

AbstractID: 7580 Title: A robust proton treatment planning strategy to account the diaphragm motion for the esophagus cancer using 4D CT

Purpose

The purpose of this work is to design a treatment plan so that the target will be adequately covered on each phase of four-dimensional computed tomography (4D CT) for patients with large diaphragm motion when the same treatment plan was recalculated in all 10 phases of the 4D CT.

Method

We evaluate two planning strategies based on (1) average CT and (2) inspiration CT. For both strategies, smearing, proximal and distal margins were adjusted to improve the target dose coverage for 10 phases of 4D CT. For an esophagus patient with large diaphragm motion (~5cm), a treatment plan was designed based on strategies (1) and (2). The same treatment plan was recalculated in all 10 phases of the 4D CT.

Result

For strategy (1), internal target volume (ITV) prescription dose coverage at inspiration/expiration phase decreased/increased from 99.3%/91.5% to 94.6%/99.6% when the smearing margin was increased from 0.5 cm to 3.5 cm. Adjusting the distal and proximal margin had not effect on the ITV coverage. For strategy (2), using the smearing margin 3.5 cm and an increased distal margin for one of the three beams, the ITV prescription dose coverage is at least 99.5% for all ten phases of 4D CT.

Conclusion

By designing a proton treatment plan on the inspiration phase with slightly adjusted planning parameters, it is possible to have the target adequately covered for the esophagus cancer patient with large diaphragm motion.