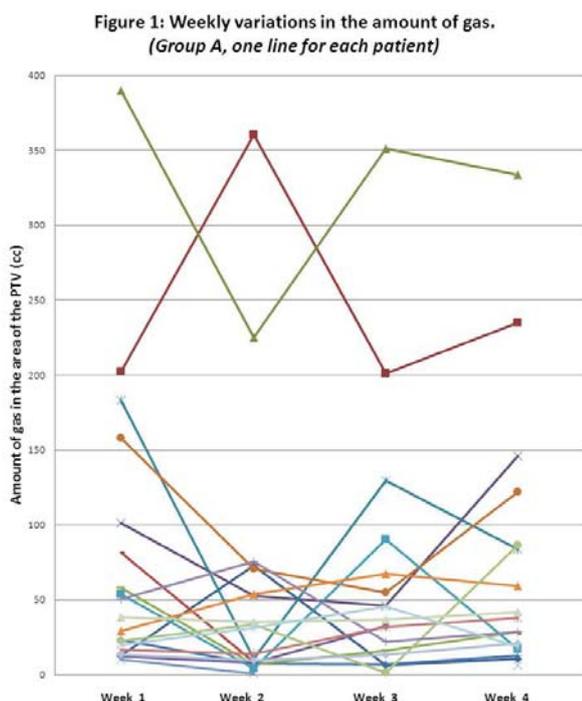


group B showed a trend toward an increase in the amount of gas. Individual week to week variations ranged from -228cc to 264 cc with the largest variations in group B.



	Group A	Group B
Average week 1	78cc	277cc
Average week 2	57cc	289cc
Average week 3	68cc	336cc
Average week 4	73cc	374cc
Largest absolute change	173cc	264cc
Mean of individual SD's	30cc	76cc

Table 1: Average amount of gas per week.

Conclusions: Differences in the amount of abdominal gas between fractions of individual patients can be substantial, especially in patients with a large initial gas volume. The

average amount of gas in the upper abdominal region however, is stable over the course of radiotherapy and does not seem to be dependent on the initial volume of gas.

PO-1097

Dosimetric comparison of 3D-CRT vs IMRT: photon and neutron doses outside the radiation beam

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Purpose/Objective: To verify and compare doses delivered by 3D-CRT and photon beam IMRT to OARs in a simulated prostate cancer treatment in a phantom. To evaluate scattered neutrons in OAR for static fields.

Materials and Methods: The doses delivered to OARs (thyroid, lung, bladder and testes) outside the target were measured in an anthropomorphic Alderson phantom using thermoluminescence detectors (TLD) 100 (⁶Li (7.5%) and ⁷Li (92.5%). Each layer in the phantom is 2.5 cm thick and the distance between dosimetric points is 3 cm. This allows for an accurate determination of the doses in the organs of interest. The neutron fluence rate [cm⁻²s⁻¹] in the selected points inside the phantom was measured in terms of neutron activation analysis (NAA), with the use of gold particles measuring 0.5 cm in diameter with a mean surface density of 0.108 g/cm³.

Results: The doses delivered by 3D-CRT and IMRT to the OAR were, respectively, as follows:: thyroid gland, 0.62 Gy vs. 2.88 Gy; lung, 0.99 Gy vs. 4.78 Gy; bladder, 80.61Gy vs. 53.75 Gy; testes, 4.38Gy vs 6.48 Gy. The neutron dose (resulting from the use of high-energy X-ray beams) was approximately 0.5% of the prescribed PTV therapeutic dose. The greater the distance from the field edge, the higher the contribution of this secondary radiation dose (from 8% to ~45%).

Localization	IMRT	3D-CRT	Neutron dose for IMRT
	Mean dose [Gy]	Mean dose [Gy]	Mean dose [mSv]
Thyroid	2.88 ± 0.004	0.62 ± 0.001	5.189
Lung	4.76 ± 0.006	0.99 ± 0.003	5.832
Bladder	53.75 ± 0.070	80.60 ± 0.054	6.201
Testes	6.48 ± 0.013	4.37 ± 0.017	

Conclusions: IMRT resulted in higher doses than 3D-CRT in all OARs, except for the bladder. These results were surprising given that IMRT is typically considered more precise than 3D-CRT. The present study shows that the photoneutron dose makes up approximately 0.5% of the therapeutic dose in the PTV.

PO-1098

Automated planning for lung SBRT: faster optimization without compromise on plan quality

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Purpose/Objective: By eliminating user variability, automated planning aims to reduce treatment planning time and improve plan quality. We investigated the use of automated planning for stereotactic body radiation therapy (SBRT) in lung cancer patients.

Materials and Methods: Ten patients with peripherally located T1N0M0 lung cancer were planned to receive a total dose of 60 Gy in 3 fractions to at least 95% of the planning target volume (PTV). Delineation of target volumes and organs at risk (OARs) was performed manually in Pinnacle 9.2 (Philips Medical Systems Inc, USA). Intensity modulated radiation therapy (IMRT) treatment plan optimization was performed using our in-house treatment planning system developed from Gravis (Sherouse Systems Inc, USA). We recorded the time necessary for optimization including the generation of beams and initial segments, segment weight and shape optimization, and final dose calculation. Nine non-coplanar beams and a standard set of optimization objectives were used. The resulting plans are further referred to as manual plans (MPs). Using an evaluation version of the Pinnacle 9.10 Auto-Planning software an additional automated plan (AP) was created for each patient. The same beam directions were used as for the MP. Based on the clinical goals for the PTV (in terms of prescribed dose) and OARs, the Auto-Planning software automatically creates derived structures, optimization objectives and constraints, and performs IMRT optimization. As for the MP, we recorded the AP optimization time including final dose calculation.

Both sets of treatment plans were blindly evaluated by three experienced radiation oncologists (ROs). A scorecard was used incorporating the clinical goals in terms of dose-volume constraints for the PTV (D_{95} , D_{99} and D_{02} , in which xx% of the PTV volume receives a dose of at least D_{xx}), lungs (D_{mean} , V_{05} and V_{20} , in which V_{xx} is the volume receiving at least xx Gy), spinal cord and esophagus planning risk volumes, plexus brachialis, heart, aorta, trachea, main stem bronchus and chest wall (D_{02}). Based on the scorecards, the full 3D dose distribution and dose-volume histograms, the ROs judged the clinical acceptability of each MP and AP separately, and if both were acceptable, they indicated their preference.

Results: The average optimization time amounted to 28'06' (1 SD = 4'39') for the MPs and 6'23' (1 SD = 0'27') for the APs. The optimization time was significantly shorter for the APs than for the MPs (paired t-test, $p < 0.001$). All 20 treatment plans were judged to be clinically acceptable by all three ROs. Two ROs preferred the AP over the MP for 10/10 patients, while the third RO preferred the AP over the MP for 6/10 patients.

Conclusions: Automated planning significantly reduced treatment plan optimization time for lung SBRT, without compromising plan quality.

PO-1099

Is it possible to create high quality inverse treatment plans with the Pinnacle automated planning module?

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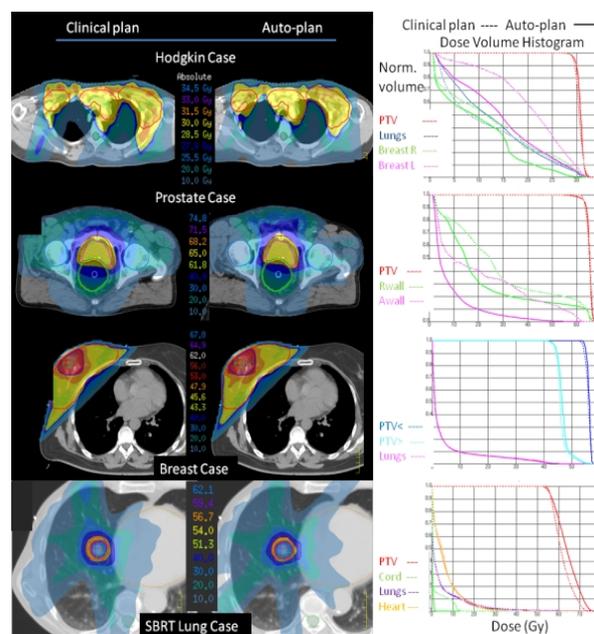
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Purpose/Objective: We investigated whether the automated planning module in the beta version of Pinnacle³ 9.10.60013 (Philips Healthcare, Fitchburg, WI, USA) is able to create treatment plans with consistent quality, independent of the experience of the planner.

Materials and Methods: We tested the auto-planning module for several treatment sites and compared the results with the applied original clinical plans. In the automated planning module a treatment technique template can be created for each tumour site and protocol. We used the same set of objectives as used for clinical treatment planning. Once the template is selected, automated planning can be activated.

We report the comparison results for Hodgkin lymphoma (IMRT step-and-shoot), prostate (VMAT), breast (mix of IMRT (20%) and conventional (80%)) and SBRT lung plans (VMAT).

Results: Figure 1 shows the comparison between clinical and automated treatment plans. The dose volume histograms and dose distributions are very similar. All automated plans fulfilled the clinical dose criteria for planning target volume coverage and organs at risk.



Conclusions: With the automated planning module it is possible to consistently create high quality clinical plans for different tumour sites independent of the user, similar to the original clinical plans that were used as a reference. We found that the auto-planning module is intuitive for operators. Selecting the technique template and running auto-planning can be seen as the last step directly following contouring needed to create a real treatment planning class solution. Therefore, we consider auto-planning to be an efficient tool to produce high quality treatment plans also in clinical practice.