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Perioperative anesthesia management of a pregnant patient with central airway obstruction: a case report

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Abstract

Mediastinal masses in pregnancy, although rare, can present with life threatening central airway obstruction if general anesthesia is required. In patients with central airway obstruction who are classified as being high risk for anesthesia, specific cardiothoracic interventions are usually required when there is no alternative to general anesthesia. We describe the case of a young female who presented in her second trimester with severe tracheal compression and worsening dyspnea secondary to a mediastinal mass. Intravenous dexamethasone was started, following which her symptoms improved and a drastic reduction in her tracheal compression was observed. The patient subsequently underwent successful vaginal delivery under epidural anesthesia. We discuss the complexities in perioperative decision making for this rare presentation and potential therapeutic options.

KEYWORDS

Tracheal compression; Pregnancy; Mediastinal mass

Introduction

Central Airway Obstruction (CAO) in a patient needing general anesthesia is harrowing prospect for many anesthesiologists. Catastrophic and sometimes irreversible airway obstruction is well documented and is still being reported in the medical literature.[1,2] Fundamental in these patients is the early identification and quantification of the level of airway obstruction with the development of an individualized management plan.[2,3] Although general anesthesia, even if safely performed, is best avoided in many of these patients who may be classified as high-risk, it may still be required in the obstetric patient. In non-emergent cases, pharmacotherapy (chemotherapy, steroids) can help reduce the degree of obstruction and its use can be facilitated by early planning.[4] Monotherapy with steroids is seldom used but can be beneficial in certain tumor types.[5] The discussed case illustrates the perioperative management of a patient with central airway obstruction who showed an excellent response to perioperative steroid use and emphasizes the importance of an individualized management plan. This specific role for steroids and the potential magnitude of its effect has been seldom reported in the literature for central airway obstruction.

Case report

A 23-year-old female who was previously well presented at 5-months (20/40) Period Of Gestation (POG) with a right sided neck mass. She noted this to be increasing in size and associated with worsening dyspnea.

On review by the ENT department, a CT scan of the neck was requested which showed a large (17×11×10 cm) anterosuperior mediastinal mass. Marked tracheal deviation to the right and significant tracheal compression at the level of the thoracic inlet was seen (Fig. 1). The transverse caliber of the compressed trachea was measured to be 4 mm with approximately 70% tracheal compression. The compressed proximal segment was 4 cm long and located 6 cm from the carina. The great vessels were encased and splayed by the mass with compression of the right internal jugular vein. No pleural or pericardial effusions were seen.

A biopsy done under local anesthesia showed features suggestive of lymphoma but was inconclusive. The patient was then counselled on the possible diagnosis and potential need for chemotherapy.

She was subsequently referred to the Obstetric Anesthesia High Risk service (OAHRS) at her local tertiary obstetric hospital. On review, she was noted to have significant supine shortness of breath with no clinical signs of Superior Vena Caval Obstruction. She was assessed as being a high risk for airway complications and an inability to ventilate in the event that general anesthesia was needed for operative delivery. Additionally, no thoracic surgeon was available in the event of airway collapse by the mediastinal mass.

Several multidisciplinary meetings were held by the OAHRS that included the ENT, Hematology, Radiology, Oncology, Obstetrics, and Intensive care departments. A referral was made to the local cardiothoracic center, however, they suggested delivery at her present hospital as they lacked an Obstetric service. Given her worsening shortness of breath and lack of cardiothoracic intervention at her present hospital the multidisciplinary team decided to trial a course of high dose steroid to facilitate reduction in tumor size and airway compression until delivery of the baby. Once the baby was delivered the patient could then be referred to a cardiothoracic center for definitive treatment of the mass. Dexamethasone 12 mg IV twice daily for a period of 5-days was commenced followed subsequently by prednisolone 30 mg orally.

Initiation of steroids was followed by rapid resolution of her symptoms and a CT scan performed shortly after initiation of dexamethasone showed a reduction in the size of the mass and significantly less tracheal compression (Fig. 2). The patient was discharged home and followed weekly in the antenatal clinic.

At 32/40 POG the prednisolone was tapered to 30 mg orally every other day. Due to the potential risk of further deterioration and the urgent need to commence treatment an elective induction was planned at 34/40 weeks POG. Another CT (Fig. 2) scan performed shortly before her induction showed a still present mass effect, but a patent trachea. Echocardiogram showed normal ejection fraction, no mass compression of any of the chambers and no pericardial effusion.

In the event of a potential need for an operative delivery and to optimize the chances of a successful vaginal delivery, a lumbar epidural was inserted at the L4–L5 interspace, with the epidural having the potential to facilitate both labor analgesia and a cesarean section if required. The epidural would also prevent fatigue and excessive straining during delivery. As a secondary option in the case of failure of epidural anesthesia, general anesthesia was planned with an inhalation induction, spontaneous ventilation, and bypass of the area of compression with the

endotracheal tube under endoscopic guidance if necessary. The labor epidural was inserted in the operating theatre with the difficult airway equipment on standby instead of in the normal labor suite.

The labor epidural was successfully used during the patient's labor with a 0.125% bupivacaine solution and 2 $ug.mL^{-1}$ of fentanyl given via continuous infusion. Adequate analgesia was achieved with a T8 level block and the patient was comfortable throughout her delivery eventually giving birth to a healthy newborn.

Postoperatively, the patient was closely monitored in the high dependency unit for 48 hours and then discharged for further definitive oncological care. Subsequent testing confirmed the mass to be a thymoma.

Discussion

Mediastinal masses in pregnancy and especially those with central airway obstruction are considered to be quite rare.[4] Despite its rarity, the implications for management remain quite significant.

An increased vigilance and awareness of the problems associated with mediastinal masses has generally led to the necessary precautions being taken when these patients present for care and this may have led to a decline in the number of adverse events being reported.[1,2] In fact, Bechard et al showed a low incidence of intraoperative complications in this group of patients and highlighted, instead, an increased risk for postoperative complications.[1] Thus, continued vigilance, even into the postoperative period is needed for this patient group.

The main challenge facing anesthesiologists caring for these patients is the risk of Mediastinal Mass Syndrome (MMS), which can lead to cardiovascular, and airway collapse intraoperatively.[6] The respiratory complications of MMS are essentially due to mechanical compression of the trachea by the mass. During general anesthesia, several factors combine to worsen this mechanical compression and its consequences. These include supine positioning, loss of functional residual capacity, post-stenotic turbulent flow and, primarily, the loss of spontaneous breathing activity.[2,6] Spontaneous breathing activity functions to reduce the transpleural pressure gradient, especially in expiration, and in so doing keeps the intrathoracic airways patent.[2] Hence, these cumulative factors and the potential for the loss of spontaneous breathing activity can lead to a potentially fatal airway collapse during anesthesia.

The NAP 4 audit into major complications of airway management in the United Kingdom provides useful guidance on the management of the difficult airway.[3] This audit emphasizes the important of early airway assessment using imaging and a comprehensive and individualized airway management plan. This we found to be foundational to the care of this patient.

Risk stratification is based on CT scanning and the patient's clinical presentation. High-risk presentations involve tracheal compression >50%, associated bronchial compression, SVC syndrome, presence of pericardial effusions and severe postural symptoms.[1,2,6] Due to the extent of tracheal compression and the presence of postural symptoms our patient would have been considered high-risk. Patients with high-risk presentations are generally considered – "unsafe" – for general anesthesia and require individualized anesthesia management plans that may include therapies to reduce the size of the mass preoperatively.[2,4]

Standards of management for these cases have been established. These include CT scanning and risk stratification, multidisciplinary consultation and avoidance of general anesthesia in high-risk cases.[2,4,6] The principles of general anesthesia involve consideration of both the respiratory and hemodynamic effects of the mass. To prevent respiratory compromise spontaneous ventilation is advocated along with bypassing the level of obstruction with the endotracheal tube once difficulty is obtained with ventilation proximal to the obstruction.[2,4]

In these high-risk cases there are occasions where a general anesthesia may be unavoidable as in the obstetric patient. In these cases, in addition to the standard measures, additional recommendations include the presence of a thoracic surgeon, rigid bronchoscopy with jet ventilation and cardiopulmonary bypass.[2] Most of these interventions are only present in highly specialized centers, which contrasts with the ubiquity of obstetric services in many countries. Our case serves to highlight a potential temporizing option in these patients that can improve the safety of anesthesia when required.

In high-risk cases, steroids and chemotherapy have been suggested by previous authors with a view to shrinking the size of the mass and its compressive effect.[4] However, their efficacy may be lesion specific and may alter the histologic diagnosis.[4] In our case, high dose steroids helped convert the patient from high risk for general anesthesia (especially in a center without advance cardiothoracic modalities) to low risk. This ensured the safety of mother and baby and we believe was the key management strategy that led to a good clinical outcome in this patient.

Given that her final diagnosis was a thymoma, there has been some evidence supporting the use of steroids in the medical literature. It also appears that certain subtypes (type B1) may have significant response to steroid therapy, which was the case with our patient.[5]

Although chemotherapy has been safely started in pregnancy for lymphomas, evidence for its use is limited and it was not started in our patient despite initial testing suggesting a lymphoma. While it may have been a viable option for shrinking the mass our oncologist and hematologist were not convinced of the adequacy of the biopsy and after consultation with the patient and the multidisciplinary team thought it best to expedite delivery and repeat the biopsy. Given the final diagnosis of thymoma, this was likely the best decision.

Conclusion

Although rare, mediastinal masses in pregnancy can pose a significant challenge during anesthesia and can be potentially fatal. Early detection of such cases can allow appropriate therapy to reduce airway obstruction preoperatively. In settings without advanced cardiothoracic facilities, consideration of the use of steroids, in select cases, can allow for a greater margin of safety if anesthesia is required.

Conflicts of interest

The authors declare no conflicts of interest.

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Figure 1 (a) Proximal tracheal compression caused by the mass at the level of the thoracic inlet. Maximal diameter from (b) was 0.4 mm.

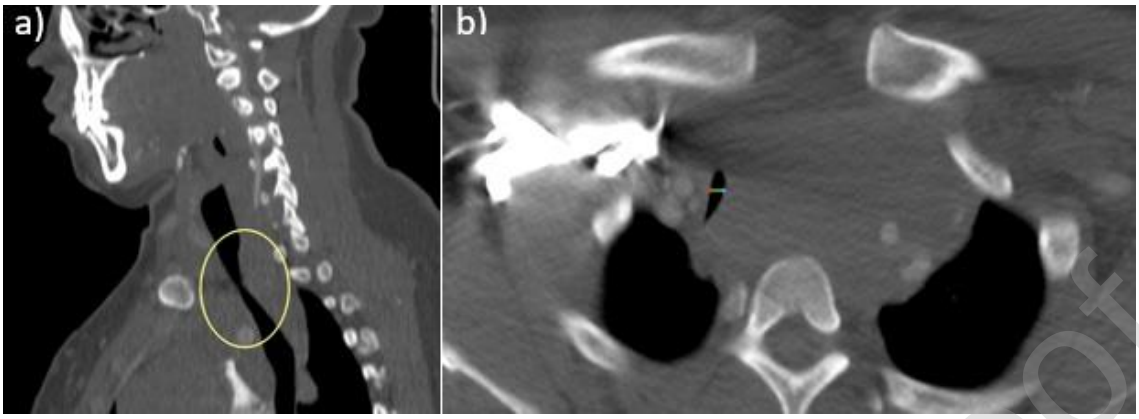

Figure 2 Progression of the tracheal compression in response to steroid therapy showing a drastic improvement, (a) represents the initial presentation, (b) shortly after steroid initiation, (c) immediately before induction of labor while on oral prednisolone.