


The Place and Importance of SBRT in Early Stage NSCLC

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Lung cancer is one of the most common types of cancer in the world. It ranks first among cancer-related deaths. Non-small cell lung cancers (NSCLC) make up the majority of lung cancer. Surgery, radiotherapy (RT), and chemotherapy methods are used in its treatment. Prognostic factors such as the stage of cancer, the patient's performance status, age, and weight loss affect the success of the treatment. Most of the cases are diagnosed at advanced stages. Therefore, their life expectancy is determined to be very low. Five-year survival rate was 15% when all stages are considered together.¹⁻⁴

The best treatment method that provides local control and survival is surgical resection. When diagnosed, only 20% of NSCLC can be surgically treated. Surgical treatment is the main treatment method in early stage lung cancer and operable patients. The basic principle in surgical treatment is the complete removal of the tumor and revealing the mediastinal lymph node condition. With surgical treatment, it is aimed to complete the lung cancer staging of the patient, to plan the appropriate additional treatment and follow-up order, and to achieve the highest survival. It has been reported that the 5-year survival rate was 67% for stage IA, 55% for stage IIA, and 23% for stage IIIA in the patient group undergoing surgical treatment.^{1,2}

Surgery is essential in the treatment of early stage NSCLC. Lobectomy is the first choice for patients with good performance and adequate respiratory capacity. Lung segmentectomy or wedge resection is also applied for tumors with borderline capacity and T1N0M0 stage lung capacity.²⁻⁶ However, wedge resection is an operation that should be preferred as the last treatment option only in high-risk patients. Within the results of many studies, some criteria have been proposed for wedge resection. These include: N0 tumor smaller than 2 cm is located in the 1/3 periphery of the lung, technically suitable for local excision, lack of endobronchial component, tumor-free surgical margin in frozen-frozen section examination, and mediastinal and hilar lymph node sampling. In cases where these criteria are met, wedge resection may be an acceptable option in patients who cannot tolerate anatomical resection.² In the prospective study reported by Ginsberg and Rubintstein and collected by the Lung Cancer Study Group, it was shown that there was no significant difference in survival compared to lobectomy in segmentectomy and wedge resections performed for T1N0 tumors, but local recurrence was 3 times higher than lobectomy.¹ Nakamura et al.⁴ studied 411 patients with stage 1 NSCLC of which 269 patients underwent lobectomy, 38 patients underwent segmentectomy and 84 patients underwent wedge resection. The 5-year survival rate for lobectomy, segmentectomy, and wedge resection was 82.1%, 87.2%, and 55.4%, respectively. As a result, they stated that the survival rate was worse in the group in which wedge resection was applied.⁴

RT plays a very important role in the treatment of lung cancer. It constitutes an important part of the treatment applied to patients with lung cancer who cannot be operated or who are in early stage medical inop. The conventional RT method is applied for early stage patients. Conventional RT results are not good enough. This is because the possibilities for dose escalation are limited. In the 1980s, postoperative RT was recommended to reduce locoregional recurrence after wide wedge or segment resection applied to patients with lung cancer with low lung capacity. However, when looking at recent clinical data, it was shown that external RT was significantly associated with a poor median overall and disease-specific survive.⁵ In conventional RT, tumor control probability is 51%, while the 5-year survival rate is 15%.⁶⁻⁸ Nowadays, adjuvant therapy is not routinely applied in cases for whom sublobar resection is planned. Instead, the most frequently discussed adjuvant therapy is intraoperative brachytherapy. Although this method is not routinely applied by many surgeons after sublobar resection, the emerging evidence is promising in selected patients. Birdas et al.⁷ compared patients who underwent lobectomy and who underwent brachytherapy after sublobar resection. They reported that brachytherapy added to sublobar resection is safe and gives similar locoregional recurrence, disease-free survival, and overall survival rates as lobectomy.⁷ With the increase of these studies and their positive results, the place of stereotactic body radiation therapy (SBRT), which is in high-dose radiotherapy techniques, in early stage lung cancer has been discussed.

In the SBRT method, treatment volumes are reduced. The doses given to healthy tissues are minimized. Higher tumor doses are given per fraction. Thus, the rate of local control of the tumor is increased with the SBRT technique. When SBRT is applied in lung cancer, a total of 48-60 Gy is usually given in 3 to 6 fractions. Thus, the biologically effective dose (BED) is higher in SBRT than in conventional RT (BED > 60 Gy vs. 100 Gy). In many studies, it has been stated that the 3-year local control rate of SBRT is approximately 90%.⁸⁻¹¹ Rosen et al.⁶ reported that lobectomy is more effective and reliable than SBRT in patients with clinical stage I NSCLC without comorbidity.⁶ Tamura et al.³ compared patients who underwent sublobar (wedge resection, segmentectomy) resection for clinical stage I NSCLC medical morbidities and patients who underwent SBRT. If the tumor is below 2 cm between the 2 groups, there was no significant difference in local tumor recurrence, disease-specific survival, and overall survival. They reported that local recurrence was less common in tumors larger than 2 cm in the surgical group.³ In another study, the 5-year overall survival rate of patients who underwent wedge resection (4517 patients) or SBRT (1778 patients) in patients with lung cancer with cT1N0 and 2 cm tumors was found to be higher in the wedge resection group.⁸ Performing a study similar to this study, Ackerson et al.⁹ reported that both tumor control and overall survival were the same.⁹ In the phase 2 study performed, they applied SBRT (54 Gy/3 fractions, 55/5 or 60/8) preoperatively in early stage NSCLC. Acute grade 3-4 toxicity was seen in 10%. In this study, it was reported that even if there is a positive result regarding its neoadjuvant role, there is not enough data to reflect it in clinical practice.¹⁰ Hou et al.¹¹ examined the efficacy and safety of SBRT in patients who had previously undergone lung resection (lobectomy, pneumonectomy and wedge resection). It has been stated that SBRT applied after surgery provides low toxicity and high local control. Looking at all these studies, it is not clear in which patient group and when SBRT will be applied.

As a result, surgical treatment and/or SBRT is applied in early stage NSCLC. Different procedures such as wedge resection, lobectomy, and segmentectomy can be applied in surgical treatment. However, it is an important issue that should not be forgotten that performing mediastinal lymph node dissection in all cases makes significant contributions to mortality and morbidity regardless of which surgical method is used. SBRT is known to be as effective and reliable as segmentectomy and wedge resection in providing local control. The role of SBRT in neoadjuvant and adjuvant therapy is not yet known. There is a need for meta-analysis or randomized clinical studies investigating the place and importance of SBRT in treatment methods.

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REFERENCES

1. Ginsberg RJ, Rubinstein LV, Lung Cancer Study Group. Randomized trial of lobectomy versus limited resection for T1 N0 non-small cell lung cancer. Lung Cancer Study Group. *Ann Thorac Surg.* 1995;60(3):615-22; discussion 622. [\[CrossRef\]](#)
2. Singhal S, Shrager JB, Kaiser LR. Multimodality therapy for non-small-cell lung cancer. In: Shields TW, LoCicero III J, eds., Ponn Rb, Rusch VW, eds. *General Thoracic Surgery.* 6th ed Philadelphia, USA: Lippincott Williams and Wilkins; 2005: 1653-79.
3. Tamura M, Matsumoto I, Tanaka Y, et al. Comparison Between stereotactic radiotherapy and sublobar resection for non-small cell lung cancer. *Ann Thorac Surg.* 2019 May;107(5):1544-1550. [\[CrossRef\]](#)
4. Nakamura H, Kawasaki N, Taguchi M, Kabasawa K. Survival following lobectomy vs. limited resection for stage I lung cancer: A meta-analysis. *Br J Cancer.* 2005;92(6):1033-1037. [\[CrossRef\]](#)
5. Rineer J, Schreiber D, Katsoulakis E, et al. Survival following sublobar resection for early-stage non-small cell lung cancer with or without adjuvant external beam radiation therapy: A population-based study. *Chest.* 2010;137(2):362-368. [\[CrossRef\]](#)
6. Rosen JE, Salazar MC, Wang Z, et al. Lobectomy versus stereotactic body radiotherapy in healthy patients with stage I lung cancer. *J Thorac Cardiovasc Surg.* 2016;152(1):44-54.e9. [\[CrossRef\]](#)
7. Birdas TJ, Koehler RPM, Colonias A, et al. Sublobar resection with brachytherapy versus lobectomy for stage 1B non-small cell lung cancer. *Ann Thorac Surg.* 2006;81(2):434-8; discussion 438. [\[CrossRef\]](#)
8. Yerokun BA, Yang CJ, Gulack BC, et al. A national analysis of wedge resection versus stereotactic body radiation therapy for stage IA non-small cell lung cancer. *J Thorac Cardiovasc Surg.* 2017 August;154(2):675-686.e4. [\[CrossRef\]](#)
9. Ackerson BG, Tong BC, Hong JC, et al. Stereotactic body radiation therapy versus sublobar resection for stage I NSCLC. *Lung Cancer.* 2018 November;125:185-191. [\[CrossRef\]](#)
10. Palma DA, Nguyen TK, Kwan K, et al. Short report: interim safety results for a phase II trial measuring the integration of stereotactic ablative radiotherapy (SABR) plus surgery for early stage non-small cell lung cancer (MISSILE-NSCLC). *Radiat Oncol.* 2017 January 27;12(1):30. [\[CrossRef\]](#)
11. Hou Y, Hermann G, Lewis JH, et al. Clinical outcomes After lung stereotactic body radiation therapy in patients With or Without a prior lung resection. *Am J Clin Oncol.* 2018 July;41(7):695-701. [\[CrossRef\]](#)