in 39 fractions). The median follow up was 59.4 months. There were 15 subjects with grade 2 rectal bleeding, three with grade 3, and none with $\geqslant$ grade 4. The 5 year K-M estimates are 16.5% for grade 2+ and 2.8% grade 3. The mean time from the start of radiation to late grade 2+ rectal bleeding was 16.0 ($\pm$15.1) months. CT scans from 57 subjects have been contoured thus far (N = 228). The median V70 was 29.0%(SD 3.7%) and for V75 was 16.7%(SD 2.3%). While there is minimal intra- and inter-observer variance in the high dose part of the rectal DVH, in the low/moderate dose region, there was a relatively large total variance with an overlap index of ~65%. The variance consists of actual anatomic variation and errors in contouring.
Conclusion: This study reveals non-uniform variance in rectal DVH where the variance is low in the high dose region and high in the low/moderate dose region. We submit that this pattern of non-uniform variance is intrinsic, making multiple blinded observers essential if investigators seek a valid and quantitative answer to the question: Does EPNI reduce the radio-tolerance of small rectal volumes to high doses and thereby increase the risk of rectal bleeding?

7032 POSTER

Bile Acid Malabsorption After Intensity Modulated Radiotherapy for Prostate Cancer

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Background: Intensity modulated radiotherapy (IMRT) is a significant technological advance in the treatment of prostate cancer, allowing increased dose delivery to tumours, with sparing of normal tissues from high radiation doses. IMRT planning employs strict dose constraints to nearby organs to limit toxicity. Typically the entire bowel is regarded as a single structure, and its tolerance is quoted as 46 Gray (Gy) delivered in 2 Gy per fraction.
Bile acid malabsorption (BAM) is a treatable condition that presents with symptoms similar to those of radiotherapy (RT)-related toxicity (diarrhoea, urgency, frequency, flatulence, abdominal pain and faecal incontinence). It has not previously been described in patients who have received contemporary RT for prostate cancer. We describe new onset BAM in a series of men after IMRT for prostate cancer.
Materials and Methods: New onset BAM was diagnosed by i) development of typical symptoms, ii) a selenium homocholic acid taurine (SeHCAT) scan with 7 day retention of <15% and iii) an unequivocal response to treatment with a bile acid sequestrant. In these patients the original RT plan was located and the terminal ileum (TI) identified by a consultant radiologist. The radiation dose received by the TI was calculated and compared with accepted dose-volume constraints.
Results: Five patients with new-onset BAM were identified (median age 65 years) out of a total of 423 men treated in a prospective series of high dose prostate and pelvic IMRT. All patients reported normal bowel habit prior to RT. The volume of TI which could be confidently identified ranged from 26 cc to 141 cc and the maximum radiation dose received by the TI varied between 8.13 Gy and 59.3 Gy. 3/5 patients had areas of TI treated in excess of 46 Gy (in 2 Gy per fraction) with volumes ranging from 1.5 cc to 48.0cc. 1 patient had mild BAM (SeHCAT 7 day retention of 10−15%), 2 moderate (SeHCAT 5−10%), and 2 severe (SeHCAT <5%). The 3 patients whose TI received $\geqslant$ 46 Gy developed moderate-severe BAM, whereas those whose TI received <46 Gy had only mild-moderate BAM.
Conclusions: Radiation delivered to the TI during IMRT may be associated with new onset BAM. Identification of the TI from unenhanced RT planning CT scans is difficult and may impede accurate dosimetric evaluation of the TI. Thorough toxicity reporting and close liaison between oncologist and gastroenterologist will allow timely diagnosis and treatment of BAM, the symptoms of which may be mistaken for late RT toxicity.

7033 POSTER

Initial Results of a Comparison of Localisation of the Prostate Gland Using an Electromagnetic Tracking System With Cone Beam CT

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Background: The Calypso® system uses electromagnetic transponders to localise and track the prostate position during radiotherapy without the use of ionising radiation. A Calypso® system was installed at the Royal Marsden NHS Foundation Trust and Institute of Cancer Research in January 2010. Initial patients were treated as part of a quality assurance and implementation programme assessing the accuracy of Calypso® with respect to cone beam CT (CBCT) used to image the Calypso transponders as markers. Preliminary results for the first 17 patients are reported here.
Material and Methods: Patients referred for radical radiotherapy to the prostate had three Calypso® electromagnetic transponders (8 mm x 2 mm) implanted in the prostate at the right base, left base and apex using a 14G needle guide. Patients were set-up to skin marks and prostate displacement from the isocentre measured using Calypso® and cone beam CT (CBCT) with the transponders used as fiducial markers (FM). Calypso® localisation co-ordinates were recorded simultaneously with CBCT displacements following registration of the FM and CBCT with the reference image. A comparison of set-up displacements from skin marks using Calypso® and CBCT was made in order to establish its accuracy in our department.
Results: Seventeen patients completed treatment between July 2010 and February 2011. All had Calypso® transponders implanted in the prostate with no adverse effects and no loss or migration of transponders. A total of 263 fractions were imaged and 1481 displacements have been analysed. The number of fractions with a displacement in any direction of >3 mm, 5 mm and 10 mm were 79% 22% and 0.7% respectively. The systematic errors measured with Calypso and FM/ CBCT displacements were similar (see Table 1). The mean difference between Calypso and FM/CBCT displacements (mm) were RL −0.1 ($\pm$0.6), SI −0.2 ($\pm$0.5), AP 0 ($\pm$0.5) (Right, inferior and posterior are positive).

Table 1. Population systematic and random errors using Calypso and FM/CBCT and skin marks

	Population systematic error (mm) Σset-up			Population random error (mm) σset-up		
	RL	SI	AP	RL	SI	AP
Calypso	2.2	1.8	3.9	1.9	2.4	2.5
FM/CBCT	1.9	2.5	4.0	1.9	2.2	2.4

Conclusions: The quality assurance and implementation programme is ongoing. Preliminary results confirm Calypso® is an accurate method of localising the prostate with close agreement with the current gold standard of fiducial markers and radiological imaging.

7034 POSTER

High Dose Rate Brachytherapy Combined With External Beam Radiotherapy for Localized Prostate Cancer − Correlation Between Clinical and Dosimetric Parameters and Incidence of Urethral Adverse Events

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Background: This study investigated whether clinical factors (initial international prostate symptom score (IPSS), volume of the prostate and history of maximum androgen blockade (MAB) therapy for $\geqslant$3 months) or dosimetric parameters (UV125, UV150, UD90, UD30, and UD5) affect the incidence of Grade 2 or worse early and late urethral adverse events after HDR-BT combined with external beam radiotherapy (EBRT).
Material and Methods: Between January 2005 and March 2008, 82 patients with localized prostate cancer were treated using HDR-BT combined with EBRT at Kochi Medical School Hospital, Japan. The fractionation schema for HDR-BT and EBRT was prospectively changed. Distribution of the fractionation schema used in patients was as follows: 9 Gy $\times$2 + 2 Gy $\times$20 in 56 patients (Group 1); and 9 Gy $\times$2 + 3 Gy $\times$13 in 26 patients (Group 2). Median duration of follow-up was 54 months (range, 36−75 months). Toxicities were graded based on the National Cancer Institute-Common Terminology Criteria for Adverse Events v3.0.
Results: Five patients (6.0%) developed grade 2 urethral adverse events in the early phase (<3 month) and 26 patients (31.7%) in the late phase. In view of the distribution of fractionation schema, no significant differences were found between Groups 1 and 2. No significant correlation was seen between patients with grade 2 or worse urethral adverse events in the early and late phases. No significant differences were found between incidence of grade 2 or worse urethral adverse events and the following factors: initial IPSS; prostate volume; history of MAB therapy; and any dosimetric parameters.
Conclusions: No significant correlations between incidence of urethral adverse events and initial IPSS, prostate volume, history of MAB therapy and any dosimetric parameters were found in this study. However, further follow-up and additional investigations are required.