Material and Methods: We identified twenty-five glioblastoma patients treated with helical IMRT (Tomotherapy) with concurrent and adjuvant temozolamide between October 2011 and December 2013 from our radiotherapy electronic database and conducted a retrospective analysis. Hippocampi were contoured in CT and MRI co-registered image data sets used for clinical radiotherapy planning and hippocampus planning risk volumes (PRV) were created by adding five-millimetre isotropic margin which were checked by a neuro radiologist. Clinical treatment dosimetry plans were overlaid to obtain dose statistics. Four selected patients were planned for hippocampus avoidance radiotherapy without compromising tumour PTV coverage using currently established hippocampus dose volume histogram (DVH) constraints.

Results: Mean hippocampus PRV maximum, minimum and mean radiation doses were 54.7, 24.15 and 38.62 Gy respectively. Hippocampus PRV V7.3, V14.9 and V20 were 99.95%, 98.41% and 95.72% and hippocampus V3 was 100%. In seventeen patients ipsilateral hippocampus was within PTVs and in seven patients both hippocampi were outside PTVs with only minimal overlapping volumes but DVH based dose constraints were not achieved.

Location	Right frontal		Right temporal		Left parietal		Posterior fossa	
Group	Treatment	HA	Treatment	HA	Treatment	HA	Treatment	HA
Max dose	53.17	51.88	51.28	45.33	56.88	55.91	52.63	61.02
Min dose	14.96	2.27	12.4	2.85	31.63	4.11	25.34	6.28
Mean dose	33.39	9.09	28	6.71	43.09	15.55	42.79	37.79
V 7.3 Gy	100	58.7	100	29.17	100	67.43	100	99.29
V 14.9 Gy	100	25.51	98.24	16	100	38.91	100	91.4
V 20 Gy	100	16.22	82	12.12	100	28.68	100	80

With hippocampus avoidance planning (HA), in four patients hippocampus PRV minimum doses and in 3 patients mean hippocampus PRV doses were reduced and significant reductions in DVH based dose constraints were achieved in 3 patients when compared to clinical treatment plans (table).

Conclusion: Our analysis showed hippocampus PRVs received significant radiation doses and currently established hippocampus DVH based dose constraints were not achieved during cranial radiotherapy for glioblastoma using helical IMRT without hippocampus avoidance planning. Our planning study demonstrated significant dose reductions were possible with hippocampus avoidance radiotherapy planning in selected patients. More clinically correlated DVH objectives for hippocampus are required for better optimisation for hippocampus avoidance cranial radiotherapy in glioblastoma for this to be considered for all patients.

EP-1648

A comparison of 6 planning RT techniques for breast treatments

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Purpose or Objective: To provide a comparison of 6 different treatment planning strategies, adopted for breast conserving-adjuvant RT, on the dose to the PTV and OARs.

Material and Methods: 22 patients CT data sets were retrospectively used for planning comparison. Patients were split in two groups of 6 left- and 5 right-sided cases (G1 and G2) according to the different dose prescription (50 Gy in 25 fractions and 42.4 Gy in 16 fractions for G1 and G2, respectively). The 6 techniques involved were: Field in Field (FiF), 2 Fields static-IMRT (sIMRT-2ff), 4 Fields static-IMRT (sIMRT-4FF), VMAT, Helical Tomotherapy (HT) and Tomo Direct (TD). Dose limits applied to PTV and OARs were taken from the RTOG protocol n.1005. Treatments plans were optimized to reduce dose to Ipsilateral Lung (IL), Contralateral Breast (CB) and, for left-sided cases, Heart (H) while maintaining an acceptable PTV coverage and homogeneity. The Wilcoxon matched-paired signed-rank test was used to compare the results. The threshold for statistical significance was $p \leq 0.05$.

Results: The highest mean value V95%=98.8%/99.2% (G1/G2) was observed for TD and it was statistically significant with respect to all others techniques except to VMAT. Similar results were obtained for D98%. The lowest mean V105%=0.2%/0.1% (G1/G2) was found for HT resulting statistically significant if compared to all other techniques except FIF/VMAT in G1 /G2, respectively. Mean D2% was also found lowest for HT (52.1Gy/43.1Gy in G1/G2) resulting statistically significant with respect to all other techniques except versus TD in G2. For IL mean V5(Gy), V10(Gy) and dose mean were lowest for TD in both groups (20.1%/19.1%, 14.2%/13% and 5.8%/4.9% in G1/G2, respectively) being statistically significant versus all other techniques in G1. The lowest values of mean V20(Gy)=7.0%/7.9% were observed for HT in both groups. CB dose maximum was found as lowest in G1 for TD (290.9cGy) and for FiF in G2 (252,6cGy) both resulting statistically significant versus all other techniques except for FiF in G1 and TD in G2 confirming a substantial equivalence for the two techniques. Minor absolute dose differences were observed for H.

Conclusion: 6 different techniques were employed to design an optimal plan for conserving breast-adjuvant RT fulfilling the dose limit criteria provided by RTOG 1005 protocol. TD provided superior target coverage maintaining a level of homogeneity similar to HT which achieved the highest value. IL dose was minimized with TD while dose to CB was lowest using both FiF and TD techniques.

EP-1649

Optimised Stereotactic Radiotherapy for pancreatic head tumours: a feasibility planning study

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Purpose or Objective: Preoperative Radiotherapy (RT) may theoretically improve resectability in locally advanced pancreatic cancer. However, effective doses of RT are limited by the tolerance of surrounding tissues. Stereotactic radiotherapy (SRT) with intensity-modulated technique (IMRT) based on the use of a Simultaneous Integrated Boost may theoretically allow to deliver a low dose to the duodenum (site of more common toxicity) and a high dose to the vessel invasion (more common reason of unresectability). Aim of this study was to perform a planning feasibility analysis of a modulated dose prescription within a pancreatic tumor treated by SRT.

Material and Methods: 15 patients with a histological confirmation of pancreatic head adenocarcinoma with vascular involvement were included. The following definitions for targets were used: duodenal PTV (PTVd) was defined as the GTV overlapping the duodenal planning at risk volume (PRV) (from the pylorus to the duodenojejunal junction adding 5 mm in craniocaudal direction (CC), 3 mm in the other directions); vascular CTV (CTVv) was defined as the surface of contact or infiltration between tumor and vessel plus 5 mm margin around the vessel (including the whole

circumference of the vessel). The vascular PTV (PTVv) was considered as the CTVv plus an anisotropic margin (5 mm CC, 3 mm in other directions). The tumor PTV (PTVt) was defined as the GTV plus an anisotropic margin (5 mm CC, 3 mm in other directions) including the PTVv and excluding the PTVd. The following doses were prescribed [in 5 daily fractions (fr)] to the PTVs: 30 Gy (6 Gy/fr) to the PTVd, 45 Gy (9 Gy/fr) to the PTVv, and 37.5 Gy (7.5 Gy/fr) to the PTVt, respectively. Constraints were based on AAPM TG101 recommendations: Dmax of PRVduodenum < 32.0 Gy, Dmax of PRVspinal cord < 30.0 Gy, Dmax of PRVstomach < 32.0%, D700cc liver < 21.0 Gy, D200 cc kidneys < 17.5 Gy. All plans were generated with Masterplan Oncentra TPS and the treatment was delivered with a step and shot IMRT technique. The primary end point was the rate of patients in whom the constraint Dmean > 90% was achieved for the 3 different PTVs. Secondary end points were the percentage of patients in whom a PTVv near minimum dose (D98%) > 90%, a PTVv D95% > 95%, and a median dose (D50%) > 95% were achieved.

Results: PTVv Dmean > 90%, PTVv D2% < 115% and OARs Dmax constraints were achieved in all patients. Both PTVv D98% > 90% and PTVv D95% > 95% were achieved in 6 patients (40%).

Conclusion: Although the objective of PTVv D95% > 95% was achieved only in 40% of patients, the study showed that in 100% of patients it was possible to administer a strongly differentiated mean and median dose, and in particular a low dose to the overlap region between the target and duodenum, a high dose to the site of vascular infiltration, and an intermediate dose to the remaining target volume. Prospective trials based on clinical application of this strategy seems to be justified at least in selected patients.

EP-1650

IMRT versus VMAT for breast: a dosimetric point of view

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Purpose or Objective: Whole breast irradiation is part of breast conservative management for early breast cancer. In addition to that boost dose to tumor bed improves local recurrence rates and is currently the standard of care. Our aim of the current study was to evaluate intensity modulated radiation therapy (**IMRT**) for whole breast versus its dosimetric properties of volumetric modulated arc therapy (**VMAT**).

Material and Methods: Eighteen consecutive women with left sided breast cancer were taken for this retrospective study. IMRT treatment plans were created for patients who already received treatment with VMAT. The plans were created in Monaco planning system using Monte Carlo (**MC**) algorithm. The Elekta Infinity linear accelerator with Agility MLC is used for VMAT delivery. Our clinic uses simultaneous integrated boost (**SIB**) technique to treat whole breast patients. The dose prescribed was 60Gy/25# to tumor bed and 45Gy/25# for whole breast. The plans were evaluated based on **QUANTTEC** dose-volume protocol. Data were statistically analyzed using Wilcoxon Signed Rank test.

Results: VMAT technique statistically significant in target coverage and dose conformity than IMRT. In addition to that lesser ipsilateral & contra lateral lung dose and reduced contra lateral breast dose with VMAT. Critical structures like Left descending artery(LAD), Spinal Cord and heart also received lower doses with VMAT than IMRT . All the dosimetric parameters and its statistical values were provided in table1.Statistics shows VMAT more significant for LAD, Ipsilateral lung dose and Conformity Index.

	Dosimetric Parameter	IMRT	VMAT	P value
TARGET	V95(%)	98.35	99.21	0.04
	V100(%)	95.72	96.38	0.04
	Conformity Index (CI)	0.96	0.98	0.03
	Heterogeneity Index (HI)	1.09	1.08	0.06
ORGANS AT RISK (OAR)	Ipsilateral Lung V20Gy(%)	25.85	18.56	0.03
	Heart V25Gy (%)	4.11	3.22	0.05
	Contra lateral Lung V5Gy(%)	18.0	15.28	0.04
	Both Lung V20Gy (%)	21.27	15.71	0.05
	Contra lateral Breast Mean (Gy)	6.55	3.54	0.04
	LAD Maximum Dose (Gy)	28.32	25.91	0.02
	Cord Maximum Dose (Gy)	23.51	18.94	0.04

Table 1: Dosimetric parameters represents the statistical values of IMRT versus VMAT for Breast patients with simultaneous integrated boost (SIB) method

Conclusion: From this study , we infer that, our switch over from IMRT to VMAT treatment technique provided better dosimetric effect for left sided breast cancer patients. Also VMAT provided significant improvement target coverage and conformity. It reduced the dose to normal tissues further to IMRT.

EP-1651

Reducing the probability of radiation-induced hepatic toxicity by changing the treatment modality

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Purpose or Objective: To estimate and compare the risk of radiation-induced hepatic toxicity (RIHT) in helical tomotherapy and fixed-beam intensity-modulated radiotherapy (IMRT) for the treatment of hepatocellular carcinoma (HCC).

Material and Methods: Twenty patients with unresectable HCC treated with tomotherapy were selected. We performed tomotherapy re-planning to reduce the non-target normal liver volume receiving a dose of more than 15 Gy (NTNL-V15Gy), and we created a fixed-beam IMRT plan (FB-P). We compared the dosimetric results as well as the estimated probability of RIHT among the tomotherapy initial plan (T-IP), the tomotherapy re-plan (T-RP), and the FB-P.

Results: Comparing the T-RP and FB-P, the homogeneity index was 0.11 better with the T-RP. However, the mean NTNL-V15Gy was 6.3% lower with the FB-P. These differences result in a decline in the probability of RIHT from 0.216 in the T-RP to 0.115 in the FB-P. In patients whose NTNL-V15Gy was higher than 43.2% with the T-RP, the probability of RIHT markedly reduced from 0.533 to 0.274.