

cancer. The toxicity profile appears comparable to conventional brachytherapy approaches. Additional followups will be needed for further biochemical outcome as well as toxicity. For future study, post treatment response using MRSI will be correlated to PSA, physical exam, and other clinical parameters. With incorporation of BTVs based on MRSI and other biological or functional imaging modalities, dose boost to BTVs should be fully explored.

#### PO116

##### Robotic needle positioner for ultrasound-guided prostate brachytherapy

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**Purpose:** Optimization of prostate brachytherapy is constrained by the fixed spacing of available template holes. In addition, tissue deflection of needles often creates challenges in achieving the desired needle positioning, as adjustments of less than the 5-mm template spacing are difficult to achieve. We developed and clinically tested a robotic needle positioner towards the goal of allowing greater freedom and accuracy of needle placement.

**Methods and Materials:** We retain the fundamentals of standard clinical setup, hardware and workflow. The template is replaced with a small tubular needle guide attached to a robotically controlled arm at each end. The robot allows translation in  $x$  and  $y$  directions over the perineum as well as angulation of  $\pm 20$  deg. The system consists of needle guidance robot, Interplant TPS (Computerized Medical Systems, Inc., St. Louis, MO), transrectal ultrasound (B&K Medical Systems, Denmark), and implant stand (AccuSeed, CMS) with digital probe position sensor. The robot and regular template are interchangeable, as they are mounted in the same location and calibrated to operate in the same coordinate frame. The robot acts as an encoded mobile guide. The needle is inserted manually, thus retaining control and natural haptic sensing.

**Results:** Phantom testing showed needle positioning error relative to the template of 0.25 mm (STD = 0.17 mm) in translation and 0.75o (STD = 0.37o) in angulation.

Five patients were treated on an IRB-approved pilot study. Of 180 needles placed, adjustments of  $>2$  mm in  $x$  direction were required in 8.9%, in  $y$  direction 5.0%, well within what we typically encounter with template guidance. Fine adjustments in needle origin were possible when tissue deflection of needles was encountered. During the 1st case we reverted to template because needles did not reach prostate base; for subsequent cases, the robot arm was successfully modified to allow deeper needle placement. No interference with other intraoperative equipment was encountered.

**Conclusions:** Robotic assistance provides needle placement accuracy equivalent to conventional templates as well as greater flexibility via continuum spacing. The system also allows angulation of needles to avoid structures such as pubic arch or urethra. Current plans are to develop an integrated system whereby the available digital encoding is used for synchronized imaging and image-based needle/seed tracking, facilitating real-time dosimetry.

#### PO117

##### Applying dosimetric benchmarks to low-dose-rate prostate brachytherapy in the community setting: Ready for prime time?

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**Purpose:** Physician quality improvement and pay-for-performance initiatives are areas of active development across the spectrum of medical care. One potential metric for quality care is dosimetric evaluation of prostate brachytherapy, as numerous studies have shown a correlation between dosimetry and biochemical outcome. Potential “benchmarks” for adequate dosimetry have been proposed. The purpose of this report is to compare the dosimetric parameters V100 and D90 of men treated with low-dose-rate prostate brachytherapy (LDRPB) for low-risk prostate cancer in a community setting with those published by high volume centers and the Radiation Therapy Oncology Group and correlate those parameters with the estimated 5-year freedom from biochemical recurrence (FFBR).

**Methods and Materials:** One hundred fifty men were treated with LDRPB from 2/98 through 10/03. All men had histologically confirmed adenocarcinoma of the prostate, categorized as low-risk using the D'Amico classification (PSA  $<10$ , Gleason score  $\leq 6$ , T stage  $\leq T2a$ ). The prescription dose was 144 Gy according to the TG43 formalism. D90 and V100 were calculated from a CT scan performed 1 month following the implant. Biochemical recurrence was defined according to the Phoenix definition. FFBR was estimated using the product-limit method. Multiple putative covariates for FFBR were examined using the proportional hazards regression method.

**Results:** The median followup for the entire cohort is 56 months and 57 months for those patients at risk of biochemical failure. The median D90 is 125 Gy (range 22–186 Gy), and the median V100 is 83% (range 30–98%). Thirty-nine percent of men had a D90 greater than 90% of the prescription dose and 57% and 16% had V100 values greater than 80% and 90%, respectively. Thirteen men have developed biochemical recurrence at a median of 41 months (range 20–84 months). No men have died from prostate cancer. The 5-year estimate of FFBR for the entire cohort is 92% (95% CI 87.2–96.8%). None of the disease-specific or treatment variables analyzed, including the dosimetric variables, were associated with FFBR.

**Conclusions:** Patients in our community with low-risk prostate cancer experienced a high rate of biochemical control despite having post-implant dosimetric parameters that are lower than those published by others. None of the putative variables analyzed were associated with FFBR. Possible explanations and a qualitative evaluation of post-implant plans will be presented. Potential implications of dosimetric benchmarks as a foundation for physician quality improvement will also be discussed.

#### PO118

##### MR-guided high-dose-rate prostate brachytherapy in a low-field open MRI unit: Feasibility and initial experiences

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**Purpose:** Our aim was to demonstrate the feasibility of transperineal MR-guided high-dose-rate prostate brachytherapy in a 0.35T open-configuration MR scanner and to present our initial clinical experiences.

**Methods and Materials:** Patients with intermediate- and high-risk prostate cancer were treated with 60 Gy of 3D conformal external beam radiotherapy followed by a single fraction of 10 Gy MR-guided HDR boost. For interventions an MR compatible custom-made device was developed. The patients were placed in the right lateral decubitus position. Template reconstruction, trajectory planning, contouring and 3D conformal treatment planning were based on T2-weighted FSE images. For image guidance and target confirmation, fast gradient spoiled-echo (FSPGR) sequence was used. Under epidural anaesthesia MR compatible coaxial needles were manually inserted through the perineum to the base plane of the prostate. After satisfactory position was confirmed, brachytherapy catheters were placed through the coaxial needles. For the imitation of our 5-channel rectal dosimeter an MR compatible model mimicking the exact detector positions was designed.