

SURGICAL TREATMENT FOR T4 CANCER INVADING THE HEART AND/OR GREAT VESSELS

Hirokuni YOSHIMURA*

Surgery is considered the only reliable therapy to cure non-small cell lung cancer (NSCLC). However, surgery for patients with locally advanced bronchogenic carcinoma invading the heart and/or great vessels is still controversial (1-5). According to UICC TNM classification (6), the primary tumor is subdivided into four T categories depending on size, site, and local involvement. T4 tumor is defined as tumor of any size that invades any of the following: mediastinum, heart, great vessels, vertebral body, carina, separate tumor nodule(s) in the same lobe, and tumor with malignant pleural effusion, all of which are generally regarded as unresectable disease.

The word "unresectable" seems to harbor two different meanings: one is "technically unable to resect" and the other is "technically resectable but of no patient's survival benefit in terms of oncology".

The purpose of this retrospective study is to investigate the immediate and long term results of a group of patients who underwent combined resection of the lung and some part of the adjacent heart and/or great vessels with direct tumor invasion.

PATIENTS CHARACTERISTICS

From February 1972 to December 1995, forty-seven consecutive patients with lung cancer with the direct invasion to the mediastinum were operated on with concomitant resection of the lung and some portion of the heart and/or great vessels.

There were 43 men and 4 women with a mean age of 58.2 years, ranging from 41 to 75 years. In all 47 patients, at least 5 years or more have passed since the time when they had the surgery.

Combined resection of the lung and a single additional organ was performed in 36 patients. The left atrium (LA) only was resected in 21 patients, the intra-pericardial portion of the pulmonary artery (PA) only

in 9, the superior vena cava (SVC) in 3 and the adventitia of the aorta in 3. More than two additional organs were resected in 11 patients. The aortic wall and PA were both resected in 2 patients, LA and PA in 2, LA and carina in 1, LA and esophagus in 1, PA and LA in 3. Three organs, the aortic wall, LA and PA were resected in 2 patient, and LA, esophagus and carina were resected in 1 patient, respectively. Thirty-nine patients had squamous cell carcinoma, 3 had adenocarcinoma, 3 had large cell carcinoma, and each one had adenosquamous cell carcinoma and small cell carcinoma respectively. Thirty-nine patients underwent pneumonectomy, 7 lobectomy and 1 wedge resection. The four out of 11 patients who underwent combined resection of the lung and more than two mediastinal organs were operated on with the use of cardiopulmonary bypass.

In four patients who underwent the resection of the left atrium and in one patient who underwent the resection of the main pulmonary artery, pathological examination revealed that their tumor invasions were restricted in the mediastinal fat pad tissues. And there was no direct extension around the base of the main pulmonary artery or the base of the pulmonary vein. Therefore, those 5 tumors were diagnosed as T3 lesions. In the other 42 patients, pathological examination revealed that apparent tumor invasions were seen either at the level of or beyond the area of the pericardial reflection around the base of the pulmonary artery or pulmonary vein or at the portion of adventitia of the aorta or superior vena cava. They are diagnosed as having T4 lesions.

RESULTS

As for patients with T3 tumor, all 5 patients were judged as having had complete resections. No patient developed any postoperative complication. Four patients, who had squamous cell carcinoma, survived more than 5 years and 1 patient, who had adenocarcinoma, died of brain metastasis 2 years and 2 months after the surgery. The 5-year survival rate for 5 patients with T3 tumor was calculated as 80%. As for patients with T4 tumor, seven (17%) out of 42 were judged as having had received an incomplete resection according to intra-operative findings or pathological examinations. The other 35 patients were judged as having had received complete resections. Ten patients had postoperative complications, including 7 bronchial fistula and 3 empyema without bronchial fistula, of which three

* Department of Thoracic and Cardiovascular Surgery
Kitasato University School of Medicine, Kanagawa,
JAPAN.

patients (7.1%) died within 30 days after surgery, and another 4 patients died within 90 days after surgery during their hospital stay. Hospital death rate was 16.7%.

The overall 5-year survival rate for 42 patients with T4 tumor was calculated as 29.7% or 13 out of 42 patients actually survived more than 5 years. Seven patients are still alive ranging from 6 years and one month to 10 years and 10 months after surgery at the time of August 1, 2001.

The 5-year survival rate for 20 patients with N0 or N1 disease was 37.3% and that for 22 patients with N2 disease was 22.7%. However, there is no statistical significance between those two groups. There were no significant differences among the survivals of patients' groups according to the kind of resected mediastinal organs or cell types.

No patients among 7 who had received incomplete resection survived more than 3 years. Whereas, the 5-year survival rate for 35 patients after complete resection was 34.3%. There is a significant difference between those two groups.

There were no 4 years survivors among 11 patients who received the resection of more than two mediastinal organs, and the three-year survival rate for those patients was 9.1%. Whereas, the 5-year survival rate for patients who received the resection of only one mediastinal organ was 40.5%. There was a statistical difference between those two groups. As for 22 patients who underwent the resection of the left atrium, the 5-year survival rate for 8 patients whose tumor invasions were seen beyond the parietal pleural reflection and reached into the intrapericardial portion of the pulmonary vein or the muscle layer of the left atrium was 25%. Where as the 5-year survival rate for 14 patients whose tumor invasions were restricted out side the pericardium (including T3 tumors) was 64.3%. There was a statistical difference between those two groups.

Conclusion

The resection of the heart or great vessels for direct involvement into the mediastinum by T4 lung cancer can be performed in selected patients with an acceptable postoperative mortality and with 30% of 5-year survival rate. The patients who required the resection of a single mediastinal organ showed significantly better 5-year survival rate than that of the patients who required the resection of multiple mediastinal organs. If the tumor invasions are restricted within the mediastinal fat pad tissue (T3 lesions), prognosis of such patients expected to be much better than that of the patients with T4 lesions.

REFERENCE

1. Ginsberg RJ, Vokes EE, Raben A. Non-small cell lung cancer. In: DeVita VT, Hellman S, Rosenberg SA, eds. *Cancer. Principles and practice of oncology*. Philadelphia: Lippincott-Raven, 1997:858-911.
2. McCormack P M: Extended Pulmonary Resections. In: Pearson FG, Deslauriers J, Ginsberg RJ, Heibert CA, McKneally MF, Urschel HC, eds. *Thoracic Surgery*. New York: Churchill Livingstone, 1995:987-990.
3. Tsuchiya R, Asamura H, Kondo H, Goya T, Naruke T. Extended resection of the left atrium, great vessels, or both for lung cancer. *Ann Thorac Surg* 1994; 57:960-965.
4. Burt ME, Pomerantz AH, Bains MS. Results of surgical treatment of stage III lung cancer invading the mediastinum. *Sur Clin North Am* 1987;67:987-1000.
5. Spaggiari L, Regnard J, Magdeleinat P, Jauffret B, Puyo P and Lévassieur P. Extended Resection for Bronchogenic Carcinoma Invading the Superior Vena Cava System. *Ann Thorac Surg* 2000;69:2336.
6. Lung and pleural tumors. In: Sobon LH, Wittekind C, eds. *UICC: TNM Classification of Malignant tumors*. 5th ed. New York: John Wiley & Sons, 1997: 91-100.