Invasion of the Main Pulmonary Artery by Lung Cancer – An Indication for Cardiopulmonary by-pass

Yusuf Bayrak, Alper Toker, Serhan Tanju, Şükrü Dilege, Göksel Kalaycı

Department of Thoracic Surgery, İstanbul University İstanbul Faculty of Medicine, İstanbul, Turkey

Abstract

Treatment options for patients with non-small cell lung cancer depend mainly to the stage of the disease. Involvement of the main pulmonary artery by the tumor has been considered as one of the inoperability criteria. We present here a a successful outcome in a 70-year-old man diagnosed as non-small cell lung cancer with involvement of the main pulmonary artery who underwent a lung resection under cardiopulmonary by-pass.

Turkish Respiratory Journal, 2005;6:(3):159-160

Keywords: *lung cancer surgery, pulmonary artery, cardiopulmonary by-pass*

Introduction

Only a small number of patients with locally advanced (T4 N0 M0) non-small lung cancer (NSCLC) are considered for surgical therapy. The treatment usually consists of chemoradiation and 5 year survival rates are 6-8% (1). On the other hand, results of surgery for extended operations for lung cancer invading the heart or great vessels showed that patients with pT4 tumor that had invaded a single mediastinal organ had a 5-year survival rate of 32.2% (2). We present the use of cardiopulmonary by-pass in the surgical management of marginal left pulmonary artery involvement by the tumor.

Case Report

A 70-year-old man presented with a 2-month-history of hoarseness and hemoptysis. Chest x-ray film showed a left hilar zone shadow. Diagnostic imaging revelead a 5.5x5 cm left hilar mass invading the left main pulmonary artery. Fiberoptic bronchoscopy demonstrated endobronchial lesion in the left upper lobe orifice and histopathological analysis confirmed the diagnosis of non-small cell carcinoma of the lung. FDG-PET showed no evidence of mediastinal and distant metastatic disease. After three cycles of cisplatin based chemotherapy, no regression occurred in the primary tumor (Figure 1). Lymph node sampling through standard and extended mediastinoscopy was performed, which

Corresponding Author: *Dr. Serhan Tanju*
İstanbul Üniversitesi İstanbul Tıp Fakültesi,
Göğüs Cerrahisi Bölümü, İstanbul, Türkiye
Phone : +90 (216) 360 23 01
Fax : +90 (212) 414 22 85
E-mail : drstanju@hotmail.com

Figure 1. *Tumor after neodajuvant chemotherapy.*

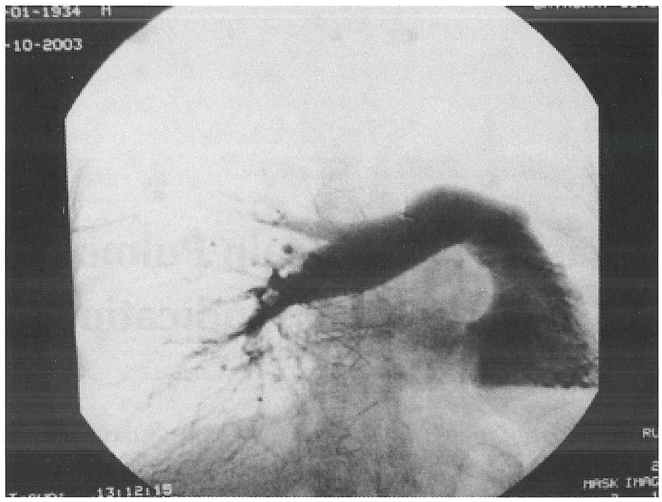

Figure 2. *Postoperative digital substruction pulmonary angiography showing the right ventricle outflow tract and main pulmonary artery.*

excluded nodal involvement even in immunohistochemical evaluation. The patient thereafter underwent cardiac echocardiography and catheterization because of atypical chest pain. His coronary vessels showed no pathological changes and heart valves had ignorable calcifications. In the quantitative perfusion scanning of the lung, it is found that the predicted postoperative FEV_1 value was 1800 ml after left pneumonectomy. Intrapericardial exploration of the main pulmonary artery through median sternotomy showed that a safe resection could only be performed under cardiopulmonary by-pass. Extracorporeal circulation was established by single aortic and bicaval cannulation. A vent catheter was introduced to the left atrium via the right superior pulmonary vein and to the right pulmonary artery to prevent any backflow. After initiating moderate hypothermia, left and part of the main pulmonary artery were resected en bloc with the left lung. The defect was then closed primarily with running polypropylene suture (Doğsan, Propilen, Turkey). Frozen section analysis were negative for both arterial and bronchial margins. All mediastinal lymph node stations were also sampled. The left hemidiaphragm was plicated because the left phrenic nerve was damaged by the resected tumor.

The postoperative course was uneventful. The patient was discharged on the ninth postoperative day. A postoperative digital substruction angiography confirmed the resection margins of the main pulmonary artery (Figure 2).

Discussion

The outcome of this patient demonstrates the potential positive effect of a combined modality therapy, including neoadjuvant chemotherapy and surgery, in this subset of patients with locally advanced tumors, if there is no evidence of distant metastases and mediastinal lymph node involvement. Preoperative work-up should include extensive pulmonary and cardiac evaluation to identify and optimize all premorbid conditions. The use of cardiopulmonary by-pass is often required for simultaneous revascularization of the coronary vessels and resection of lung tumors (3-5). Although it is unusual to perform a pneumonectomy, mediastinal lymph node sampling and diaphragm plication through a median sternotomy, the surgeon has excellent exposure to the major vascular structures with the exception of the inferior pulmonary vein. Also the right heart was emptied by bicaval cannulation, thus making pulmonary artery clamping unnecessary.

The postoperative period of such operations is usually bloody, and will require treatment by transfusion of donor blood, fresh frozen plasma and other medical hemostatic agents (6). Saitoh et al reported that the results of surgical treatment for lung cancer located in the aortic window are poor; however, there are few long-term survivors in their series, and most survivors belong to the group of patients whose tumors had invaded the anterior mediastinum including the central part of the pulmonary artery (7).The present case report demonstrates successful outcome after a surgical procedure for lung cancer, which could otherwise be inoperable under standard resection rules with thoracotomy.

References

1. Mountain CF. Revisions in the international system for staging lung cancer. Chest 1997;111:1710-7.
2. Yoshimura H, Shinada J. Extended operation for lung cancer: concomitant resection of the heart or the great vessels with the lung. Kyobu Geka. 1995 Jul;48:716-21.
3. Danton MH, Anikin VA, McManus KG, et al. Simultaneous cardiac surgery with pulmonary resection: presentation of series and review of literature. Eur J Cardiothorac Surg 1998;13:667-72.
4. Ricci C, Rendina EA, Venuta F, et al. Reconstruction of the pulmonary artery in patients with lung cancer. Ann Thorac Surg 1994;57:627-32.
5. Tsuchiya R. Cardiopulmonary bypass for lung cancer surgery. Rinsho Kyobu Geka 1989;9:535-9.
6. Gillinov AM, Greene PS, Stuart RS, et al. Cardiopulmonary bypass as an adjunct to pulmonary surgery. Chest 1996;110:571-4.
7. Saito Y, Minami K, Tokunou M, et al. Results of surgery for bronchogenic carcinoma located in the aortic window. Lung Cancer. 1997 Aug; 18:47-56.