Tab 1

	$r_{v(5Gy)}$
3D-CRT	0,766
IMRT 5 fields, PTV coverage	0,560
IMRT 8 fields, PTV coverage	0,786
VMAT PTV coverage	0,876
HT, PTV coverage	0,154
	$r_{v(5Gy)}$
3D-CRT	0,398
IMRT 5 fields, lung optimization	-0,557
IMRT 8 fields, lung optimization	-0,253
VMAT lung optimization	0,266
HT, lung optimization (coll. 2,5cm)	-0,886
HT, lung optimization (coll. 1cm)	-0,571

Conclusions: IMRT with 8 fields is the best technique to obtain the goals of the optimization. VMAT can be used when the 'PTV length-lung length' ratio is low. Tomotherapy doesn't allow to maintain an acceptable PTV coverage if the ratio is high.

PO-0830

Accelerated Partial Breast Irradiation (APBI): are breath hold and volumetric radiation therapy useful?

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Purpose/Objective: APBI with external beam RT (EBRT) has emerged in the recent years as a treatment option for selected patients with early stage breast cancer. Some studies demonstrated the feasibility of using volumetric modulated arc therapy (VMAT) for APBI as away to improve PTV dose conformity and to deliver lower doses to the ipsilateral lung and breast as compared to the conventional 3D-CRT techniques. Separately, multiple studies have confirmed the effectiveness of breath hold techniques in reducing the cardiac dose for left sided breast cancer treated with EBRT. In the search of an optimal APBI treatment procedure, we investigate the use of VMAT (RapidArc®) and/or voluntary moderately deep inspiration breath hold (vmDIBH) in patients treated with external beam APBI.
Materials and Methods: Three patients were included in this study. For each patient 2 CT scans were made, one in free breathing (FB) and one in vmDIBH. In each scan, five different tumours were contoured in the left breast: upper inner, upper outer, central, lower inner, and lower outer. On each CT scan, a conventional 3D-CRT and a RapidArc® plan were made using the Varian Eclipse™ treatment planning system, leading to 60 combinations of patient, tumour site and technique. Dose parameters for the PTV, heart, lungs, breasts were compared for all plans.
Results: Preliminary results of this ongoing study show that the highest cardiac doses were observed in 3D-CRT plans combined with FB for tumors located in the lower inner part of the breast [mean dose 3.7 ± 0.7 Gy]. With vmDIBH these values were reduced to 1.8± 0.3 Gy. The heart volume receiving > 5Gy (V_{5Gy}) was reduced to 7.8% for RapidArc® plans in vmDIBH compared with 24.7% and 14.7% in 3D-CRT plans in FB and with vmDIBH respectively. For other tumour positions, the mean heart dose ranged from 0.2 Gy to 1.3 Gy in FB, which is always slightly reduced using vmDIBH to a maximum of 0.5 Gy in all plans. RapidArc® plans in breath hold also slightly decreased the ipsilateral lung doses [V_{5Gy}= 12.6% ± 1.2%] compared to 3D-CRT plans[V_{5Gy} = 15.8% ± 7.3%]. The fraction of the non-target part of the ipsilateral breast receiving 50% of the prescribed dose or more was on average reduced by 30% in RapidArc® plans as opposed to 3D-CRT plans. While, no dose was given to the contralateral breast in 3D-CRT plans, RapidArc® plans showed a slight increase in the low dose [V_{5Gy} = 2.3% ± 0.6%]. In all RapidArc®plans the dose conformity was better compared with that of 3D-CRT plans [CI =0.9 ± 0.05 vs. 0.7 ± 0.08].
Conclusions: APBI with RapidArc® offers good PTV dose conformity and delivers lower doses to lungs and ipsilateral breast compared to 3D-CRT. This has been at the cost of slightly higher volumes of contralateral breast receiving low dose radiation. Patients with tumours in the lower inner part of the breast are most likely to benefit from combined VMAT and breath hold techniques.

PO-0831

Quality control of operator IMRT/VMAT optimizations using experience-based automated re-planning

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Purpose/Objective: Although a lot of tools are available in modern treatment planning systems to evaluate 3D dose distributions (DVH, biological indices, isodoses in arbitrary planes), the optimality of a given IMRT/VMAT plan still depends mainly on the experience of the planner and on the way that the optimization problem has been formulated in terms of dose objectives. To overcome this bias, we have implemented a system that uses our experience in IMRT optimization to predict final organ-at-risk (OAR) dose based on individual patient geometry. With this technique, we can detect and evaluate deviations between predicted and planner results, or automatically generate plans with OAR doses consistent with our past clinical experience.
Materials and Methods: In this study we focused on prostate cancer. We reviewed all photon IMRT/VMAT plans treated in the past two years and found that the final equivalent uniform dose (EUD) for bladder and rectum showed a strong linear correlation with the overlap volume with the PTV. We used the overlap volume to predict plan optimization objectives for rectum and bladder EUD. These actions were implemented by user-scripting in our treatment planning system (Philips Pinnacle[3]). This automated technique was applied on 23 patients to be treated for a prostate cancer in our institution.
Results: Although they respected clinical goals, significant deviations between the operator's final plan and the automated plan (EUD>2Gy) were observed in 6 cases indicating non-optimal plans in comparison to our past experience. This approach permitted to reduce by half in average the planning time, mainly be reducing the number of manual iterations loops which are often needed to achieve good quality plans.
Conclusions: The implementation of this experience-based IMRT quality control step has shortened the treatment planning time and enables us to easily detect bad optimizations compared to previously treated plans. The planner has now the ability to quickly evaluate quality of its plan incomparison to previously treated plans. We plan to extend this approach to other clinical sites.

POSTER: PHYSICS TRACK: TREATMENT PLAN OPTIMISATION

PO-0832

Is an automated planning technique a useful tool for use in isotoxic lung planning?

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Purpose/Objective: Increasing the dose delivered via IMRT planning; specifically patient specific dose escalation is of current clinical interest in improving local control and in turn survival in NSCLC patients. Dose escalation usually requires a plan to be created for each feasible prescription until an OAR constraint can not be met or a plan is optimised using the maximum prescription. To identify the optimum prescription for a patient requires a significant amount of planning time and the manual creation of multiple redundant plans. This study aims to investigate the effectiveness of an automated IMRT planning technique in reducing the planning time required by minimising the number of plans being created manually.
Materials and Methods: The automated planning system is operated using an in house written java program. Constraints used for inverse plan optimisation in Pinnacle v9.0 are iteratively changed using the java program. The resulting plan is compared against a static group of evaluation objectives to ensure suitability. Clinically relevant constraints chosen for optimisation are placed into several levels of precedence. Tumour coverage is given the initial priority followed by serial organ near-max doses. Once a suitable plan is created the system increases the prescription dose and the optimisation is repeated using the constraints from the previous iteration as a starting point. Figure 1 demonstrates the process used by the system. The initial prescription dose of 55.8Gy is increased by adding additional fractions of 1.8Gy. The treatment schedule is bi-daily over a 4 week period. Dose escalation continues until a maximum prescription dose of 79.2Gy is achieved or an OAR objective cannot be met. This technique was evaluated by applying it to 5 NSCLC patients. Evaluation objectives were selected from an isotoxic lung feasibility study. In addition to the evaluation of the dose statistics using a plan