The purpose of this study was to assess the impact on dose to the planning target volume (PTV) and organs at risk (OAR) by using four differently generated CT datasets for dose calculation in stereotactic body radiotherapy (SBRT) of lung and liver tumors. Additionally, dose differences between 3D conformal radiotherapy and volumetric modulated arc therapy (VMAT) plans calculated on these CT datasets were determined. Twenty SBRT patients, ten lung cases and ten liver cases, were retrospectively selected for this study. Treatment plans were optimized on average intensity projection (AIP) CTs using 3D conformal radiotherapy (3D-CRT) and volumetric modulated arc therapy (VMAT). Afterwards, the plans were copied to the planning CTs (PCT), maximum intensity projection (MIP) and mid-ventilation (MidV) CT datasets and dose was recalculated keeping all beam parameters and monitor units unchanged. Ipsilateral lung and liver volumes and dosimetric parameters for PTV (Dmean, D2, D98, D95), ipsilateral lung and liver (Dmean, V30, V20, V10) were determined and statistically analysed using Wilcoxon test. Significant but small mean differences were found for PTV dose between the CTs (lung SBRT: <=2.5 %; liver SBRT: <=1.6 %). MIPs achieved the smallest lung and the largest liver volumes. OAR mean
doses in MIP plans were distinctly smaller than in the other CT datasets. Furthermore, overlapping of tumors with the diaphragm results in underestimated ipsilateral lung dose in MIP plans. Best agreement was found between AIP and MidV (lung SBRT). Overall, differences in liver SBRT were smaller than in lung SBRT and VMAT plans achieved slightly smaller differences than 3D-CRT plans. Only small differences were found for PTV parameters between the four CT datasets. Larger differences occurred for the doses to organs at risk (ipsilateral lung, liver) especially for MIP plans. No relevant differences were observed between 3D-CRT or VMAT plans. MIP CTs are not appropriate for OAR dose assessment. PCT, AIP and MidV resulted in similar doses. If a 4DCT is acquired PCT can be omitted using AIP or MidV for treatment planning.

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