

INTRODUCTION

- Lung cancer is the second most common cancer in North Carolina after breast cancer and causes the most deaths of all cancers in North Carolina¹
- Stereotactic Ablative Radiotherapy (SABR) is noninvasive and delivers a concentrated radiation dose to the target lesion
- SABR uses multiple fiducials placed around the tumor to follow its movement during breathing cycles throughout treatment
- Tracking at least 3 fiducials is required for 6-D information and tumor rotations
- Tracking errors can prevent additional fiducials from being tracked:
 - Rigid body - fiducials not moving together as a group
 - Spacing – fiducials too close or far apart
 - Shadowing – fiducial in line with another fiducial
 - Uncertainty – fiducial’s movement cannot be determined by tracking system
 - Collinearity – 3 fiducials within 15-degrees of a straight line



MATERIALS & METHODS

- Population: Patients who received SABR for lung tumors and had fiducial tracking data from 2016 to 2019 at Vidant
- Retrospective review of patient demographics, prior lung history, prior lung surgeries, pulmonary function, technical treatment data, local control and overall survival
- Technical treatment data included number of fiducials tracked and respective tracking errors if less than 3 were tracked
- PFT data was determined pre-bronchodilators
- Local control was determined from chest CT/PET impressions with t=0 at treatment end date
- Overall survival was determined from obituary searches, EPIC records and most recent correspondences with t=0 at treatment end date
- Clinical correlations, overall survival and local control were determined using Chi-square and Kaplan-Meier analysis from MedCalc v19.0.6

RESULTS

| Demographics, n=73 | | | |
|----------------------------------|-----------------------------|-----------------------------|---------|
| Age, median (range) | 69 (37-90) | | |
| Sex, n (%) | | | |
| Males | 33 (45.2%) | | |
| Females | 40 (54.8%) | | |
| Race, n (%) | | | |
| Caucasian | 47 (64.4%) | | |
| African American | 26 (35.6%) | | |
| Treatment characteristics, n=77 | | | |
| | <3 fiducials tracked (n=55) | ≥3 fiducials tracked (n=22) | p-value |
| Age at treatment (median, range) | 69 (55-90) | 68 (37-89) | 0.238 |
| Sex, n (%) | | | 0.678 |
| Male | 23 (41.8%) | 11 (50%) | |
| Female | 32 (58.2%) | 11 (50%) | |
| Race, n (%) | | | 1.00 |
| Caucasian | 34 (61.8%) | 16 (72.7%) | |
| African American | 21 (38.2%) | 6 (27.3%) | |

Table 1. Demographic data for study population with p-values from logistic regression comparing these characteristics between less than 3 fiducials versus 3 or more fiducials tracked.

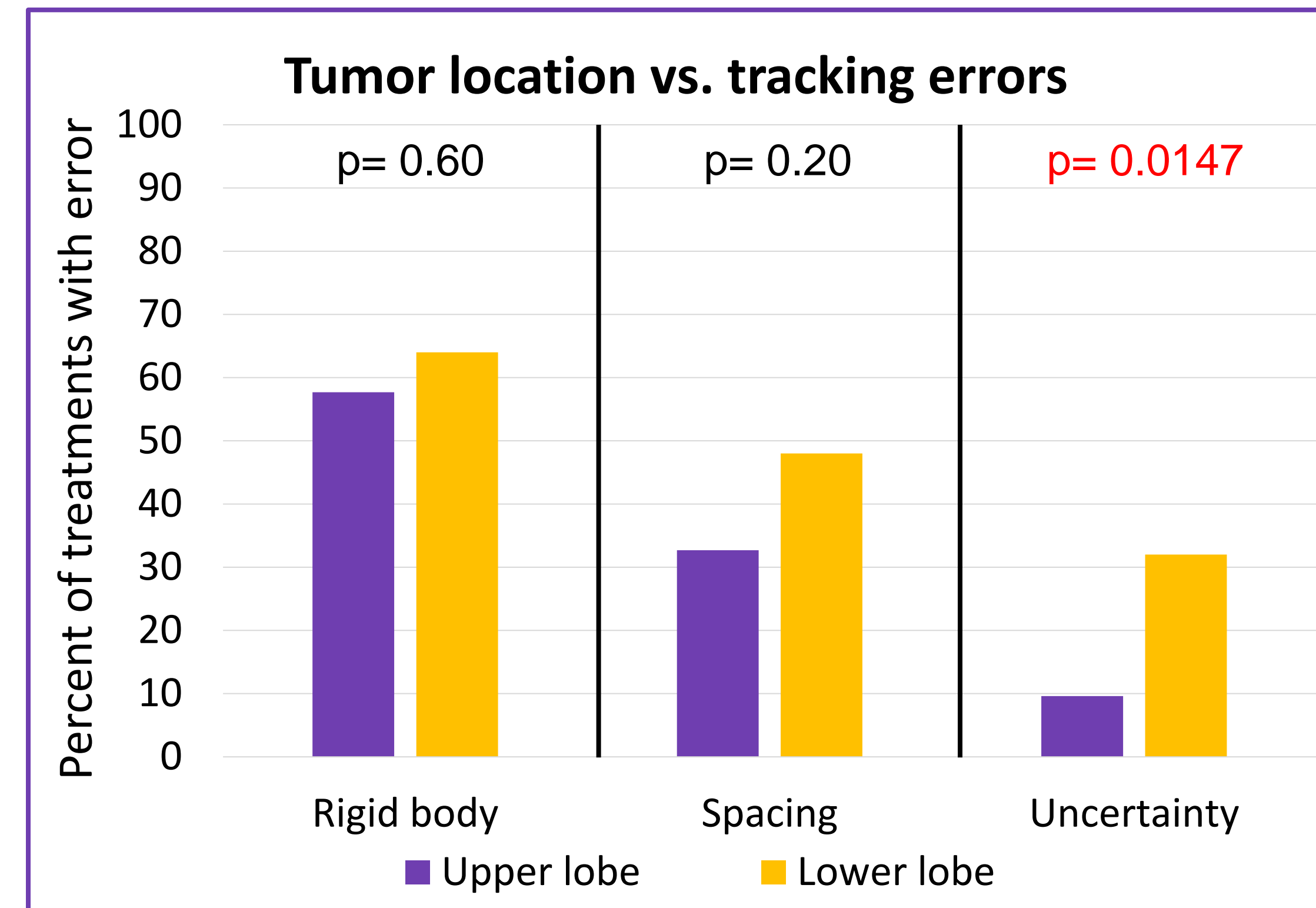


Figure 1. Comparison of frequency of tracking errors between upper and lower lobes. Right middle lobe was grouped with the upper lobe. Uncertainty errors were significantly higher in lower lobes compared to upper lobes (p=0.147).

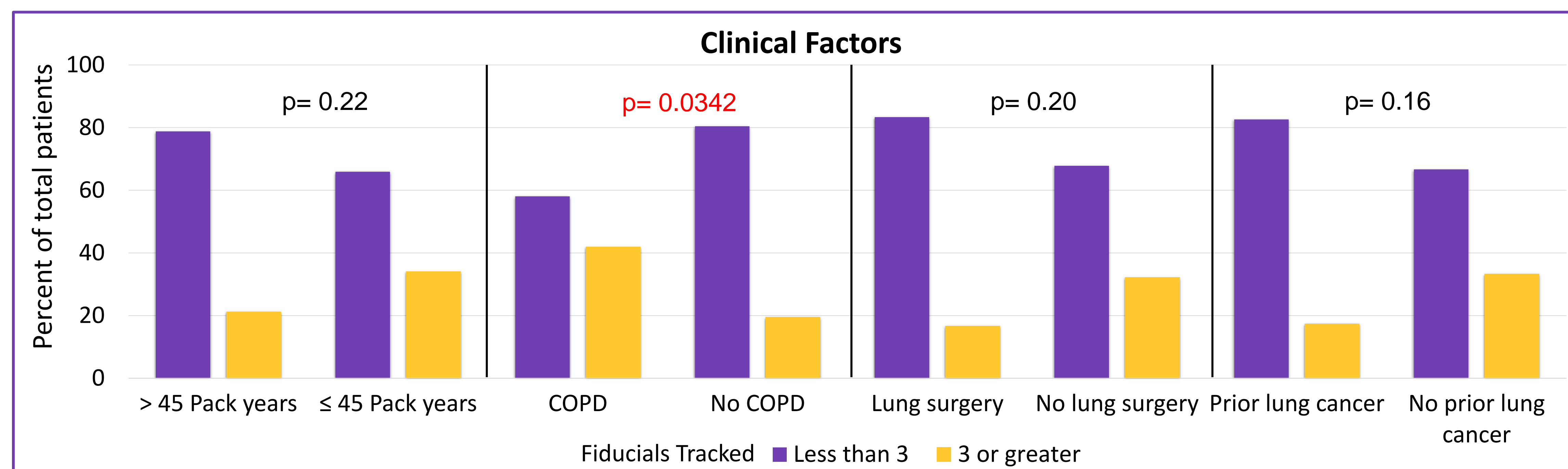


Figure 2. Comparison of effects of various clinical characteristics on number of fiducials tracked. Significantly more number of patients with COPD had 3 or more fiducials tracked than compared to patients without COPD (p=0.342).

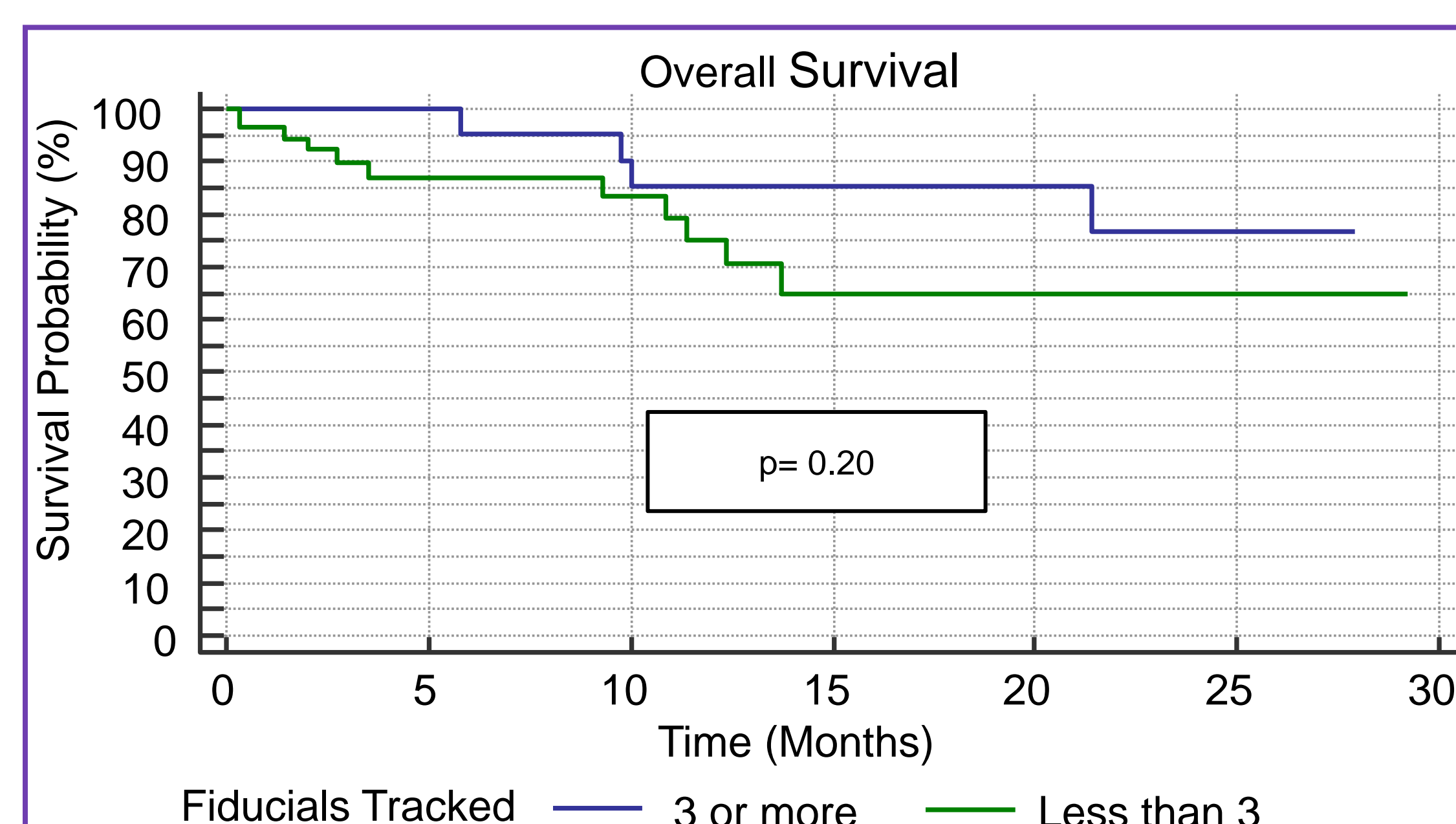


Figure 3. Kaplan-Meier curve comparing survival rates between patients with 3 or more or less than 3 fiducials tracked. No significant difference was found between the two populations (p=0.20)

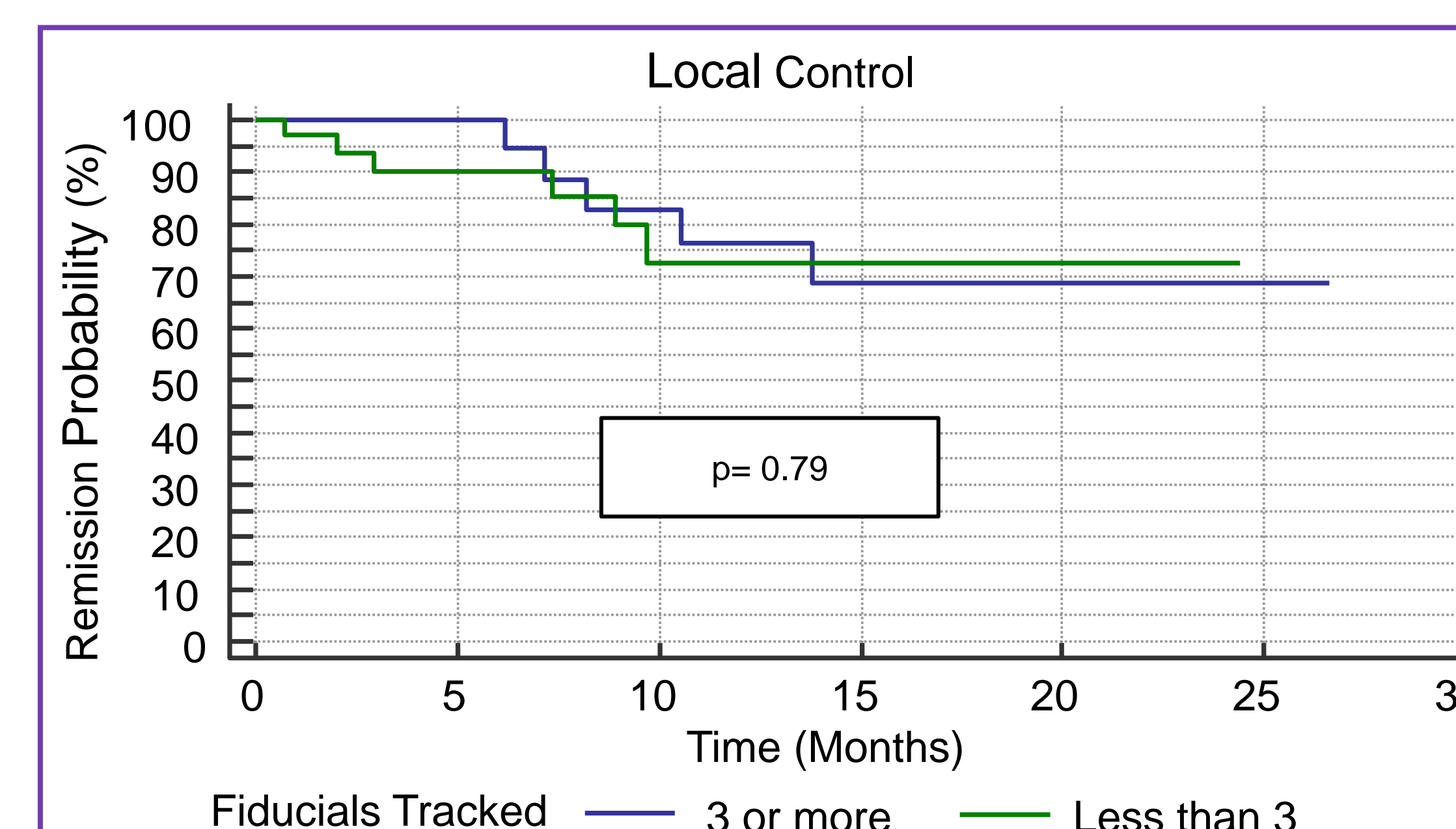


Figure 4. Kaplan-Meier curve comparing local control between patients with 3 or more or less than 3 fiducials tracked. No significant difference was found between the two populations (p=0.79)

RESULTS

- 73 patients with 77 treatment courses were identified, 48 with PFTs.
- COPD was associated with having 3 or more fiducials tracked during SABR (p=0.034)
- Pulmonary function, smoking history, prior lung surgeries and tumor location did not correlate with the number of fiducials tracked
- Tumors in the lower lobes were correlated with higher rates of uncertainty errors (p=0.015) but not spacing or rigid body errors
- Having 3 or more fiducials tracked did not affect overall survival or local control

DISCUSSION

- Increased uncertainty errors in the lower lobe could be due to increased movement that part of the lung
- More fiducials may have been tracked in patients with COPD due to reduced elastic lung tissue
- Greater motion in lower lobes can contribute to certain errors that prevent more fiducials from being tracked
- With a medium follow-up of 2.5 years, having more or less than 3 fiducials tracked resulted in similar overall survival and local control, although longer follow-up is required
- Additional follow-up analysis with more patients may result in stronger correlations between patient and tumor factors and outcomes

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- The authors declare no conflict of interest