

**Purpose:**The use of volumetric CT as an imaging metric to better assess cancer response to treatment requires knowledge of measurement reproducibility. This study was designed to explore the reproducibility of tumor volumes obtained by radiologist manual delineation (MAN), computer-aided method (CAM) and computer alone (CA) using a same-day repeat CT dataset of 32 non-small cell lung cancer (NSCLC) patients.

**Methods:**We used a publicly accessible repeat CT dataset aimed at studying cancer treatment response. Briefly, each patient was scanned twice within 15 minutes using the same imaging protocol and CT scanner (16- or 64-row). Patients were repositioned before the second scan. Thin-sectional images of 1.25mm slice interval were reconstructed using a shaper filter. Thirty-two lesions (one per patient) were analyzed using the following three methods: (1) MAN- an experienced radiologist manually drew tumor contours on two repeat scans in a side-by-side mode, (2) CAM- an operator applied a home-grown algorithm to segment the tumors and the computer-generated contours were reviewed/edited by the same radiologist, also in a side-by-side mode, and (3) CA- an operator applied a different, also home-grown, algorithm to delineate tumor contours (no edit). Bland-Altman plots were constructed to assess the agreement between volumes measured by each method on the two repeat scans. Volume difference between MAN and CA on each patient's first scan was analyzed using a paired t-test.

**Results:**The 95% limits of agreements for the tumor volumes made by MAN, CAM and CA on two repeat scans were (-19.9%, 19.6%), (-12.1%, 13.4%) and (-11.8%, 16.0%), respectively. The difference between tumor volumes measured by MAN and CA was not statistically significant ( $p=0.497$ ).

**Conclusions:**MAN is the least reproducible method for measuring tumor volumes compared to CAM and CA. The recommended way to obtain tumor volumes is to use a computer algorithm to segment tumors followed by radiologist's supervision.

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