

SBRT for Early NSCLC: Markov Model Insight for Optimal Patient Selection

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Background: We developed a Markov model to simulate outcomes in different sub-groups of patients with stage I NSCLC to help define the role of SBRT in this disease.

Methods: We modeled the 5 year clinical history of (i) operable stage I NSCLC patients treated with either SBRT or lobectomy, and (ii) patients aged ≥ 75 years with COPD who undergo SBRT or best supportive care (BSC). Parameters for recurrence rates and Markov state utilities for appropriate AJCC stages of NSCLC were extracted from the literature and adapted to monthly time intervals. For operable patients, age- and sex-specific rates of death from all other causes were extracted from standard life tables and varied according to smoking habit. Surgical outcomes from the model were compared to Adjuvant! Online (AO). Elderly COPD patients were stratified into 4 classes according to T stage and COPD GOLD score. We report various treatment strategy overall and quality adjusted survival stratified by age, sex, smoking history, COPD, and T-stage. Sensitivity analyses on Markov utilities, treatment-related death, and the proportion of patients with recurrent disease treated radically were performed to determine thresholds for treatment modality preference.

Results: For surgical patients, the 5-year overall survival, cancer specific survival, and other causes of death as predicted by our model correlated closely with AO, ranging from 0.0% to 3.8%. Differences between surgery and SBRT ranged from 2.2% to 3.0% in 5-year overall survival and 0.07 to 0.09 in quality adjusted life years, both in favor of surgery. The SBRT utility threshold for preferring SBRT over surgery was 0.90. Outcomes were sensitive to the SBRT utility, the proportion of recurrences treated radically, and the surgical and SBRT treatment related mortalities. For high risk patients, our model predicted for a benefit in 5-year overall survival of 4.0% to 38.2% and 8.8 to 17.4 quality-adjusted life months in favor of SBRT over BSC for the 4 classes. Outcomes were not sensitive to the SBRT utility or disease progression.

Conclusions: Withholding SBRT based on age and/or COPD severity may be unjustified. SBRT may offer comparable overall survival and quality adjusted life expectancy compared to surgical resection in operable cases.