A right para-tracheal mass extending into the anterior mediastinum: An anesthetic management conundrum

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ABSTRACT

The anesthetic management of patients with a mediastinal mass represents a challenge due to the potential for difficult ventilation and intubation, as well as the risk of cardiovascular collapse upon induction of general anesthesia. Different strategies and alternatives have been described. We present the case of a 70-year-old man with a right para-tracheal mass extending into the anterior mediastinum with 90% mid-tracheal lumen obstruction who was successfully managed with venous-venous extra-corporeal membrane oxygenation (ECMO) during mass debulking and tracheal stent placement.

Keywords: Anterior mediastinum, case report, difficult airway, ECMO, para-tracheal mass

INTRODUCTION

The anesthetic management of patients with a mediastinal mass represents a challenge due to the potential for difficult ventilation and intubation, as well as the risk of cardiovascular collapse upon induction of general anesthesia. Different strategies and alternatives have been described, each with its own risks and benefits. We present the case of a 70-year-old man who presented with a right para-tracheal mass extending into the anterior mediastinum with 90% mid-tracheal lumen obstruction who was successfully managed with venous-venous extra-corporeal membrane oxygenation (ECMO) during mass debulking and tracheal stent placement.

CASE PRESENTATION

A 70-year-old man with past medical history of hypertension and chronic obstructive pulmonary disease (not oxygen-dependent) presented to the emergency department complaining of progressively worsening shortness of breath over the previous 10 days associated to dry cough. On physical exam, he had hoarseness and inspiratory and expiratory stridor, although breath sounds were audible bilaterally. Oxygen saturation was 96% on room air.

Imaging studies showed a 7 × 5 × 8 cm right para-tracheal mass in the anterior mediastinum with compression and deviation of the mid-trachea, obstructing 90% of its lumen [Figure 1]. There were no signs of superior vena cava (SVC) obstruction. The patient was scheduled for flexible bronchoscopy, tumor biopsy and debulking and tracheal stent placement with venous-venous ECMO.

Preoperatively, a left internal jugular (IJ) vein catheter and a left radial artery catheter were placed with no
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sedation. Within the operating room, after administering an intravenous bolus of midazolam, a ketamine infusion was started. While keeping the patient spontaneously ventilating with supplemental oxygen via a simple face mask at 6 L/min, the surgeon cannulated the right IJ and right femoral veins, and ECMO was initiated.

After confirming adequate oxygenation via arterial blood gas analysis, general anesthesia was induced with a ketamine bolus and finally rocuronium was administered. A laryngeal mask airway (LMA) was placed and pressure-control ventilation was started without significant hemodynamic changes. Flexible bronchoscopy showed an abrupt extrinsic mass effect on the trachea with over 90% of tracheal lumen obstruction starting 4 cm below the level of the vocal cords and extending distally up to 3 cm above the carina [Figure 2]. Biopsies were taken and a neodymium-doped yttrium aluminum garnet (Nd: YAG) laser was used for tumor debulking. A 20 × 80 mm AERO tracheobronchial stent (Merit Medical Systems, South Jordan, UT) (self-expanding nitinol stent) was finally placed with significant improvement in tracheal lumen diameter.

At this point, ECMO was stopped (total ECMO time: 90 minutes) and after ensuring adequate oxygenation on room air, the cannulas were removed. With the patient fully awake, the LMA was removed and he was transferred to recovery saturating 94% with oxygen supplementation via nasal cannula at 4 L/min. The final pathology report described an ulcerated squamous cell carcinoma originating from the trachea [Figure 3].

DISCUSSION

This case describes a patient who presented with a right para-tracheal mass which postoperatively was found to be a squamous cell carcinoma arising from the trachea. Even though the mass did not originate from the anterior mediastinum, it was anatomically located in it. Since there are no clear anatomical or fascial planes between the mediastinal compartments, irrespective of where the mass arises from or what the anatomopathological diagnosis is, it is paramount for the anesthesiologist to preoperatively review then imaging studies to delineate the anatomical relation of the mass to the cardiopulmonary structures. This will help the anesthesiologist assess the current degree and risk of compression of vital structures and anticipate a rescue position in case cardiopulmonary collapse occurs.

ECMO presents several advantages as an alternative in the anesthetic management of patients with a mediastinal mass. The capability to provide both complete gas exchange as well as circulatory support makes it an ideal option for patients with a mediastinal mass effect on the airway and vascular structures. Furthermore, the fact that it can be placed under local anesthesia makes it convenient as it can be secured before induction of general anesthesia, as well as continued post-operatively if needed.

General anesthesia has been shown to decrease thoracic volumes. In cases in which it is required, maintaining spontaneous ventilation and avoiding neuromuscular relaxation have been classically encouraged.
However, recent reports suggest that muscle relaxants and positive-pressure ventilation may improve airway diameter,[5] although further studies are needed. In this case report, after having secured adequate oxygenation by ECMO, both muscle relaxants and positive-pressure ventilation were utilized to enable an adequate operative setting for the performance of the flexible bronchoscopy and endotracheal stent placement. It is imperative, however, to ensure complete reversal of the neuromuscular paralytic agent before tracheal extubation, as any residual effect would be deleterious, especially in this patient population.

In summary, the anesthetic management of patients with a mediastinal mass represents a challenge. Irrespective of the origin of the mass, careful preoperative review of imaging studies is paramount to identify the anatomical relation of the mass to the cardiopulmonary structures. ECMO may present a valuable alternative in these cases. If general anesthesia is required, positive-pressure ventilation and neuromuscular relaxation may improve the ventilatory mechanics and operative field during airway surgery, although further studies are still needed.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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