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Technology and applied physics

2I-SBRT leveraging eXaCradle

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Background. Minimizing the volume is critical to adequately treat thoracic injuries. In order to achieve this, SBRT methods are applied to control physiological movements – such as breathing. We designed and patented a modular system – "eXaCradle" – that enables the application of high precision SBRT by controlling position and movements of organs & tumors.
The objective. Show our SBRT procedure, that we've called 2i-SBRT. This procedure combines: • Modular system that combines eight points of compression to produce a really customized & efficient treatment base – eXaCradle. • CT-CT and MRI fusion simulation while applying to the patient the customized compression scheme with eXaCradle. • Elekta IGRT and a new quasi-online adaptative method based on electronic density differences between slow simulation CT and ConeBeam. We achieve very short treatment times with VMAT techniques.
Methods. We work with eXaCradle that gives us an enormous quantity of degrees of freedom to customize the compression of every patient, to every tumor. The following procedure is followed: (a) A Slow-CT of the patient inside the eXaCradle is acquired without any type of compression and in free breathing. (b) On the movement blurring and following the manufacturer's recommendations, the most appropriate combination of compressions is decided. (c) A new Slow-CT* is acquired while applying the compression scheme. (d) A third CT is acquired with breathing held. (e) Organs at risk and tumor must be contoured on the third CT. (f) The third CT and the Slow-CT* are fused. Around the tumor, its movement blurring will be clearly visible. This is the ITV. (g) We design treatment on the Slow-CT*. (h) In the ConeBeamCT the tumor blurring must not exceed the PTV. (i) Patient is treated on Elekta-Synergy linac. (j) After every treatment we repeat the acquisition IGRT and check the modifications during treatment.
Conclusions. eXaCradle and ConeBeamCT form a precise and rapid SBRT system. It's a secure technology for the patient and the application of stereotactic therapies.

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Stereotactic radiotherapy with eXaFrame and eXaSkin in Elekta VMAT-IGRT

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Introduction. Nowadays frameless systems for stereotactic radiotherapy are so common. The point is that this procedure is a workable solution for the most brain pathology, and the key is to improve the precision set-up come from CT-MRN fusion.
Purpose. Show our procedure to stereotactic or high quality CT-MRN fusion images with new device patent by us, eXaFrame, that allow to introduce the inmovilization of head and neck treatment into the MRN antenna. We get so accurate and confidence CT-MRN fusion even for head and neck treatment.
Method. The procedure improved thermoplastic immobilization by means of a sub-mask (eXaSkin by Anatomical-Geometry). A similar number of CT and axial magnetic resonance images were acquired with the same immobilization. It is possible using eXaFrame system. Daily patient positioning was checked with IGRT (Elekta XVI).

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Results. Until now we have treated 38 patients, being the differences in fusion images less than 1 mm. Total time spent on the process, including contouring, treatment design and verification does not change the normal treatment time consuming.
Conclusions. Our stereotactic and CT-MRN fusion procedure get the doctor confidence at the time of lesion contour and the time of treatment in a very efficient way.

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