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Case Report

Pleuroperitoneal Shunt for Chylothorax and Chylopericardium in Lung Cancer: A Case Report

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A 70-year-old man with T1N3M1 stage IV squamous cell carcinoma in the right upper lobe of the lung developed chylothorax and chylopericardium as rare simultaneous complications. Intravenous hyperalimentation, repeated pleurodesis, and ligation of the thoracic duct were all ineffective. A pleuroperitoneal shunt was inserted into the right pleural cavity from the fifth intercostal space, and a peritoneal catheter was placed in the abdominal cavity. Chylothorax was markedly improved, and the quality of life of the patient increased. This case indicates that a pleuroperitoneal shunt can be used for lung cancer-related chylothorax, as well as for malignant pleural effusion.

Key words: lung cancer, chylothorax, chylopericardium, pleuroperitoneal shunt

Introduction

The incidence of combined chylothorax and chylopericardium as rare complications after cardiac surgery is reported to be 0.25%.[1, 2] We encountered a patient suffering from chylothorax and simultaneous chylopericardium due to disturbance of the thoracic ductal flow caused by metastasis of lung cancer to mediastinal lymph nodes. Conservative treatment for chylothorax, such as thoracic tube drainage, repeated pleurodesis, and intravenous hyperalimentation with fasting, was unsuccessful. Since cardiac tamponade from chylopericardium developed, we tried to ligate the thoracic duct by thoracotomy, but this surgical approach was ineffective and chylorrhea continued for 2 months. Finally, we performed pleuroperitoneal shunting combined with the establishment of a pericardial window connecting the pericardial cavity with the pleural cavity, and this produced marked control of chylorrhea. Here, we report the details of this new approach for treatment of uncontrollable chylothorax due to lung cancer.

Case Report

The patient was a 70-year-old man who was a former smoker of 80 packs per year and had a history of chronic hepatitis, diabetes mellitus and hypertension. He was referred to St. Marianna University Hospital for further examination of an abnormal chest shadow that had recently appeared. Squamous cell carcinoma in the right upper lobe was diagnosed histologically by bronchoscope. The clinical stage according to the international staging system[3] was T1N3M1 stage IV because of the extent of supraclaviclar lymph node metastases and liver metastases. Despite two courses of chemotherapy with

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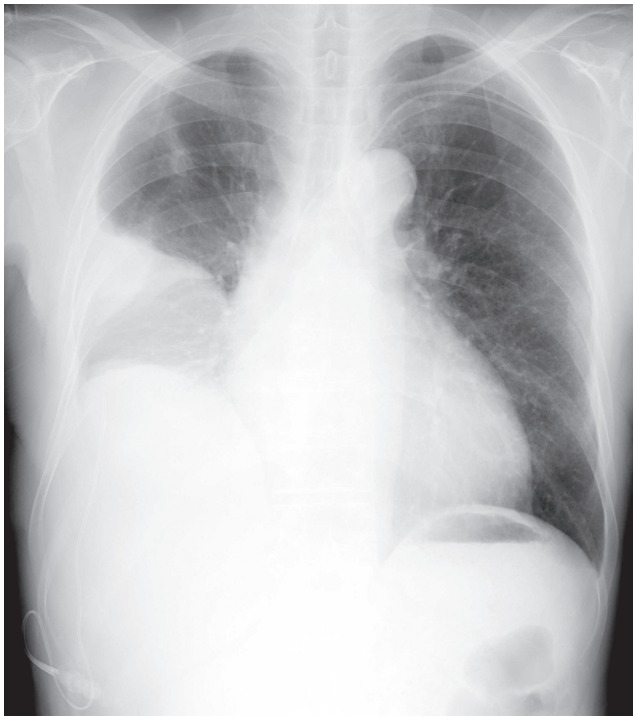

Fig. 1 Massive pleural effusion in the right hemithorax and pericardial effusion in a chest radiograph.

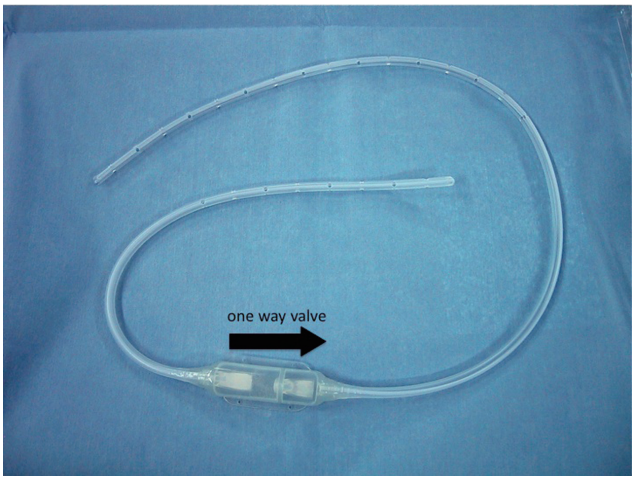

Fig. 2 Denver pleuroperitoneal Shunt®, Denver Biomedical Inc., Denver, CO.

carboplatin and gemcitabine, growth of the primary tumor and metastatic lymph nodes rapidly progressed and chylothorax and chylopericardium developed (**Fig. 1**). The total amount of drainage chyle in both spaces was 1500 to 3000 ml per day. Since the triglyceride concentration was always higher in fluid obtained from the pericardium than in the fluid obtained from the pleural cavity, a speculative diagnosis of primary chylopericardium with secondary chylothorax was made. Repeat cytological examinations of the chyle were all negative for cancer cells. Despite intravenous hyperalimentation and repeated pleurodesis, the chylopericardium and chylothorax was uncontrollable. We tried to ligate the thoracic duct directly through a left thoracotomy; however, the point of leakage could not be found, intraoperatively, thus, only a mass ligature of the tissue around the thoracic duct was performed. After surgery, the amount of chyle drainage gradually decreased to 1500-2000 ml per day; however, the amount gradually increased to the preoperative level within 2 weeks. Although the general condition of the patient was relatively good, his QOL was decreased for long-continuing chest tube drainage.

With this background, we decided to place a pleuroperitoneal shunt (Denver Shunt®, Denver Biomedical Inc, Denver, CO) (**Fig. 2**) two months after establishing a pericardial window. A fenestrated thin pleural catheter (16 Fr) was inserted into the right pleural cavity from the fifth intercostal space and was connected via a subcutaneous tunnel to the main pump chamber, which has two one-way valves and was lodged in a subcutaneous pocket overlying the right costal margin. A peritoneal catheter was placed in the abdominal cavity through the pararectus abdominis muscle at the right upper level (**Fig. 3**). Chylothorax was dramatically improved and the patient became symptom free (**Fig. 4**). No further therapeutic intervention for chylothorax was required for 17 months until death, and there were no problems with the pleuroperitoneal shunt during the course.

Discussion

Pleuroperitoneal shunting for chylothorax was first reported by Azizkhan et al.[4] for five ventilator-dependent newborns with persistent chylothorax. Four of the five infants had complete resolution of chylothorax and pulmonary insufficiency. Murphy and colleagues also described the use of a pleuroperitoneal shunt for uncontrolled chylothorax in 16 children,[5] with emphasis of the safety and advantages of pleuroperitoneal shunting as a less invasive method compared with a surgical procedure. This device has also been used in a patient with chylothorax secondary to filariasis with a previous history of chyluria,[6] but to our knowledge, its use for secondary chylothorax due to primary chylopericardium has not

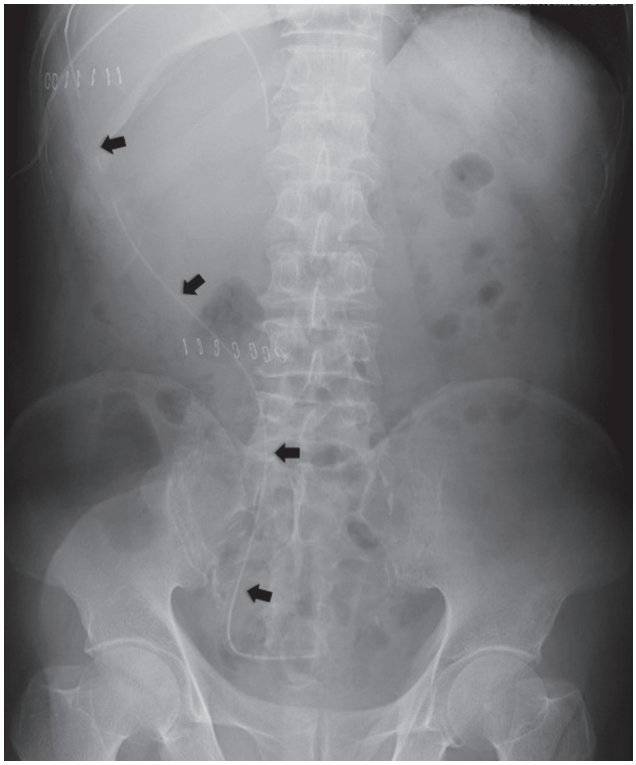

Fig. 3 A pleuroperitoneal Denver® shunt catheter (arrows) positioned in the abdominal cavity.

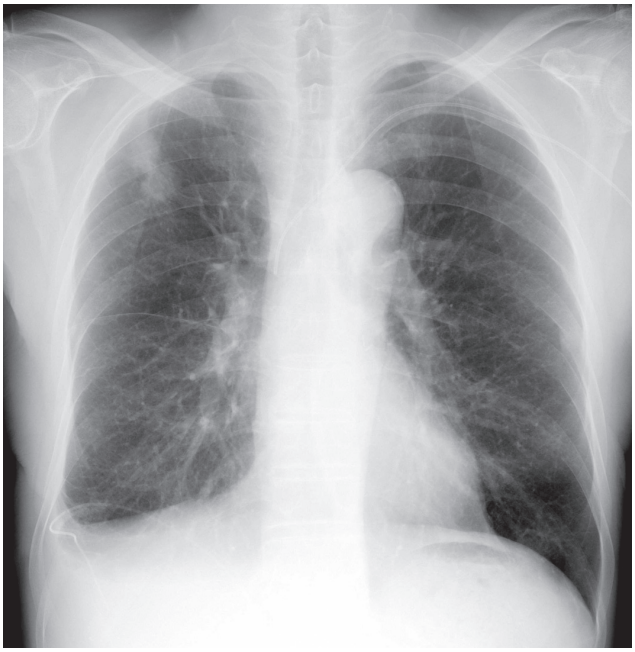

Fig. 4 Chest radiograph, 2 months after placement of the shunt, showing a marked improvement of chylothorax and chylopericardium.

been reported.

The precise etiology of the chylous collection in the pericardial space is still unclear. Campbell et al.[7] supposed that the mechanism of chylopericardium after cardiac surgery might be due to elevated systemic venous pressures. Since pericardial space is surrounded by a network of lymphatic vessels, venous back pressures easily overwhelm the lymphatic valves within the major mediastinal lympatics, resulting chyle accumulation. We believe the same mechanisms worked in our case through mediastinal swallen metastatic lymph nodes (N3) from advanced lung cancer. Our trial to ligate the thoracic duct failed probably because of rich collaterals of such proliferated lymphatic vessels. Conservative therapy could not control the increasing chyle, either.

The shunting apparatus consists of a fenestrated pleural catheter, a flexible pump chamber containing two miter valves, and a fenestrated peritoneal catheter. A one-way valve with a manual pump through this shunt makes drainage of the retention chyle possible regardless of the pressure gradient between the thorax and abdomen. However, there are some difficulties with this procedure. Limited drainage may occur in a case with pleural fluid loculation: most such cases receive repeated thoracocentesis and sclerotherapy and this can cause difficulty with drainage of septal fibrous structures. Placement of the catheter tip into an abdominal or thoracic site can also be difficult: this is an inherent problem in the procedure and the elasticity of the silicon catheter is somewhat soft, which makes it especially difficult to insert into the abdomen. A patient with a previous history of abdominal surgery may also be difficult to treat using a pleuroperitoneal shunt, and confirmation of patency after device placement is important. The final concern is the possibility of occlusion of the catheter due to fibrous debris or coagulation. Postoperatively, the pump chamber should be compressed regularly for the first 24 hours to minimize the risk of early shunt occlusion.

The pleuroperitoneal shunt is commonly used for uncontrollable massive malignant pleural effusion. The major concern with the use of this shunt in patients with lung cancer is a potential risk for iatrogenic dissemination of malignant cells to the peritoneal cavity, since there is no filter to prevent cancer cells entering the pump chamber. Given the concern of dissemination,[8, 9] we performed repeated cytological examinations to con-

firm the absence of lung cancer cells in the pleural fluid. Our experience with this case led us to conclude that a pleuroperitoneal shunt can improve the quality of life of patients with lung cancer, accompanied by persistent chylothorax that is refractory to surgery or chest tube drainage.

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