherapy (MRT) has been realised at the Australian Synchrotron with scalability included to allow for patient positioning chairs and couches with many more degrees of freedom. The protocol marks a further step towards the clinical translation of synchrotron MRT.

References:

Brauer-Krisch E et al (2010) Effects of pulsed, spatially fractionated, microscopic synchrotron X-ray beams on normal and tumoral brain tissue. Mutat Res 704:160-166.

Crosbie, J C et al (2010) Tumor cell response to synchrotron microbeam radiation therapy differs markedly from cells in normal tissues. Int J Radiat Oncol Biol Phys 77:886-894.

Pelliccia D et al (2016a) Image guidance protocol for synchrotron microbeam radiation therapy. J Synchrotron Rad 23:566-573.

Pelliccia D et al (2016b) Phase contrast image guidance for synchrotron microbeam radiotherapy. Phys Med Biol accepted.

Keywords or phrases (comma separated)

pre-clinical,x-ray,image guidance, synchrotron, microbeam, radiation, therapy

Are you a student?

Yes

Do you wish to take part in</br>the Student Poster Slam?

Yes

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

No

What is your gender?

Male

Primary author(s) : Mr BARNES, Micah (RMIT)

Co-author(s) : HAUSERMANN, Daniel (Australian Synchrotron); Dr PELLICCIA, Daniele (RMIT University); Mr GAGLIARDI, Frank (William Buckland Radiotherapy Centre); Dr LIVINGSTONE, Jayde (Australian Synchrotron); Dr CROSBIE, Jeffrey (RMIT University)

Presenter(s) : Mr BARNES, Micah (RMIT)

Session Classification : Concurrent Session 4: Radiotherapy II

Track Classification : Radiotherapy