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Adaptive 4D volume perfusion CT in lung cancer: effects of computerized motion correction and the range of volume coverage on measurement reproducibility

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PURPOSE: The purpose of this study was to determine whether measurement reproducibility can be improved using computerized motion correction and whole tumor coverage in 4D adaptive perfusion CT of lung cancer.
MATERIALS AND METHODS: Perfusion CTcovering the entirez-axis of a mass was obtained in 40 patients with lung cancer. Perfusion CT included 17 repeated spiral dynamic CT scans obtained during 93 seconds. Tumor blood flow (BF), blood volume (BV), and permeability were measured in four different manners: in whole tumor coverage before motion correction (whole-precorrection) and with motion correction (whole-motion-corrected); in a small volume of interest without motion correction (small- precorrection) and with motion correction (small-motion-corrected). Intra- and inter-observer reproducibility were assessed through Bland-Altman analyses.
RESULTS: Intra-observer reproducibility for BF, BV, and permeability were: −52.1–48.0%, −22.4–27.8%, and −33.2–38.5% in whole-precorrection, respectively; −53.3–45.6%, −17.7–20.6%, and −31.5–37.0% in whole-motion-corrected data; -107.8–97.4%, −98.3–93.7%, and −132.3–100.7% in small-precorrection; and −74.9%–98.6%, −74.5%–88.1%, and −109.8%–114.1% in small-motion-corrected data. Inter-observer reproducibility for BF, BV, and permeability were: −57.0–62.5%, −36.8–52.6%, and −47.7–66.0% in whole-precorrection, respectively; −55.7–55.8%, −25.8–42.0%, and −35.3–46.7%, in whole-motion-corrected data; −146.6–165.1%, −117.1–137.7%, and −143.2–149.8% in small-precorrection; and −106.2–133.6%, −99.5–122.4%, and −108.6–170.0% in small-motion-corrected data. Overall, the best reproducibility was obtained with whole-motion-corrected data.
CONCLUSION: Measurement reproducibility of perfusion parameters improved with computerized motion correction and measurement using whole tumor coverage. The best reproducibility in parameter values was obtained with motion correction and whole tumor coverage.