

## CASE REPORT

## PAEDIATRIC THORACIC TUMOUR RESECTION: CHALLENGE FOR AN ANAESTHESIOLOGIST

**Syed Shabbir Ahmed, Khalid Samad, Muhammad Saad Yousuf, Faisal Junejo\***

Department of Anaesthesia, The Aga Khan University Hospital, Karachi, \*Tabba Heart Institute, Karachi-Pakistan

Paediatric thoracic tumours resection is one of the most difficult procedure for any anaesthetist. Paediatric population is different from adults in many aspects, as they have small thoracic volume and more compressible mass effect on their airway and vascular structures. we are reporting a case of a huge paediatric thoracic tumour resection occupying the left thoracic cavity. The possible mechanism, consequences, prevention and management discussed in this report.

**Keywords:** Mediastinal mass; Paediatric thoracic surgery; Teratoma

**Citation:** Ahmed SS, Samad K, Yousuf MS, Junejo F, paediatric thoracic tumour resection: challenge for an anaesthesiologist J Ayub Med Coll Abbottabad 2020;32(1):132-5.

## INTRODUCTION

Thoracic anaesthesia for thoracic surgery in the paediatric population has improved remarkably over the last two decades after the emergence of video - assisted thoracoscopic surgery (VATS) and robotic surgery. Mediastinum is the space between two pleural cavities and is divided into compartments (superior and inferior which further divides into anterior, middle and posterior), and each compartment has its own characteristic tumours.

Thymomas and germ cell tumours are most common lesions in anterior mediastinum. Bronchogenic cysts are common in middle mediastinum whereas neurogenic and soft tissue tumours comprise the largest group of tumours in the posterior mediastinum. Mediastinal lymphomas are also common and may be found in any of the three regions. Thoracic anaesthesia has special concerns because of different physiology, technique and patient position. In the paediatric population, it presents additional challenges to the routine problems encountered in adult patients presenting with thoracic disease.<sup>1,2</sup> We are presenting a case report of paediatric patient with huge anterior mediastinal mass, as anaesthetic management in these patients may present life-threatening challenges.

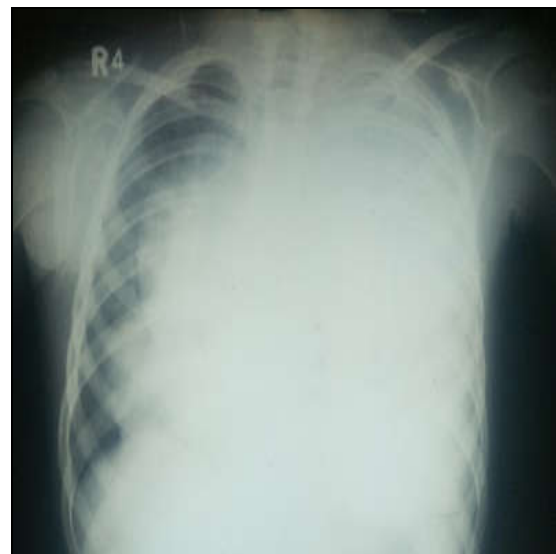
## CASE REPORT

A 10-year old boy with 26 Kg weight and height of 126 cm presented one year ago with history of fall from a certain height after that he developed cough gradually and for that reason he was investigated and found left thoracic opacity on chest x-ray (Figure-1).

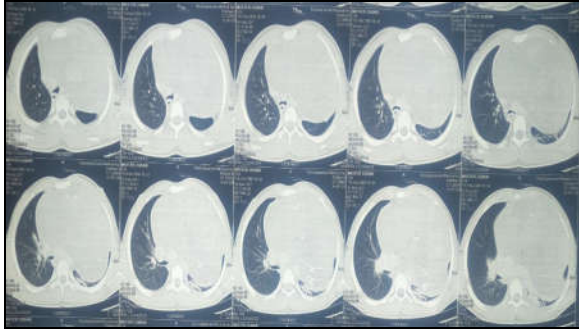
Underwent CT scan which showed a large left sided heterogeneous density mass measuring 13.0×14.0×14.5 cm in size (Figure-2).

Extending from anterior superior mediastinum to anterior mediastinum inferiorly. Medially it is crossing the midline and extending into the right hemithorax, laterally extending to left hemithorax causing compression effect on the left lung causing subsegmental atelectasis of left upper lobe. Anteriorly it is abutting the chest wall and pleura and posteriorly abutting the heart and vessels. Furthermore, mass lesion is also displacing the mediastinal structures towards contralateral side and posteriorly. Moderate pericardial effusion also noted.

Trachea and its bifurcation were normal and no vascular and bony rib cage abnormality noted in CT scan. Patient already had tru-cut biopsy which showed teratoma. Symptoms worsened gradually and he started dyspnoea on exertion unable to lying supine and cough. Had chemotherapy and presented after 10-months of his diagnosis for resection in our centre.



**Figure-1: Left thoracic opacity**



**Figure-2: Large left sided heterogeneous density mass measuring 13.0×14.0×14.5 cm in size**

Patient was vitally stable with normal routine labs; his oxygen saturation was 94% on room air tachypnoeic with respiratory rate of 28 breath/min and worsening of symptoms on exertion and lying down. Prior to anaesthesia, two 20-gauge intravenous cannulas with left radial arterial line taken. Cardiothoracic surgeon and all preparation of heart lung machine was available in the operating room. Patient preoxygenated with 100% oxygen and induced in slight head up position with midazolam and ketamine keeping in mind compression effect. Patient was deepened with inhalational agent gradually and after confirmation of easy bag mask ventilation, suxamethonium was used and trachea was intubated with single lumen endotracheal tube, no problem occurred during induction and patient remained stable. Patient subsequently paralyzed with atracurium. Right internal jugular central line placed for any emergency medication and infusion. Median sternotomy was done by cardiothoracic surgeon. Mass was adherent to surrounding structures and fine dissection wasn't possible due to impaired visualization so mass dissected bluntly as whole. During dissection diaphragm teared and pericardium dissected in pieces. All repaired and heart stabilized with pericardium. Left lung wasn't inflated completely. Patient became hemodynamically unstable due to bleeding and blunt dissection, required four pint packed red cell and inotropic support with norepinephrine. Chest tube inserted, sternum closed and shifted to intensive care unit on ventilator support. Patient stabilized and extubated in next 20 hours and then discharged from hospital after 10 days of procedure. Histopathological finding was mature teratoma of 22×21×11.5 cm with weight of 2085 grams.

## DISCUSSION

Mediastinal masses in children presented with different aetiologies including congenital, neoplastic and infectious lesions. It varies in size from small asymptomatic lesions to a large lesion with airway

compression. In mediastinum after lymphoma and neurogenic tumours, Germ cell tumours consider the third most common neoplasms. They account for 6–18% of anterior mediastinal tumours in children. Teratoma is the most common type of germ cell tumor,<sup>3</sup> which can be divided into mature and immature types. Malignancy found in approximately 14% of mediastinal germ cell tumours. Teratomas affect males and females in similar distribution. Germ cell tumours present as round, sharply demarcated masses with calcification on radio-graphs in approximately 25–53% of teratoma. Mediastinum is the second most common extra-gonadal site for these kinds of tumour and labelled as malignant germ cell tumours if invaded into the adjacent mediastinal structures.<sup>4</sup>

Children with anterior mediastinal masses present with different sign and symptoms, dependent on its position, size, and the rapidity of growth. Adults with anterior mediastinal masses are usually without symptoms on the other hand, 70% of children have symptoms related to the mass with multiple reasons. First, with malignancy it faster in growth and infiltrative. Second, children cannot afford it as easily as adults due to smaller intrathoracic volume. Finally, in children it has more compressible effect on their airway and vascular structures because of central position of tumour. Sign and symptoms include cough, chest fullness, tachycardia, dyspnoea, Jugular venous distension, weight loss, hoarseness, SVC syndrome, stridor, cyanosis, orthopnoea, fever and weight loss.<sup>5</sup>

It is more challenging to paediatric anaesthesiologist while managing patients presenting with an anterior mediastinal mass (AMM). These lesions most often cause complications during general anaesthesia, like extreme cardiopulmonary compromise that can be worsened. Various case reports have shown cardiopulmonary collapse during induction or maintenance of general anaesthesia and even cases reported for procedures done without anaesthesia.<sup>6</sup> The literature has proved that perioperative anaesthetic complication with AMM ranges from 9–20%.<sup>5</sup>

Knowledge of the risks and hazards of the procedure, collaboration between surgeon and anaesthetist, including radiologists, critical care physicians in team provides the basis for appropriate management.<sup>7</sup> The goals of anaesthesia are securing airway and maintenance of cardiovascular stability, therefore preoperative assessment is very crucial in paediatric population for AMM resection surgeries. In pre-operative anaesthesia visit, the anaesthesiologist not only clinically evaluate the patient, but get history specifically from the child's mother who gives the proper history about the ideal

position adopted by the child to maximize airflow and decrease work of breathing.<sup>8</sup> Apart from routine investigations used to diagnose AMM, three main investigations of interest for anaesthesia are CT scan, pulmonary function test and transthoracic echocardiography (ECHO). Evaluation of tracheal and adjacent organ compression must be considered for any perioperative complication. However, studied by Stricker *et al*<sup>9</sup> emphasized the possible disagreement between presentations and observed degree of compression effects on airway, cardiac, or great vessels on computed tomography (CT) scan imaging. Strongly agreed with Kar S<sup>8</sup> for risk stratification and protocol plan to minimize cardiovascular and airway related problems and supports Blank and de Souza,<sup>10</sup> who divided patients into categories of low, medium, and high risk. It is believed that whenever going to plan AMM resection, always prepare for any major catastrophe even patient who have low risk or less than 50% of tracheal compression on CT scan. However, paediatric patients are poor candidates for flow volume loop assessment of gravitational dependency and compressibility effects of mediastinal mass on the airway and the great vessels.<sup>5</sup> ECHO may offer additional information to assess pericardial tamponade, which would increase perioperative risks therefore, it is no harm or cost effect to getting an ECHO for evaluation for these patients. In our case trachea and other major organs did not show any compression effect but we were prepared with all emergency equipment's and main power present inside the operating. We inserted arterial line before induction and induced with ketamine and midazolam with head up position.

Different anaesthetic drugs (dexmedetomidine, propofol, ketamine, and volatile anaesthetic agents) can be used for sedation or general anaesthesia, and it proves that no one is superior as long as they are used wisely. It is cautious and wise to keep patient on spontaneous ventilation during the anaesthesia to avoid any compressive effects of AMM. Literatures proves that both techniques can be used either inhalational or intravenous. Therefore, it is necessary to maintain spontaneous ventilation and hemodynamic stability during induction and maintenance of anaesthesia with either of the technique used. If muscle paralysis is necessary for the procedure, always starts with gradual deepening the anaesthetic with short-acting drugs and administer neuromuscular blocker after confirming that the patient can safely tolerate positive-pressure ventilation. Therefore, it is judicious to use Short-acting muscle relaxant, like suxamethonium before administering longer-acting agents. In this case ketamine and midazolam used

and deepened with inhalation agent and short acting paralyzing agent after confirmation of easy bag mask ventilation. Patient with AMM must be proceed in the operating room where all necessary equipment promptly available as well as expert's physician who is experienced in rigid bronchoscopy present in case of any problem during airway collapse. Rigid bronchoscope may help to lift the AMM away from the trachea or bronchus and restore effective ventilation and oxygenation. Standard endotracheal intubation may be an insufficient rescue plan because airway compression may still occur distal to the end of the endotracheal tube.

Options like cardiopulmonary bypass on standby in the event of a cardiopulmonary collapse is not feasible. It must be discussed preoperatively, and if the benefits outweigh the risks, it should be consider to placing bypass lines and have them connected to the machine before induction of anaesthesia, this in itself may be of particular challenge in the paediatric population.<sup>5</sup> In this case patient became unstable hemodynamically because of bleeding and compressive effect of surgical technique. Manual dissection was used to dissect the tumor, because direct visualization of entire mass was not possible especially with this large mass, therefore, patient required intraoperative blood transfusion and inotropic support. Positive ventilation was stopped several times and required very low tidal ventilation intermittently to clear surgical field which is another difficult task for anaesthetist to maintain adequate ventilation with this age group.

Children present with an AMM for resection always give a unique challenge to the anaesthetic provider. Adequate preoperative planning with multidisciplinary approach determine anaesthetic and rescue plans for a successful and safe anaesthetic procedure.

## REFERENCES

1. Soomro NH, Shariff AS, Zafar AA, Ehtisham O, Maxood G, Panjwani K. Patterns Of Mediastinal Tumors; A Two And Half Year Experience. Professional Med J 2016;23(2):223-7.
2. Mlika M, Braham E, Hamrouni R, Zribi H, El Mezni F. About a challenging mediastinal tumor. Asian Cardiovasc Thorac Ann 2015;23(9):1125-8.
3. Ranganath SH, Lee EY, Restrepo R, Eisenberg RL. Mediastinal masses in children. AJR Am J Roentgenol 2012;198(3):W197-216.
4. Singh AK, Sargar K, Restrepo CS. Paediatric Mediastinal Tumors and Tumor-Like Lesions. Semin Ultrasound CT MR 2016;37(3):223-37.
5. Pearson JK, Tan GM. Paediatric anterior mediastinal mass: A review article. Semin Cardiothorac Vasc Anesth 2015;19(3):248-54.
6. Suominen PK, Kanerva JA, Saliba KJ, Taivainen TR. Unrecognized mediastinal tumor causing sudden tracheal obstruction and out-of-hospital cardiac arrest. J Emerg Med 2010;38(5):e63-6.

7. Shamim F, Ullah H, Rehman A. Anaesthetic management of a child with massive extracranial arteriovenous malformation. *J Anaesthesiol Clin Pharmacol* 2012;28(1):117–20.
8. Kar S. Paediatric Anterior Mediastinal Mass: A Night Mare for the Anaesthesiologist & the Need for a Systematic Evidence Based Approach towards Management of Anterior Mediastinal Mass in Paediatric Population. *Anal Resusc Curr Res* 2017;3:3–6.
9. Stricker PA, Gurnaney HG, Litman RS. Anesthetic management of children with an anterior mediastinal mass. *J Clin Anesth* 2010;22(3):159–63.
10. Blank RS, de Souza DG. Anesthetic management of patients with an anterior mediastinal mass: continuing professional development. *Can J Anaesth* 2011;58(9):853–9.

*Submitted: September 9, 2019*

*Revised: October 15, 2019*

*Accepted: October 27, 2019*

**Address for Correspondence:**

**Syed Shabbir Ahmed**, Senior Instructor, Department of Anaesthesia, The Aga Khan University Hospital, Karachi-Pakistan

**Email:** shabbir.ahmed2@aku.edu