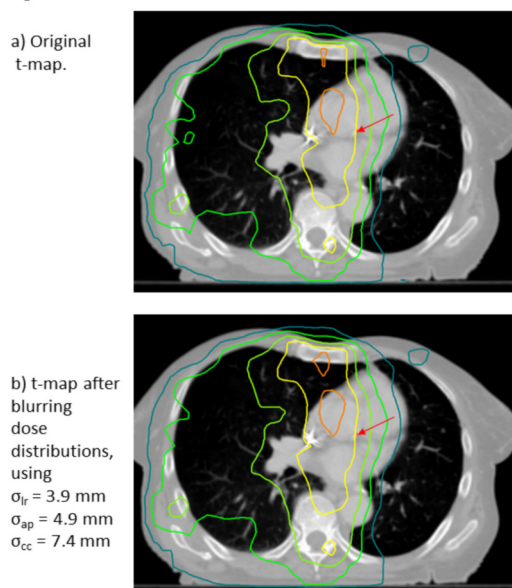


Figure 2: T-maps resulting from data mining. The arrow points to the base of the heart, which is within an area of high significance.



Conclusion

This work proposed a method to quantify global and local random registration uncertainties for data mining approaches related to an organ of interest. Changes in the registration algorithm or its parameters will affect the uncertainty, therefore, quantification of registration random uncertainties should be run parallel to data mining and accounted for in the analysis. The found registration uncertainties did not change the conclusions of our previous study.

[1] A McWilliam et al. *IJROBP* 96(2S):S48-S49 Oct 2016.

PV-0287 Determination of MC-based predictive models for personalized and fast kV-CBCT organ dose estimation

H. Chesneau¹, M. Vangvichith¹, E. Barat¹, C. Lafond², D. Lazaro-Ponthus¹

¹Commissariat à l'Energie Atomique- LIST, Département de physique, Gif-sur-Yvette, France

²Centre Eugène Marquis, Département de Physique Médicale, Rennes, France

Purpose or Objective

Monte Carlo (MC) simulations were shown to be a powerful tool to calculate accurately 3D dose distributions of kV-CBCT scans for a patient, based on planning CT images. However, this methodology is still heavy and time consuming, preventing its large use in clinical routine. This study hence explores a method to derive empirical functions relating organ doses to patient morphological parameters, in order to perform a fast and personalized estimation of doses delivered to critical organs by kV-CBCT scans used in IGRT protocols.

Material and Methods

Doses to critical organs were first computed using a PENELOPE-based MC code previously validated [H. Chesneau et al., *ESTRO* 2016], for a set of fifty clinical cases (40 children and 10 adults) covering a broad range of anatomical localizations (head-and-neck, pelvis, thorax, abdomen) and scanning conditions for the Elekta XVI CBCT. Planning CT images were converted into voxelized patient geometries, using a dedicated tissue segmentation procedure: 5 to 7 biological tissues were assigned for soft tissues, whereas ten different bone tissues were required for accurate dosimetry in the kV

energy range. Correlations between calculated mean organ doses and several morphological parameters (age, weight, height, BMI, thorax and hip circumference ...) were then studied for each anatomical localization to derive appropriate empirical fitting functions.

Results

As expected, results on the paediatric cohort show dose variations highly correlated with the patient morphology, varying in the range 3:1 between a 17-y old teenager and a 2-y old baby, for the same CBCT scan. Except for the head-and-neck localization, for which the mean organ doses show no significant variations with the morphology, doses to all major organs at risk can be predicted using linear or exponential functions for thorax, pelvis and abdomen scans. The use of morphological parameters directly measured on the planning CT allows to reach better correlations than global parameters such as BMI, because they represent most relevant indicators of the patient morphology at the scan time.

Conclusion

This study demonstrates that it is possible to derive mathematical models predicting the doses delivered to major critical organs by kV-CBCT scans according to morphological parameters. This method allows a fast and personalized estimation of imaging doses usable in clinical routine.

Presidential symposium

SP-0288 Mind the gaps!

Y. Lievens¹

¹University Hospital Ghent, Department of Radiation Oncology, Gent, Belgium

In 2012, ESTRO has formulated its vision statement for 2020: "Every cancer patient in Europe will have access to state of the art radiation therapy, as part of a multi-disciplinary approach where treatment is individualised for the specific patient's cancer, taking account of the patient's personal circumstances".

Now five years later, it is timely to overlook the advances that have been made and the challenges that are still ahead of us, in order to make our dream of accessible, qualitative, safe and efficient radiotherapy for all cancer patients in Europe, and beyond, come true.

Award Lecture: Regaud Award Lecture

SP-0290 More than one century after the serendipitous discovery of X-rays, there is still a bright future for radiation oncology ...

J. Bourhis¹

¹Centre Hospitalier Universitaire Vaudois, Department of Radiation Oncology, Lausanne Vaud, Switzerland

Radiotherapy (RT) was born a few weeks after the serendipitous discovery of X-rays. Soon after this revolutionary breakthrough, the founders of RT understood that fractionation could allow the tolerance of "relatively high total doses of RT in large fields". Claudius Regaud was one of the most distinguished of these pioneers: "Observe and Translate" was his message. One century later, the fantastic advances in science, biology, physics and imaging led to more efficient and much better tolerated RT". One of the most dramatic advances was stereotactic-RT allowing the safe delivery of "extremely high doses of RT" in small fields with very few fractions and no or minimal side effects. In the rapidly evolving field of oncology, this powerful tool can be also successfully combined with other advanced oncologic treatments, such as cancer immunotherapy ... More than ever, RT remains at the forefront of the fight against cancer and ... perhaps