component detected as a positron emitting isotopes by the PET apparatus was defined as ^{15}O, not only ^{11}C.
Conclusion: Imaging of the autoactivation has an impact to confirm a proton beam in patients with prostate cancer. However, physiological factors, especially urine in the urinary bladder, need to be taken into account for the comparison to the dose distribution in the future.

4060 POSTER

Annual ibandronic acid to prevent gonadotropin included bone loss in men with prostate cancer

A. Papaioannou[1], P. Heras[2], A. Hatzopoulos[2], K. Kritikos[2]. *[1]General Hospital of Argos, Urological Department, Argos, Greece; [2]Hellenic Medical Society for the Study of Psychosomatic Problems, Athens, Greece*

Background: Gonadotropin decrease bone mineral density (BMD) and increase fracture risk in men with prostate cancer. Ibandronic acid (6 mg IV every 3 months) increases BMD in GnRH agonist treated men. Intermittent ibandronic acid (6 mg IV once annually) increases BMD in postmenopausal women with osteoporosis but the efficacy of the annual treatment schedule in hypogonadal men is unknown.
Patients and Methods: Én a 12-month open-label study, men with nonmetastatic prostate cancer (n = 44) who were receiving a GnRH agonist were assigned randomly to ibandronic acid (6 mg IV $\times$ 1) or placebo. BMD of the posteroanterior lumbar spine and total hip were measured by dual energy x-ray absorptiometry at baseline and month 12.
Results: Mean (+SE) BMD of the posteroanterior lumbar spine increased by 4.0+0.9 in men treated with ibandronic acid and decreased by 3.1$\pm$0.9 percent in men who received placebo ($p < 0.001$ for between-group comparison). BMD of the total hip decreased by 0.7+0.6 percent in men treated with ibandronic acid and decreased by 1.9+0.7 percent in men who received placebo ($p = 0.005$).
Conclusions: In men receiving a GnRH agonist for prostate cancer, a single treatment of ibandronic acid significantly increased bone mineral density of the total hip and spine at 12 months. ÁnnuaÉ ibandronic acid may provide a convenient and effective strategy to prevent bone loss in hypogonadal men.

4061 POSTER

Intensity modulated radiation therapy with ultrasound-based daily target localization for clinically localized prostate cancer: institutional experience and acute toxicity outcomes

I. Rodriguez Melcon[1], C. Martin[2], P. Soria[1], E. Marques[2], A. Oviedo[1], M. Martin[1]. *[1]Hospital Universitario de Salamanca, Radiation Oncology, Salamanca, Spain; [2]Hospital Universitario de Salamanca, Radiation Physics, Salamanca, Spain*

Background: The I-BEAM ultrasound (US) based system provides a real-time, non invasive and rapid means of patient alignment, to take into account the prostate positional variations during IMRT treatments. This investigation reports our experience on the daily use of I-BEAM and the analysis of 947 US procedures in 42 consecutive patients treated with IMRT for prostate cancer. In addition, the impact of this technology on acute toxicity is assessed.
Methods and Materials: From September 2005 to March 2007, 42 patients were treated using I-BEAM. All patients underwent to a 3D simulation-CT, the target and critical organs were delineated using Focal Contouring Software and treatment plans were calculated using XiO Planning System. Patients were classified into risk groups according with their T stage, PSA level and Gleason Score. Prostate and seminal vesicles were treated with a IMRT to 78 and 62.4 Gy respectively, and whole pelvis, when required, was treated with a 3D-CRT to 45 Gy. During the treatment, the position of all patients was controlled using orthogonal portal images for accounting to set-up variations, and a daily US procedure was performed to correct the organ motion displacements. The individual I-BEAM shifts were charted in each of the 3 principal directions. Acute toxicity was scored for all patients according to RTOG genitourinary (GU), gastrointestinal (GI), anal and cutaneous acute toxicity scales.
Results: The mean shift in each direction, averaged over all patients, was −0.09, 0.84 and −2.51 mm in the lateral (RL), antero–posterior (AP) and superior–inferior (SI) dimensions, respectively. Interfraction standard deviation of prostate position was 3.35, 4.87 and 4.25 mm in the RL, AP and SI dimensions, respectively. The GU toxicity rates were grade 0: 35.7% and grade 1: 64.3% (no toxicities $\geqslant$ grade 2 were reported). The GI toxicity rates were grade 0: 57.1%, grade 1: 30.9% and grade 2: 11.9%. The anal toxicity rates were grade 0: 66.7% and grade 1: 33.3%, and the cutaneous toxicity rates were grade 0: 83.3% and grade 1: 16.7%.
Conclusions: Organ motion is the main obstacle to correctly delivering IMRT, so an alignment system is necessary to ensure the prostate position before each IMRT fraction. US-based IGRT is relatively simple, fast and feasible, and permits the safe delivery of high doses of radiation. When available, this technology makes possible a margin reduction and reduces the acute toxicities, especially rectal complications.

4062 POSTER

Risk-adapted high-dose 3D-radiotherapy combined with hormonal treatment for prostate cancer

E. Villafranca Iturre[1], P. Romero Rojano[1], F. Arias de la Vega[1], M.A. Domínguez Domínguez[1], E. Martínez López[1], A. Manterola Burgaleta[1], G. Asín Felipe[1], M. Rico Osés[1], S. Pellejero[2]. *[1]Hospital of Navarra, Radiation Oncology, Navarra, Spain; [2]Hospital of Navarra, Medical Physical, Navarra, Spain*

Introduction: Based on risk-group (MSKCC classification), we designed in 2001 our protocol of treatment for patients with prostate cancer. We present our preliminary results.
Material and Method: According to MSKCC risk-group, there were 3 groups: Group A (low-risk), Group B (intermediate risk) and Group C (high risk). Treatment by groups: Group A, radiation therapy (RT) confined to the prostate (P) to a total dose of 72 Gy; Group B, RT to the prostate and seminal vesicle (SV), 54 Gy, followed by prostate boost to a dose of 76 Gy, combined hormonal treatment (CHT) during 6 months; and Group C, RT to the pelvis 45 Gy followed by RT to P+SV (54 Gy) and a final boost over P to 76 Gy, hormonal treatment consisted of 3-months neoadjuvant CHT, concomitant CHT with RT, and 2 years of adjuvant treatment with LH-RH analogous.
Results: There were 142 patients (pts) (2001–2003). Aged from 58 to 81 (median 70 years). Group A 31 pts (22%);Group B 46 pts (32%), and Group C 65 pts (46%). Follow-up: smallest 36 months (median: months).
Protocol compliance: Of the group C, 6 pts received less dose of RT than scheduled and other 6 adjuvant hormonal therapy only for 6 months (intolerance).
Acute toxicity (RTOG): Grade 2: dysuria 49 pts (34%); urinary frequency 38 pts (26%), stool frequency 14 pts (9.9%), rectal 62 pts (43%). Grade 3: dysuria 3 pts (2%); urinary frequency 23 pts (16%), stool frequency 0%, rectal 0%. Grade 4: urinary frequency 1 pt (0.7%).
Late toxicity: Grade 2: genitourinary: 8 pts (5.6%), gastrointestinal 31 pts (22%); Grade 3: genitourinary 7 pts (4.9%), gastrointestinal 5 pts (3.5%); Grade 4: genitourinary 1 pt (0.7%). Actuarial toxicity 5 years grade 2−4: genitourinary 14%; gastrointestinal 5.5%.
Survival: Five-year biochemical disease-free survival (BDFS): Group A: 100%, Group B: 95%, Group C: 87%. Five-year clinical disease-free survival (CDFS): Group A: 100%, Group B: 85%, Group C: 91%. Five-year disease-specific survival (DES): Group A: 100%, Group B 100%, Group C: 95%.
Conclusions:
1. The compliance of the treatment has been acceptable in general, with only minor deviations.
2. Acute and late effects have been moderated and according to the literature.
3. Preliminary data BDFS, CDFS and DES are promising.

4063 POSTER

78 Gy prostrate cancer dose escalation programme: dosimetry and acute toxicity

M. Bell[1], D. Lim Joon[1], V. Khoo[2], C. Mantle[1], R. Chee[1], E. Zupan[1], L. Spiteri[1], A. See[1], M. Lim Joon[1], K. Rykers[1]. *[1]Austin Repatriation Cancer Centre, Radiation Oncology, Heidelberg West, Australia; [2]Royal Marsden, Radiation Oncology, London, United Kingdom*

Background: Radiotherapy dose escalation in prostate cancer improves outcome. Precision radiotherapy techniques such as 3D CRT and IMRT that incorporate appropriate target dose and normal tissue dose goals and constraints are required to deliver these higher doses safely. This paper presents the dosimetry and acute toxicity of the prospective 78 Gy dose escalation study at Austin Health.
Material and Methods: The patient cohort includes the first fifty patients treated for localised prostate cancer to a dose of 78 Gy in 2 Gy per fraction at the Austin Health. The cohort consists of mainly locally advanced prostate cancer patients: 5% low risk, 10% intermediate and 85% high-risk patients (NCCN criteria). The mean PSA was 18 (2−83). The majority received 3 months of neoadjuvant and then concurrent hormonal therapy with LHRH agonists. All patients underwent planning with a CT scan co-registered with an MRI unless there was a contraindication for MRI.
Volumes were marked and planned according to the dose goals and limits listed in table 1. We delivered all treatments re using IMRT. Toxicity was scored according to the RTOG acute toxicity grading criteria.

Table 1

Structure		Goal/ Constraint	Mean	Max	Min
PTV1[a]	D99% (Gy)	50	50	66	21
	V > 48 Gy (%)	95	97	100	77
PTV2[b]	D99% (Gy)	>69	70	76	60
	V > 74 Gy (%)	>95	98	100	92
Rectal wall	V > 40 Gy (%)	<60	48	59	41
	V > 50 Gy (%)	<50	35	48	21
	V > 60 Gy (%)	<40	23	35	14
	V > 70 Gy (%)	<25	14	25	6
	V > 75 Gy (%)	<15	6	13	1
	V > 78 Gy (%)	<8	1	6	0
Bladder wall	V > 50 Gy (%)	<50	33	63	28
	V > 70 Gy (%)	<20	20	42	37
Anorectal junction	Mean dose(Gy)	<45	48	58	18
	V > 50 (%)	<65	49	67	10
Urethra	D max (Gy)	<80	80	82	79
Right femur	V > 60 Gy (%)	<10	6.0	20	27
	V > 50 Gy (%)	<50	46	70	0
Left femur	V > 60 Gy (%)	<10	5	16	22
	V > 50 Gy (%)	<50	49	65	0

[a]Prostate and seminal vesicle plus anisotropic margin.
[b]Prostate plus anisotropic margin.

Results: Thirty-six percent of patients had no urinary toxicity and 66% had mild (grade 1&2) toxicity. No patient developed grade 3 urinary toxicity or higher. 68% of patients had no bowel toxicity and 32% had grade 1 or 2 bowel toxicity. No patient developed grade 3 or higher bowel toxicity. The median radiotherapy week of maximum bowel and urinary toxicity was the same at 5 weeks. Over a third of patients experienced no acute toxicity and no patients required treatment at two weeks following radiotherapy.
Conclusion: We have demonstrated that using a protocol employing the above dose constraints we can treat prostate cancer to 78 Gy with minimal toxicity. We will report on further outcomes as the data matures.

Oral presentations (Wed, 26 Sep, 09.00−11.00)
Urology

4500 ORAL

Evidence based guidelines for the follow-up of testicular cancer

N. van As[1], D.C. Gilbert[1], D.P. Dearnaley[1], A. Horwich[1], S. Beesley[2], J. Money-Kyrle[3], D. Bloomfield[4], R.A. Huddart[1]. *[1]Royal Marsden Hospital, Academic Radiotherapy, Sutton, United Kingdom; [2]Kent Cancer Centre, Clinical Oncology, Maidstone, United Kingdom; [3]Royal Surrey County Hospital, Clinical Oncology, Guildford, United Kingdom; [4]Royal Sussex County Hospital, Clinical Oncology, Brighton, United Kingdom*

Introduction: Testicular germ cell tumours are uncommon malignancies (UK lifetime risk 1 in 500 males) [1]. Since the introduction of Platinum based chemotherapy, high cure rates are achieved for all stages of the disease. The European Germ Cell Cancer Consensus Group has provided clear guidelines for the primary treatment of both Seminoma and Non Seminomatous germ cell tumours. There is however no international consensus on how best to follow patients after their initial management. As part of the process of developing guidelines for the SE England testis network we reviewed the available evidence and developed evidence based guidance to best practice.

Aim: To develop evidence based pragmatic, user-friendly follow-up protocols for all scenarios of both Seminomatous and Non-Seminomatous Germ Cell tumours (NSGCT).
Methods: We reviewed the available published literature and our own centre's extensive experience with germ cell tumours, producing follow-up guidelines.
Results: Individualised, pragmatic follow up protocols were produced for Seminoma/NSGCT managed by surveillance chemotherapy or radiotherapy. These encompassed the twin aims of follow-up – detecting relapse and monitoring late side effects of treatment. We developed an Excel program that allows the user to select the treatment scenario and enter the date of diagnosis, then produces an individualised follow up schedule for the patient. The Guidelines will be made available online.
Conclusion: Appropriate follow up must balance the benefit of disease detection against costs to both patient and health cares systems, particularly those resulting from excessive diagnostic imaging. Our protocols provide a pragmatic, easily accessible user-friendly basis for other centres to use or to adapt to suit their needs.

References

[1] Horwich, A., Testicular Tumours, 2nd edition. Oxford Textbook of Oncology, ed. R. Souhami. Vol. 2. 2002, Oxford: Oxford University Press.

4501 ORAL

Long term neurological and peripheral vascular toxicity following chemotherapy treatment of testicular cancer

J. Glendenning[1], A. Norman[2], D.P. Dearnaley[3], A. Horwich[3], C. Parker[3], R.A. Huddart[3]. *[1]Royal Marsden NHS Foundation Trust, Urology, Sutton London, United Kingdom; [2]Royal Marsden NHS Foundation Trust, Computing, Sutton London, United Kingdom; [3]Institute of Cancer Research and Royal Marsden NHS Foundation Trust, Urology, Sutton London, United Kingdom*

Background: Testicular cancer is the commonest cancer of young men. It is curable in the majority of patients but given the long life expectancy of these men the late effects of treatment are an important consideration. We report here a cross sectional study of the long term effects of chemotherapy (C) on neurological function and development of Raynauds phenomena.
Methods: 739 patients treated between 1982 and 1992 gave written consent to enter the study. Patients were classified in two groups according to whether their received C (n = 384) or no C [NC] (n = 355). 67% of C patients received cisplatin based chemotherapy. Patients completed a general health questionnaire and quality-of-life (QoL) form (EORTC QLy-C30 with testicular module) and were assessed in clinic. Raynauds phenomenon (RP) was diagnosed on the basis of description of clear cold-related peripheral discomfort and skin colour change. Neurological examination, including peripheral nerve function testing for light touch, vibration sense (using a 128 MHz tuning fork) was performed. 577 patients underwent audiometry with hearing thresholds in each ear measured at 1000, 2000, 4000 and 8000 Hz. Patients were asked about the presence of tinnitus. On QoL a score of 3 or 4 ('quite a bit' or 'a lot') were considered significant.
Results: On physician assessment; peripheral neuropathy (PN) (C 21.7%, NC 9.1%, $p < 0.001$) and RP (C 20.3%, NC 1.7%, $p < 0.001$) were more common after chemotherapy. Similar results were obtained from QoL scores (score 3−4 PN C 12.5%, NC 5.5%, $p = -0.002$; RP C 9.7%, NC 3.6%, $p < 0.001$). The doses of cisplatin and vinca alkaloids was higher in those with both PN and RP. On regression analysis (RA), cisplatin dose and age were significant predictors for PN and cisplatin dose alone was predictor for RP. For hearing statistically significant differences in thresholds was only noted at 8000 Hz [median (IQR) threshold (dB) C 30 (17.5−52.5), NC 25 (15−38.7), $p < 0.01$) and was related on RA to age, cisplatin and vincristine dose. Subjective toxicity was present in a small proportion of patients and was not statistically different between groups (hearing difficulty C 6.5%, NC 3.4%, $p = 0.06$; Tinnitus C 7.7%, NC 4.9%, $p = 0.14$).
Conclusions: On long term follow up PN and RP remain detectable in about 20% and significantly symptomatic in about 10% of patients. Detectable effect on high frequency thresholds are also present but only cause significant problems to patients in a small proportion. These effects are persistent and related to dose of cisplatin +/− vinca alkaloids.