Pneumopericardium is a rare disorder having traumatic and non-traumatic causes. Penetrating or blunt chest trauma and iatrogenic complications associated with surgery, endoscopic procedures or positive pressure ventilation are major causes. Spontaneous pneumopericardium caused by cancer invasion is very rare. We present a 46-year-old man with buccal cancer and cavitated lung metastasis, in which pneumopericardium was found by chest X-ray. A chest CT scan showed multiple cavitory lesions of both lungs with broncho-cavity and cavity-pericardium communication which may be one of possible mechanisms of spontaneous pneumopericardium in this case.

Key Words: Buccal cancer • Metastatic lung cancer • Pneumopericardium

INTRODUCTION

Pneumopericardium is a rare disorder with traumatic and non-traumatic causes. Penetrating or blunt chest trauma and iatrogenic complications associated with surgery, endoscopic procedures or positive pressure ventilation are major causes. Spontaneous pneumopericardium is very rare. Fistula formation from air-containing structure to pericardium caused by primary lung, mediastinum or esophagus cancer have been reported in cases of spontaneous pneumopericardium. To our knowledge, pneumopericardium complicating metastatic lung cancer has not been reported in the medical literature. We herein describe such a case of buccal cancer with lung metastasis complicating pneumopericardium.

CASE REPORT

We report a case of spontaneous pneumopericardium in a 46-year-old man who had right buccal cancer (cell type: squamous cell carcinoma) with metastasis to bone, lung, liver, and spleen, and was admitted to the hospice ward for palliative care. He presented with pain in the upper left abdominal quadrant, a reddish swelling around gastrostoma, and mild shortness of breath. His initial symptoms of buccal cancer were teeth swelling and pain. He received a wide excision and marginal mandibulectomy. Recurrent, right upper gingival, squamous cell carcinoma developed, and wide excision and partial maxillectomy were performed. Radiotherapy was begun with a total dose of 6300 cGy. Whole-body positron emission tomography showed metastasis to the orbital, left hilar lymph nodes and scapula. Chemotherapy was begun with a regimen of Carboplatin plus 5-Fluorouracil. Lung, liver, and bone (right pelvic bone, right subtrochanteric, right lumbar spine) metastases were noted. Because of drowsy consciousness and restlessness, the patient was transferred to our hospital for palliative and hospice care. He was discharged after improvement of the symptoms. He presented in our emergency room again suffering from left, upper quadrant abdominal pain and a reddish swelling around gastrostoma.
A chest x-ray was performed and the film showed insertion of a chemo-port line with the tip located at the superior vena cava, normal heart size with tortuosity of the thoracic aorta, pneumopericardium, engorged size of the bilateral pulmonary arteries, pulmonary congestion, and multiple cavitating masses of varying sizes disseminated in both lungs (Figure 1). Lung metastasis was considered the probable cause of the masses. Echocardiography showed gas above the visceral pericardium with an acoustic shadow and poor image of the heart. A computed tomography scan of the chest and abdomen showed cavitary lesions in bilateral lung fields with a bronchocavity fistula and a cavity-pericardium fistula (Figure 2), small left pleural effusion, hypodense lesions in the spleen and bilateral liver from metastases, a large air collection in the pericardial space, bony metastases involving multiple vertebral bodies, the left anterior side ribs, and right iliac bone, thecal sac compression from epidural extension of the spinal metastases. Physical examination showed blood pressure 118/76 mmHg, heart rate 92 per minute, respiratory rate 16 breaths per minute, an oral tumor wound, no jugular vein engorgement, no pulsus paradoxus, diminished breath sounds, distant heart sounds, and erythematic swelling of the gastrostomy with discharge. Leukocytosis (white blood cells 24,960/ul), high C-reactive protein (20.170 mg/dl), anemia (hemoglobin 10.6 g/dl), azotemia, hyperkalemia, and hyponatremia were noted. Antibiotics were begun with ampicillin/sulbactam (Unasyn) 1.5 gm intravenously every 8 hours and blood culture grew Klebsiella pneumoniae. Palliative treatment with narcotic analgesics, intravenous fluid, oxygen supplement, and wound care were begun after admission. The patient’s general condition deteriorated and he died 15 days after admission.

**DISCUSSION**

Pneumopericardium, defined as the presence of air in the pericardial cavity, is an uncommon complication of lung and mediastinal tumors. The chest X-ray of our patient showed air surrounding the heart shadow within the pericardium, which did not extend beyond the reflections of the aorta and pulmonary artery. The etiologies of pneumopericardium can be classified into four types: (1) iatrogenic, such as barotraumas or lead perforation after pacemaker implantation; (2) trauma, for example either open or blunt chest trauma; (3) pericarditis from gas-producing organisms; and (4) fistula formation between the pericardium and air-containing structures such as the bronchial tree, gastrointestinal tract, and pleural or peritoneal cavity. Examples of this last type of pneumopericardium are bronchial asthma, esophagopericardial fistula, gastropericardial fistula, intestino-pericardial fistula, lung tuberculosis, lung or mediastinal cancer, spontaneous rupture of alveoli after exertion, pneumonia, etc.

Patients with pneumopericardium usually have chest pain and dyspnea. Hypotension, bradycardia, tachycardia and pulsus paradoxus manifest when tension pneumopericardium has developed. On auscultation, a mill wheel murmur (bruit de moulin) is typical, due to the movement of the heart with fluctuation of air and fluid. Normal heart sound, pericardial rub, and muffled heart sound have been reported in the absence of pericardial fluid. Electrocardiography may be unremarkable. Echocardiography may not evaluate the heart due to interference of air, or reveal air in the pericardial space together with effusion. Chest X-ray is diagnostic for most cases of pneumopericardium. Computed tomography of the chest can be performed to provide more definitive causes. Contrast study and endoscopy are useful if there is fistula from the esophagus or stomach to the pericardium.

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![Figure 1](image.png)

*Figure 1. Chest x-ray film showed bilateral cavitary metastases and pneumopericardium.*
The course of pneumopericardium may be self-limited or progress to tension pneumothorax. Emergent pericardiocentesis followed by chest tube drainage is life-saving for tension pneumopericardium. Surgical intervention is needed if a fistula or communication is present. In our case, the communication between brocho-cavity and cavity-pericardium was minute. Because there was no symptom or sign of cardiac tamponade, conservative treatments with oxygen therapy, bed rest, sedation, analgesics and antibiotics were prescribed in this terminal cancer patient.

There are several possible pathogenesis of pneumopericardium. The first mechanism is apposition of tracheobronchial and pericardial tears. The second is traumatic tears or pleuropericardial connections that lead to pneumopericardium in association with a pneumothorax. The third mechanism involves pulmonary interstitial air leaking from the alveoli and tracking along the perivascular planes of the pulmonary vessels into the pericardium. Within this pathogenesis, spontaneous cases of pneumopericardium associated with staphylococcal pneumonia, and exertion have been reported. In addition, increases in intra-alveolar pressure because of bronchospasm or cough could provoke the disruption of some alveoli, through which the air could reach and cross the pericardial wall. For example, Pooyan et al. reported a case involving a patient with diabetic ketoacidosis complicated with pneumopericardium that resulted from changes in pressure gradients in the lung alveoli secondary to vomiting and/or Kussmaul respirations. The fourth mechanism is fistula formation from an air-containing structure to the pericardium.

Pneumopericardium caused by neoplasms of the lung, mediastinum, or nearby organs, for example esophageal or gastric cancer, have been reported before. However, pneumopericardium caused by cavitary metastatic cancer has not been reported in the literature. We detected the broncho-cavity and cavity-pericardium communications by computed tomography scan. Air apparently leaked from the bronchus to the cavitated tumor. The leaked air may have traversed from cavity to cavity, and finally entered the pericardial sac through the cavity-pericardium communication or tracked along the perivascular planes of the pulmonary vessels into the pericardium. In our case, there was no sign of cardiac tamponade and no pericardial effusion. The communications between the bronchus to the cavity and the cavity to the pericardium were minute, which explained the relatively slow progression of the clinical manifestations.

REFERENCES