Choice of Immobilization of SBRT in Lung Tumor Patient by BMI

Jin Wang, Guo-fu Chen, Bai-qiang Dong, Yuchen Li, Yu-jin Xu, Ming Chen.

Conclusion

- The immobilization choice of SBRT for lung tumor depends on patient’s BMI.
- TMP offers better reproducibility with significantly less inter-fractional set up displacement than VCS for patients with BMI≥24, resulting in fewer CBCT scans. However, VCS may be preferable to TMP for patients with BMI<24.
- More research is needed to identify the optimal immobilisation system for use in lung SBRT.

Background

The use of an accurate, reproducible and comfortable immobilization device is essential for stereotactic radiotherapy (SBRT) in lung tumor patients.

Aim

The purpose of the present study was to compare thermoplastic masks (TMP) and vacuum cushion (VCS) system to assess differences in inter-fraction and intra-fraction set up accuracy, and to assess the impact of patients’ BMI on immobilization choice.

Result

Using CBCT internal target volume was matched within ±6mm in 78.6% of all fractions at localization, 95.3% at medial-lateral (ML) direction, 89.5% at cranial-caudal (CC) direction, and 91.4% at anterior-posterior (AP) direction (Fig 1). For patients with BMI≥24, mean displacements for the TMP and VCS systems, respectively, were as follows: 1.4±1.2mm vs 2.4±2.0mm at ML direction (p<0.001), 2.0±1.9mm vs 2.0±1.9mm at CC direction (p=0.917), 2.4±1.4mm vs 2.6±2.1mm at AP direction, (p=0.546, Fig 2). For patients with BMI<24, mean displacements for the TMP and VCS systems, respectively, were as follows: 1.8±1.4mm vs 2.1±1.8mm at ML direction (p=0.098), 2.9±2.3mm vs 2.2±2.2mm at CC direction (p=0.001), 1.8±1.8mm vs 2.3±2.0mm at AP direction, (p=0.006, Fig 3). Proportion of treatment fractions within tolerance stratified by immobilization type for patients with BMI<24 or BMI≥24 was shown in Fig 4. No difference was found in intra-fraction set up error by different immobilization type (p>0.05).

Fig 1 Proportion of fractions within tolerance measured on localization cone-beam computed tomography (CBCT) scans, in (a) medial-lateral (b) cranial–caudal (c) anterior–posterior (d) any direction (N = 121).

Fig 2 Set-up error stratified by immobilization type for patients with BMI≤24

Fig 3 Set-up error for stratified by immobilization type patients with BMI<24

Fig 4 Proportion of treatment fractions within tolerance stratified by immobilization type and BMI. (a) in medial–lateral direction, for patients with BMI≤24; (b) in medial–lateral direction, for patients with BMI<24; (c) in cranial–caudal direction, for patients with BMI≤24; (d) in cranial–caudal direction, for patients with BMI<24; (e) in anterior–posterior direction, for patients with BMI≤24; (f) in anterior–posterior direction, for patients with BMI<24 (N = 121 patients).

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