facilitate MRI-based dosimetry and MR image-guided prostate brachytherapy.

OR28 Presentation Time: 6:00 PM

Registered ultrasound and fluoroscopy for intraoperative dynamic dosimetry in prostate brachytherapy
Danny Y. Song, M.D. 1 Anton Deguet, Ph.D. 1,2 Julian Iordachita, Ph.D. 1,2 Eloeun Armour, Ph.D. 1,2 Ameet Jain, Ph.D. 1,2 Evetette C. Burdette, Ph.D. 1,2 Gabor Fichtinger, Ph.D. 1,4 Radiation Imaging and Molecular Radiation Sciences, Johns Hopkins University School of Medicine, Baltimore, MD; 2Computer Science, Johns Hopkins University, Baltimore, MD; 4Acoustic Medsystems Inc, Urbana-Champaign, IL; 4Computer Science, Queen’s University, Kingston, ON, Canada.

Purpose: Clinical outcomes following permanent prostate brachytherapy are highly dependent upon dosimetric results achieved intraoperatively. Factors such as tissue deformation, prostatic edema, and source migration create dynamically changing intraoperative dosimetry, yet currently available brachytherapy techniques do not allow identification of source positions after they have been deposited into the prostate. We developed and clinically tested a system which spatially coregisters fluoroscopy images with ultrasound in order to provide dynamic dosimetry intraoperatively.

Methods and Materials: The registration of ultrasound to fluoroscopy system (RUF) utilizes a non-invasive, radio-opaque fiducial mounted onto the needle guidance template, as well as a unique software algorithm which runs on a laptop computer interfaced with the treatment planning system (Interplant, Computerized Medical Systems, St. Louis, MO). Otherwise no additional hardware is required. For seed position reconstruction, a set of 4-5 non-coplanar X-ray images are acquired with a non-isocentric C-arm. The seed coordinates are calculated by formalizing seed matching as a network flow problem. Calculated seed positions are then imported into the treatment planning software, and the treatment plan re-optimized.

Results: Six patients were treated on an IRB-approved protocol. C-arm images were obtained and RUF calculation of seed positions was performed 3 times during each case, and subsequent seed placement modified as determined by physician judgment. Seed counts identified by RUF matched the number of seeds actually placed. Based on RUF data, 3–10 seeds were added to the original treatment plan to alter areas of visualized underdosing. Day 0 CT dose-volume histogram data are as follows: prostate D90 of 98–139%, V100 of 88–99%, urethral D30 98–143%, urethral D5 114–154%, rectal R100 of <0.1 cc. One patient (D90 = 98% and V100 = 88%) was identified intraoperatively as having an area not covered by the prescription isodose line, but all available seeds had been utilized.

Conclusions: Dynamic intraoperative dosimetry was achieved using our system of registered ultrasound and fluoroscopy. Further work is directed at streamlining the image processing workflow and developing a system which eliminates the need for the entire fiducial to be captured in every image. A Phase II clinical trial is planned to confirm the dosimetric results achieved in this pilot trial.

OR30 Presentation Time: 8:10 AM

Long-term results of function preservation by transrectal ultrasound (TRUS)-guided fractionated HDR brachytherapy boost complementary to external beam radiation ± chemotherapy in anal cancer
Gyorgy Kovacs, M.D., Ph.D. 1,2,3 Marek J. Doniec, M.D. 2 Bodo Schniewind, M.D. 2 Matthias Loehnert, M.D., Ph.D. 2 Peter Niehoff, M.D. 3 Peter Kohl, Ph.D. 2 Bernd Kremer, M.D., Ph.D. 3 1Interdisciplinary Brachytherapy Unit, UK-SH Campus Luebeck, Luebeck, Germany; 2General and Thoracic Surgery, UK-SH Campus Kiel, Kiel, Germany; 3Radiation Therapy (Radiooncology), UK-SH Campus Kiel, Kiel, Germany.

Purpose: In this prospective observation we analyzed the long-term results of endorectalography (TRUS)-guided target definition and implantation procedure as well as of real-time volume optimized treatment planning and fractionated radiation delivery in the interstitial boost brachytherapy of anal cancer. Interdisciplinary cooperation and the use of the RASHA-applicator aimed resulting in an improvement in long-term outcome at the function preservative treatment of anal cancers.

Methods and Materials: Fifty patients with biopsy proven primary cancer of the anal canal (n = 58) or-margin (n = 12) without distant metastases were treated between 1993–2001. Before treatment all pts received TRUS and sphincter function measurements. The treatment started with 45 Gy EBRT to the pelvic region with conventional fraction and in case of N+ or T3-T4 in combination with chemotherapy. Within 2–4 weeks after completing EBRT a high-dose-rate intensity modulated interstitial brachytherapy boost (IMBT) was administered to the tumor bed/residual tumor using two fractions of 4–6 Gy and the RASHA applicator. Fraction dose was defined at the surface of the TRUS visible target volume, needle geometry followed the rules of the Paris system. Mean followup was 34 months (6–96).

Results: Ninety-two per cent of the patients demonstrated a complete tumor remission after completing the treatment. Local recurrence occurred in one patient 15 months after treatment. Disease-specific 5-year survival rate was 82%. Five patients received abdomino-perineal resection (3 pts with persistent tumor, 1 with a local recurrence and 1 because of suspected recurrence). Four out of these 5 patients died on progressive disease. Because of the observed mild proctitis (2/50) and severe sphincter necrosis (3/50) we reduced the initial 2x6 Gy HDR fraction dose to 2x4 Gy. In the following there were no acute severe side effects due to...