Favorable outcome using a maze procedure for left pneumonectomy combined with resection of the left atrium in stage IIIB lung cancer

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Abstract

We report a case of a 67-year-old woman with stage IIIB locally advanced non-small cell lung cancer who had also suffered from hyperthyroidism with persistent atrial fibrillation (AF). Thiamazole provided euthyroid status, but medication failed to resolve AF. A computed tomography (CT)-scan revealed a 5×5 cm mass in the left hilar region that involved the left atrium (LA) and bifurcation of the pulmonary artery. Left pneumonectomy, LA partial resection and reconstruction of the bifurcation of the pulmonary artery were performed. In addition, a maze procedure was performed using cardiopulmonary bypass and cardiac arrest. We present the first case report of advanced lung cancer surgery with a maze procedure. Follow-up by CT-scan 34 months later did not show any recurrence and attacks of AF (no medication after surgery) were completely resolved after the operation.

Keywords: Lung cancer; Left atrium; Pulmonary artery; Atrial fibrillation; Maze procedure

1. Introduction

A role for resection for stage IIIB non-small cell lung cancer (NSCLC) remains controversial, however, there have been survivors without any evidence of lung cancer recurrence. Thus, when deciding to operate on patients with stage IIIB lung cancer, the selection of surgical candidates and the appropriate surgical procedure are very important [1].

We present the first case report of extended pneumonectomy with partial resection of the left atrium (LA), reconstruction of the pulmonary artery and a maze procedure under cardiopulmonary bypass and cardiac arrest [2].

2. Case report

A 67-year-old woman was admitted to our hospital with a left hilar mass on a chest X-ray film in May 2007. She had suffered from hyperthyroidism with AF that gave her dizzy spells. Although AF had been detected in 2000, digoxin and procainamide had failed to resolve her atrial fibrillation (AF). On admission, a chest computed tomography (CT) revealed a 5×5 cm mass in the left hilar region that extended into the LA and bifurcation of the pulmonary artery without lymph node metastasis (Fig. 1). An electrocardiogram showed persistent AF. An echocardiogram showed: left atrial dimension (LAD) of 43 mm; ejection fraction (EF) of 0.77; aortic regurgitation (AR); mitral regurgitation (MR); minimal tricuspid regurgitation (TR); and no thrombus.

Laboratory test results were within normal ranges. Biopsy showed NSCLC, endobronchial ultrasound-guided transbronchial needle aspiration (EBUS) showed no mediastinal lymph node metastasis and the clinical stage was T4N0M0.

Surgery was performed via median sternotomy in May 2007. The tumor was confirmed to have invaded the LA and bifurcation of the pulmonary artery. Cardiopulmonary bypass was performed for cardiopulmonary support and hypothermic circulatory arrest was used. The patient was cooled to 26°C and cardiac arrest was induced. After cardiopulmonary bypass was initiated, the heart was arrested with antegrade blood cardioplegia. The left atrium was mobilized, and the left atrium and pulmonary bifurcation were reconstructed using a homograft patch. The left atrium and pulmonary bifurcation were reconstructed using a homograft patch. The right upper lobe and right lower lobe were removed. The last stump of the right upper lobe was oversewn, and the right lower lobe was resected. The left upper lobe was also removed. The left upper lobe was resected. The left lower lobe was also removed. The left lower lobe was resected. The left lower lobe was also removed. The left lower lobe was resected. The left lower lobe was also removed. The left lower lobe was resected.

A maze procedure was performed using cardiopulmonary bypass and cardiac arrest. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced. The patient was cooled to 26°C and cardiac arrest was induced.

Follow-up by CT-scan 34 months later did not show any recurrence and attacks of AF (no medication after surgery) were completely resolved after the operation.

Fig. 1. Chest CT for this case. A lesion mass in the left hilar area extending into the bifurcation of the pulmonary artery and the left atrium. CT, computed tomography.
bypass was performed between the right atrium and the ascending aorta. We resected the tumor which had invaded the bifurcation of the pulmonary artery and LA, and then performed a maze procedure through the left atriotomy. We used cryothermy as an ablation energy source during the maze procedure, as freezing the myocardium to \(-60^\circ C\) or lower results in irreversible necrosis. It took one to two minutes and created a line of conduction block to prevent the propagation of repetitive activations from the pulmonary veins toward the LA. Then the LA was closed and the left pneumonectomy, and finally, reconstruction of the bifurcation of the pulmonary artery with a patch [expanded polytetrafluoroethylene (EPTFE) sheet 0.4 mm] and lymph node dissection were performed (Fig. 2). Duration of cross-clamp time was 49 min. A pathological study confirmed the diagnosis of squamous cell lung cancer as T4N0M0, stage IIIB.

The postoperative course was unremarkable. The patient is being followed up by our department. Currently, she is healthy with no documented tumor recurrence and no AF without medication after 34 months.

3. Discussion

A number of ablation devices in AF surgery have been developed that can create complete conduction blocks [3]. The maze procedure might contribute to reducing the morbidity, mortality, and length of hospital stay [4]. Lung cancer atrium with TNM classification IIIB has been recognized as inoperable [5]. Development of diagnostic tools and introduction of the techniques of cardiovascular surgery to lung cancer surgery have made en bloc resection of the lung possible along with involved parts of the LA, aorta, superior vena cava and pulmonary artery. A case of lung cancer that is localized and involves great vessels directly (superior vena, LA and pulmonary artery) or carina would be a relatively promising candidate for surgery in stage IIIB, while a case with a tumor located peripherally with metastatic lymph nodes and involving the great vessels (p-TxN2) would be a candidate with a poor prognosis [6]. Our case might be a rare case of lung cancer and AF surgery under cardiopulmonary bypass. Ablative devices in AF may be flexible to permit the use through a small thoracotomy.

A surgical indication with the best possibility for a good prognosis is to perform complete en bloc resection of lung cancer with a localized tumor and involving the great vessels.

References