Purpose/Objective: Radiotherapy quality assurance (RTQA) is now a requirement of radiotherapy clinical trials since poor protocol compliance has been shown to impact on outcomes. We aim to determine the degree of variation in lung cancer target volume delineation using pre-accrual benchmark cases.

Materials and Methods: The IDEAL-CRT trial which is investigating isotox dose escalation and acceleration in lung cancer chemoradiotherapy requires all prospective principal investigators to submit pre-accural contouring benchmark cases. The cases are assessed for protocol compliance and if necessary clinicians are asked to resubmit their contours following amendment. We collected all of the benchmark cases that had been submitted by June 2012 by prospective trial centre principal investigators in DICOM format. Each exercise was analysed using a tumour management group (TMG) consensus contour and Dice coefficient (DCC), Jaccard index (JI) and geographical miss index (GMI) was calculated for each individual structure. The data was pre-processed to ensure uniform structure nomenclature and then analysed using automated trial analysis tools built using MATLAB R2011a and CERR v.4.0.

Results: Up until May 2012 11 clinicians had submitted a total of 21 benchmark cases; 11 for contouring case 1 and 10 for contouring case 2. In total approximately 160 individual structure contours were analysed. Structures analysed included GTV, CTV, PTV, spinal cord (SC), right lung (RL), left lung (LL), heart and oesophagus. All conformity indexes showed varying levels of conformity in clinician contouring. For IDEAL-CRT case 1 the median JI for the SC was 0.40 (Interquartile Range (IQR) 0.04), the heart 0.90 (IQR 0.05), the GTV 0.65 (IQR 0.16) and the oesophagus 0.41 (IQR 0.08). For IDEAL-CRT case 2 the median JI for the SC was 0.46 (IQR 0.06), the heart 0.87 (IQR 0.04), the GTV 0.77 (IQR 0.07) and the oesophagus 0.48 (IQR 0.07).

Conclusions: Our results show that clinician target volume conformity varies significantly within the IDEAL-CRT trial. Our results also suggest that the degree of variation depends upon the target structures shape and complexity. Prospective individual case review for the first 1-3 cases is standard for this trial.

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Functional imaging plus CT: Is it useful for radiotherapy planning in patients with NSCLC?

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Purpose/Objective: To determine role of single photon emission tomography (SPECT) with 99mTc-MIBI and computerized tomography (CT) in selection of patients with non small cell lung cancer (NSCLC) for radiation therapy.

Materials and Methods: SPECT with 99mTc-MIBI was performed after conventional staging in 84 NSCLC patients. Acquisition was started 15 min after 1/2 injection of 740 MBq of 99mTc-MIBI. SPECT images of the chest were acquired over 360° using the following parameters: a 64 - 64 word matrix, a 3° angular step, and 30 s/frame. Diagnostic results of SPECT and conventional CT staging were validated by histological examinations of operation material. Various diagnostic strategies were tested as a tools for noninvasive staging of NSCLC and subsequent guidance of radiotherapy strategy.

Results: According to histological verification 35 of 84 evaluated patients had lymph node (LN) invasion by NSCLC. Sensitivity (Sen), specificity (Sp) and accuracy (Ac) of SPECT in diagnosis of LN invasion by NSCLC were as follows: 80%, 67%, 72%. Diagnostic accuracy of CT for detection of LN involvement was inferior to SPECT: Sen - 70%, Sp - 63%, Ac - 66%. Only combination of SPECT and CT data offer important diagnostic solution. If LN involvement was detected by at least one of these methods Sen reached 94% with corresponded Sp -52%, Ac - 70%. This strategy was 88% sensitive for diagnosis of N2 LN invasion. It means that patients with normal SPECT and CT are suitable for curative radiosurgery without additional invasive staging procedures.

Conclusions: In patients without pneumonia or atelectasis and SPECT plus CT signs of LN invasion Sp reached 97%, N2 invasion was also detected with high Sp (88%). Patients from this group are candidates for palliative radiotherapy.