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ORIGINAL ARTICLE

Simultaneous resection of pulmonary tumor following cardiovascular surgery

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Summary *Background:* A pulmonary tumor is occasionally detected on a chest computed tomography (CT) scan before cardiovascular surgery.
Purpose: In this study, we examined clinical courses of patients who had undergone the simultaneous resection of a pulmonary tumor following cardiovascular surgery.
Methods: From 2008 to 2013, 18 patients (13 men and 5 women) with a median age of 69.8 years underwent the wedge pulmonary resection for a lung tumor through a median thoracotomy following cardiovascular surgery in our hospital. Cardiovascular surgeries consisted of off-pump coronary artery bypass grafting (CABG) in six patients, aortic valve replacement and/or mitral valve plasty in 10 patients, total arch replacement in 10 patients and descending aorta replacement in 10 patients.
Results: No complications associated with pulmonary resections were observed. Pathological examination revealed that 15 patients (83.3%) were diagnosed with lung cancers including 13 adenocarcinomas and two squamous cell carcinomas, with the clinical stages of 1A in 13 patients, 2A in one patient and 2B in one patient. Among them, five patients received the radical pulmonary resection subsequently, whereas 10 patients were unable to receive it due to their poor cardiopulmonary function. Kaplan-Meier analysis of patients with lung cancer revealed that the 5-year survival rate and progression-free survival (PFS) rate after 3 years from the surgery were 46.2% and 73.8%, respectively.
Conclusion: The simultaneous resection of pulmonary tumor following cardiovascular surgery is safely performed, and is useful for the pathological diagnosis of the tumor. Further studies

Conflicts of interest: All authors declare that they have no financial conflicts of interests to disclosed.

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are warranted, however, this procedure may contribute to controlling the progression of lung cancer in patients with cardiovascular disease with comorbidities.

1. Introduction

Lung cancer is the leading cause of cancer-related death in males in the Asia-Pacific region and globally,[1,2] and it accounted for 13% (1.6 million) of the total cancer cases and 18% (1.4 million) of deaths in 2008.[1] In Japan, the total number of general thoracic surgeries in 2012 was 72,899, and > 49% of those cases underwent surgery for lung cancer.[3] The number of patients diagnosed with lung cancer is steadily increasing, leading to an increase in the number of patients undergoing thoracic surgery. Furthermore, the number of cardiovascular surgeries for adults was reported to be > 50,000 in Japan in 2012.[3] An unhealthy lifestyle seems to be a major factor for the increase in thoracic and cardiovascular surgeries, and the number of these surgeries continues to increase.

Cases of concomitant lung cancer with cardiovascular disease are also increasing. Cases of incidental pulmonary tumor, which is detected by chest computed tomography (CT) before cardiovascular surgery is performed, present the greatest challenge for surgeons. Johnson and colleagues reviewed 3364 consecutive patients who had undergone coronary artery bypass grafting (CABG) and reported that 191 patients (5.7%) had pulmonary nodules.[4] As opposed to cases of pulmonary nodules with calcification, for pulmonary nodules suspected to be lung cancer in patients with cardiovascular disease, guidelines for the diagnosis and treatment of pulmonary nodules are yet to be established.

To obtain the diagnosis for an incidental pulmonary tumor detected before cardiovascular surgery, patients undergo conventional radiological and serological examinations, which are in part useful for the diagnosis. However, physicians appear reluctant to perform examinations to obtain the pathological diagnosis of the tumor before cardiovascular surgery because of the poor cardiovascular function of the patients. Thus, some physicians may consider performing a bronchoscopy after cardiovascular surgery; however, there is an increased risk of bleeding following a transbronchial lung biopsy (TBLB) due to the administration of anticoagulant drugs after cardiovascular surgery.[5]

To resolve such a dilemma, we performed simultaneous resection of pulmonary tumor during cardiovascular surgery. In previous papers on this surgical procedure, patients who had undergone a radical surgery, such as a lobectomy or a pneumonectomy, for lung cancer and cardiovascular surgery simultaneously were included.[6–9] The pulmonary vascular bed is decreased by a lobectomy or a pneumonectomy, causing a serious strain on cardiac function. Thus, although it has been reported that this surgical procedure is safe, postoperative complications may increase because of the radical lung surgery.

With this in mind, during cardiovascular surgery, we decided to perform simultaneous wedge resection of incidental pulmonary tumor which had been detected prior to cardiovascular surgery. We previously reported early to mid-term results of this procedure, demonstrating that there was neither operative mortality nor any major cardiac complication associated with it and that it had a mean progression-free survival (PFS) time of 17 months.[10]

In the present report that included more patients than the previous report, the safety and effectiveness of this procedure were evaluated retrospectively. We herein report that this procedure can be safely performed and is useful to obtain the pathological diagnosis of incidental pulmonary tumors. In addition, this procedure may be useful for controlling the progression of lung cancer in patients with severe cardiovascular disease.

Table 1 Patients' characteristics.

Age (median)	50～86 (69.8)
Gender	
Male (%)	13 (72)
Female (%)	5 (28)
Cardiovascular surgery	
OPCAB (%)	6 (33)
AVR and/or MVP (%)	9 (50)
AVR and TAR (%)	1 (5.6)
TAR (%)	1 (5.6)
DAR (%)	1 (5.6)
Location of pulmonary tumor	
Right lung (%)	11 (61)
Upper	7
Middle	2
Lower	2
Left lung (%)	7 (39)
Upper	2
Lower	5

AVR = aortic valve replacement; DAR = descending aorta replacement; MVP = mitral valve plasty; OPCAB = off-pump coronary artery bypass grafting; TAR = total arch replacement.

2. Patients and methods

2.1. Patients

From February 2008 to April 2013, incidental pulmonary tumors were detected using preoperative chest CT in 18 patients who had been scheduled for cardiovascular surgery