PTV margins were large and anisotropic (from 1 cm at the apex to >2 cm at the top). This, likely translates, a mix of translational and around the apex rotational motion of the target.

4043 POSTER

Effect of edema on postimplant dosimetry in prostate brachytherapy using CT/MRI fusion

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Purpose: To investigate the time course of prostatic edema and the impact on the dose volume histograms of the prostate for patients treated with brachytherapy.
Methods and Materials: Seventy-four patients with prostate cancer were enrolled in this prospective study. TRUS-based preplan was performed 4 weeks before the implant and CT/MRI fusion-based postimplant dosimetry was performed on the day after implantation (day 1) and 30 days after implantation (day 30). Forty-eight patients underwent neoadjuvant hormonal therapy. All patients were treated with loose 125I radioactive seeds using a Mick applicator. The updated American Association of Physicists in Medicine (AAPM) Task Group 43 (TG-43) formula was used in the planning and calculation of the final dosimetry. The prostate volume, prostate V100 and D90 were evaluated with prostate edema over time. Group comparisons for the volumes and dosimetric parameters were performed using the t test. All tests were two-sided, and a p value of $\leqslant 0.05$ was considered to be statistically significant.
Results: Prostate edema was the greatest on day 1, with the mean prostate volume 36% greater than preplan TRUS-based volume and it thereafter decreased over time. It was 9% greater than preplan volume on day 30. The V100 increased 5.7% from day 1 to day 30, and the D90 was increased 13.1% from day 1 to day 30. The edema ratio (Postplan/Preplan) on day 1 of low-quality implants V100 of <80% was significantly greater than that of intermediate to high-quality implants (80% < V100) ($p = 0.0272$). The lower V100 on day 1 showed a greater increase from day 1 to day 30. V100 on day 1 of >92% is unlikely to increase >0% during the time interval studied.
Conclusion: Low-quality implants on day 1 were highly associated with edema, however, such a low-quality implant on day 1 with significant edema tended to improve by day 30. If a high-quality implant (V100 > 92%) can be obtained on day 1, then a reexamination is no longer necessary.

4044 POSTER

Failure to achieve PSA level less than or equal to 1 ng/ml following neo-adjuvant LHRHa therapy predicts for a lower rate of biochemical control and lower overall survival in localised prostate cancer treated with radiation therapy

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Background: The benefit of using neo-adjuvant, concurrent and adjuvant Luteinizing Hormone Releasing Hormone agonists (LHRHa) along with external beam radiotherapy (EBRT) for locally advanced prostate cancer has been confirmed in several studies. We observed that not all patients acheived complete suppression of PSA prior to commencement of radiotherapy, despite receiving neo-adjuvant hormonal deprivation (NAHD) therapy with an LHRHa. We investigated if the failure to suppress PSA to less than or equal to 1 ng/ml after at least 2months of NAHD in patients due to receive EBRT was associated with reduced biochemical failure free survival.
Materials: A retrospective case note review of consecutive patients with intermeadiate or high risk prostate cancer treated between January 2001 and December 2002 with NAHD and EBRT was performed. Patients' data were divided for analysis based on whether or not the PSA in week 1 of EBRT was less than or equal to 1 ng/ml. Biochemical failure was determined using the ASTRO (Pheonix) definition.
Results: One hundred and nineteen patients were identified, 67 with post NAHD PSA levels of less than or equal to 1 ng/ml and 52 with post NAHD PSA levels of >1 ng/ml. At a median follow-up of 49 (4.2−67.8) months, the 4year actuarial biochemical failure free survival was 84% vs 60% ($p = 0.0016$) in favour of the patients with a post NAHD PSA of less than 1 ng/ml, and overall survival was 94% vs. 77.5% ($p = 0.0045$). Disease specific survival at 4 years was 98.5% vs. 82.5%. Post NAHD PSA remained an independent statistically significant predictor of biochemical failure when examined using multivariate regression analysis.
Conclusions: Patients who have a PSA > 1 ng/ml at the beginning of external beam radiotherapy following at least 2months of neo-adjuvant LHRHa therapy, have a significantly higher rate of biochemical failure, and a lower survival rate compared to those who have PSA less than or equal to 1 ng/ml. Patients who fail to acheive adequate suppression should be considered as a higher risk group and considered for either dose escalation or the use of novel therapies.

4045 POSTER

Gastrointestinal toxicity after ^{125}I permanent implantation for prostate cancer: relationship between patient-assessed quality of life score and physician-assessed toxicity score

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Purpose: The present study investigated correlations between physician-assessed toxicity and patient-assessed quality of life (QOL) for the gastrointestinal tract following permanent interstitial brachytherapy.
Materials and Methods: Gastrointestinal toxicity in 130 patients with low-risk prostate cancer was assessed by 1 urologist and/or 1 radiation oncologist at 1, 3, 6, 9, 12, 18, and 24 months after implantation using Radiation Therapy Oncology Group (RTOG) scale and National Cancer Institute Common Toxicity Criteria (NCI-CTC). Every patient received a QOL questionnaire before implantation and at the same times as physician assessment, excluding 9 months. The questionnaire included the UCLA-Prostatic cancer index, and the columns for "bowel function" and "bowel bother" were used in this study. Analysis focused on comparing QOL scores after implantation with respective baseline scores. Relationships between patient-assessed QOL score and physician-assessed toxicity score were assessed.
Results: Median follow-up period was 18 months. Most patients displayed no gastrointestinal toxicity after implantation according to physician assessment. Only 2.3% of patients displayed Grade 2 toxicity during follow up period. No gastrointestinal toxicity of Grade 3 or more was identified. A total of 282 returned QOL questionnaires were accepted from patients after implantation. On average, QOL scores remained at the same level as baseline after implantation. Physician-assessed RTOG grades correlated significantly with "bowel bother" scores, but not with "bowel function" scores. However, RTOG Grade 0 patients displayed broad variations in QOL score changes, and 7.8−30.4% of patients with Grade 0 toxicity displayed greater decreases in QOL scores than median changes for Grade 1 or 2 patients.
Conclusion: Few patients experience gastrointestinal toxicity after permanent interstitial brachytherapy for prostate cancer. However, our results indicate discrepancies between patients-assessed QOL score and physician-assessed toxicity scores, particularly in patients with mild toxicity. Reassessment of interstitial brachytherapy from the perspective of QOL appears warranted.

4046 POSTER

Health-related quality of life in patients with localized prostate cancer receiving high-dose-rate brachytherapy: a time-course analysis

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Background: High-dose-rate brachytherapy (HDR-BT) has gradually become one of the major treatment modalities for localized prostate cancer with excellent outcomes, but study of health-related quality of life (HRQoL) associated with HDR-BT is falling behined other major modalities, therefore a prompt analysis is required. The purpose of this study is to make a time-course analysis of HRQoL in patients with localized prostate cancer received HDR-BT.
Materials and Methods: Examination of HRQoL has been performed at Kawasaki Medical School Hospital since May 1, 2004. The 36-items Short-Form Health Survey version 2.0 (SF-36v2) and the University of California Los Angeles Prostate Cancer Index (UCLA-PCI) were adopted. SF-36 is consisted of 8 aspects with 36 questions about general condition. The 8 aspects are Physical functioning (PF), Role physical (RP), Bodily pain (BP), General health perceptions (GH), Vitality (VT), Social functioning (SF), Role emotional (RE), and Mental health (MH). Meanwhile, UCLA-PCI is consisted of 6 categories with 20 questions about disease-specific symptoms. The 6 categories are Urinary function (UF), Urinary bother (UB),

Bowel function (BF), Bowel bother (BB), Sexual function (SF), and Sexual bother (SB). Patients were required to complete these two questionnaires before (baseline), and 1, 6, and 12 months after treatment. HDR-BT combined with EBRT (24.0 Gy in four fractions of HDR-BT within two days and 36.8 Gy in 16 fractions of EBRT during three weeks) was performed in patients with intermediate and high risk factors, whereas HDR-BT as monotherapy (37.5 Gy in five fractions within 2 days) was performed in patients with low risk factors. The average scores of both SF-36 and UCLA-PCI were calculated at every point to make clear the time-course change and the differences between those at baseline and at 12 moths after treatment were analyzed by paired t-test.
Results: Total number of patients was 165; 5 dropped out and 160 were eligible. Median age was 71 years (range: 49−84). Neoadjuvant hormonal therapy was administered in 94 patients (58.8%) with the median duration of 3 months (range: 1−36). HDR-BT combined with EBRT was performed in 92 patients (57.5%), HDR-BT as monotherapy was performed in 68 patients (42.5%). The average scores in all aspects of SF-36 at 12 months were better than those at baseline. The differences were statistically significant in PF ($p = 0.002$), RP ($p = 0.002$), VT (0.02), SF (0.005), RE (<0.001) and Mental health (<0.001). In UCLA-PCI, UF, UB, BF, and BB showed similar transition as SF-36, but SF and SB showed significant declination. SF and SB scores were 25.0 and 77.8 at baseline and declined to 16.6 and 68.7 at 12 months. Both p-values were <0.001.
Conclusion: HRQoL associated with HDR-BT seemed to be favorable, but it was found out that sexual disorder was not ignorable. Therefore more attention should be paid to sexuality to achieve better patient's HRQoL.

4047 POSTER

Evaluation of the correlation between implant dosimetry and post implant dosimetry using CT and MRI in the treatment of early prostate cancer with ^{125}I permanent seed brachytherapy

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Introduction: The use of permanent seed brachytherapy is established in the treatment of early prostate cancer. Post implant dosimetry is used for dose analysis and as a learning tool to assess the quality of a seed implant. In this study we assess the correlation between real-time dosimetry at time of implantation with CT or MRI based post implant dosimetry.
Methods: Records of all patients treated with ^{125}I brachytherapy at the Royal Free Hospital from April 2002 to November 2006 were analysed. The patients were implanted using the transperineal approach under ultrasound guidance with real-time computer dosimetry. Post-implant dosimetry was performed one month following implantation using MRI and CT. To assess dosimetry of the prostate we collected data for the prostate V100, prostate D90 and prostate V150. For organs at risk the rectal V100 and D30 and urethral D30 were collected.
Results: From April 2002 to November 2006 ninety patients were implanted with ^{125}I seed prostate brachytherapy. In nine patients post implant dosimetry data was not available for analysis. The mean prostate volume implanted was 36.3 cc and median 34 cc (range 13.7−71.14). The mean number of seeds used was 69.8 with a median of 70 (range 47–100) and median number of needles used was 21 (range 16−28). The mean activity implanted was 0.554 mCi and median 0.558 (range 0.458−0.713) and all patients had a prescribed dose of 160 Gy.
At implantation the mean prostate D90 was 196 Gy with a median of 188 Gy (range 145–220). On post implant dosimetry the mean prostate D90 was 180 Gy with a median of 180 Gy (range 113–228 Gy). On post implant dosimetry the prostate V150 mean was 55.8%, median 60% (range 9.4−85.8). At implantation the rectal V100 mean was 0.35 cc with a median of 0.115 cc (range 0−3.023), on post implant dosimetry this was 1.08 cc and 0.94 cc (range 0−6.61) respectively. At implantation the rectal D30 mean was 92 Gy and median 89 Gy on post implant dosimetry this was 68 Gy and 67 Gy respectively.
Conclusions: These results demonstrate that the dose delivered to the prostate is lower when assessed on post implant as compared with real-time dosimetry. However, the rectal doses, V100 and D30, are higher on post implant dosimetry. There is a 4% discrepancy between the D90 measured at the time of implantation as compared with post implant dosimetry. This discrepancy maybe related to seed migration following implantation, differences in image quality and anatomical delineation and organ motion. Operator variability is eliminated in this study as the implantation and subsequent volume definition were carried out by the same clinicians. Therefore, in addition to real-time dosimetry, post implant dosimetry remains an essential component of prostate seed brachytherapy. Our results demonstrate that mean and median doses delivered to the prostate are above the minimum recommended dose and the doses to the organs at risk are acceptable.

4048 POSTER

Distribution of prostate sentinel nodes – a SPECT derived anatomic atlas

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Background: The randomised RTOG 94−13 trial revealed that coverage of the pelvic lymph nodes in high risk prostate cancer confers a bNED advantage in patients with $\geqslant$15% lymph risk of node involvement. In order to facilitate an improved definition of the adjuvant target volume a precise knowledge regarding the localisation of the relevant lymph nodes is necessary. Therefore we generated a three-dimensional sentinel lymph node atlas based on SPECT imaging.
Materials: In 50 patients with prostate cancer a three-dimensional (3D) visualization of the sentinel lymph nodes was performed using a double-headed gamma camera with an integrated X-ray device (Millennium VG & Hawkeye®, GE) after transrectal intraprostatic injection of ~250 MBq ^{99m}Tc-Nanocoll (1.5−3 h p.i.) followed by an anatomic-functional image fusion. Numbers and 3D-localisations of the sentinel lymph nodes were analysed.
Results: A total of 282 sentinel lymph nodes in 49 of 50 patients (98%) were detected with 0 to 16 nodes per patient (median 5.5, mean 5.6). The anatomic distribution of the sentinel nodes (Martinez-Monge) was as following: external iliac 33%, internal iliac 18.1%, common iliac 13.1%, sacral 8.5%, perirectal 5.7%, left paraaortic 5.7%, right paraaortic 4.6%, seminal vesical lymphatic plexus 3.9%, deep inguinal 1.8%, superior rectal 1.8%, perivesical 1.1%, internal pudendal 1.1%, retroaortic 0.4%, inferior rectal 0.7%, superficial inguinal 0.4%, periprostatic 0.4%.
Conclusion: The distribution of sentinel lymph nodes as detected by SPECT imaging correlates well with the distribution determined by intraoperative gamma probe detection. The lower rates of sentinel nodes in close proximity to the bladder and seminal vesicles are probably caused by the radionuclide accumulation in the bladder. In regard to IMRT radiotherapy techniques the presented anatomic atlas may allow optimised target volume definitions.

4049 POSTER

Prospective evaluation of intestinal quality of life in patients with conformal radiation therapy for prostate cancer

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Background: To evaluate intestinal quality of life (QOL) in patients with conformal radiation therapy for prostate cancer.
Materials and Methods: 110 patients were entered into the study. 78 (71%) received definitive CRT at a median dose of 70 Gy to the prostate (64.8−74 Gy) and 32 (29%) were treated with adjuvant CRT after radical prostatectomy at a median dose of 59.4 Gy (55.9−64.8 Gy). Patients were assessed before CRT, at 40 Gy and 60 Gy, as well as 2, 12 and 24 months after CRT. Ano-rectal symptoms and fecal bother were analyzed with standardized questionnaires and QOL was assessed with the EORTC QLQ-C30 and the prostate cancer module PR25. The Friedman test was carried out to detect changes in ano-rectal symptoms and QOL during and after CRT. When significant, the Wilcoxon test was performed to determine the differences to pretreatment values.
Results: The response rate was high with >90% of the patients responding to the questionnaires at the different time points. Stool frequency, defecation pain, mucous discharge and tenesmus increased significantly during CRT but returned to baseline levels within one to two years after radiotherapy. Rectal bleeding, fecal urge and fecal incontinence increased during CRT and stayed significantly above baseline levels during follow-up. Fecal bother and PR25-bowel symptoms deteriorated during CRT and remained inferior to the baseline throughout follow-up. Global QOL and emotional functioning did not change significantly during CRT, however, scores were superior to baseline levels at one and two years after CRT. Role functioning, fatigue, PR25-urologic symptoms and PR25-sexual activity deteriorated significantly during CRT but recovered as soon as 8 weeks after treatment and stayed within baseline levels throughout further follow-up. In multivariate analysis the following variables were associated with lower global QOL values two years after CRT: hormonal therapy for biochemical recurrence ($p = 0.001$), increasing number of concomitant diseases ($p = 0.002$) and a higher fecal incontinence score ($p = 0.017$).