

Case Report

Giant Anterior Mediastinal Mass Requiring Awake Venovenous Extracorporeal Membrane Oxygenation Therapy: Case Report and Review of the Literature

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Abstract

Background

Anterior mediastinal masses may be the result of hematological or solid malignancies. Giant masses may cause significant compression on vital structures, including the trachea and main bronchi, and might lead to airway obstruction and respiratory collapse. Extracorporeal membrane oxygenation (ECMO) support may be life-saving in these extreme situations.

Case report

A 23-year old female admitted to the intensive care

unit (ICU) in our hospital due to giant anterior mediastinal mass and severe impending airway obstruction, in which intubation could not be performed due to severe narrowing of the trachea. Awake venovenous ECMO support was initiated in the sitting position while the patient was breathing spontaneously. ECMO support was used as a bridge to chemotherapy and decrease in tumor burden and tracheal compression.

Conclusion

In patients with large anterior mediastinal masses

causing impending airway obstruction and severe narrowing of the trachea, awake ECMO may be a considerable option, with a potential to avoid difficult intubation and post-intubation airway obstruction with life-threatening respiratory collapse. ECMO support may be used as a bridge to chemotherapy, in cases of hematological malignancies, or to surgery, in cases of solid tumors.

Keywords: Anterior mediastinal mass; VV ECMO; Hodgkin's lymphoma; Superior vena cava syndrome; Tracheal obstruction

1. Introduction

Anterior mediastinal mass may be benign or malignant. They can develop from structures that are normally located in the mediastinum, such as lymph nodes or the thymus gland, or as metastases from distal malignancies. Differential diagnosis includes lymphoma, thymoma, tumor of the thyroid gland and teratoma or germ-cell tumor [1]. Symptoms, if present, may be due to mass effect or to systemic disease. Symptoms due to mass effect include superior vena cava syndrome, dyspnea, stridor and wheezing due to compression of trachea and bronchi, dysphagia due to compression of the esophagus, Horner syndrome, hoarseness due to involvement of the recurrent laryngeal nerve, and hypotension due to cardiac tamponade [2]. Symptoms due to systemic illness include fever, weight loss, pruritus, night sweats and multiple paraneoplastic syndromes [2]. Giant anterior mediastinal masses, causing significant compression on vital structures, may be very challenging to manage. In the case of giant solid tumors, extracorporeal membrane oxygenation (ECMO) support may be required during surgery to remove the tumor. Fortunately, most of the anterior mediastinal tumors, especially in young patients, are lymphomas, for which

chemotherapy is usually very effective, leading to relatively rapid decrease in tumor size. However, even in the case of lymphomas, if the mediastinal mass is large enough to compress vital structures, such as the trachea, leading to impending airway obstruction and respiratory or cardiovascular collapse, sometimes bridging with ECMO support, until the effect of chemotherapy takes in, may be essential and life-saving. Here we present a case of a young woman who was admitted to the intensive care unit (ICU) in our hospital due to giant anterior mediastinal mass and severe impending airway obstruction, in which intubation could not be performed due to severe narrowing of the trachea.

2. Case presentation

A previously healthy 23-year-old female was admitted to the emergency department in our hospital due to shortness of breath and cyanotic spells at home. She described progressive swelling of her neck and face during the past four months, accompanied by profound pruritus, significant loss of weight, dysphagia and orthopnea. In the last month she could not lie in the supine position, due to dyspnea, and had to sleep in a sitting position. She could not eat solid food and could only drink liquids. She did not seek for medical attention previously, and attributed her symptoms to common cold. Upon admission she had tachypnea of 30-40 breaths per minute, and dyspnea, with sinus tachycardia of 120 beats per minute, saturation of 98% in room air and normal blood pressure and body temperature. In physical examination she had severe cachexia and extreme swelling of the neck (figure 1), with stridor and wheezing, and had extremely hoarse voice. She could not lie down and could breathe only while sitting and leaning forward. Her face was crimson with distended neck veins. Blood analysis was

unremarkable except for borderline beta human chorionic gonadotropin level. Chest X- ray revealed giant mediastinal mass, with large left pleural effusion (figure 2). She was admitted to the ICU urgently. Upon admission she received 20 mg of Dexamethasone intravenously (IV), as lymphoma was suspected, along with 7.5 mg of Rasburicase to avoid hyperuricemia due to tumor lysis. IV hydration was initiated. As superior vena cava syndrome was suspected, central line was inserted in the left femoral vein. She had urgent ultrasound-guided true-cut biopsy from the mass in her neck, followed by echocardiography, showing normal contraction of both ventricles with small pericardial effusion, normal pulmonary artery pressure and no significant compression of the inferior vena cava or right atrium. Urgent Computed tomography (CT) scan of the neck, chest and abdomen, performed in a semi-sitting position, revealed huge anterior mediastinal mass of 15 x 8 cm, wrapping large blood vessels in the mediastinum, compressing and blocking the superior vena cava and the brachiocephalic vein, with venous drainage through collateral veins and the Azygos vein, with severe narrowing of the trachea, up to 0.6 cm. In the neck severe lymphadenopathy was noted, with obstruction of both jugular veins, with venous drainage through collaterals in the anterior neck. Bilateral axillary lymphadenopathy was also observed (figure 3). Initial biopsy results were inconclusive, suggesting T-cell lymphoma, but could not rule out other diagnoses, such as teratoma. We consulted the oncologists and hematologists whether to initiate chemotherapy for probable lymphoma before final results of the biopsy, due to the critical and life-threatening condition of the patient. After multidisciplinary discussion, it was decided to wait until final results of the biopsy in order to select the specific and appropriate chemotherapy. Due to the extreme narrowing of the trachea, and the possibility

not only to encounter difficult intubation, but also the very likely risk of not being able to ventilate the patient following anesthesia and intubation due to obstruction of the distal trachea by the giant mass, we decided to connect the patient to veno-venous ECMO support while being awake, in the sitting position and while maintain spontaneous breathing. Oxygen was administered through high flow nasal cannula with gas flow of 40 liter per minute and 100% oxygen. Under local anesthesia with lidocaine, cannulas were inserted into the left and right femoral veins, and ECMO was initiated at blood flow of 3 liters per minute with gas flow of 2 liters per minute. Several minutes after ECMO initiation, we observed a significant improvement in the patient's tachypnea, with decrease of respiratory rate from 40 to 13 breaths per minute. Heart rate declined from 130 to 90 beats per minute, and blood pressure and saturation were normal. Final results of the biopsy showed histological and immunostain findings compatible with classical Hodgkin's lymphoma. Chemotherapy with Doxorubicin, Bleomycin, Vincristine, Dacarbazine and Dexamethasone was initiated. No signs of tumor lysis syndrome were observed. After several days, significant improvement of the swelling in the neck and face was noted. CT scan, performed a week following ICU admission, showed significant decrease in the size of the mediastinal mass, with improvement in the diameter of the trachea, from 0.6 to 1 cm (figure 4). The patient was able to lie in the supine position during the CT scan without dyspnea. The patient was successfully weaned of ECMO and had decannulation the following day. Pleurocentesis was performed with drainage of 1.5 liter of transudate from the left pleural space. The patient was transferred to the department of hematology in a stable condition, and she will continue chemotherapy for the next 6 months.



Figure 1: Large mass of neck at admission

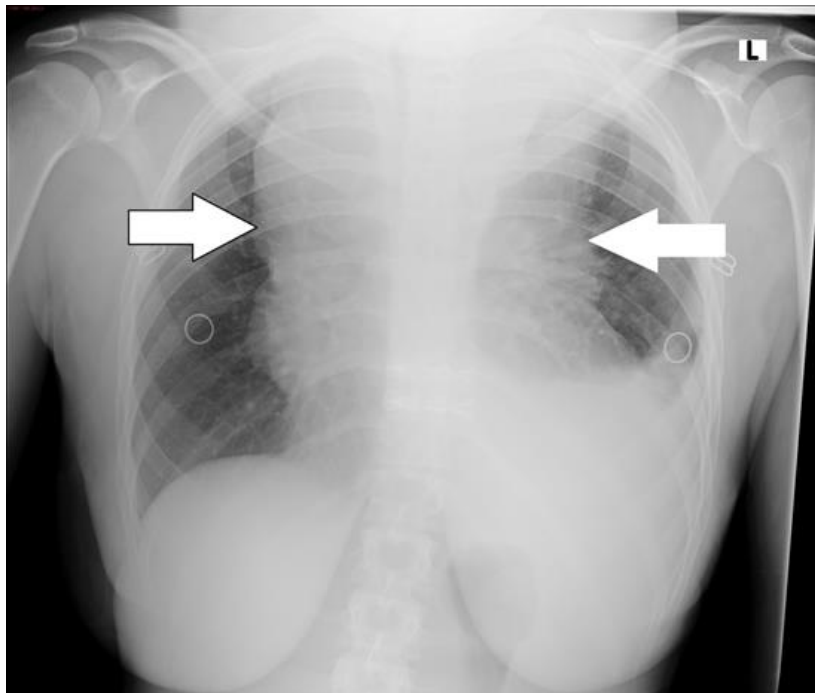


Figure 2: Chest X-ray at admission, showing large anterior mediastinal mass

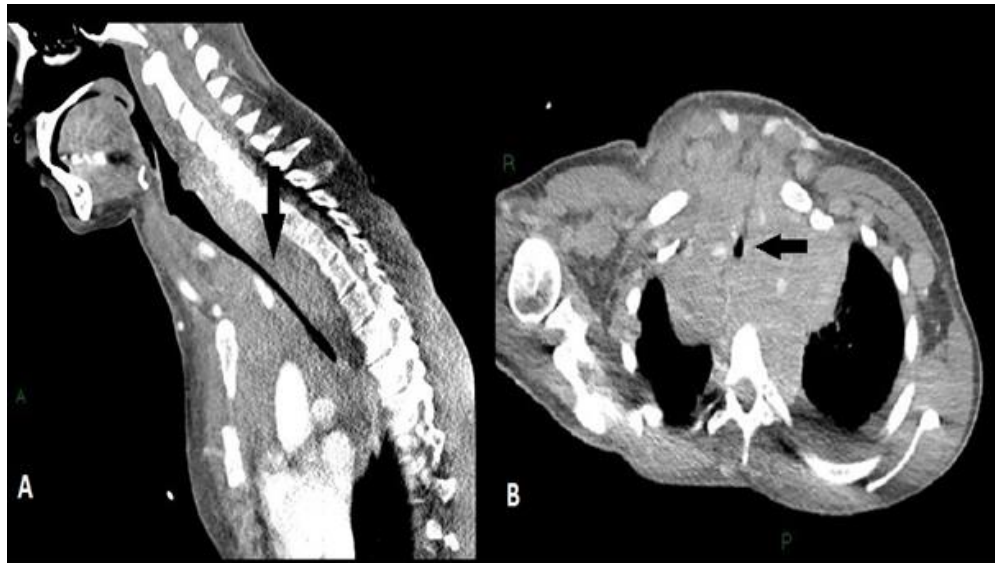


Figure 3: Computed tomography scan of the chest at admission, showing severe narrowing of the trachea



Figure 4: Computed tomography scan of the chest one week after chemotherapy, showing improvement of the tracheal diameter

3. Discussion

We present a case of a young woman who required awake veno-venous ECMO due to a giant anterior mediastinal mass compressing the trachea. The need for emergency ECMO for impending respiratory collapse in mediastinal malignancy is rare. We found

several case reports in the literature [3-9]. One of them described a similar case of a young female who presented with large mediastinal mass due to T-cell lymphoblastic leukemia, complicated by acute cardiorespiratory collapse from mechanical compression on the trachea and pulmonary embolism

[3]. The patient was intubated but remained hypoxemic and in cardiogenic shock, and therefore emergency veno-arterial ECMO was used as a rescue therapy, and then as a bridge to cytoreductive therapy. Another case report describes an 18-year old male presenting with large mediastinal B-cell lymphoma causing airway obstruction. During a bronchoscopy in an attempt to insert endobronchial stent, massive airway bleeding with respiratory failure ensued. Emergency veno-venous ECMO therapy was initiated [4]. Veno-arterial ECMO was used as a rescue therapy in a woman who had cesarean section at full term and collapsed due to mediastinal B-cell lymphoma and superior vena cava syndrome [5]. In another case, veno-venous ECMO was used as a life-saving emergency measure for a 45-year old female who was intubated due to airway obstruction caused by large B-cell mediastinal lymphoma, and ventilation was impossible afterward due to severe mechanical tracheal compression [6]. A very similar case was described by Oto et al. [7] and a case series of 3 patients who required emergency rescue ECMO support for patients with solid mediastinal malignancies during surgery for tumor resection was described by Leow et al. [8] Oyake et al. [9] described a similar case of a patient with mediastinal T-cell lymphoma and airway compression, but in their report planned ECMO was used to avoid life-threatening complications during bronchoscopy and insertion of endobronchial stent, and Hong et al. [10] described a case series of 13 patients who required emergency rescue ECMO support during bronchoscopies in patients with severe airway obstruction due to malignant masses. In all cases but one [9] the ECMO was used as emergency, life-saving therapy, and all the patients were connected to ECMO support while being intubated. The patient described in our case report was not intubated prior to ECMO support, since the trachea diameter, as measured in CT

scan, was severely narrowed. In this case, not only intubation could have been very difficult, due to a large mass in the neck distorting normal anatomical structures (as would have been emergency surgical airway), but even if intubation could take place, ventilating the patient post intubation might have been impossible, due to extreme mass effect on the distal trachea. In addition, since the patient had impending airway obstruction, we obviously did not want to wait until respiratory collapse ensues. Therefore, we decided to initiate veno-venous ECMO support while the patient was still with normal blood oxygen saturation levels (however with severe dyspnea and hypoxemia, as described above) and to do it while the patients is awake, not intubated, and in the sitting position (due to severe orthopnea). Since the patient was hemodynamically stable, we decided to initiate veno-venous and not veno-arterial ECMO support. However, we prepared for the option of veno-arterial ECMO, in case the patient will become hypotensive. Insertion of cannulas for ECMO while the patient is fully awake, in a sitting position and in extreme respiratory distress is very challenging. Fortunately, the patient was cooperative and the procedure was performed without technical complications. Relief of respiratory distress was immediate, and due to good response of the tumor to chemotherapy, we were able to wean the patient of ECMO after 1 week.

4. Conclusion

In patients with large anterior mediastinal masses causing impending airway obstruction and severe narrowing of the trachea, awake veno-venous or veno-arterial ECMO may be a considerable option, with a potential to avoid difficult intubation and post-intubation airway obstruction with life-threatening respiratory collapse. ECMO support may be used as a bridge to chemotherapy, in cases of hematological

malignancies, or to surgery, in cases of solid tumors.

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None.

Conflict of interests

The authors declare no conflict of interests.

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