Introduction

The advent of stereotactic body radiotherapy (SBRT) provides a nonsurgical therapy for patients with inoperable early-stage non-small cell lung cancer (NSCLC), oligometastatic lesions to the lung or for operable patients who refuse surgery. Stereotactic body radiotherapy uses elements of 3-dimensional conformal radiotherapy combined with stereotactic tumor localization to deliver ablative daily doses of radiation while limiting radiation dose to the surrounding normal tissues. The Radiation Therapy Oncology Group (RTOG) recently published the results of a phase II prospective study (0236) for inoperable early-stage NSCLC showing local tumor control of 97.8% and an overall survival of 55.8% at 3 years. The use of volumetric modulated arc therapy with RapidArc® radiotherapy technology provides advantages over conventional, fixed gantry delivery lung SBRT by significantly decreasing treatment times.

Case Report

The patient is an 82 year old African American male with a 40 pack year smoking history, hypertension and COPD. He was incidentally found to have a 2.8 cm right upper lobe pulmonary nodule. Positron emission spectroscopy (PET) showed hypermetabolic activity within the lung mass. No abnormal mediastinal or hilar lymph nodes were identified. The patient underwent CT-guided core needle biopsy which demonstrated squamous cell carcinoma. Pulmonary evaluation showed severe obstructive changes with an FEV1 of 0.8 liters (36% predicted) and a diffusion capacity of 19% predicted. The patient was evaluated in a multidisciplinary setting, was determined to be high risk for anatomic resection and was therefore offered SBRT as an alternative treatment modality.

The patient underwent CT simulation for radiation treatment planning. Four-dimensional (4D) CT with the Varian Real-time Position Management ™ (RPM) system was used to assess respiratory motion for treatment planning. The tumor was found to move 8mm in the cranial-caudal direction. A maximum intensity projection (MIP) image was used to define the internal tumor volume (ITV) and a subsequent 5mm planning target volume (PTV) was used. A total dose of 48Gy was delivered in 4 fractions over a period of 10 days. The total treatment time from setup to delivery was 30 minutes for each treatment.

The patient experienced no acute or chronic radiation-induced toxicities. At 6 months post-treatment the mass reduced in size by 70%, with stability at 10 months.

Discussion

SBRT using RapidArc achieved successful treatment of an early-stage NSCLC. SBRT is a reasonable alternative to sublobar resection in high risk patients. Additionally, the use of volumetric modulated arc therapy with RapidArc provides beneficial advantages over conventional, fixed gantry delivery by significantly decreasing treatment times. This case demonstrates the utilization of RapidArc-based SBRT for the treatment of inoperable early-stage NSCLC.

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Pre-SBRT Thoracic CT  

6-month post-SBRT thoracic CT demonstrates mass reduction of 70%

The information presented is intended to provide an informative case study example only. Varian is not endorsing the specific actions or treatment protocols of the clinical team involved in the delivery of radiation treatment of the specific patient. Health care professionals must always rely on their professional clinical judgment when deciding whether a patient is a candidate for radiation therapy and how to use radiation therapy.