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Clinical comparison of 2D transabdominal and 3D transperineal ultrasound image guidance methods for prostate RT
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Purpose/Objective: Our clinic is a long-term user of a 1st generation trans-abdominal (TA) ultrasound image guidance (USIG) system (BAT, Best Nomos Inc) for prostate cancer treatments. We are also an early adopter and development partner for a new, second generation 3D USIG system (Clarity, Elekta Inc), which allows for trans-perineal (TP) localization and intra-fractional tracking of the prostate. This new system has been evaluated at our institution, by direct comparison with the previously established TA method for prostate alignment.

Materials and Methods: Patients were positioned according to routine clinical protocol and aligned to skin marks using treatment room lasers. TP USIG was performed and TP shifts from tattoo were performed and recorded prior to performing TA USIG for verification purposes only. The observed differences of TA USIG from TP shifts were recorded. A total of 569 fractions delivered to 30 prostate cancer patients were thus analyzed for agreement between the two USIG systems. For each patient, a graph and tables showing shift of skin marks to TP USIG and agreement between the USIG systems of all applicable fractions were generated.

Results: The mean TP-based initial shift from tattoo was -1.78, -0.27, and -2.36 mm in left-right (LR), anterior-posterior (AP), and superior-inferior (SI) directions, respectively. The average difference (AD) between the two USIG systems was -0.06, -0.05, and -0.02 mm in LR, AP and SI directions respectively. The respective standard deviations of the AD were 0.19, 0.45 and 0.38 mm. Image 1 shows a sample of patients, with the dot representing the mean agreement between the USIG systems for a patient. The error bars represent the patient specific standard deviation.

Conclusions: Data evaluated here, which includes the initial competency development period for the new TPUS acquisition approach in our clinic, showed the average difference between TPUS and TAUS, across all 569 fractions evaluated here as less than 1 mm in the three principle directions (LR, AP, SI). There was no systematic difference found between the two systems. In addition to superior image quality, a prime observed advantage of the TP USIG approach was the intra-fraction tracking capability.

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Radiotherapy QA of the DAHANCA 19 protocol
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