

other than those reported in literature about SBRT and SBRS on abdominal area.

EP-1207

Can DIBH technique be used for SABR of large and mobile tumors of lung and liver? A clinical study

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Purpose or Objective: To assess clinical feasibility, local control and toxicity of deep inspiratory breath hold (DIBH) technique for delivery of SABR for large and mobile tumors of lung and liver.

Material and Methods: All patients suitable to undergo SABR, underwent respiratory training consisting of DIBH on demand for 15-25 seconds at a time. Patients underwent 2 sets of immobilization and imaging, one in DIBH phase and other in free breathing (FB) phase. Respiratory monitoring was performed using Varian RPM system and a 4mm gating threshold window was allowed. Set-up verification was performed using KV imaging and gated cone beam CT both taken in DIBH. All patients were planned with 2-4 arc VMAT using 6MV flattening filter free (FFF) photon beams to a dose of 60Gy in 5 fractions.

Results: 12 patients of lung tumors and 9 patients of liver tumors were treated with DIBH based SABR. In patients with lung tumors, DIBH resulted in 1.53 times higher mean lung volumes (3937 cc vs. 2576 cc, $p=0.003$). Compared to ITV based contours, PTV volumes were 1.48 times smaller for lung and 1.38 times smaller for liver tumors in DIBH CT compared to FB CT (36.15 cc vs. 53.83 cc, $p=0.002$, 57.76cc vs. 79.78, $p=0.03$). All the plans accepted for delivery met the standard criteria (ROSEL for lung and RTOG 1112 for liver) for both target and OAR constraints. On an average, V20 was reduced by 30%(18-38) in DIBH plans compared to FB plans. Time taken to deliver each session in DIBH phase with FFF beams was longer by an average of 2 minutes due to interruptions (maximum 4 interruptions/arc each lasting <10 seconds). Mean setup errors in cm quantified on CBCT were 0.1, 0.2 and 0.1 in vertical, longitudinal and lateral dimensions respectively and a uniform margin (based on Van Herk's formula) of 4mm appears to be safe. Except for 1 patient with symptomatic grade 2 pneumonitis and 1 patient with grade 2 chest wall pain, none had any major toxicities. With a median follow-up of 16 months, 18 month local control was 95%.

Conclusion: DIBH based SABR is clinically feasible and effective and should be considered standard for treating mobile and especially large tumors of lung and liver provided patient is suitable for treatment with DIBH technique. DIBH-CBCT based verification appears to be reproducible and effective to reduce setup errors. A margin of 4 mm appears to be safe in DIBH setting with 4 mm gating threshold window. Despite minimal increase in treatment time, DIBH is an effective way to deliver high throughput high quality SABR.

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Radiation-induced pulmonary function change after postoperative radiotherapy in NSCLC

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Purpose or Objective: We aimed to establish the model predicting radiation-induced pulmonary function change after postoperative radiotherapy (PORT) in non-small cell lung cancer (NSCLC).

Material and Methods: From March 2003 to December 2011, 37 patients with NSCLC who underwent PORT were analyzed.

All patients took the forced expiratory volume in 1 second (FEV1) at the beginning of PORT and follow-up FEV1 within 6-36 months after the completion of PORT. We calculated mean lung dose (MLD) as a dosimetric parameter of the lung. Simple linear correlation and regression model were implemented to establish the prediction model between MLD and radiation-induced pulmonary function change.

Results: The median absolute value of FEV1 at the beginning of PORT, and follow-up FEV1 were 1.76 L (range, 0.90-3.05), and 1.66 L (range, 0.93-3.08), respectively. Radiation-induced pulmonary function change (follow-up FEV1 minus FEV1 at beginning of PORT) ranged from -0.71 to 0.40 L (median, 0.06). The median MLD of PORT was 12.3 Gy (range, 0.5-20.4). Radiation-induced FEV1 change and MLD showed statistically significant correlation (correlation coefficient = -0.357, $p = 0.030$). PORT-induced FEV1 change could be predicted by simple linear regression model [FEV1 change (L) = 0.295 - 0.026 MLD (Gy)].

Conclusion: Radiation-induced FEV1 change was significantly correlated with MLD in patients with NSCLC who underwent surgery followed by PORT. Follow-up FEV1 after the completion of PORT can be predicted by simple linear regression model using this correlation.

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WBRT plus SRT versus WBRT alone or SRT alone for brain metastases from non-small cell lung cancer

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Purpose or Objective: The benefits of addition of whole brain radiotherapy (WBRT) to stereotactic radiotherapy (SRT) with respect to overall survival of patients with brain metastases from non-small cell lung cancer (NSCLC) are unclear. Most of the published studies addressing this issue recruited the patients with diverse histology and primary sites, with only few focusing on NSCLC. We addressed this issue by evaluating institutional experience in efficacy of SRT plus WBRT vs. SRT alone or WBRT alone in patients with NSCLC.

Material and Methods: The analysis encompassed 143 patients with brain metastases from NSCLC, including 65 with squamous-cell cancer (45.5%), 53 adenocarcinoma (37.1%), 25 NOS (17.4%). SRT alone was used in 52 patients (36.4%), WBRT alone in 33 patients (23.1%) and WBRT plus SRT in 58 patients (40.5%). Two chief subgroups were considered: those with 1-3 brain metastases (121 patients, 84.6%) and those with >3 metastases (22 patients, 15.4%). WBRT doses ranged from 20-30 Gy in 3.0-4.0 Gy per fraction, SBRT was given in 1-6 fractions (median 1 fraction) of 6-22 Gy (median 15 Gy).

Results: 1-year actuarial overall survival was 8%, 6% and 27% for SRT, WBRT and SRT+WBRT respectively. The difference in overall survival among 143 patients treated with SRS+WBRT vs. SRS or WBRT was highly significant ($p<0.0001$). The difference in overall survival between SRS+WBRT vs. SRS or WBRT was also apparent in a subgroup of patients with 1-3 metastases (1-year OS of 9%, 0% and 26%, respectively). By contrast, the differences in OS according to treatment were not significant among the patients with >3 metastases. A multivariate analysis showed that out of several variables considered only WBRT alone or SRT alone (HR=1.85, $p=0.001$) and age over 70 years (HR=2.08, $p=0.005$) were associated with unfavorable survival.

Conclusion: Although conclusions from this study are limited by nonrandomized selection of the treatment schedule and some heterogeneity in prescription practice the data presented suggest that combination of WBRT and SRT vs. WBRT alone or SRT alone result in considerably improved