CASE REPORT

Lateral Position Prevents Respiratory Occlusion during Surgical Procedure under General Anesthesia in the Patient of Huge Anterior Mediastinal Lymphoblastic Lymphoma

Lymphoblastic lymphoma, an aggressive mediastinal mass, is recognized as serious threat to the patient in developing cardiac tamponade or airway obstruction. Surgical procedure is often required to relieve clinical emergency and to establish prompt pathological diagnosis. However, in such a patient, acute respiratory occlusion in the spine position can be a life-threatening complication during general anesthesia. We describe a 17-year-old man whose cardiac tamponade was treated by pericardial-pleural window through a left anterior thoracotomy in the lateral position. The patient recovered from hemodynamic compromise without showing respiratory occlusion during general anesthesia and remained in the lateral position until extubation. Pathological diagnosis was precursor T-lymphoblastic lymphoma. There were no complications attributable to the operative procedure. Further chemotherapy reduced the mediastinal mass in size after two weeks when the patient developed sepsis and died. Lateral position prevents respiratory occlusion during surgical procedure under general anesthesia in the patient of huge anterior mediastinal tumor with airway obstruction. (Jpn J Thorac Cardiovasc Surg 2004; 52: 476–479)

Key words: lymphoblastic lymphoma, cardiac tamponade, airway obstruction, lateral position, general anesthesia

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Lymphoblastic lymphoma (LBL) is well known as a highly malignant tumor in children and young adults that frequently presents with cardiorespiratory symptoms due to compression of the normal mediastinal structures or massive effusion.[1-3] We present a 17-year-old patient who was admitted with life-threatening cardiac tamponade and airway obstruction. Open surgical drainage was carried out for the relief of tamponade and pathological diagnosis. Cardiac tamponade was effectively treated by pericardial-pleural window through a left anterior thoracotomy in the lateral position without compromising respiratory occlusion during general anesthesia.

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Case

A 17-year-old man was admitted in clinical emergency with exertional dyspnea, hypoxia, tachycardia and hypotension. He had been suffering from orthopnea since a week before admission. Chest roentgenogram revealed massive widening of the mediastinal and cardiac silhouette with a large bilateral pleural effusion. On computed tomography, the normal mediastinal structures were markedly displaced by the huge anterior mediastinal mass, and massive pleural and pericardial effusion were noted (Fig. 1). The airway from the thoracic inlet to the bilateral bronchi was severely compressed in an antero-posterior direction that was suggested to be a risk for respiratory occlusion when general anesthesia is induced in the supine position (Fig. 1A). Echocardiogram showed direct compression of the

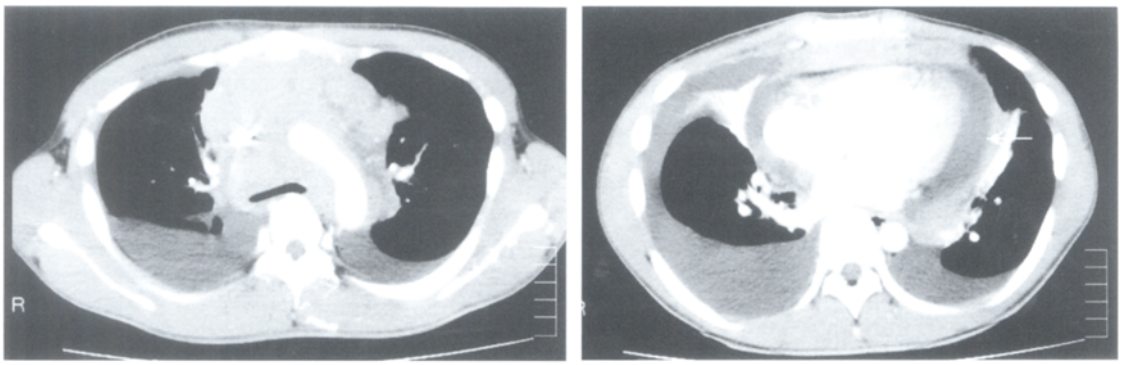

Fig. 1. Computed tomography study showed that the normal mediastinal structures were clearly displaced by the huge mediastinal mass. Bilateral massive pleural effusion and pericardial effusion were noted.
A: Carina was markedly compressed in an antero-posterior direction.
B: The right ventricle was directly compressed by the huge anterior mediastinal tumor. Note that massive pericardial effusion was collected on the left side of the heart (arrow).

right ventricle by the mediastinal mass and no respiratory variation in size of the inferior vena cava, indicating cardiac tamponade. The patient required immediate surgical pericardial drainage to relieve tamponade and establish pathological diagnosis following right thoracic drainage. Pleural fluid from the right chest was serous and sent for cytological analysis that showed class II.

The patient was transferred to the operation suite, and after endotracheal intubation, we confirmed that the ventilation was almost occluded in the spine position. Then, the patient was rapidly changed to the lateral position to overcome respiratory occlusion and the ventilation improved effectively. A left anterior thoracotomy was employed through the 6th intercostal space. When pericardium was incised, 900 ml of serosanguineous pericardial effusion was drained, which was reported class V and suspected malignant lymphoma in cytology. Then, a 5×7 cm window was created and biopsy specimen obtained from anterior mediastinal tumor was sent for pathological study. After the surgical drainage, patient's hemodynamics became stable and central venous pressure was decreased from 15 to 3 mmHg. Chest tube was placed in the left thoracic cavity. During the procedure, acute respiratory failure as a result of airway obstruction did not occur. A methylprednisolone 1 g bolus was given for 3 days.

The patient remained in the lateral position during intubation and was extubated on postoperative day (POD) 2. There were no complications attributable to the operative procedure. A biopsy specimen from the mediastinal tumor revealed precursor T-LBL and clinical stage was classified as Stage IV_{AEX}. The patient was treated with chemotherapy regimen for acute lymphoblastic leukemia (CALGB 8811) in addition to 60 mg of prednisolone by mouth. The mediastinal enlargement on the chest roentgenogram was markedly reduced in size after two weeks. The amount of the chest tube drainage had been reaching 200 to 500 ml daily, when the patient developed sepsis following leukopenia due to laryngitis or colitis and died.

Discussion

Our case report illustrates a rare situation where the patient of LBL with airway obstruction who developed life-threatening cardiac tamponade was effectively treated by pericardial-pleural window through a left anterior thoracotomy in the lateral position without compromising respiratory occlusion during general anesthesia.

LBL often produces compression of normal mediastinal structures. The rapid growth within the closed spaces of the mediastinum and massive effusion, which requires prompt diagnosis and treatment, may lead to cardiac tamponade or airway obstruction.[1-3] The risk of this occurrence in LBL exceeds that of any other neoplasm including Hodgkin's disease.[2,4] However, the combination of both problems in a single patient of LBL, that presented an unusual clinical challenge, is without precedent in a literature review.

Airway compression in LBL mainly occurs in an antero-posterior direction that is recognized to be at risk for airway occlusion when general anesthesia is induced in the spine position.[2,5] Furthermore, with the patient

in the spine position, anesthesia and muscle paralysis lead to a decrease in the dimensions of the rib cage, a cephalad displacement of the dome of the diaphragm, and a reduction in functional residual capacity. The reduction in the dimensions of the chest wall may limit the available space for the trachea relative to the tumor, and the decrease in tracheal distending pressure at low lung volumes promote its collapse. Prakash et al.[6] reported that bronchoscopic examination in the patient with malignant mediastinal lymphoma revealed almost total extrinsic compression of the trachea in the spine position without evidence of intraluminal disease, and that reexamination of the trachea in the sitting and semiprone positions showed resolution of the extrinsic compression. The effect of body position on the cross-sectional area of the trachea is not only explained by gravity acting on the mass itself but also related to the increase in functional residual capacity and the descent of the diaphragm in the upright position. It was also reported that general anesthesia for the patient with malignant mediastinal lymphoma, carried out with the patient half-sitting, should be aimed at maintaining spontaneous breathing and should be prepared to change the patient rapidly to a lateral or prone position.[5] In the present study, massive cardiac effusion was mainly demonstrated on the left side of the heart on the computed tomography, because the heart was directly compressed by the anterior mediastinal tumor (Fig. 1B). Thus, we employed left thoracotomy in the lateral position to avoid respiratory occlusion. We believe that subxiphoid approach even in the half-sitting position at maintaining spontaneous breathing would be difficult and not effective in this case.

Takeda et al.[7] reported a case of large anterior mediastinal tumor that developed respiratory occlusion during general anesthesia. Although life-threatening hypoxia was treated by rapid use of percutaneous cardiopulmonary support followed by extirpation of the tumor, it often takes much time to establish extracorporeal circulation. We estimate that the conversion of the body position from the spine to lateral could be a rapid and effective procedure of choice for the management of such respiratory occlusion during general anesthesia. Tracheobronchial stents are also effective to relieve clinical emergency in the patient with major airway obstruction and collapse.[8] In this case, the distressing symptoms were mainly associated with cardiac tamponade that was resolved by pericardial-pleural window, and lateral position itself appear to help avoid respiratory occlusion. Once the patient had revealed deterioration in dyspnea from further airway obstruction, tracheobronchial stents would be a useful addition in maintaining the airway.

The patients of LBL with extensive mediastinal involvement, frequently have clinical and echographic signs of cardiac tamponade.[3] It is well recognized that these patients are in the far-advanced stage with a short term life expectancy. In a series of 66 cases with malignant pericardial effusion, Reitknecht et al.[9] reported that open surgical drainage offered immediate symptomatic improvement with minimal complications and may increase the longevity of the patients. Furthermore, pericardial-peritoneal window or pericardial-pleural window is the effective choice of treatments for the patients with recurrent symptomatic pericardial effusions, although pericardial-pleural window is associated with significant morbidity and mortality.[10] In our case, there was no major complication or death attributable to the surgical procedure.

In conclusion, despite the grave prognosis of LBL, it is still our belief that malignant pericardial effusion should be treated aggressively by open surgical drainage to allow further therapies for the primary malignancy. Lateral position prevents respiratory occlusion during surgical procedure under general anesthesia in the patient of huge anterior mediastinal tumor with airway obstruction.

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