to assess any differences in these anatomical sub-regions. The spatial relationship was analyzed with respect to points of interest placed at the extreme margins boundaries of the two GTVs i.e. superior, inferior, anterior and posterior. The difference in cm between the CT-GTV and M-GTV points of interest co-ordinates was calculated to quantify the spatial differences.
Results: The mean overall CT-GTV/M-GTV volume ratio for the entire tumor was 1.2 (range 0.5 to 2.9). For the portion of GTV in the true rectum the mean ratio was 1.3 (0.8–2.9) and recto-sigmoid was 1.6 (0.4–4.6). Only one patient had a portion of GTV present in the anus and this was only visible on MRI. With respect to the spatial comparison, the CT-GTV minus M-GTV values showed a mean difference for the superior margin of 0.19 cm (range −2.0 to 4.0 cm), for the inferior margin 0.49 cm (range −3.0 to 4.0 cm), for the anterior margin −0.35 cm (−5.7 to 1.95 cm) and for the posterior margin −0.15 cm (−0.93 to 0.77 cm). Underestimation of the GTV by CT compared to the M-GTV occurred in two patients and was highlighted by volume differences in the sigmoid and with the spatial differences in the anterior and superior boundaries. Overestimation of the GTV by CT could occur in the true rectum or sigmoid and is usually due to faeces in close proximity to the tumor.
Conclusions: CT defined target volumes can provide a reasonable estimate of the GTV compared to MRI but in some cases there is substantial over- and under-estimation of the GTV. Overestimation by CT results primarily from faeces in close proximity to the tumor. Underestimation and potential geographic miss using CT results from difficulty in visualizing the extent of tumor invasion within the sigmoid colon and anus. The use of MRI may avoid these potential problems.

1412 POSTER

Interfractional lung tumour and oesophageal movement using Active Breathing Control (ABC) during fractionated radical radiotherapy (RT)

N. Panakis[1], R. Mendes[1], H. McNair[2], C. Knowles[2], R. Symonds-Tayler[3], J. Bedford[3], S. Ashley[4], M. Brada[1]. [1]*The Institute of Cancer Research, Academic Department of Radiotherapy, Sutton, United Kingdom;* [2]*The Royal Marsden NHS Foundation Trust, Department of Radiotherapy, Sutton, United Kingdom;* [3]*The Institute of Cancer Research, Joint Department of Physics, Sutton, United Kingdom;* [4]*The Royal Marsden NHS Foundation Trust, Department of Information and Computing, Sutton, United Kingdom*

Introduction: Concomitant chemo-radiation appears to result in a survival advantage in patients with Non-Small Cell Lung Cancer (NSCLC) compared to sequential therapy, at the expense of increased radiation-induced pulmonary and oesophageal toxicity. RT planning takes into account tumour movement by adding a margin to the Gross Tumour Volume (GTV) called the Planning Target Volume (PTV). We aimed to immobilise the tumour with ABC to consider PTV margin reduction and assess the extent of oesophageal movement on radiation dose delivered to the oesophagus before introducing techniques to avoid it.
Method: 16 NSCLC patients had CT scans using an ABC device (William Beaumont Hospital, USA) in the first, middle and final week of RT. CT images were registered using bony anatomy. Change in the GTV with treatment was recorded. The GTV centre of mass was defined by the planning system using a spherical method. In 7 patients, the oesophagus was contoured and the position of the oesophageal borders relative to fixed bony anatomy was measured at 4 cm intervals. Displacement of the GTV centre of mass and oesophageal borders relative to the first scan provides a measure of movement.
Results: 12/16 (75%) of patients tolerated ABC for 3 scans. 4 were excluded from the analysis (2 progressed, 2 did not tolerate ABC). Mean reduction in the GTV was 34% by the 3rd CT. Mean displacement and standard deviation (SD) of the GTV and oesophagus is shown in the table. Results quoted are in relation to the first scan.

Direction of displacement	Mean displacement and Standard Deviation (SD) in mm		
	Right–left	Anterior–posterior	Superior–inferior
GTV scan 2	1.4 (1.7)	1.6 (1.8)	1.7 (1.6)
GTV scan 3	1.2 (0.6)	1.7 (1.4)	2.9 (2.4)
Oesophagus scan 2	Right 2.4 (3.2)	Anterior 2.1 (2.7)	–
	Left 2.1 (2.7)	Posterior 2.1 (2.7)	–
Oesophagus scan 3	Right 1.8 (2.8)	Anterior 1.9 (2.6)	–
	Left 2.1 (2.8)	Posterior 1.7 (2.1)	–

GTV displacement was greatest in the superior-inferior direction for the 3rd scan as 2 patients had resolution of collapse distal to the GTV causing a shift in position up to 7.7 mm in this direction. Oesophageal movement varied along its length, more marked at the level of the carina and gastro-oesophageal junction and less marked at the thoracic inlet. The mean SD of oesophageal displacement over all levels was 1.6 mm.
Conclusion: ABC was well tolerated at 3 time points during RT. Incorporation of movement of the GTV and oesophagus with ABC into standard margin calculations may allow reduction of dose to the lung and oesophagus reducing the risk of radiation-induced toxicity.

1413 POSTER

Normal tissue radiation sensitivity in cancer patients undergoing radiotherapy

G. Safrany[1], E. Kis[1], G. Bognar[1], K. Lumniczky[1], O. Esik[2]. [1]*NCPH – National Research Institute for Radiobiolog, Molecular and Tumor Radiobiology, Budapest, Hungary;* [2]*Pecs University of Sciences, Department of Oncotherapy, Pecs, Hungary*

Background: Very serious radiation-induced side effects will develop in about 5–10% of cancer patients undergoing radiation therapy. The aim of our experiments is to establish screening methods to identify radiation sensitive patients before the onset of radiation therapy.
Material and methods: Blood samples and skin biopsies were taken from cancer patients undergoing radiation therapy. The in vitro radiation sensitivity of peripheral blood lymphocytes was studied by single-cell electrophoresis (comet) and micronucleus assays. Primary fibroblast cultures were established from skin biopsies and the radiation sensitivity of fibroblasts was investigated by comet assay and by determining the survival fraction after 2 Gy irradiation (SF2 value). The in vitro data were correlated to the clinical symptoms of the patients. The gene expression patterns of radiation sensitive and resistant patients were studied by Agilent's whole human genome micro array system containing 44000 human genes.
Results: The comet and micronucleus assays were not informative. The SF2 values of control patients ranged between 26–40%. The SF2 values of patients with radiation-induced late toxic reactions in the central nervous system moved toward lower ranges and peaked between 8–15%. Similar alterations have been observed in patients with early and late radiation-induced toxic reactions in the skin and mucosa. There the SF2 values peaked between 15–20%. The gene expression analysis revealed genes responsible for radiation response in human fibroblasts and different expression patterns were detected in radiation sensitive and resistant patients.
Conclusions: In vitro assay might be applied to estimate the radiation sensitivity of cancer patients before the start of radiation therapy. This might be used for the individualization of radiotherapy protocols.

1414 POSTER

Induction of fluoropyrimidine metabolizing enzymes after an exposure of a cancer cell to an ionizing radiation – a concept supporting continuous schedules of chemoradiotherapy

P. Vitek[1], O. Taltynov[2], P. Hozák[2], J. Rosina[3], J. Zamecnik[1]. [1]*Institute of Radiation Oncology, Univ. Hospital Na Bulovce, Prague, Czech Republic;* [2]*Institute of Experimental Medicine, Czech Academy of Science, Prague, Czech Republic;* [3]*Institute of Biophysics, 3rd Medical Faculty Charles University, Prague, Czech Republic*

Background: Chemoradiotherapy employing fluorinated pyrimidines is a standard treatment approach although the exact mechanism of mutual potentiation has not been fully clarified. The original concept of an induction of fluoropyrimidine anabolizing enzymes within a post-radiation reaction was introduced in early 90th years. With the aim to establish a time dependence between a radiation dose (fraction) and maximal fluoropyrimidine efficacy a series of experiments was performed assessing the development of both the transcripts and proteins of fluoropyrimidine metabolizing enzymes after a single dose of radiation.
Material and methods: HeLa cells were irradiated by a dose of 200 cGy followed by an array of assessments mRNA encoding thymidine phosphorylase (TP), thymidine kinase (TK), thymidine synthetase (TS) and dihydropyrimidine dehydrogenase (DPD). A real time PCR method was employed using beta-actin (BA) as a reference gene. When mRNA induction was proved, an array of TP, TK, TS and DPD assessments was planned accordingly. A Western blot analysis was performed using specific commercially available antibodies. The time intervals between radiation and onset of increased enzyme concentration were established.
Results: The TP, TS and DPD mRNA levels decrease early after the radiation. A strong increase follows from the 5th hour after the radiation. There is a short early increase of TK mRNA 10 minutes after the radiation, however 5 hrs. later the development is similar to other enzymes. The mRNA levels increase 2–6 fold. The protein levels of TP, TS and DPD