

1. Radiother Oncol. 2014 Mar;110(3):523-8.

Intra- and interfractional variations in geometric arrangement between lung tumours and implanted markers.

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PURPOSE:

To quantify the intra- and interfractional variations between lung tumours and implanted markers.

MATERIALS AND METHODS:

Gold markers were implanted transbronchially around a lung tumour in fifteen patients. They underwent four-dimensional computed tomography scans twice, and the centroids of the tumour and markers were determined. Intrafractional variations were defined as the residual tumour motions relative to the markers due to respiration from the end-exhale phase. Interfractional variations were defined as the residual setup errors after correction for the position of the implanted markers in end-exhale phase images.

RESULTS:

The intrafractional variations differed between patients. The root mean squares of standard deviations for each phase were 0.6, 0.9, and 1.5mm in the right-left, anterior-posterior, and superior-inferior directions, respectively. The maximum difference in intrafractional variation among 10 phases was correlated with the amplitude of tumour motion in all directions and the tumour-marker distance in the anterior-posterior and superior-inferior directions. The interfractional variations were within 2.5mm.

CONCLUSIONS:

The intrafractional variations differed according to the amount of tumour motion and the tumour-marker distance. Additionally, interfractional variations of up to 2.5mm were observed. Thus, a corresponding margin should be considered during implanted marker-based beam delivery to account for these variations.