

AbstractID: 1657 Title: Experimental Study of an IMRT Technique that Compensates for Organ Motion

Organ motion presents a significant challenge in adequate target irradiation and sparing of normal structures. To accommodate for lung motion, large PTV margins have been frequently used causing excessive lung dose. In this work, we experimentally studied a novel IMRT technique for moving targets that provides adequate uniform target dose and reduced dose to surrounding tissues. Two IMRT plans were developed for a cylindrical target (3cm radius, 3.5cm long) placed in the middle of a 16cm cubic box phantom filled with lung equivalent medium. This phantom was attached to a solenoid-driven mechanism that provided variable periodic motion of the target. EDR2 films were placed in the coronal plane through middle of target. The first IMRT plan used uniform prescription dose to the entire PTV. The second plan used the ITV concept and modified prescription dose: GTV was prescribed full dose, ITV and PTV 18% and 25% lower doses respectively. To achieve full prescription dose to the entire moving target, outer 0.5cm rim of GTV was given 25% higher dose. Study results demonstrated that IMRT with modified, non-uniform prescription delivered prescribed dose to the entire target volume. However, the conventional PTV based IMRT resulted in increased target dose non-uniformity (from 10 to 20%). More importantly, with modified IMRT, lung tissues received significantly lower dose. For example, at 2cm distance from the target, lung received 50% less dose. In addition, lung D30 and D20 were reduced by 12 and 18% respectively.