AbstractID: 6910 Title: Efffect of Tumor Motion on the Pixel-based Analysis of DCE-MRI Data for Cervical Cancer

Purpose: The quantitative imaging analysis of dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) data is subject to errors caused by motion during the image acquisition. Previous studies on the pixel-by-pixel analysis of perfusion DCE-MRI for cervical cancer ignored this motion effect or corrected it manually. To improve the quantification of tumor perfusion, a comprehensive analysis of the tumor motion was conducted in this work by automatically registering the time series of DCE-MRI.

Methods and Materials: Fifty-six patients and a total of 192 MR examinations were included in the registration study. To improve image quality, before registration the image noise was first reduced by employing edge preserving smoothing techniques. A mask region including uterus, bladder and cervix was applied to all time-serial slices so that both internal organ motion and patient body movement were taken into account in the image registration. The registration was then performed by rigid translation using the normalized mutual information (NMI) algorithm to compensate respiratory and bowel motion, followed by non-rigid transformation using the Demons algorithm to compensate for deformation within the slice plane.

Results: For all 56 patients and 192 studies, most of slices (80%) in each study have ±1 mm or less translational displacement from registration to the reference image, and 20% of the slices have a $\geq$ 2 mm translational displacement. In most slices (80%), the absolute motion is approximately 1 pixel (1.526 mm) and 10% of slices have more than 3-pixel motion ($\geq$ 4-5 mm).

Conclusions: Movements at the level larger than the pixel size will lead to pixel misalignment in a time series, consequently will influence the pixel-based analysis of tumor perfusion data. Therefore, accounting for and correcting tumor motion effects by image registration may improve the results of the pixel-based analysis of DCE-MRI data for cervical cancer.