Case Report

Posterior Mediastinal Mass in a Neonate Causing Airway Compression: Perioperative Anesthetic Management

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ABSTRACT

Posterior mediastinal masses by their location pose a risk of compression of heart, great vessels and airway. These risks are further exaggerated, with the use of neuromuscular relaxants and lateral positioning during anesthesia. We report a case of a 2.5 months old baby with posterior mediastinal mass causing compression of left bronchus and significant mediastinal shift with respiratory distress as a primary complaint. This posterior mediastinal Mass (PMM) was removed by right lateral thoracotomy without the initial use of neuromuscular blockade till the pleura was opened.

Keywords: Anaesthesia, pediatric, posterior mediastinal mass, thoracotomy

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INTRODUCTION

In the pediatric population, common posterior mediastinal masses include neurogenic tumors, foregut duplication cysts, and lymphoma. Patients with large mediastinal masses are recognized to be at a higher risk of cardiorespiratory failure. In the presence of symptoms of cardiorespiratory compression such as dyspnea, orthopnea, stridor, syncope, or superior vena cava compression syndrome, administration of general anesthesia may be fatal.

CASE REPORT

A 2.5-month-old baby, weighing 3.4 kg, presented to the emergency with a history of cough and rapid breathing for the past 2 weeks. The baby was born at term by caesarean section and had an antenatal ultrasonographic diagnosis of the posterior mediastinal cyst. Transthoracic echocardiogram of the child was a typical study with no evidence of any congenital cardiac abnormality.

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At birth, the baby was asymptomatic, and chest X-ray showed no gross abnormalities. The baby was admitted in the neonatal intensive care unit and initially managed with supplemental oxygen therapy and intravenous antibiotics. Chest skiagram at admission revealed hyperinflation of the left lung with a mediastinal shift toward the right [Figure 1].

Computed tomography thorax done revealed a posterior mediastinal cyst of size 26 × 13 × 28 mm, which was causing focal attenuation of the left main bronchus, resulting in hyperinflation of both the lobes of the left lung with a mediastinal shift toward the right. There was a volume loss of the right lung with collapse–consolidation, which was most prominent in the perihilar region [Figure 2]. A thoracotomy was planned given the imaging findings with a plan to excise the posterior mediastinal cyst causing left bronchial compression. On arrival in the operation theater, the baby had a heart rate of 136/min, noninvasive blood pressure of 100/60 mmHg, respiratory rate of 70/min,

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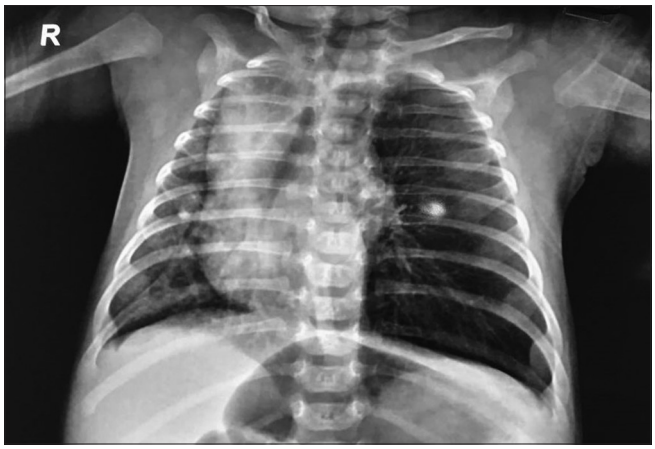

Figure 1: Chest skiagram at admission showing hyperinflation of the left lung with a mediastinal shift toward the right

SpO_2 of 94%–96%, and was kept on oxygen at 2 L/min through nasal cannula. On auscultation, air entry of the left lung was grossly reduced. The baby was induced with sevoflurane with FiO_2 of 60% (O_2 + air) and inj. ketamine 5 mg was given slowly intravenously in increments, and assisted ventilation was maintained with Jackson Rees modification of Ayres T piece (JRMAT). The baby was intubated with 3 mm ID uncuffed endotracheal tube. The anesthesia was maintained with FiO_2 of 0.6 and sevoflurane to keep SpO_2 above 94%. Initially hand-assisted ventilation was done with JRMAT. In the right internal jugular vein, triple-lumen polyurethane central venous catheter 4.5 Fr and 22 G polyurethane arterial line in the left femoral artery were inserted. The positive pressure ventilation could result in further mediastinal shift resulting in the cardiopulmonary collapse of the baby, so the baby was kept on hand-assisted ventilation. Just before the opening of pleura, 15 mg of atracurium was given. Once muscle relaxation was achieved, the baby was shifted to pressure-controlled ventilation up to 25 cm H_2O with a respiratory rate of 30–34/min. Intravenous fluid (5% dextrose) was given at 4 mL/kg/h, plus Ringer's lactate at 6 mL/kg/h was given as maintenance. When the operative right lateral decubitus position was obtained, the SpO_2 dropped to 86%, and FiO_2 was increased to 70%. There was initial hypotension which was managed with a crystalloid bolus.

Left posterolateral thoracotomy was done through the fifth intercostal space. On thoracotomy, the left upper and lower lobes of lung were hyperinflated, and a posterior mediastinal cyst of size approx. 3 × 4 cm in close apposition with the left main bronchus, esophagus, arch of the aorta, and left pulmonary artery was seen. The cyst was dissected from all adjoining structures and resected out completely. The left lung got decompressed after cyst excision and showed normal excursion on ventilation. At the end of the surgery, the intercostal nerve block was given with 2.5 mL of 0.2% ropivacaine directly by the surgeon at fifth and sixth ribs each. The baby was shifted with an endotracheal tube *in situ* for elective mechanical ventilation in the neonatal intensive care unit. The baby was gradually weaned and extubated after 48 h, and the recovery was uneventful. On histopathology, the diagnosis of the bronchogenic cyst was confirmed. At 3 months of follow-up, the child is asymptomatic, and chest X-ray is normal.

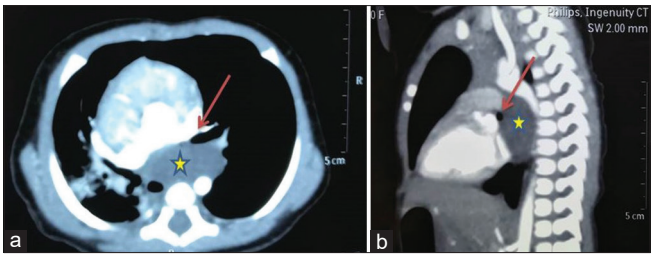

Figure 2: Computed tomography thorax: (a) axial view and (b) sagittal view showing a posterior mediastinal cyst (star) causing focal attenuation of the left main bronchus (arrow), resulting in hyperinflation of both the lobes of the left lung with the mediastinal shift toward the right

DISCUSSION

Posterior mediastinal masses are always challenging for the treating team because they can cause significant compression of the heart, lungs, and surrounding structures leading to cardiorespiratory symptoms.[1]

The posterior mediastinal masses show variable presentation from an incidentally detected mass to tracheobronchial tree compression, cardiac chamber or vascular compression, and recurrent pneumonia.[2,3]

These complications are exaggerated in the pediatric age group because of the small thoracic cavity. General anesthesia and lateral positioning increase the risk of hemodynamic collapse by compression of heart and great vessels increase. Ventilation also becomes difficult because of bronchial compression by the mass itself along with shunting of blood.

After induction of anesthesia and use of muscle relaxants, positive pressure ventilation may cause hyperinflation of the lung, further increasing the mediastinal shift to the opposite side, which in turn increases the cardiopulmonary compromise by compression of heart, great vessels, and reduction of venous return. So in this case, we avoided muscle relaxants until thoracotomy was done and pleura was opened. The invasive arterial line for the beat-to-beat monitoring is imperative in such cases, and so is a central venous catheter for inotrope and fluid infusion. There was

oxygen saturation drop to 86% when the lateral position was made as the child was under assisted ventilation with closed chest and so there was redistribution of ventilation toward nondependent lung causing significant ventilation (V):perfusion (Q) mismatch. There was an overall reduction in lung volumes and functional residual capacity of both lungs in lateral position. This reduction in saturation was mitigated with the help of increasing FiO_2 to 70% for a brief period. Initial hypotension after positioning was due to mass effect on great vessels, and it was manageable with an intravenous fluid bolus. Mediastinal masses are always to be treated with caution. Maintenance of spontaneous assisted respiration is a crucial aspect to maintain venous return and avoid compression of surrounding structures like heart, great vessels, and trachea-bronchial tree.[4] Monitoring must always include an invasive arterial line and central venous lines. Thoracotomy should be done immediately and swiftly, once the patient is induced under general anesthesia. In some cases, even a cardiopulmonary bypass (CPB) has been described in children for surgical excision of mediastinal masses which are associated with cardiopulmonary instability.[5] Preoperative evaluation of such patients must include transthoracic echocardiography as it guides us about the encroachment of heart, thoracic, vascular structures, congenital defects, and pulmonary hypertension due to prolong lung collapse.

CONCLUSION

Perioperative anesthetic management of patients with mediastinal masses may pose serious challenges related to ventilation and hemodynamic compromise at various stages in the operating room. A thorough preop evaluation and risk stratification should be done to quantify the chances of intraoperative compression syndrome. The course of such cases can range from being uneventful to the extent of the requirement of CPB and extracorporeal membrane oxygenation. A well-coordinated interdisciplinary approach including surgeons, anesthesiologists, intensivists, and neonatologists paves the way for successful management of such cases.

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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