

Extended Resection of Lung Cancer Invading the Left Subclavian Artery by Using Cardiopulmonary Bypass

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We treated a 54-year-old man with large cell carcinoma of the left upper lobe invading the esophagus and the left subclavian artery (SCA) from its origin. The tumor was completely resected by lobectomy under cardiopulmonary bypass. The left SCA was dissected at the aortic arch and reconstructed with a graft. The muscle layer of the esophagus was resected, followed by patching with an intercostal muscle flap. The pathological tumor stage was T4N0M0. The tumor recurred at two months after surgery in the neck lymph nodes and brain. Both sites were treated with radiation therapy and the patient is now alive without recurrence at 26 months after surgery. Lung cancer invading the great vessels and other mediastinal structures can be cured or long survival can be obtained by extended resection and postoperative adjuvant therapy. (Ann Thorac Cardiovasc Surg 2005; 11: 211–3)

Key words: lung cancer, extended resection, great vessels, subclavian artery

Introduction

It has been reported that lung cancer patients with involvement of the aorta could not survive more than five years after surgery.¹⁾ However, recent developments in the techniques of cardiovascular surgery have enabled the extended resection of lung cancer invading the great vessels and has led to long-term survival.²⁻⁶⁾ We treated a patient with lung cancer who has now remained alive for 26 months after combined resection of the esophageal muscle layer and the left SCA under cardiopulmonary bypass with postoperative radiation therapy.

Case Report

A 54-year-old man consulted our hospital because of left-

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sided back pain. Chest X-ray films, CT scans, and MRI showed a mass measuring 6.5 cm in the left upper lobe invading the left SCA (Figs. 1-3). The artery was involved by tumor for 6 cm from its origin and was completely surrounded. Bronchoscopic biopsy revealed a diagnosis of large cell carcinoma. The clinical tumor stage was T4N0M0.

Surgery was done via posterolateral thoracotomy on December 17, 2001. The tumor was confirmed to invade the left SCA, but it also invaded the esophagus and the left brachiocephalic vein. Left upper lobectomy was performed, leaving the invaded structures. Part of the left brachiocephalic vein was resected using a side clamp. Cardiopulmonary bypass was performed between the pulmonary artery and the descending aorta. The aortic arch, including part of the left common carotid artery, was clamped to provide enough space for reconstruction at the origin of the left SCA. The distal end of the left SCA and the descending aorta were also clamped. Then the left SCA was dissected at the aortic arch. An extended polytetrafluoro-ethylene (EPDFE) graft measuring 10 mm in diameter was sutured to the aortic arch in a side-to-end fashion, and then cardiopulmonary bypass was removed. Subsequently, the tumor was dissected together with the left SCA and the muscle layer of esophagus. The other



Fig. 1. Chest X-ray shows the abnormal shadow above the aortic arch.

end of the graft was sutured to the distal part of the left SCA in an end-to-end fashion (Fig. 4), and the defect in the esophageal muscle was patched with an intercostal muscle flap. Total intraoperative blood loss was 1,700 ml and the operating time was 529 min. The patient was discharged from hospital 12 days after surgery without complications. The pathologic diagnosis was large cell carcinoma (T4N0M0). Two months after surgery, the tumor recurred in the left neck lymph nodes and the brain. The brain metastasis was solitary and was treated with γ -knife radiation therapy. Radiation therapy (44 Gy) was also given to the neck and upper mediastinum. The patient is currently alive at 26 months after surgery without any recurrence.

Discussion

One of the important points in the present case was reconstruction of the SCA at the aortic arch. Because there is little space between the origin of the left SCA and the left common carotid artery, the proximal clamp on the aortic arch covered part of the left common carotid artery to provide enough space for reconstruction and to carry out the procedure.

Several kinds of bypass procedures, such as temporary bypass, left heart bypass with a Bio-pump, and cardiopulmonary bypass, have been used for reconstruction

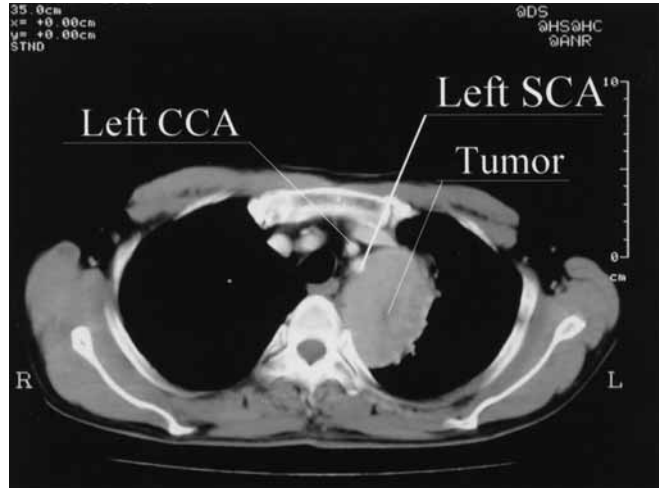


Fig. 2. Chest CT shows the tumor invaded the whole circumference of the left subclavian artery. CCA: common carotid artery; SCA: subclavian artery.



Fig. 3. Chest MRI shows the tumor invaded at the orifice of the left subclavian artery. SCA: subclavian artery.

of the aorta. Temporary bypass was not suitable in the present patient because left thoracotomy provides little exposure of the ascending aorta. While left heart bypass with a Bio-pump has the advantage of using less heparin than cardiopulmonary bypass, we chose the latter for the following reasons: (1) accidental massive bleeding could be managed by cardiopulmonary bypass and recirculation system of the blood, and (2) desaturation during reconstruction could be easily managed.

The prognostic factors for lung cancer after combined

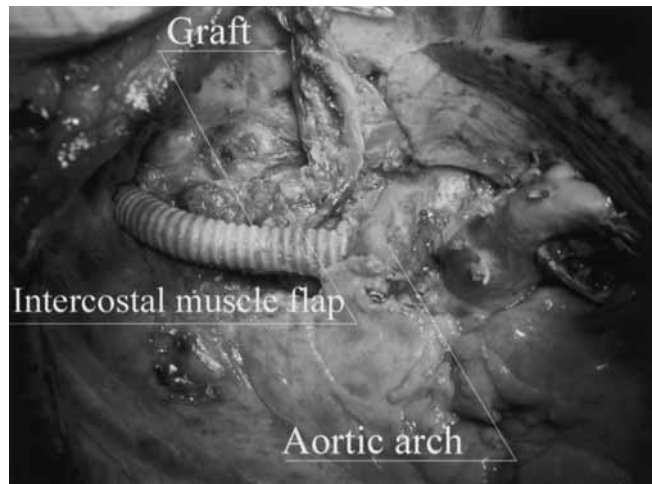


Fig. 4. Intraoperative findings after reconstruction of the left SCA and esophageal muscle layer.

resection of the great vessels have been reported to be complete resection, lymph node metastasis, and involvement of other mediastinal structures. Patients with N0 or N1 disease can achieve long survival after surgery.²⁻⁶⁾ Yoshimura and Shinada reviewed 43 patients with lung cancer who received combined resection of cardiovascular structures, and showed that the five-year survival rate was 32% after surgery for tumors that only involved the left atrium or great vessels, while there were no five-year survivors among patients with tumors that also invaded other mediastinal structures.³⁾ While the present patient had no lymph node metastases, the tumor invaded not only the left SCA but also the left brachiocephalic vein and the esophagus. The tumor recurred in the neck and brain after surgery, but both metastases have now been controlled by radiation therapy for 26 months after surgery. In conclusion, some lung cancers that involve both the great vessels and other mediastinal structures may be cured or long-term survival may be achieved after extended resection and postoperative adjuvant therapy.

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