

# A National Cancer Database Analysis of Radiofrequency Ablation versus Stereotactic Body Radiotherapy in Early-Stage Non–Small Cell Lung Cancer

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## ABSTRACT

**Purpose:** To compare overall survival (OS) after radiofrequency (RF) ablation and stereotactic body radiotherapy (SBRT) at high-volume centers in patients with early-stage non–small cell lung cancer (NSCLC).

**Materials and Methods:** Cases in the National Cancer Database of stage 1a and 1b NSCLC treated with primary RF ablation or SBRT from 2004 to 2014 were included. Patients treated at low-volume centers, defined as facilities below the 95th percentile in volume of cases performed, were excluded. Outcomes measured include OS and rate of 30-day readmission. The Kaplan-Meier method was used to estimate OS. The log-rank test was used to compare survival curves. Propensity score matched cohort analysis was performed.  $P < .05$  was considered statistically significant.

**Results:** The final cohort comprised 4,454 cases of SBRT and 335 cases of RF ablation. Estimated median survival and follow-up were 38.8 months and 42.0 months, respectively. Patients treated with RF ablation had significantly more comorbidities ( $P < .001$ ) and higher risk for an unplanned readmission within 30 days (hazard ratio = 11.536;  $P < .001$ ). No difference in OS for the unmatched groups was found on multivariate Cox regression analysis ( $P = .285$ ). No difference was found in the matched groups with 1-, 3-, and 5-year OS of 85.5%, 54.3%, and 31.9% in the SBRT group vs 89.3%, 52.7%, and 27.1% in the RF ablation group ( $P = .835$ ).

**Conclusions:** No significant difference in OS was seen between patients with early-stage NSCLC treated with RF ablation and SBRT.

## ABBREVIATIONS

HR = hazard ratio, HVC = high-volume center, NCDB = National Cancer Database, NSCLC = non–small cell lung cancer, OS = overall survival, SBRT = stereotactic body radiotherapy

Approximately 234,030 new cases of lung cancer are expected to be diagnosed in 2018, of which non–small cell lung cancer (NSCLC) comprises approximately 85% (1,2). For the 16% of new diagnoses made at an early stage (American Joint Commission on Cancer stage I or II disease), surgical

management remains the standard of care, with 5-year overall survival (OS) generally accepted to be 60%–80% (3). However, interest in nonsurgical modalities for patients who refuse surgery or are deemed medically inoperable continues to increase (4). The 2 preeminent treatment approaches in early NSCLC include stereotactic body radiotherapy (SBRT) and radiofrequency (RF) ablation.

Multiple prior prospective studies have reported 3-year OS of 55%–60% (5–7). A systematic review of outcomes after SBRT for early-stage NSCLC demonstrated 1-, 3-, and 5-year OS of 87%, 59.6%, and 39.6%, with improved outcomes seen with patients treated at high-volume centers (HVCs) (8,9). Image-guided thermal ablation has recently emerged as an effective alternative to radiotherapy. In early-stage NSCLC, retrospective data report 1- and 3-year OS of 90%–94% and 66%–74%, respectively, in medically inoperable patients (10,11). Two prospective trials evaluating 87 patients reported 1- and 2-year OS of 70%–86% and 48%–70%, respectively (12,13). Published data directly

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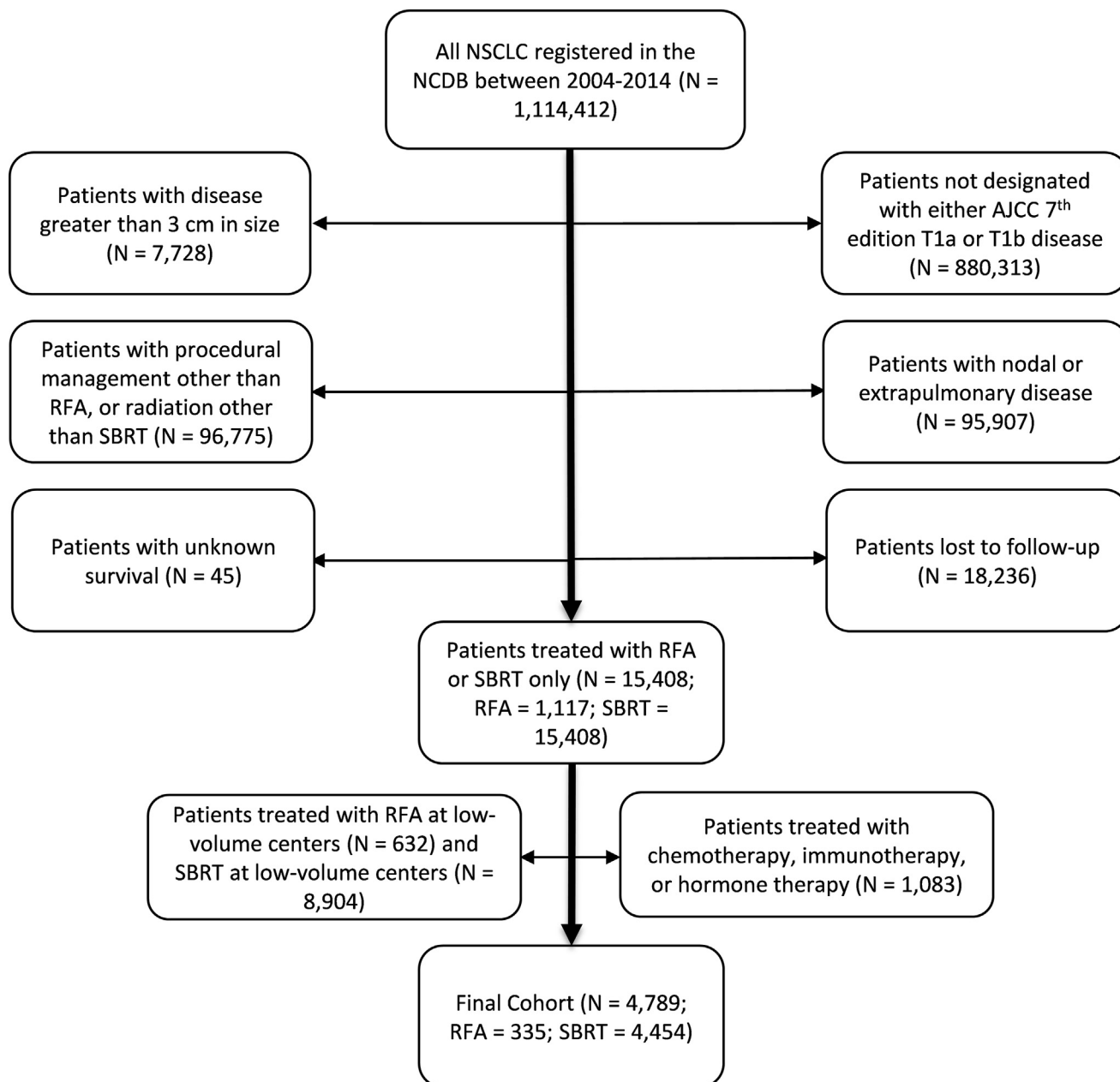
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Table E1 is available online at [www.jvir.org](http://www.jvir.org).

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**Figure 1.** Flow diagram of the patient selection process. AJCC = American Joint Committee on Cancer; RFA = RF ablation.

comparing clinical outcomes for these 2 nonsurgical modalities are limited. The purpose of this study was to retrospectively compare OS between patients treated with RF ablation and SBRT at HVCs for early-stage NSCLC with an analysis of the National Cancer Database (NCDB).

## MATERIALS AND METHODS

### Data Source and Study Population

The study cohort was derived from the NCDB, a prospectively collected oncology registry jointly sponsored by the American College of Surgeons and the American Cancer Society. The data file includes cases diagnosed from 2004 to 2014 and represents > 70% of newly diagnosed cancer cases (14). This study was approved by the institutional review

board. A retrospective cohort study of patients with the diagnosis of NSCLC between 2004 and 2014 was performed. Patients with histology codes (International Classification of Diseases for Oncology codes) corresponding to adenocarcinoma (8012), squamous cell carcinoma (8070–8076), and large cell carcinoma/NSCLC not otherwise specified (8012, 8013, 8014, 8046) were included. Only patients with American Joint Committee on Cancer staging 7th edition T1aN0M0 and T1bN0M0 disease with tumors  $\leq 3$  cm and treated at HVCs were included. For the purposes of this study, an HVC was defined as the top 95th percentile of centers by volume of patients treated over the entire study period. Facility volumes were calculated separately for SBRT and RF ablation. The selection process is summarized in [Figure 1](#).

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