

AbstractID: 9075 Title: Guidelines for optimizing image quality and minimizing technique-specific uncertainties in 3D ultrasound imaging for online image guided radiotherapy of the prostate

Purpose: To provide guidelines for improving image quality of ultrasound scans and to suggest specific techniques for optimal visualization and contouring of the prostate gland.

Materials and methods: The Clarity™ 3D U/S-IGRT system (Resonant Medical Inc., Montreal, Canada) is currently in clinical use as the standard practice at our institution for daily imaging of the prostate gland. The CT and U/S images are fused in the Clarity Workstation where the positioning reference volume is developed as the reference volume relative to which daily shifts are made. Primary factors in ensuring high quality U/S scans are the patient bladder filling and the therapist scanning technique. Therapists were asked to try four different scan techniques on the same patient at the same treatment session: angled scans and more vertical scans, each scan being acquired initially with no U/S probe pressure and then repeated with a firm and steady probe pressure. Inter-user variability was assessed by evaluating scan techniques of different therapists and associating these techniques with the couch shifts.

Results: A moderately full bladder allows for proper propagation of the ultrasonic signal thereby facilitating visualization of the prostate gland at the prostate-bladder/rectum interfaces. To minimize variability in bladder filling each patient is given a set of written instructions at the time of consult, which stresses the importance of a proper bladder filling. Inter-user variability was found to be significant (up to 8 mm) in some instances and was related primarily to the scanning technique. A recommended scanning technique is to use steady pressure on the U/S probe while scanning through bladder at an angle to avoid the shadow zone caused by the pubic bone.

Conclusion: Patient bladder filling and the therapist scanning technique were found to be important factors in optimizing image quality for IGRT-based U/S imaging of the prostate.