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Towards image-guided radiotherapy of prostate cancer

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CONCLUSIONS

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The past decade advances in image-guided radiotherapy (IGRT) for prostate cancer are enormous. This thesis describes steps that were taken to develop a method for reliable and accurate prostate localization that could be used for online or offline IGRT with a cone-beam computed tomography (CBCT) device mounted on the accelerator.

From this thesis one may conclude that we succeeded in developing a non-invasive procedure for IGRT of the prostate based on three-dimensional (3D) grey-value registration of (CB)CT scans of the prostate, i.e., without the use of implanted markers. The method provides the possibility to guide on prostate, seminal vesicles and organs at risk. It has been clinically implemented in an offline adaptive radiotherapy protocol in combination with registration on markers, for efficiency reasons. By that, it becomes slightly invasive, but one can still use the CBCT data to guide on prostate, seminal vesicles, organs at risk and potentially on elective regions.

When applying the 3D grey-value registration algorithm in combination with CBCT scans one has to take into account that a dietary protocol is required to guarantee a high reliability. For methods like ultrasound and marker-based registration methods, one has to keep in mind that related effects of probe pressure and deformation, respectively, can have a large influence on the accuracy.

Future developments in IGRT will probably result in even more accurate treatment of the prostate, although clinical trials will be necessary to prove the benefits of these new methods.

