SUPERIOR VENA CAVAL SYNDROME IN CHILDREN

- A Case Report -

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Introduction

Mediastinal masses in children are known to cause potentially life-threatening respiratory and cardiovascular complications[1]. The tumor mass which directly compresses the trachea and bronchus induces hypoxia and asphyxia eventuating in cardiac arrest or even fatality in the process of general anesthesia[2]. Obstruction of major airways, superior vena cava obstruction and cardiac compression are the potential problems to be anticipated during general anesthesia[3,4].

Superior vena cava syndrome is rare in children and occurs commonly with T-cell acute lymphoblastic leukemia or non-hodgkin's lymphoma[5]. The most common cause of superior vena cava syndrome in adults is lung cancer while in children it is non-Hodgkin's lymphoma. To establish a confirmed diagnosis biopsy may prove to be too dangerous for the child.

We recently encountered a 1½ year old child with bilateral neck swelling with a large tumor in the superior mediastinum without any clinical symptoms of airway involvement. The hazards of general anesthesia in this patient and the problems encountered are reviewed and discussed.

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Case Report

A 1½ year old female child weighing 12 kg presented with the complaint of increasing swelling all over the body starting from the face to the feet, with a history of increasing body weight for the previous 15 days.

Her past, personal and family history were not significant. On physical examination she had bilateral cervical lymphadenopathy with no abnormal cardiorespiratory signs. Her heart rate was 110 beats/min, respiratory rate was 25 breath/min and blood pressure was 116/50 mm Hg. Excursion of her chest cage was symmetrical with equal breath sounds in both lung fields.

The child was anemic with a hemoglobin level of 9 g/dl. Serum electrolytes, glucose, blood urea nitrogen, creatinine, albumin and bilirubin were all within normal limits. Chest Roentgenogram showed a large mediastinal mass in the superior mediastinum, a prominent right hilum with normal lung fields (Fig. 1).

X-Ray Chest

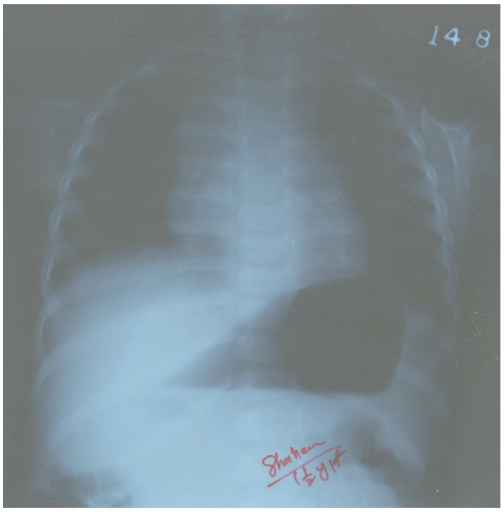

Fig. 1: X-Ray chest PA view shows a homogenous soft tissue density shadow in the superior mediastinum

On the morning after admission, the child was scheduled for a computerized axial tomography (CAT) but it was aborted due to a mechanical error in the equipment. The patient was then scheduled for a cervical lymph node biopsy the next day under general anesthesia.

In the operation theatre her blood pressure was 120/66 mm Hg, heart rate was 120 beats/min, respiratory rate was 28 breaths/min and arterial oxygen saturation (SpO_2) was 98%. Following an informed high risk consent, a slow infusion of Isolyte-P was started. Premedication included glycopyrrolate (0.01 mg/kg), hydrocortisone hemisuccinate (1 mg/kg) intravenously along with ventilation with oxygen by mask at 5 Lt/min. The ECG was monitored continuously. Anesthesia was induced with Ketamine 2 mg/Kg IV and succinylcholine 1 mg/Kg IV and following IPPV patient was intubated with appropriate size endotracheal tube, placed effortlessly in the first attempt. On laryngoscopy enlarged bilateral tonsils were seen. Anesthesia was maintained with O_2 and N_2O (50:50), with intermittent halothane 0.5% and atracurium 0.5 mg/kg intravenously.

On positioning the patient for surgery with the head turned to the right side, there was obstruction to ventilation through the endotracheal tube with a fall in SpO_2 to 86%. On turning the head back to neutral position, ventilation was unobstructed and SpO_2 was maintained at a level of 97-98%. On repositioning the head to the right, desaturation was again noted hence it was decided to continue surgery in the neutral position.

On completion of surgery patient was reversed with neostigmine 0.06 mg/kg and glycopyrrolate 0.01 mg/kg intravenously. After reversal respiratory excursion, though spontaneous but inadequate, SpO_2 gradually dropped to 85-88% and ventilation became increasingly difficult within 5 min after reversal. On auscultation there was bronchospasm. Deriphylline 6 mg/kg was given intravenously. Patient was ventilated with 100% O_2 but SpO_2 did not improve, simultaneously pink frothy sputum was seen from ETT which led to a provisional diagnosis of pulmonary edema. Management of pulmonary edema included Furosemide 0.2 mg/kg, hydrocortisone 50 mg and Dexona 2 mg intravenously. Inj. aminophylline infusion was also started at the rate of 0.3 mg/kg/hr. Subsequently patient was shifted on ventilator to the NICU.

Later after 15 min, patient developed cardiac arrest, CPCR started but inspite of all efforts patient could not be revived.

Discussion

Tumors growing into the lumen of the trachea have often been reported as a cause of airway obstruction but it appears to be less common for mediastinal tumors to cause compression of trachea severe enough to obstruct the airway[6].

In our case, the child had clinically normal airways preoperatively but became severely obstructed after the induction of anesthesia, when position of head changed from neutral to lateral position for surgery.

Obstruction was most probably due to the extrinsic compression of distal end of ETT by tumor mass. Site of obstruction was confirmed by passing of suction catheter through the endotracheal tube. It was relieved when patient was placed back in the neutral position, presumably due to lifting of some of the weight of the tumor off the trachea. Squeezing of the trachea can occur due to any mediastinal mass in the child as it is easily collapsible compared to the adult trachea[7]. Despite the surgeons discomfort regarding positioning, biopsy of a cervical lymphnode was accomplished uneventfully with the head in neutral position as was also observed by Ferrari LR, Bedford RF[7].

In patients having anterior mediastinal mass, anticipation of problems that can occur during general anesthesia are airway obstruction and major vessel compression. The ability to rapidly alter both patient position and anesthetic technique are key factors in preventing anesthetic complications.

The SVCS occurs more frequently in patients with diffuse histocytic lymphoma than in those with Hodgkin's disease and other lymphomas. It is more frequently associated with lesions on right side and obstruction below the azygous channel[5]. Facial edema on admission is a finding consistent with the SVCS[3] as was also observed in our patient.

A survey by Piro et al of patients with Hodgkin disease undergoing

staging laparotomy, demonstrated that perioperative airway complications are related to the size of tumors within the chest[3].

However, airway abnormality cannot be demonstrated by preoperative roentgenographic examination and forewarn us of airway complication following induction of anesthesia. The absence of symptoms does not preclude serious complications. In patients with evidence of airway compromise or with symptoms suggestive of potential respiratory embarrassement (i.e. cough or supine dyspnea) preanesthetic medication and monitoring should be provided as for the symptom free group, except that venous access should be secured via a lower extremity to obviate problems related to complete SVC obstruction[7]. In our case venous access was secured in the upper extremity which could have attributed to the enhancement of SVC obstruction. Diagnostic procedures in patients with a large anterior mediastinal tumor seem best performed under local anesthesia whether the child is symptomatic or not[1,3]. However, children do not tolerate diagnostic procedures under local anesthesia and the biopsy result may prove inconclusive. In our patient lymphnode biopsy was performed under general anesthesia.

Preoperative radiation therapy has been advocated for this patient group prior to their receiving general anesthesia in an attempt to decrease these risk[3,4]. Our child was not subjected to preoperative radiation therapy. In this case, the onset of pulmonary edema could be attributed to the repeated episodes of hypoxemia.

Conclusions

We conclude that a child with bilateral lymphoma in the neck with extension in mediastinum who had normal airway preoperatively may develop an obstructed airway after the induction of anesthesia. This appears to be the result of compression of the trachea by the tumor mass. As lymphomas are extremely radiosensitive so child having large mediastinal tumor, with SVCS should be subjected to radiotherapy preoperatively to prevent anesthetic complications when tumor resection is planned. A number of benign conditions such as cystic hygroma,

teratoma and thymoma can present similarly as anterior mediastinal masses. Therefore a tissue diagnosis is mandatory before radiation or chemotherapy can be started. If there is evidence of cardiac impairment in a patient who must undergo diagnostic cervical node biopsy, anesthesia in the sitting position is recommended[8].

We also conclude that venous access should be secured in the lower extremity to obviate problems related to SVC obstruction. However, such mediastinal masses present with complex diagnostic and therapeutic dilemmas and should ideally be managed by a multidisciplinary approach in a well-equipped centre.

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