69% had co-morbidity and 20% had chronic lung disease. FEV_1 range was 0.84−4.1 L. 36% had weight loss prior RT. 33% were current smokers.
Results: A total of 47 (46.6%) had radiological changes only (CTC grade 1) while 18 patients (17.5%) presented neither clinical nor radiological signs of PR. Mild RP was observed in 21 patients (20.4%) and moderate to severe RP was observed in 16 patients (15.5%) including one death due to RP. Radiological changes were observed in 76 patients, in 59 patients these CT changes were confined to radiation field, while17 patients had out-of-field RP. Median time from RT start to the onset of symptoms was 4.5 months (CI 95% 4.2−4.9). All the severe RP incidents occurred in the first 6 months and 50% of patients with severe RP symptoms were dead at 6 months. The median OS of this group was 12 months, which was significantly lower then OS for patients with no/mild/moderate RP symptoms (21 months) ($p = 0.004$). Median overall survival for the whole group was 18 months (CI 95% 13−23). Among dosimetric factors, mean lung dose was significantly associated with the incidence of severe RP ($p = 0.03$ Fisher's exact test). Clinical factors, such as weight loss, co-morbidity and lung dysfunction did not show the significant association, but the trend was towards severe RP.
Conclusion: Severe RP is a significant side effect of curative RT and in some cases it can be potentially lethal. The incidence of severe RP in our study is similar to other published data. The mortality rate of NSCLC patients with severe RP is extremely high. Further studies on methods to reduce the lung toxicity are need.

9047 POSTER

Stage IIIa and IIIb NSCLC Treated With Sequential Chemo-radiotherapy Using Helical Tomotherapy

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Background: Despite of concomitant chemo-radiotherapy is considered the standard of care of locally advanced NSCLC, a large part of patients with IIIa-IIIb NSCLC at the time of diagnosis is not suitable of combined modality treatment. Aim of this study is to investigate the impact of Helical Tomotherapy in the sequential radiation treatment of locally advanced NSCLC.
Materials and Methods: At the Department of Radiation Oncology of S.Camillo-Forlanini Hospital, 30 consecutive patients with diagnosis of stage IIIA or IIIB NSCLC were treated with Helical Tomotherapy. Induction chemotherapy with a platinum-containing doublet or triplet was administered before radiotherapy for at least three cycles in all patients. After the chemotherapy a FDG-PET-TC was performed, in order to stage the disease and to define CTV in planning radiation treatment. The treatment was performed using the TomoTherapy HiArt II system (Tomotherapy Inc., Madison, WI) a new modality of combined image-guided and Intensity-Modulated Radiation Therapy. Mean radiation prescription to the PTV dose ranged from 64.5 to 68.4 Gy in 30 fractions with 2.15–2.28 Gy per fraction.
Results: Median follow-up was 10 months (range 6−20). Toxicity was evaluated using EORTC/RTOG scoring system: 21 patients experienced G1 and 7 G2 acute oesophagitis; 2 patients experienced G2 pneumonitis treated with pharmacological therapy. At the first follow-up, only one patient presented distant relapse (brain metastases); 15 patients presented stable disease, 12 partial and 2 complete response. Six months after the end of radiotherapy, 8 patients had complete local response, 13 stable disease and 8 local progression or metastatic disease.
Conclusions: Highly conformal radiotherapy techniques, such as Helical Tomotherapy, will be necessary to achieve significant dose-per-fraction escalation without morbidity. Attempts have been made to increase local control increasing total radiation dose.
Helical Tomotherapy allows to obtain good local control of disease with low toxicity in the treatment of locally advanced NSCLC.

9048 POSTER

Intratumoral Rapid Arc Boost Using PET/CT Delineation in Non-small Cell Lung Cancer

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Purpose: Lung tumours with high fluoro-deoxy glucose (FDG) uptake on PET/CT scans tend to have a more aggressive clinical course than those with a low metabolic rate and therefore may benefit from dose-escalation. The goal of this study was to assess the feasibility of delivering an intratumoral boost to a PET/CT-defined high SUV region using Rapid Arc (RA).
Materials and Methods: RA plans were created for 10 computer tomography (CT) data sets from patients previously treated with 3D-conformal radiotherapy (3D-CRT) for stage III non-small cell lung cancer to a dose of 60 Gy/30 fractions. Using PET/CT fusion with the CT data sets, a gross tumour volume boost (GTV_{boost}) was outlined based on 50% of the maximum standardized uptake value (SUV 50%max), while gross tumour volume (GTV) was defined as tumour volume with SUV $\geqslant$2.5. Planning tumour volume (PTV) was generated with GTV + 1 to 1.5 cm margin. The PTV was planned to receive 60 Gy/30 fractions and a simultaneous boost of 66 Gy-70 Gy/30 fractions was given to the GTV_{boost} with organs at risks (lungs, esophagus, spinal cord, heart, and brachial plexus) limited by the QUANTEC guidelines. The parameters evaluated included the doses to organs at risk and tumour volume parameters.
Results: RA technique was able to meet the assigned dose constraints to normal critical structures, while boosting the GTV_{boost} to >66 Gy. Average of the maximal SUV was 14.7 (4.6–19.9). The ratio of the GTV_{boost}/GTV was 26.6% (12.7–51.1%). The average mean dose to the PTV (volume excluding the GTV_{boost}) was 61.4 Gy (60.0–62.9 Gy) and to the GTV_{boost} was 68.7 Gy (67.2–71.1 Gy). The average V_{20} for the lungs was 22.1% (17.7–28.9%) and mean lung dose was 14.1 Gy (11.2–16.8 Gy). Mean doses to the esophagus and heart were 25.9 Gy (14.9–32.7 Gy) and 7.7 Gy (1.3–22.3 Gy), respectively. Maximal doses to the brachial plexus and spinal cord were 39.8 Gy (2.2–66.0 Gy) and 41.4 Gy (20.6–48.6 Gy), respectively.
Conclusion: The use of RA with intratumoral boost based on high FDG uptake is a feasible technique. It achieves a higher tumour dose while respecting the QUANTEC dose guidelines. Future analysis will examine tumour control probability and equivalent uniform doses.

9049 POSTER

Patterns of First Failure After Concurrent Chemoradiotherapy With Accelerated Hyperfractionation for Limited-stage Small Cell Lung Cancer

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Background: To retrospectively evaluate the patterns of first failure after concurrent-chemoradiotherapy (C-CRT) with accelerated hyperfractionation (AHF) for limited-stage small cell lung cancer (LS-SCLC).
Materials and Methods: Patients with LS-SCLC diagnosed between January 2006 and May 2010 at our institution were retrospectively recruited from our database. C-CRT consisted of 4 cycles of cisplatin/etoposide repeated every 4 weeks, with 30 fractions of twice daily radiotherapy of 45 Gy. Up to 30 Gy, radiotherapy was delivered to the primary tumour, metastatic lymph nodes and regional lymph nodes as elective nodal irradiation (ENI) except supraclavicular region. A booster dose of 15 Gy was delivered to the primary tumour and metastatic lymph nodes. To patients who responded to C-CRT, prophylactic cranial irradiation (PCI) of 25 Gy in 10fractions was performed. We assessed the patterns of first failure after CRT. First failure sites were detected by radiological imaging and classified into 4 categories; A: primary tumour and/or metastatic lymph nodes, B: regional lymph nodes within ENI field, C: supraclavicular region, D: distant metastases.
Results: 49 patients were included in this analysis. Their characteristics were as follows: median age, 69 years; male/female, 39/10; T1/T2/T3/T4, 19/20/0/10; N0/N1/N2/N3, 0/11/33/5. The median follow-up period for the surviving patients was 18.6 months. Complete response or partial response was achieved in 48 patients and only 1 patient had progressive disease. PCI was delivered to 35 patients. At the last follow-up, 17 patients achieved progression-free survival. The median progression-free and overall survivals were 11 months and 26 months, respectively. First failure sites among the remaining 32patients are shown in Table 1.
Conclusion: In our analysis, a most frequent first failure site was category D:distant metastases and there was no incidence of first failure in category B: regional lymph nodes within ENI field. This analysis suggests that reduction of distant metastasis may be one of the ways to improve survival. Reduction of local recurrence and necessity of ENI to improve survival is controversial.

Table 1. Patterns of first failure

Category	Patients
Progression-free	**17/49**
First failure	**32/49**
A: primary tumour and/or metastatic lymph nodes	11/32 (34%)
with distant metastases	8/11
B: regional lymph nodes within ENI field	0/32 (0%)
C: supraclavicular lymph nodes	2/32 (6%)
with distant metastases	1/2
D: distant metastases	28/32 (87%)