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Purpose

To investigate dosimetric effect of tumor tracking. To evaluate changes of treatment volumes when tracking is applied.

Method and Materials

Tumors in thorax region incur significant amount of motion and deformation due to respiratory and cardiac cycles. In this study, volumetric and dosimetric effect of tumor motion tracking have been investigated. We have analyzed data for ten patients who were diagnosed with lung cancer. In order to make dosimetry comparison, the treatment plan was made for each of ten phases of tumor motion. The dosimetric and volumetric effects were analyzed for two groups of tumor motion. In the first group tumor motion was up to 1.5cm, whereas for the second the motion was up to 2.5cm.

Results

It was observed that during respiratory cycle GTV was changed from 1-3cm^3 for GTVs around 20cm^3, 5cm^3 for GTVs around 50cm^3, and 20cm^3 for GTVs of 100 cm^3 and above, depending on tumor position and respiratory cycle itself. When active tracking was applied and tumor motion was up to 1.5 cm, irradiated PTV was from 20-30% less for medium size tumors and more than 50% for small size tumors. For tumor motion range up to 2.5cm, irradiated PTV was two times smaller when tracking is applied. It was noticed that V20 with tracking was from 2-15% less of V20 without tracking, for tumor motion up to 1.5cm. For tumors within motion range from 2.2cm to 2.5cm, V20 with tracking was from 11-30% less comparing to one without tracking. Calculating dose it was concluded that 20% of healthy lung approximately receives from 2Gy to 6Gy less when tumor tracking technique was used.

Conclusion

Implementation of real-time tracking techniques can minimize irradiation to healthy tissues and improve sparing of critical organs. Consequently, quality of patient treatment potentially can be improved.

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