CASE PRESENTATION:
The Emerging Role of Stereotactic Body Radiotherapy in Early-Stage Lung Cancer

A 55-year-old male with a 40-pack-year history of smoking is found to have a 1.5 cm suspicious right upper lobe nodule on CT of the chest (see Figure 1A). CT-guided biopsy of this nodule revealed a diagnosis of non-small-cell lung cancer (NSCLC), adenocarcinoma type (see Image 1B). Subsequent staging PET-CT study showed no evidence of distant metastasis; however noted equivocal mediastinal lymph nodes. He was ultimately referred to the Comprehensive Stereotactic Radiosurgery Program, part of UPMC CancerCenter.

Evaluated by both thoracic surgery and radiation oncology the same day, the patient was deemed medically inoperable based on advanced COPD and an associated poor pulmonary reserve. However, he was thought to be a potential candidate for definitive stereotactic body radiotherapy (SBRT) should an endobronchial-ultrasound-guided sampling of the equivocal mediastinal lymph nodes be negative for metastatic disease. The sampling was negative, and he elected to proceed with SBRT for his medically inoperable Stage I NSCLC.

Using Varian Trilogy® Intensity Modulated Radiosurgery with dynamic respiratory compensation, he went on to receive 60 Gy in 3 SBRT fractions to the right upper lobe lesion over seven elapsed days without toxicity (see Figure 2). Four months post-SBRT, a follow-up PET-CT study was obtained (see Figure 1C and 1D) and showed a complete metabolic response and no evidence of treatment-related toxicity.

Despite advances in multimodality management, lung cancer remains the leading cause of cancer-related mortality. While only a minority of newly diagnosed NSCLC patients present as localized disease (15-20%), increased adoption of high-risk screening may translate into increased early detection. Surgical resection is the standard of care for Stage I NSCLC; however many patients, such as the case presented in this report, represent poor operative candidates due to baseline pulmonary dysfunction and medical comorbidities.

Building upon advances in radiation planning and delivery, SBRT has emerged as a noninvasive definitive therapy for early-stage NSCLC delivering high doses of increasingly conformal radiation therapy with an...
accuracy less than 1 mm that integrates radiation delivery with respiratory cycle motion (1). Multiple single institutional series, including pioneering collaborations between UPMC CancerCenter Radiation Oncology and Thoracic Surgery, suggest excellent local control less than 90% and minimal toxicity in medically inoperable patients (2).

These results were recently further substantiated in a cooperative Phase 2 study (RTOG-0236), demonstrating a three-year local control of 98% approaching, if not exceeding, prior reported surgical series for early-stage NSCLC (3). Building on these promising results in medically inoperable patients, numerous ongoing international trials including, Dutch ROSEL, RTOG 0618, and JCOG 0403, are comparing SBRT to definitive surgical resection in operable patients. The Comprehensive Stereotactic Radiosurgery Program offers patients with early-stage NSCLC a state-of-the-art, noninvasive definitive therapy in a multidisciplinary approach where radiation oncologists and thoracic surgeons collaboratively optimize the application of emerging technologies, such as SBRT, promising to challenge current paradigms and improve outcomes in the management of early-stage NSCLC.

REFERENCES: