A lung SBRT plan, treatment, and follow up according to RTOG 0236 protocol

**Introduction:** Lung SBRT (stereotactic body radiotherapy) techniques have been considered an alternative way to conventional radiation therapy due to its improved disease control and shorter treatment time. Several RTOG protocols (such as RTOG 0236, RTOG 0813 etc.) described prescription and critical structure tolerances. However, the techniques to implement those protocols were less mentioned from end-to-end. Most of importance, the clinical outcomes following those techniques were seldom mentioned. For a hospital-based organization, it is very important to demonstrate the effectiveness and efficiency of those techniques and clinical outcomes for SBRT treatment. In this study, we described a clinical case for lung SBRT treatment following RTOG 0236 protocol from planning to 6-month follow up.

**Materials and Methods:** A 77-old patient with squamous cell lung cancer needs radiation therapy treatment. The patient got consultation at our clinic and selected SBRT treatment method as his primary care. A GE 4D 4-slice CT scan was performed with free breathing and CIVCO Body Pro-Loc immobilization device. The 4D CT were transferred to GE 4D workstation to contour the ITV (internal target volume) by the physician. The contours were then transferred to Eclipse treatment planning system (version 8.6). A 7 mm universal margin was added to the ITV to create PTV (planning target volume) in Eclipse treatment planning system. All other critical structures were contoured according to RTOG 0236 guideline. Co-planar six-conformal arcs with 60 degree each were set up according to Yale University published technique (1) with minor modifications (patient’s arm was up during CT scan, removing treatment table for planning and no heterogeneity correction according to the RTOG 0236 protocol). AAA dose calculation algorithm was used without heterogeneity correction according to the RTOG 0236 protocol. The prescription was 20 Gy X 3 fractions. All the organs at risk tolerances met RTOG 0236 protocol. For treatment delivery, a CBCT was performed before treatment. Image registration was performed by a physicist and double checked by a physician. The 6 arcs were delivered after the CBCT matching.

**Results:** The treatment plan quality matching RTOG 0236 protocol well. The patient went through 3 fractions treatment in three weeks. The patient follow-up CT were done after 3 months and 6 months later. The gross tumor volume shrinks from 13.80 cc (plan date) to 5.43 cc (3 months later) and 4.72 cc (6 months later). Figure 1 shows the comparison of the tumor shrinking.

![Figure 1. Left: 3-month later after treatment comparison with the original image. Right: 6-month later after treatment. Contours are based on original image to show the tumor shrinking.](image)

**Conclusion:** The RTOG 0236 protocol is effective for this lung SBRT patient treatment. The Yale University modified dynamic conformal arc technique (MDCA) technique is efficient for the lung SBRT treatment if the tumor location is not too close to chest wall and other critical structures. 4D CT, CIVCO Body Pro-Loc, CBCT were essential for the lung SBRT plan and delivery.