Advances in radiation therapy have improved survival rates for early stage lung cancer patients

Analysis of Veteran’s Health Administration database from 2001 to 2010 finds survival rates doubled with increased adoption of SBRT for stage I NSCLC

BOSTON, September 25, 2016 -- A new analysis of records in the Veteran’s Affairs Central Cancer Registry demonstrates a clear positive impact of the increased use of stereotactic body radiation therapy (SBRT) to treat patients with stage I non-small cell lung cancer (NSCLC) in recent years, according to research presented today at the 58th Annual Meeting of the American Society for Radiation Oncology (ASTRO). Escalated adoption of this advanced form of radiation therapy (RT) from 2001 to 2010 was associated with substantial increases in overall survival (OS) rates and lung cancer specific survival (LCSS) rates.

“Lung cancer causes more than one million deaths each year worldwide,” said Matthew Boyer, MD, PhD, lead author of the study and a resident in radiation oncology at Duke University in Durham, North Carolina. “Moreover, an increasing number of localized, or stage I, lung cancer diagnoses are occurring, due to an aging population and advanced screening techniques.”

While the majority of patients with stage I NSCLC underwent surgery, RT is recommended for patients who cannot tolerate surgery or desire non-surgical management. SBRT, which was developed in the 1990’s, uses advanced imaging techniques to deliver highly-targeted radiation to a tumor and limit damage to surrounding tissue. Preserving healthy tissue is particularly important for NSCLC patients, whose tumors are located near or in essential organs including the heart and lungs.

Researchers sought to determine whether the increased use of SBRT in recent years had a subsequent impact on the outcomes of patients with NSCLC. Using the Veteran’s Affairs Central Cancer
Registry (VACCR), they identified more than 14,000 patients diagnosed with stage I NSCLC from 2001 to 2010, including 3,012 records of patients who received RT as their primary treatment. From this cohort, 468 patients were identified who had SBRT and 1,203 patients who received conventional RT (i.e., the CRT group). Data regarding fractionation, co-morbidities, treatment toxicity, PET utilization and vital status were obtained from the VA Corporate Data Warehouse (VACDW).

Primary outcomes included rates of overall survival (OS) and lung cancer specific survival (LCSS) measured at four years following RT. Researchers computed hazard ratios (HR) to compare OS and LCSS rates and changes in survival rates between the SBRT and CRT groups as well as employed multivariate analysis to assess the influence of participant characteristics on survival outcomes.

The average age of study participants was 72, and 98.6 percent of patients were male. At the time of diagnosis, nearly nine in 10 patients (89.4 percent) were current or former smokers. In terms of disease type, 50.5 percent of patients were diagnosed with stage IA NSCLC, and 41.5 percent were diagnosed with squamous cell carcinoma.

Average survival rates for all patients increased over the study period, as did the use of SBRT. Four year OS for study participants as a whole who underwent radiation rose from 12.7 percent to 28.5 percent and four year LCSS rose from 33.9 percent to 50.4 percent, concurrent with increased utilization of SBRT from 4.7 percent to 60.3 percent.

At four years follow-up, both overall and lung cancer specific survival rates were significantly higher for SBRT patients than for CRT patients. By Kaplan Meier analysis, four-year OS was 37.0 percent for SBRT patients, which was significantly higher than the 18.8 percent OS rate for CRT patients (HR, 0.60; \( p < 0.001 \)). This improvement in OS was largely due to an increase in LCSS which, at four years, was 53.2 percent for patients treated with SBRT as compared to 28.3 percent for patients treated with CRT (HR, 0.39; \( p < 0.001 \)).

On multivariate analysis, treatment with SBRT vs. CRT was associated with a nearly 30 percent reduction in the risk of death (HR, 0.72; \( p < 0.001 \)). In addition, older age (HR, 1.01 per year; \( p = 0.022 \)), higher Charlson co-morbidity score (HR, 1.52 for a score of 2 vs. 0; \( p < 0.001 \)), and higher stage (HR, 1.39 for Stage IB vs. IA; \( p < 0.001 \)) were associated with improved survival. Notably, there was no significant difference in survival on multivariate analysis based on receipt of PET scans for staging (HR, 0.88; \( p = 0.084 \)) or treatment era (HR, 0.93 for 2006-2010 vs. 2001-2005; \( p = 0.317 \)), indicating that the doubling in survival for patients receiving radiation was strongly correlated with increased utilization of SBRT and not with improved staging with PET scans or other improvements in treatment and care over the same time period.

“\( It \) is very rare for a study to show that double the number of patients were likely to be alive at
four years due to the introduction of a new treatment,” said Dr. Boyer. “We identified that this doubling was due to the introduction of these advanced radiation techniques collectively termed stereotactic body radiation therapy, or SBRT. These findings of improved survival in stage I lung cancer patients in general, and those undergoing radiation specifically, are generalizable to patients outside the VHA. Although a number of studies are underway to define the best treatment for stage I non-small cell lung cancer, our study, and others, indicate that advances in radiation treatment and delivery can improve patient survival and that SBRT should be the standard treatment for patients treated with radiation for stage I NSCLC.”

The abstract, “Survival with Stereotactic Body Radiation Therapy (SBRT) and Conventional Radiation Therapy (CRT) in Stage I NSCLC Patients in the Veterans Health Administration,” will be presented in detail during a scientific session at ASTRO’s 58th Annual Meeting at 1:15 p.m. Eastern time on Sunday, September 25, 2016. To speak with Dr. Boyer, please contact ASTRO’s media relations team on-site at the Boston Convention and Exhibition Center September 25 through 28, by phone at 703-286-1600 or by email at press@astro.org.

ATTRIBUTION TO THE AMERICAN SOCIETY OF RADIATION ONCOLOGY (ASTRO) ANNUAL MEETING REQUESTED IN ALL COVERAGE.

This news release contains updated data from the study author(s). Full study abstract available on the final page of this release.

ABOUT ASTRO’S ANNUAL MEETING
ASTRO’s 58th Annual Meeting, the nation’s premier scientific meeting in radiation oncology, will be held September 25-28, 2016, at the Boston Convention and Exhibition Center in Boston. The 2016 Annual Meeting is expected to attract more than 11,000 attendees from across the globe, including oncologists from all disciplines and members of the entire radiation oncology team. Led by ASTRO president David C. Beyer, MD, FASTRO, the 2016 meeting will feature keynote addresses from Kathleen Sebelius, former U.S. Secretary of Health and Human Services; Thomas James Lynch Jr., MD, Chair and CEO, Massachusetts General Physicians Organization; and Jason Ragogna, general manager, SMS and Safety Alliances, Corporate Safety, Security, and Compliance, Delta Air Lines, Inc. The Presidential Symposium, “Prostate Cancer: Defining Value and Delivering It,” highlights the meeting’s theme of “Enhancing Value, Improving Outcomes” and will feature recent practice-changing studies and current developments in value-based care for prostate cancer. ASTRO’s four-day scientific meeting will feature a record number of abstracts, including 368 oral presentations, 1,760 posters and 180 digital posters in more than 50 educational sessions and 20 scientific panels for 20 disease-site tracks. For more information about ASTRO’s 58th Annual Meeting, visit www.astro.org/AnnualMeeting. For press registration and news briefing information for ASTRO’s 58th Annual Meeting, visit www.astro.org/AMPress.

ABOUT ASTRO
ASTRO is the premier radiation oncology society in the world, with more than 10,000 members who are physicians, nurses, biologists, physicists, radiation therapists, dosimetrists and other health care professionals who specialize in treating patients with radiation therapies. As the leading organization in radiation oncology, the Society is dedicated
to improving patient care through professional education and training, support for clinical practice and health policy standards, advancement of science and research, and advocacy. ASTRO publishes three medical journals, International Journal of Radiation Oncology • Biology • Physics (www.redjournal.org), Practical Radiation Oncology (www.practicalradonc.org) and Advances in Radiation Oncology (www.advancesradonc.org); developed and maintains an extensive patient website, RT Answers (www.rtanswers.org); and created the Radiation Oncology Institute (www.roinstitute.org), a nonprofit foundation to support research and education efforts around the world that enhance and confirm the critical role of radiation therapy in improving cancer treatment. To learn more about ASTRO, visit www.astro.org.
Survival with Stereotactic Body Radiation Therapy (SBRT) and Conventional Radiation Therapy (CRT) in Stage I NSCLC Patients in the Veterans Health Administration

M. J. Boyer\textsuperscript{1}, C. Williams\textsuperscript{2}, M. J. Kelley\textsuperscript{3}, and J. K. Salama\textsuperscript{1}; \textsuperscript{1}Duke University Medical Center, Durham, NC, \textsuperscript{2}Durham Veterans Affairs Medical Center, Durham, NC, \textsuperscript{3}Durham VA Hospital and Duke University, Department of Medical Oncology, Durham, NC

Purpose/Objective(s): The optimal stage I NSCLC radiation modality is unknown. We sought to compare survival and cause of death between SBRT and CRT among patients with stage I NSCLC using VA historical databases.

Materials/Methods: Using the VA Central Cancer Registry (VACCR), stage I NSCLC patients diagnosed from 1/2001-12/2010 were identified. Patients classified as having only radiation as their primary treatment were included. Data regarding fractionation, co-morbidities, treatment toxicity, PET utilization and vital status were obtained from the VA Corporate Data Warehouse (VACDW). Cause of death was obtained from the National Death Index. Radiation fractionation was determined by CPT codes for treatment limited to within 180 days of diagnosis, one treatment/day, and $\leq$ 1 week between consecutive treatments or by review of VACDW abstracted data; a patient was scored as receiving SBRT if noted so or had received a series of radiation with $\leq$ 5 fractions. Charlson Comorbidity Index (CCI) was calculated using ICD-9 codes in the year before diagnosis. Treatment toxicity was determined based on ICD-9 codes up to 180 days after treatment. PET utilization was based on the CPT codes from 6 months before diagnosis to day of first treatment.

Results: 14,177 patients were identified with stage I NSCLC; 3,132 received radiation as their only initial treatment. Median follow-up was 6.73 years. Mean age was 71.9, 98.6% were male and 82.2% were white. 89.5% were current/former smokers. 50.7% had stage IA NSCLC and 41.4% had squamous cell carcinomas. Median survival for all radiated patients was 1.85 years; 4 year overall survival (OS) was 21.6%. Of the 2,075 patients with known fractionation, 804 had SBRT and 1,271 had CRT. 4 year OS was significantly improved with SBRT (30.0% vs 19.2%, HR 0.739, p<0.001). 4 year disease-specific survival (DSS) was also significantly improved with SBRT (54.7% vs 33.7%, HR 0.586, p<0.001). 90 day mortality was 2.3% in all patients receiving radiation with radiation pneumonitis and esophagitis rates of 1.4% and 2.4%, respectively. 4YOS increased from 12.9% to 29.2% from 2001 to 2010 along with increased SBRT utilization from 15.6% to 47.3% and PET utilization from 12.0% to 69.4%. On multivariate analysis SBRT (HR= 0.85), in addition to younger age (HR=0.99 per year), lower CCI (HR = 0.67 for CCI 0 vs CCI of 2), later year of diagnosis (HR = 0.84 for 2007-2010 vs 2001-2004), and stage IA (HR = 0.67) were associated with improved survival (p<0.05); patients who had a pre-RT PET had a strong trend for improved survival as well (HR = 0.90, p=0.055).

Conclusion: In this VA population of stage I NSCLC patients diagnosed from 2001-2010, SBRT is associated with an improved OS and DSS compared to CRT. OS of yearly cohorts also increased during this time with concurrent with increasing utilization of SBRT and PET. These population-based data suggests SBRT improves outcomes for stage I NSCLC patients treated with radiation.