Purpose:

With increasing concern for patient dose from CT scan, we are trying to reduce CT scan and use intravenous contrast-enhanced CT (contrast CT) in treatment planning. This study is to investigate dose calculation accuracy using contrast CT in treatment planning for lung, esophagus and pancreas cancer.

Methods:

We analyzed treatment plans for 8 patients for whom CT simulation was performed both with and without intravenous contrast agent (CA) (non-contrast CT). IMRT/3D plans were generated with inhomogeneity correction on the non-contrast CT scan. Contrast CTs were fused to the non-contrast studies and all contours and plans were copied to the contrast CT scans. For each patient, we analyzed dose-volume histograms (DVH) for planning volumes (PTV) and the organs-at-risk (OAR), comparing the doses generated on non-contrast CT scans with those generated on contrast CT scans.

Results:

Maximum doses ratio Dmax(contrast)/Dmax (non-contrast) in PTVs was 1.0009±0.0013. The ratio of D05 (contrast)/D05 (non-contrast) was 0.996±0.005. The ratio of mean PTV dose Dmean(contrast)/Dmean(non-contrast) was 0.990±0.005%. The ratio of minimum dose Dmin(contrast)/Dmin(non-contrast) and D95(contrast)/D95(non-contrast) were 0.970±0.030 and 0.984±0.009, respectively.

Contrast CT raised cord dose slightly. The ratio of cord Dmax was 1.005±0.026. However there were two cases the ratio of cord Dmax were 1.035.

Conclusions:

The PTV D95 is usually normalized to prescription dose and the D95 differences between contrast and regular CT were within 2%. In most cases, the contrast CT could be used to treatment planning clinically. However more attention should be paid to maximum cord dose if it is already close to criteria limit.