Carlo Plan (SMCP) [2]. The inverse treatment planning process starts with the definition of the SSD, the gantry angle and the collimator rotation for each electron field. Then the DAO is initiated and a potential aperture or energy change is determined. A cost function (cf) which determines the squared dose differences in all voxels of the PTV and the OARs between the actual value and a given upper or lower limit is to be minimized. The actual dose distribution has to be determined efficiently in each iteration step. For this purpose, the initial electron field has been divided into a grid of beamlets for which the dose distribution has been pre-calculated using eMC [3]. Hence, the update of the dose distribution is realized by adding or subtracting the corresponding beamlet dose distributions. After DAO the final apertures have been set up as MLC shaped fields. To correct for the MLC impact on the dose distribution which has not been accounted for during the DAO, post processing steps are carried out by a weight optimization or adjusting the MLC apertures. The DAO implementation has been tested using a water phantom containing an artificial PTV and a distal OAR.
Results: The DAO converged after about 2000 iterative steps which corresponds to 25 minutes. In about 15% of the steps, the changes selected by the SA have been accepted. The resulting treatment plan for the water phantom consists of three fields employing 20 MeV,12 MeV and 9 MeV. Applying these MLC shaped fields and carrying out the post processing weight optimization, this results in a conformal dose distribution with a V_{95} of 92% and a V_{105} of 11% for the PTV.
Conclusions: The presented DAO has been successfully implemented within SMCP and allows inverse treatment planning of MERT for phantom situations. This work was supported by Varian Medical Systems.
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PD-0282
Flattening filter free (FFF) HybridArc for stereotactic treatments in the brain
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Purpose/Objective: HybridArc is a new treatment technique available in version 4.5 of the treatment planning system iPlan (BrainLAB AG, Feldkirchen, Germany). Modulated arc fields are combined with IMRT fields along these arcs. The aim of this work was to investigate the suitability of HybridArc using the linear accelerator in the flattening filter free (FFF) mode for stereotactic treatments in the cranial region and to compare this method with HybridArc using the conventional flattening filter (FF) mode.
Materials and Methods: HybridArc was commissioned in iPlan for the 6 MV FFF as well as for the 6 MV FF mode of a Truebeam equipped with a high definition multileaf collimator (Varian Medical Systems, Inc., Palo Alto, USA). For 10 patients with single metastases with a median target volume of 0.755 ccm (ranging from 0.275 ccm to 4.588 ccm) FFF-HybridArc plans were calculated and compared with FF-HybridArc plans. Each plan consists of three HybridArc fields with two embedded IMRT fields per arc. The dose distributions were analyzed and compared according to homogeneity (homogeneity index: *H-index* = $(D_{2\%} - D_{98\%}) / D_{Prescription} * 100\%$) and conformity (conformity index: *CI* = *prescription isodose volume / target volume*) to the target. A normal tissue structure was defined as the 5 mm wall around the target volume. The dose to this normal tissue structure as well as the total number of monitor units (MUs) per plan were investigated.
Results: The mean (mean ± 1 std) H-index over all 10 patients decreased from 4.0%±0.4% for the FF-HybridArc method to 2.2%±0.3% for the FFF-HybridArc method. The mean conformity index over all 10 patients was comparable for both methods: 1.35±0.12 and 1.33±0.14 for the FF-HybridArc and FFF-HybridArc method, respectively. The number of MUs per plan decreased by 9% comparing FFF-HybridArc plans with FF-HybridArc plans. The maximum and the mean dose in the normal tissue structure were decreased by up to 3% when using FFF-HybridArc instead of FF-HybridArc.
Conclusions: FFF-HybridArc is a suitable method for stereotactic treatments of small targets in the cranial region (e.g. for brain metastases). In comparison to the conventional FF-HybridArc method the dose homogeneity in the target volume is improved while the conformity remains the same. The total number of MUs is decreased and the normal tissue sparing is slightly improved. Additionally, the higher dose rates available using FFF modes in comparison to FF modes leads to shorter beam on times.

PD-0283
4D dose accumulation for dose painting by numbers for lung cancer
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Purpose/Objective: In conventional radiotherapy of locally advanced lung cancer (LALC) doses levels are homogeneously delivered to the entire PTV, whereat dose escalation is restricted by normal tissue toxicity. Several studies have shown the geometrical correlation between high FDG uptake in a PET scan and tumour recurrence. This is the rationale for FDG-based local dose escalation, e.g. by dose prescription on the voxel values of a PET scan – dose painting by numbers (DPBN). The aim of this study is to investigate the robustness of the DPBN plans against tumour motion.
Materials and Methods: For 3 patients with LALC respiratory-correlated 4D-PET/CT studies were acquired (Philips GeminiTF64). The GTV delineation of the primary tumour was performed manually on 3DCT and a 10mm margin was used for generation of the PTV. DPBN plans were generated with a baseline dose of 60Gy at 2Gy fractions to the entire PTV and a DPBN boost to the GTV. A linear relationship between the prescription dose to voxels within the GTV and the underlying SUV in ungated PET reconstruction was used. Planning was performed with Pinnacle TPS, research version 9.100 (Philips, USA) using a plugin extension for DPBN that was created by the authors. In the IMRT planning optimization, doses within GTV were increased up to a maximum dose of 100Gy in 30 fractions, applying the standard normal tissue constraints from the clinical routine. A DPBN plan was created and the dose distributions were transformed to and summated in asingle CT phase using a model-based nonrigid image registration. The 3D and summated 4D DPBN plans were compared based on DVHs of the target volumes and volumes corresponding to 50-90% of SUVmax.
Results: Summated 4D plans showed significant differences in the doses to the target volumes with maximal differences up to 7% in the Dnear-min and Dnear-max as compared to the 3D DPBN plans. The high-dose region stayed confined to the GTV in summated 4D plans. In mean, in all summated 4D plans, the dose delivered to 99% of the 50% and 90% of SUVmax volumes exceeded 72Gy and 83Gy respectively, compared to 76Gy and 87Gy in 3D plans. The dose to the lung and other organs at risk didn't differ significantly within 3D and summated 4D plans.
Conclusions: Our first results show good target coverage and no hot spots outside of PTV for DPBN plans. Further evaluation of 4D accumulation of DPBN plans for other patients with locally advanced lung cancer is in progress.

AWARD LECTURE: HONORARY PHYSICIST AWARD LECTURE

SP-0284
Collaboration supports success
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The preparation and delivery of high quality radiotherapy is dependent on a healthy working relationship between the members of the multidisciplinary team. Recognition of the knowledge and skills sets of each profession and how they can complement those of our colleagues is both positive and enriching for professionals and improves the care given to our patients. The problem of professional recognition and lack of dedicated education programmes faced by radiotherapy physicists in many countries is similar to those faced by the RTTs and if we worked together to address these in the context of improved patient care our voices may have a far greater impact.
The experience over the past years in ESTRO has clearly demonstrated the benefits of such collaboration and the level of mutual respect shown by the two groups has resulted in shared conferences and workshops becoming much more the norm. My personal experience with my physics colleagues has been challenging and exciting and I