CASE REPORT

Anesthetic considerations of central airway obstruction

Abdelazeem El-Dawlatly, Sami Alnassar[1], Ahmed Abodonya, Nada Almutlaq, Waseem Hajjar[1]

Department of Anesthesia and [1]Thoracic Surgery, College of Medicine, King Saud University Riyadh, KSA

Address for correspondence:
Dr. Abdelazeem El-Dawlatly, Department of Anesthesia, College of Medicine, King Saud University, Riyadh, KSA.
E-mail: dawlatly@ksu.edu.sa

ABSTRACT

Central airway obstruction (CAO) is a serious presentation of lung cancer and associated chest diseases. It presents a real challenge to the anesthesiologist because usually the patient admitted to the hospital as an emergency case with high grade dyspnea scheduled to undergo rigid bronchoscopy for diagnostic and possible therapeutic interventions. In this case report, we described the anesthetic management of a patient who was admitted to our hospital with CAO.

Key words: *Anesthesia, central airway obstruction, ventilation*

INTRODUCTION

Central airway obstruction (CAO) is a serious presentation of lung cancer and associated chest diseases. It presents a real challenge to the anesthesiologist because usually the patient admitted to the hospital as an emergency case with high grade dyspnea scheduled to undergo rigid bronchoscopy for diagnostic and possible therapeutic interventions. In this case report, we described the anesthetic management of a patient who was admitted to our hospital with CAO.

CASE REPORT

A 48-year-old male patient who is a known case of bronchial asthma was admitted to the emergency department with severe shortness of breath diagnosed as severe bronchial asthma and transferred to intensive care unit (ICU) for further management. Chest x-ray done in ICU showed lobulated lesion at the level of the carina [Figure 1]. The thoracic surgery service was consulted where CT scan of the chest with i.v. contrast was advised for further evaluation of the carinal mass. The CT scan of the lung showed a well-defined endotracheal lesion at the level of the carina extending toward the right main bronchus [Figures 2 and 3]. The lesion size was approximately 1.7×1.9 cm. Also there were three liver lesions appeared on the CT abdominal scan possibly hemangiomas. The patient was scheduled to undergo rigid bronchoscopy with possible excision of the endotracheal-endobronchial lesion. On the preoperative visit, the patient was in semi-sitting position, dependent on oxygen supplementation, with severe dyspnea to the extent he was not able to complete one full sentence. His laboratory biochemical data were within normal ranges. His arterial blood gases (ABG) data on room air were: pH 7.34, PaO_2 70 mmHg, $PaCO_2$ 42 mmHg, bicarbonate 22 mmHg, and saturation 94%. Cardiovascular system evaluation revealed no abnormality. A racemic epinephrine nebulization was prescribed to the patient preoperatively. No premedication drug prescribed. On the day of bronchoscopy the patient was transferred to operation room with oxygen face mask supplementation. He was placed on operation room table in semi-sitting position with nearly 45° and oxygen by face mask was continuously delivered. The patient was connected to routine monitoring devices. An i.v. and radial artery cannulation were performed under local anesthesia. Induction of anesthesia was achieved with i.v. midazolam 3 mg and sevoflurane inhalation induction. Following easy and adequate face mask ventilation, i.v. suxamethonium 100 mg was given to facilitate rigid bronchoscopy introduction. At this stage the patient was placed in the supine position. Following insertion of rigid bronchoscopy in the trachea ventilation

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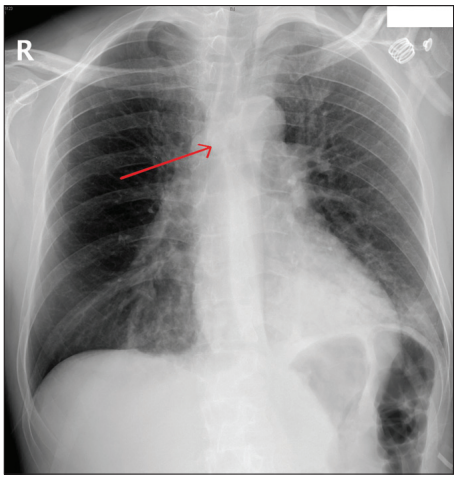

Figure 1: Chest X-ray showing lobulated lesion at the level of the carina (red arrow)

Figure 2: Sagittal CT lung scan with dye showing nearly complete central tracheal obstruction with the tumor

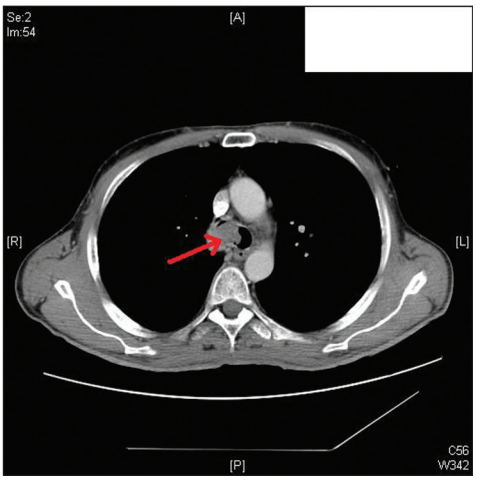

Figure 3: CT lung scan showing the tracheal mass extending and obliterating the right main bronchus

was maintained with jet ventilation (Manujet, VBM medicine technic, Germany) where we have to reach an inspiratory pressure of 40 cmH_2O in order to be able to deliver the desired tidal volume. Anesthesia was maintained with i.v. fentanyl and propofol and muscle relaxation was maintained with cisatracurium. During the procedure we noticed the rising up of $PaCO_2$ till before the end, a figure of $PaCO_2$ 101 mmHg was recorded on ABG sample analysis. The tumor was visualized at the carinal level and was almost removed completely by the help of loop cautery. Following the removal of the tumor the trachea was intubated with 7.5 tracheal tube and flexible bronchoscopy was performed. The operation took 90 min. At the end of the bronchoscopy, the patient was shifted to the ICU with the trachea intubated and lung ventilated for further management. Next day, the trachea was extubated and he made an uneventful recovery. The patient was further investigated by triphasic liver scan to confirm the nature of the liver lesions that showed lesions in segment 6 of the right lobe, most probably hemangioma with small lesion in segment 7 which showed poor contrast enhancement. For further clarification, MRI abdomen was done and showed multiple focal lesions consistent with hemangioma. The histopathology report of the endotracheal-endobronchial mass showed moderately differentiated squamous cell carcinoma. The oncology team was consulted and advised bone scan and CT scan of the brain. Bone scan showed increased trace uptake in the right rib posteriorly. The CT scan of the brain showed a slightly ill-defined hyperdense area in the left occipital region which could be of metastatic nature. The patient was discharged home to be seen later for further evaluation.

DISCUSSION

The rescue procedures for the airway in CAO patient is either a tracheal tube or a rigid bronchoscope. Passing either will require anesthetizing the patient which carries a high risk of morbidity and/or mortality. The rigid bronchoscope is also therapeutic. It allows the operator to bypass the obstruction and hence alleviates the airway obstruction for better oxygenation of the patient.[1,2] There are different surgical approaches to deal with CAO which are all performed through the rigid bronchoscope. Those therapeutic approaches are dilation of the airway, electrocautery, laser therapy, cryotherapy, brachytherapy, or insertion of airway stents.[3-5] Anesthesia for CAO patients presents real challenge to anesthesiologists. Usually those patients presented with severe shortness of breath and stridor which requires immediate interference to secure the airway. As in our patient who presented with CAO, he was severely distressed and was not able to complete one full sentence besides he was oxygen dependent. Preoperative preparation of this patient with racemic epinephrine nebulization made some improvement in the degree of dyspnea. On the day of the bronchoscopy, we have noticed a slight improvement

and he was more comfortable regarding the breathing pattern versus the day of admission. A mixture of helium and oxygen was suggested for preoperative preparation for CAO patients. Helium with its lower density compared to nitrogen will increase laminar flow to establish more quickly which results in lowering the driving pressure to a given flow and hence reduce the work of breathing.[6] We think that the role of racemic epinephrine in the case presented is different from helium as it will decrease the edema formation at the level of CAO and hence improves the patient breathing pattern. The challenges met in the presented case were: How to induce and maintain anesthesia, how to secure the airway, how to ventilate the lungs through the rigid bronchoscope and what is the alternative plan to rescue the airway if complete CAO occurs during anesthesia? As per the alternative plan in the case of complete CAO, we believe that the rigid bronchoscope can make the central airway open if complete obstruction occurs at induction of anesthesia. Therefore, the thoracic surgeon should be physically available in the operation room and the rigid bronchoscope should be readily available for use at time of induction of general anesthesia (GA). In the literature, there is a report on the use of local anesthesia and sedation for rigid bronchoscope for emergency relief of CAO with successful outcome.[7] Due to the unpleasantness of local anesthesia in cases of CAO, there is a general agreement among anesthesiologists that GA is the method of choice. The choice between conventional intravenous or inhalation anesthesic induction depends on the patient disease. For a fixed CAO, a conventional intravenous anesthetic induction with muscle relaxants is advised. However, for patients with variable intrathoracic obstruction, an inhalation anesthetic induction can be sufficient to avoid the use of muscle relaxant till securing the airway.[8] Although spirometry was nearly impossible to perform in our patient but with the CT scan finding of tracheobronchial mass, a variable intrathoracic obstruction pattern was anticipated where there will be limitation of airflow during expiration. Therefore, inhalation anesthetic induction was appropriate in our case. In our case, ventilation through the rigid bronchoscopy was adequate and achieved using the manual jet ventilator. However and due to possible hypoventilation, hypercapnea occurred at the end of the endoscopy. It is well known that dynamic hyperinflation results from central airway resistance that is more obvious during exhalation.[5] In one report where the manual jet was used it was found that the jet of oxygen will deliver adequate tidal volume and the technique carries the advantage of performing uninterrupted endoscopy.[9]

One problem still exists in this category of patients during electrocautery, airway fires. It was recommended that the FiO_2 should be less than 0.4 whenever electrocautery is used with special reference to the jet ventilation which entrains room air with 100% oxygen. Therefore, cessation of ventilation during electrocautery is essential to avoid disastrous airway fires.[10]

In conclusion, anesthesia for CAO patients presents many challenges to anesthesiologists. Careful preoperative evaluation and preparation for the endoscopy will be reflected on the outcome of those patients. Induction with inhalation anesthetic while the patient is in the semi-sitting position will improve breathing and prevent further CAO. Use of manual jet ventilation seemed to be appropriate in those patients. Less FiO_2 during electrocautery is recommended to avoid airway fires. Above all, close communication between surgeon and anesthesiologist is important during endoscopy of CAO patient for better outcome.

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