



ORIGINAL RESEARCH PAPER

Anesthesiology

ANAESTHESIA MANAGEMENT OF CHILD WITH MEDIASTINAL MASS AND CHEMOTHERAPY INDUCED HEART FAILURE FOR PERCUTANEOUS CT GUIDED BIOPSY

KEY WORDS: mediastinal mass, anesthesia management, percutaneous CT guided biopsy, chemotherapy induced heart failure.

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ABSTRACT **Background:** Anesthesia for children with heart failure undergoing procedure for anterior mediastinal mass is challenging. Huge mass, by its mass effects on mediastinal structures can cause dangerous cardiovascular collapse which worsens under anesthesia. Therefore anesthesia techniques with spontaneous ventilation are important. **Case report:** Successfully done CT-guided(Computed Tomography) biopsy of anterior mediastinal mass in a child with heart failure by maintaining spontaneous ventilation with intravenous anesthesia without muscle relaxants. **Conclusion:** Anesthesia with spontaneous ventilation in procedures for anterior mediastinal mass can be done using graded propofol, fentanyl and ketamine without muscle relaxants with knowledge of intraoperative airway collapse management.

INTRODUCTION
Anesthesia management of mediastinal masses with heart failure is extremely challenging. Mediastinal surgeries are rarely performed nowadays. So the anesthesiologist should know the dangerous complications and management associated with it. Compression of mediastinal structures by huge mediastinal mass can cause difficult positive pressure ventilation and hemodynamic compromise which can exacerbate under general anesthesia. Maintaining adequate airway with minimal muscle relaxation is vital to prevent airway collapse. Therefore anaesthetic techniques with spontaneous ventilation are important.

Case Report
13year old girl, with anterior mediastinal mass, diagnosed as acute T-Lymphocytic leukemia was posted for percutaneous CT guided biopsy. Child presented with neck swelling, dyspnea, dysphagia and fever. Chest x-ray showed mediastinal widening with tracheal deviation to right and left pleural effusion. HRCT(High Resolution Computed Tomography) showed 7.8x10x12 cm anterior mediastinal mass with mass effect on superior vena cava and aorta. Intercostal drain was inserted for management of pleural effusion and pleural fluid cytology showed malignant cells. Diagnosis confirmed by ultrasound guided fine needle aspiration cytology. No metastasis seen in PET(Positron Emission Tomography) scan. Patient was started on chemotherapy and steroids. Initial echocardiography was normal and later it showed features of left ventricular dysfunction(Ejection Fraction-45%), most likely chemotherapy induced (daunorubicin and vincristine), started on Carvediolol, Aldactone and Ramipril tablets. Repeat PET scan showed reduced anterior mediastinal mass size with persistent metabolic activity. Decision of CT guided biopsy of metabolically active lesion was taken. Cardiac drugs were continued till morning of the procedure. Informed high risk consent taken. Patient was vitally stable, room air saturation was 100% and left side air entry reduced on auscultation. Other systemic examinations were normal. Blood investigations were normal. Electroencephalogram(EEG) showed sinus tachycardia and indirect laryngoscopy showed bilateral mobile vocal cord. In CT room pulse oximeter, blood pressure and ECG were attached. Oxygen by nasal cannula 2L/minute started. 20G intravenous cannula secured in lower limb. CT scan done to locate the biopsy site. Intravenous midazolam 1mg and paracetamol 15mg/kg was given and child anesthetized with propofol 50 mg in graded

dose and fentanyl 50 mcg while maintaining spontaneous ventilation. Adequate local anesthetic infiltration given in site. Patient was maintained on intermittent propofol boluses and ketamine 0.25 mg/Kg as required. One episode of hypotension occurred which responded to intravenous phenylephrine. Procedure was uneventful.

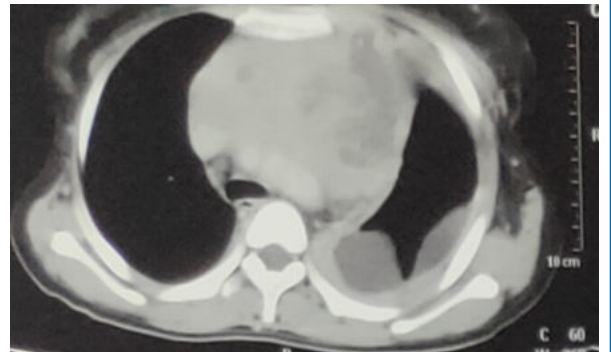


Figure 1: Large mediastinal mass compressing airway and major blood vessels

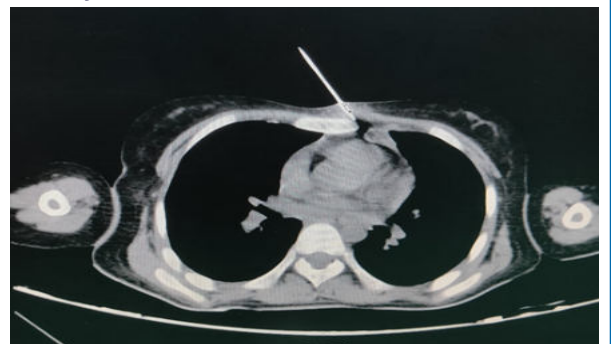


Figure 2 : percutaneous biopsy after post chemotherapy

DISCUSSION
Mediastinal masses are not very common and they can be benign or malignant. Anterior mediastinal masses are dangerous as they may cause severe cardiorespiratory problems. In children; lymphoma, PNET & neuroblastoma are more common. Treatment of newly diagnosed T-cell acute lymphocytic leukemia(T-ALL) involves chemotherapy with or without cranial radiation. Common complication of cancer chemotherapy which have anaesthetic implications are

cardiac, pulmonary, renal, hepatic and CNS toxicity and SIADH secretion. Heart failure with left ventricular dysfunction is the most serious cardiac side effect. Patients with decreased left ventricular ejection fraction $\leq 50\%$ started on angiotensin converting enzyme inhibitor and beta blockers show improved cardiac function. Patients with mediastinal masses can come for diagnostic or therapeutic surgical procedures. Anaesthesia options include local or GA, depending on the nature of procedure. For large anterior mediastinal masses, biopsy under local anaesthesia is ideal. This may be difficult in children as they need deep sedation or GA. General anaesthesia exacerbates compressive symptoms by decrease in lung volume, relaxation of bronchial smooth muscle, reduction in normal trans pleural gradient by muscle relaxant induced paralysis of diaphragm. For patients undergoing GA, technique of induction and intubation include awake fiberoptic intubation, inhalational or routine intravenous induction. For fiberoptic intubation child should be co-operative. Inhalational induction should be used cautiously, as partially obstructed respiration can generate large negative pressure which can lead to complete airway obstruction. Intravenous induction can be done by propofol; with or without ketamine with maintaining spontaneous ventilation till definitive airway is secured or end of the procedure. Ketamine maintains intercostal and chest wall tone better than inhalational agents⁵ and is also useful in impaired ventricular function because it has sympathomimetic properties that can augment cardiac output. Dexmedetomidine is a suitable sedative agent for radiological studies as it can maintain airway smooth muscle tone and spontaneous ventilation¹. Common adverse effects are bradycardia and hypotension andirons should be cautiously used in patients with left ventricular dysfunction or severe heart block. As procedure is diagnostic, less invasive and to avoid manipulation of patient airway and endotracheal intubation, we started with intravenous anaesthesia with graded propofol and fentanyl with intermittent boluses of propofol and ketamine to maintain spontaneous ventilation. Oxygen delivered through nasal cannula. Difficult airway equipment, cardiac drugs, cardiologist, paediatric, ENT and cardiovascular surgeons were standby. Episode of hypotension was managed with alpha agonist. Anthracycline treated patient under anaesthesia can develop acute intraoperative left ventricular failure refractory to beta-receptor agonists. In such cases Amrinone and sulmazole may be useful⁷. Intra-operative airway collapse management include 1) repositioning the patient to displace mass 2) rigid bronchoscopy to stent the collapsed airway 3) emergency thoracotomy and elevation of mass 4) emergency femoro - femoral bypass.

REFERENCES

1. Carollo DS, Pestieau S, Bosco R. Dexmedetomidine for anterior mediastinal mass computed tomography-guided biopsy: a case series. *Ochsner J*. 2013;13(4):541-543.
2. Raetz EA, Teachey DT. T-cell acute lymphoblastic leukemia. *Hematology Am Soc Hematol Educ Program*. 2016;2016(1):580-588.0
3. Gehdoo RP. Anticancer Chemotherapy and it's Anaesthetic Implications (Current Concepts). *Indian J Anaesth*. 2009;53(1):18-29.
4. Fadol AP. Management of Chemotherapy-Induced Left Ventricular Dysfunction and Heart Failure in Patients With Cancer While Undergoing Cancer Treatment: The MD Anderson Practice. *Front Cardiovasc Med*. 2018;5:24.
5. Reddy CSK, Phang DLK, Ng ASB, Tan AM. A simplified approach for anaesthetic management of diagnostic procedures in children with anterior mediastinal mass. *Singapore Med J*. 2020 Jun;61(6):308-11.
6. McLeod M, Dobbie M. Anterior mediastinal masses in children. *BJA Educ*. 2019;19(1):21-26.
7. Hu X, Shen X. Airway loss during inhalation induction of anesthesia with sevoflurane in a pediatric patient with laryngeal papillomatosis: A case report. *Exp Ther Med*. 2015;10(6):2429-31.
8. Sharifian Attar A, Jalaieian Taghaddomi R, Bagheri R. Anesthetic management of patients with anterior mediastinal masses undergoing chamberlain procedure (anterior mediastinostomy). *Iran Red Crescent Med J*. 2013; 15(4): 373-374.
9. Mazzeffi M, Johnson K, Paciullo C. Ketamine in adult cardiac surgery and the cardiac surgery Intensive Care Unit: an evidence-based clinical review. *Ann Card Anaesth*. 2015;18(2):202-09.
10. Lin YY, He B, Chen J, Wang ZN. Can dexmedetomidine be a safe and efficacious sedative agent in post-cardiac surgery patients? a meta-analysis. *Crit Care*. 2012;16(5):R169.