prescribed dose (V107) of PTV ($p < 0.001$), and significant gain in the homogeneity index of PTV ($p < 0.001$). The mean dose of the thyroid, submandibular gland, and carotid artery were all significantly lower for the FIF technique than wedge technique ($p < 0.001$), as was the maximum dose of the spinal cord ($p < 0.001$). The MU was lower for the FIF technique ($p < 0.001$).

Comparison of DVH parameters and MU between the FIF technique and wedge technique (mean ± standard deviation)

		FIF	Wedge	*P* value
PTV	V95 (%)	85.81 ± 9.10	85.95 ± 8.41	0.758
	V107 (%)	1.06 ± 2.76	10.55 ± 11.07	<0.001
	Dmax (Gy)	32.43 ± 0.74	33.11 ± 0.78	<0.001
	HI (%)	84.87 ± 9.37	76.50 ± 10.76	<0.001
Thyroid	Dmean (Gy)	28.80 ± 1.57	30.52 ± 4.42	<0.001
SG	Dmean (Gy)	28.88 ± 1.55	29.38 + 1.54	<0.001
CA	Dmean (Gy)	29.26 ± 1.77	29.68 + 1.80	<0.001
Spinal cord	Dmax (Gy)	30.83 ± 0.93	31.70 ± 1.24	<0.001
Mucosa	Dmean (Gy)	31.56 ± 0.90	32.67 ± 2.41	<0.001
SNT	V107 (%)	3.79 ± 6.10	41.52 ± 55.99	<0.001
MU		223.91 ± 20.45	343.56 ± 12.73	<0.001

SG, submandibular gland; CA, carotid artery; SNT, surrounding normal tissues; FIF, field-in-field technique; Wedge, wedge technique; PTV, planning target volume

Conclusions: Compared with the wedge technique, the FIF technique improved dose homogeneity of the PTV, reduced the dose to normal structures, and was associated with fewer MUs in the treatment of patients with unilateral cervical malignant lymphoma.

EP-1635

Comparison of IMRT, three-dimensional conformal and combined planning techniques in lung cancer radiotherapy

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Purpose/Objective: External radiotherapy constitutes essential components of inoperable early and locally advanced lung cancer treatment. Dosages of non-tumor lung tissue located in our treatment volume, esophagus, heart and medulla spinalis(MS) must be adjusted carefully. Intensity modulated radiotherapy(IMRT)'s place in treatment is controversial due to increasing lung volume which receives low dose in lung cancer radiotherapy. It is supposed that usage of combined radiotherapy tecnique would decrease lung toxicity, on the other hand, provide opportunity to lower MS and esophagus dosages. In our study, we aimed to compare the dosages that standart tissue and target volumes took in IMRT, three-dimensional radiotherapy(3D CRT) and combined radiotherapy (Anterior-Posterior/Posterior-Anterior +IMRT) planning with patients with lung cancer.

Materials and Methods: We planned our study to compare three different radiotherapy tecniques used in planning of 13 lung cancer patients (1 in stage 1B, 1 in stage 2A, 1 in stage 2B, 7 in stage 3A, 3 in stage 3A) diagnosed in our clinic. We prepared an IMRT, 3D CRT and combined radiotherapy plan to give our target volume 60 gy with 2 gy/ fraction day. We identified ipsilateral, contralateral and total lung, heart, esophagus and MS as volumes at risk. We calculated ipsilateral, contralateral, total lung volume (V)5, V10, V20, V30, V40; mean lung dose(MLD), maximum dosages of MS and esophagus, volume of heart taking 60 gy, dosage that 95% of intended target volume takes (PTV95), dosage of the volume which is gained by substracting PTV volume from total body volume, and we compared the values we had found.

Results: It is assigned that PTV95 of 13 patients that we counted in our study were indifferent statistically. Ipsilateral V5, V30, V40 values in IMRT tecnique, were found lower than combined tecnique and 3D CRT tecnique ($p<0.05$). The lowest value was attained with combined plan tecnique for ipsilateral V20 value, and it is determined to be different than two other tecniques ($p<0.05$). In contralateral V5, V10, V20 and V30 lung volumes, the lowest values were attained with combined tecnique ($p<0.05$). It is found that V5, V10 and V20 values are low in combined plan, V30 and V40 values are low in IMRT tecnique, and this decline is found to be statistically significant. No differences found in esophagus maximum dosage and heart V60 values. With MLD comparison, it is found that combined tecnique is superior to IMRT and conformal tecnique.

Conclusions: Dosage, that contralateral, total lung critic volumes and rest of the body volume take with combined plan tecnique in inoperable early stage and locally advanced lung cancer radiotherapy, decreases compared to IMRT and 3D CRT; dosages of organs at risk such as MS, heart, esophagus can be hold in tolerance limits. Outcomes of our study support the use of combined plan tecnique in inoperable and locally advanced lung cancer for diminishing side effects.

EP-1636

Feasibility study of the use of SmartAdapt to evaluate the dosimetric impact of organ deformation in prostate case

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Purpose/Objective: In radiotherapy, deformation of rectum and bladder due to intrinsic factors such as faecal content and bladder filling have an impact on the delivered doses to the prostate. Each of these pelvic organs is usually constraint to a lower tolerance dose to avoid undesired adverse side effects. This study evaluates the use of SmartAdapt to analyse the impact of inter-fraction organ deformation on the delivered treatment (74Gy given over 37 fractions).

Materials and Methods: 37 cone-beam computed tomography (CBCT) images from a patient who had underwent prostate image-guided radiotherapy (IGRT) were exported to SmartAdapt (Varian Medical Systems, Eclipse™, version 11). Deformable image registration (DIR) was performed using the planning CT (pCT) as the reference image source for deformation to each daily CBCT images. Automatic segmentation tools was utilised to propagate the updated anatomy of the rectum and bladder based on the CBCT images. Deformation correction tools were employed to correct areas of discrepancy. Deformed images were reviewed and exported back to the Eclipse treatment planning system for dose calculation. A total of 37 individual plans were generated using the deformed CT images. Dose volume histograms (DVHs) from each plan were overlapped to provide a mean dose level.

Results: V50 of rectum in the deformed plans ranged from 32.2%-48.8% versus 34.1% in the pCT. Rectum D_{2cc} in the pCT

was 74.2Gy and it ranged from 75.3Gy-77.2Gy in the deformed plans. V65 and V70 of bladder ranged from 7%-28.3% and 5.7%-24.3% versus 13.7% and 11.5% in the pCT respectively. Prostate D98 and D2 ranged from 75Gy-75.8Gy and 77.2Gy-77.9Gy versus 74.2Gy and 76.2Gy in the pCT. Mean deformed volume of the prostate ranged is 40.6cm^3 (35.5-44.4cm^3) versus 40.4cm^3 in the pCT. Mean centre of mass (COM) shifts of the prostate in the x-y and z directions were -0.02cm, -0.16cm and -0.02cm respectively. Mean bladder volume is 171.4cm^3 (83.3-268.9cm^3) versus 195.9cm^3 in the pCT. Mean Dice Similarity Coefficient (DSC) of the prostate was 0.894.

Conclusions: SmartAdapt is a useful tool in generating various statistical parameters such as COM shifts, DSC and volume of contoured structures. The DIR algorithm had performed well in achieving DSC >0.8 for the prostate structure set. Daily dose statistics can also be analysed for evaluation of the delivered doses with consideration of anatomical changes.

EP-1637

Dosimetric impact on different target separations in craniocaudal direction using dynamic jaws in Tomotherapy

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Purpose/Objective: Helical Tomotherapy (HT) has the capacity of treating multiple targets continuously in a treatment fraction. In conventional fixed jaw delivery mode, the choice of the field width determines the dose gradient in superior-inferior (SI) direction. A wider field width elevates the dose significantly to normal tissue superior and inferior to PTV. By using the new dynamic jaw technique of HT, there is a potential improvement in the dose gradient and the conformity in the craniocaudal borders of targets. However, the effectiveness of this dose reduction between targets using dynamic jaw may possibly be affected by the distance between targets in SI direction. In this study, the dosimetric impact and the effectiveness of reducing dose between targets as a function of separation between targets in SI direction using dynamic jaw technique was investigated.

Materials and Methods: Two sets of HT plans in fixed and dynamic jaw settings were generated. In each plan, two identical cylindrical targets with 6 cm diameter and 4 cm length in solid water phantom images were used for planning. The targets were aligned along SI direction with separations varied from 3.5 to 1 cm with 0.5 cm decrement in each plan for each mode. All plans were optimized with identical prescription (2 Gy per fraction to 95 % of both PTVs) and planning objectives using 2.5 cm fixed and dynamic jaw settings, respectively. The longitudinal dose profiles along the central axis in SI direction were measured for all the plans. The corresponding absolute and relative doses were calculated and compared. All plans were delivered and verified by film dosimetry. The dose distribution at the central coronal plane of the target was measured with EDR2 film sandwiched at the solid water phantom. Measured and calculated dose distributions for each plan were compared using Gamma analysis with criteria of 2% in dose difference and 2 mm in DTA were calculated.

Results: Measured dose distributions using films showed good agreements with those calculated by the TPS. The passing rates of Gamma analysis were higher than 90% for all plans. From Fig. 1, the minimum relative dose within the separation along the SI direction normalized with the prescribed dose were increased from 18.9, 32.6, 62.4, 77.8, 94.3 and 100.7 % for 3.5, 3, 2.5, 2, 1.5 and 1 cm separation between targets, respectively, using dynamic jaw mode. It showed that the effectiveness of dose reduction decreased with the decrease in the distance between targets in SI direction. For fixed jaw mode, the corresponding minimum relative dose were increased from 81.9 to 100.8 % for 3.5 to 1 cm separation between targets, respectively.

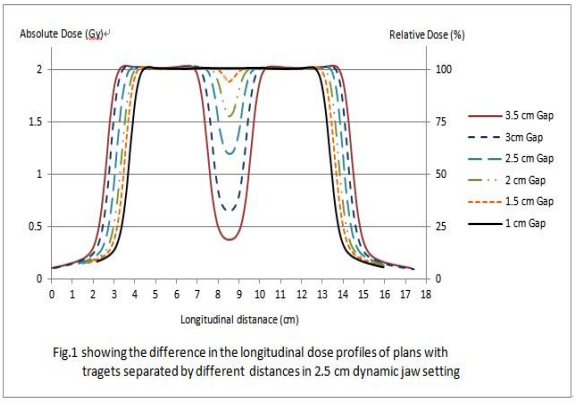

Fig.1 showing the difference in the longitudinal dose profiles of plans with tragets separated by different distances in 2.5 cm dynamic jaw setting

Conclusions: As rapid dose fall-off at the craniocaudal borders of targets can be achieved using dynamic jaw delivery technique, dose between targets can be reduced significantly compared with fixed jaw delivery. However, it decreased significantly with the decrease in the separation between targets in SI direction.

EP-1638

Evaluation of ovary dose using Tomotherapy for childbearing woman with breast cancer

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Purpose/Objective: The aim of this study is to evaluate unwanted scattered dose to ovary by scattering and leakage generated from treatment fields of Tomotherapy for childbearing woman with breast cancer.

Materials and Methods: The radiation treatments plans for left breast cancer were established using Tomotherapy planning system (Tomotherapy, Inc, USA). They were generated by using helical and direct Tomotherapy methods for comparison. The CT images for the planning were scanned with 2.5 mm slice thickness using anthropomorphic phantom (Alderson-Rando phantom, The Phantom Laboratory, USA). The measurement points for the ovary dose were determined at the points laterally 30 cm apart from mid-point of treatment field of the pelvis. The measurements were repeated five times and averaged using glass dosimeters (1.5 mm diameter and 12 mm of length) equipped with low-energy correction filter. The measures dose values were also converted to Organ Equivalent Dose (OED) by the plateau dose-response model.

Results: Scattered doses of ovary which were measured based on two methods of Tomo helical and Tomo direct