registration with the radiotherapy planning CT in the first patient, and with reference to bony anatomical landmarks in the second. A radiotherapy boost dose was then delivered to the sites of lymphatic involvement using an IMRT technique. Fig 1c shows the radiotherapy dose distribution for the first patient at the level of the involved lymph node in the left obturator region.

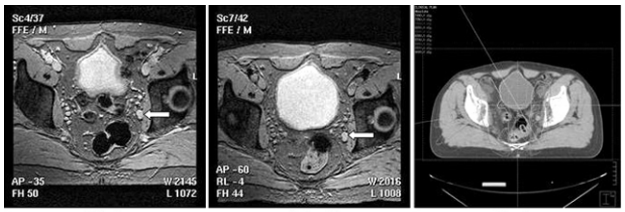


Fig 1a Fig 1b Fig 1c

Fig. 1

**Discussion:** MR scanning pre and post ferumoxtran at the time of the radiotherapy planning scan can provide clarification of pelvic lymph node status in patients with suspicious radiological findings at presentation. Such MRI images can be co-registered with the planning CT in order to achieve more precise target definition.

**1382** POSTER

**Validation of perfusion computed tomography (CT) parameters as surrogate markers of hypoxia in squamous cell carcinoma of the head and neck**

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**Background:** Hypoxia is a determinant of radiation responsiveness and correlates with outcome in squamous cell carcinoma of the head and neck (HNSCC). A non-invasive method for identifying areas of reduced oxygenation within tumours may enable radiotherapy planning and delivery to be individually optimised.
**Aim:** To validate perfusion CT parameters as surrogate markers of hypoxia in HNSCC. These parameters were compared to pimonidazole hydrochloride, an extrinsic marker of hypoxia.
**Methods:** 48 measurements of perfusion CT parameters from 12 regions of interest (ROIs) were made in 5 patients with HNSCC prior to surgical resection. All scans were performed on a GE Lightspeed 16® scanner. The CT protocol includes a cine perfusion sequence with a rotation time of 1 sec, total acquisition time of 50 secs, using 80 kV and 100 mAs. Intravenous contrast agent, iohexol 300 was injected at a dose of 0.5 ml/kg at 4 ml/sec. Perfusion CT parameters are analyzed using GE CT Perfusion 3® software which yields parameter maps of tissue blood volume, BV(ml/100 g); blood flow, BF (ml.100 $g^{-1}min^{-1}$); mean transit time, MTT(s) and microvascular permeability surface area product, PS (ml.100 $g^{-1}min^{-1}$). 0.5 g/$m^2$ pimonidazole hydrochloride was administered intravenously 16–20 hours before surgery. At resection the tumour was orientated such that the pathological specimen was sectioned in the image plane. The pimonidazole uptake was identified by immunohistochemistry. A histological section within the tumour was matched to the corresponding image slice and corresponding ROIs drawn on both the image slice and the section. The percentage of pimonidazole staining within the ROIs defined the hypoxic fraction. Correlations between the perfusion CT parameters and the hypoxic fraction were assessed using the Spearman rank correlation coefficient (Rs).
**Results:** see table 1

| | BF | | BV | | MTT | | PS | |
|---|---|---|---|---|---|---|---|---|
| Min | Mean | Min | Mean | Max | Mean | Max | Mean | |
| Rs | 0.726 | 0.389 | 0.583 | 0.483 | −0.431 | −0.431 | −0.536 | 0.35 |
| 95%CI | 0.242 to 0.92 | −0.256 to 0.794 | −0.005 to 0.872 | −0.144 to 0.834 | −0.812 to 0.209 | −0.812 to 0.209 | −0.854 to 0.075 | −0.298 to 0.777 |
| P | **0.01** | 0.23 | **0.05** | 0.12 | 0.18 | 0.18 | 0.08 | 0.29 |

**Conclusion:** These preliminary results suggest that selective parameters derived from perfusion CT may be of use as surrogate markers of hypoxia in HNSCC. Such a non-invasive, spatial mapping of intratumoural hypoxia may enable targeted radiation dose escalation to radioresistant clonogens with the potential for improved local control and survival in this group of patients.

**1383** POSTER

**Dosimetric parameters on the development of radiation pneumonitis – the significance of topographic dose distribution**

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**Background:** A variety of different dose-volume histogram (DVH) parameters have been reported to be correlated to the incidence of radiation pneumonitis (RP). But these DVH parameters do not take topographic dose distribution of lung into account. We tried to reveal the correlation of incidence of RP and the topographic dose distribution of lung including other known several DVH and clinical parameters.
**Material and methods:** From July 2000 to October 2004, of patients irradiated for small and non-small cell lung cancer, 63 patients who received more than 50 Gy and were followed-up for more than 6 months were analyzed for RP according to National Cancer Institute Common Toxicity Criteria. There were 46 males and 17 females and median age was 70 years (35~91 years). ECOG performance score was PS 0–1 in 29 and 2 or more in 34 patients. Most patients were stage III (I-II 4, IIIa 13 and IIIb 46). Prior to radiation therapy, five patiens received open thoracotomy without lung resection and 25 patients received induction chemotherapy. Concurrent chemotherapy was given to 23 patients during the radiation therapy. After acquisition of planning CT, 3D planning and dosimetric calculations were done with Pinnacle[3]® (Philips, USA). Total dose ranged from 50.0–70.2 Gy (median 63.0) with conventional fraction size (1.8–2.0 Gy). Analyzed parameters included clinical (age, gender, performance status, Stage, FEV1, open thoracotomy and induction or concurrent chemotherapy) and DVH (mean lung dose (MLD), V20 and V30) parameters. After dividing the normal lung volume into total (TL), involved lateral (IL), upper (UL) and lower (LL) (with equal volume), topographic distribution of DVH parameters were also analyzed.
**Result:** Median follow-up period was 13 months (6–52 months). Grade 2 or higher RP developed in 17 patients (27%). Median time to development of Grade 2 or higher RP was 3 months (2~14 months). Induction chemotherapy reduced the incidence of RP ($p = 0.0258$). Other clinical parameters did not influence on the incidence of RP. Total prescribed dose did not influence on the RP incidence ($p = 0.3852$). DVH parameters of upper half lung (MLD_UL, V20_UL and V30_UL) were not significant. On the other hand, although the mean value of MLD_LL was lower than that of MLD_UL (7.3 Gy vs 21.1 Gy, $p = 0.000$), parameters of lower half lung were all significant ($p = 0.0166$ for MLD_LL, 0.0027 for V20_LL and 0.0164 for V30_LL). MLD_TL also showed statistical significance ($p = 0.0206$), but other parameters of involved lateral and both lung did not show consistency.
**Conclusions:** Lower half lung seemed to be more sensitive to radiation pneumonitis. This topographic difference of the vulnerability to radiation pnuemonitis should be taken into account at the time of radiation therapy planning and biological response modeling.

**1384** POSTER

**Interclinican variability in delineation of tumour volumes for glioblastomas with the assistance of MRI fusion**

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**Background:** The aim of this study is to assess the intra- and interclinician variability in contouring target volumes of glioblastomas in the post-operative setting with and without the assistance of pre-operative MRI fusion.
**Methods and materials:** 8 clinicians participated in the study (including a radiologist) and were asked to contour tumour volumes on 2 randomly selected patients with typical glioblastomas. Both patients underwent pre-operative imaging with an MRI, followed by debulking surgery. Planning CTs were then performed post-operatively. Clinicians were asked to contour gross tumour volumes (GTVs) on the planning CT (GTV-CT), using the pre-operative MRI films as a guide to the tumour bed. This process was then repeated with on a fused CT-MRI image. Clinicians expanded the fused GTV (GTV-MRI) a planning target volume (PTV) using the EORTC guidelines (2–3cm margin). Variability was analysed in terms of total volume and position (by comparing the centre of the volumes (COV) in the x, y and z planes and by the amount of non-overlap (residual volumes) between the volumes).
**Results:** There was a significantly lower inter-clinician variability in the GTV-MRI volumes compared with the GTV-CT in cubic centimetres (standard deviation of 35 and 14 respectively, $p = 0.002$). Expansion to a PTV from the GTV-MRI resulted in an increase in the variability of the volumes (standard deviation = 22). The location of the COV of the GTV-MRI was less variable than the COV of the GTV-CT in 3 planes. The average spread of the COV in the x-, y-, and z-planes for both patients in cm was 0.93, 1, and 1.2 for the GTV-CT and 0.36, 0.25 and 0.6 for the GTV-MRI. The residual volumes in comparing the GTV-CT and GTV-MRI expressed