Case Report

A Surgical Intervention Using Percutaneous Cardiopulmonary Support for Contralateral Pneumothorax following Pneumonectomy

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We describe here a 63-year-old man presenting with a contralateral pneumothorax following pneumonectomy. After setting up a percutaneous cardiopulmonary support system (PCPS) in advance in preparation for hypoxemia during the operation, resection of bullae was performed. His oxygen saturation and hemodynamic status were stable intraoperatively and we achieved a successful and safe operation swiftly. He had no complications and was discharged on the 10th postoperative day. (Ann Thorac Cardiovasc Surg 2001; 7: 235–6)

Key words: percutaneous cardiopulmonary support system (PCPS), pneumothorax, pneumonectomy

Introduction

The percutaneous cardiopulmonary support system (PCPS) is used for cardiac dysfunction and cardiopulmonary resuscitation. We report a case of contralateral pneumothorax following pneumonectomy and describe respiratory management of this patient using PCPS.

Case

A 63-year-old man complained of right chest pain and dyspnea. He consulted another hospital, but was referred to our hospital because of a contralateral pneumothorax following pneumonectomy on October 21, 1999. He had undergone left pneumonectomy for squamous cell carcinoma on December 3, 1997. A chest X-ray and a chest computed tomography (CT) scan showed pneumothorax (Fig.), and arterial blood gas analysis was as follows: PaO_2, 68.8 mmHg; $PaCO_2$, 37.7 mmHg under room air. A chest tube was inserted and dyspnea was improved immediately. However, air leakage continued. For treatment of the continuous air leakage, he was put under general anesthesia and we set up a PCPS system in advance in preparation for hypoxemia during the operation. Our PCPS system consisted of a pump (Sarns Delphin 3M, Ann Arbor, MI, U.S.A), a membrane oxygenator (Menox AL6000, Kurare, Japan), and a reservoir. Heparin (5000 U) was intravenously injected before cannulation. After insertion of a 17 Fr arterial cannula (Bio-Medicus, Medtronic, Eden Prairie, MN, U.S.A.) into the right femoral artery and a 21 Fr venous cannula (Bio-Medicus, Medtronic, Eden Prairie, MN, U.S.A.) into the right femoral vein going to the right atrium, axial thoracotomy was performed with a PCPS flow of 2.0 L/min. Although the patient was not ventilated by the respirator for 15 minutes, the patient's oxygen saturation was maintained at 100%. The support duration time was 74 min and the hemodynamic status was stable during the operation. Total bleeding volume was 70 ml and he had no complications such as embolism, thrombosis, bleeding, or infection. The chest tube was removed on the 5th postoperative day and the postoperative course was uneventful. He was discharged in a normal and healthy condition on the 10th postoperative day.

Discussion

Contralateral pneumothorax following pneumonectomy is rare. Blalock[1)] and Harman[2)] reported contralateral pneumothorax as a complication following pneumonectomy with a morbidity rate of 0.3-1.2%. For such cases, Hubbard[3)] reported tetracycline pleurodesis was more effective than the other conservative measures (expect-

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Received November 13, 2000; accepted for publication January 15, 2001.
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Fig. A chest X-ray and a chest CT revealed right pneumothorax.

ant observation, aspiration, or chest drain insertion). In this patient, we inserted a chest drain as a first treatment, but air leakage continued. We judged that the risk of recurrence would be high with a pleurodesis alone, thus we selected curative resection of bullae as treatment. During the operation, the lung needed to be collapsed to find the bullae/bleb of the lung surface for accurate surgical resection. However, if the lung was collapsed intraoperatively in this patient following pneumonectomy, blood oxygenation would become insufficient. Therefore we set up the PCPS system in advance in preparation for hypoxemia during the operation.

In this study, we introduce the usefulness of the PCPS system for respiratory support during resection of bullae in cases of pneumothorax following pneumonectomy. PCPS is used to contribute to hemodynamic stabilization, so it is useful in severe cardiac dysfunction or cardiopulmonary resuscitation. Recently, Tsunezuka[4] and Ayabe[5] reported its suitability as a pulmonary support for respiratory insufficiency. During the resection of the bullae, the patient was not ventilated for 15 minutes, but oxygen saturation was maintained at 100% with a PCPS flow of 2.0 L/min, and we achieved a safe and successful operation swiftly. The complications of PCPS can be embolism, thrombosis, bleeding, and infection. Systemic heparinization (5000 U) was performed for prevention of embolism and thrombosis preoperatively, but the quantity of bleeding was only 70 ml. This bleeding volume showed no difference compared with same operation without PCPS and there were no complications in this patient. As for treatment of contralateral pneumothorax following pneumonectomy, there are fatal cases when treatment is late, so to reduce the postoperative recurrence is important. With this purpose, it is necessary to remove bullae surgically without leaving intraoperatively. By using PCPS, it was possible to observe the mediastinum side closely and we were able to perfrom bullectomy skill more safely.

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