AbstractID: 10633 Title: Towards Online Image Guided Radiotherapy for Cervical Cancer: Accurate Cervix-Uterus Prediction Based on Measured Bladder Volumes

Purpose: To investigate whether variable bladder filling CT-scans can be used to predict the cervix-uterus shape and position based on measured bladder volumes and to determine the number of CT-scans required for an accurate prediction. **Methods and Materials:** Two series of CT-scans were acquired for eleven patients in prone position, the first before EBRT and the second after 40 Gy. Each series consisted of a full bladder CT-scan and four subsequent CT-scans with a naturally filling bladder (empty to full). The cervix-uterus and bladder were manually contoured and 3D cervix-uterus surfaces were generated. For each patient non-rigid registration was used to generate corresponding points on all ten surfaces. Patient-specific models were built by fitting the coordinates of the corresponding points of a variable number of first series surfaces to linear functions of the bladder volume. Each model was used to predict, based on bladder volume the cervix-uterus surfaces excluded from the model generation. The prediction error was quantified by the margin required around the predicted to accommodate 95% of the observed surface. **Results:** The maximum cervix-uterus displacement range was 14-49 mm at planning and 16-72 mm after 40 Gy. The prediction error moderately increased with the decrease of the number of input surfaces (from 5 to 7 mm at planning and from 8 to 9 mm after 40 Gy for 4 to 2 input surfaces). For 9/11 patients the bladder vs. cervix-uterus relationship was hardly influenced by radiotherapy (error range 6-7 mm). **Conclusion:** This work demonstrates the potential for accurate cervix-uterus localization by using a prediction model based on measured bladder volumes. For most patients the prediction error was well below the extent of motion of the cervix-uterus, even if only two CT-scans were included in the model. The model could be used to facilitate the adaptation of treatment plans.