# Anaesthetic management of posterior mediastinal mass: a case report

Anjum Saiyed, Reema Meena, Babita Ambesh, Indu Verma

Department of Anaesthesiology, SMS Medical College & Associated Group of Hospitals, Jaipur, Rajasthan, India

Correspondence to Anjum Saiyed, MD, J-180 Rajiv Gandhi Marg, Adarsh Nagar, Jaipur, Rajasthan, 302004, India
Tel: 0091-141-2611022;
e-mail: dranjumsaiyed@gmail.com

**Received** 07 September 2014
**Accepted** 05 October 2014

**The Egyptian Journal of Cardiothoracic Anesthesia** 2014, 8:104–107

Posterior mediastinal mass surgery is a challenge to the anaesthetist in terms of airway obstruction, compression of great vessels due to mass effect of tumour and severe cardiovascular and/or respiratory collapse. This may occur following decrease in chest wall tone associated with neuromuscular blockade. In this case study, we report an 8-year-old male child presented with a large posterior mediastinal mass, displacing and partially encasing the aorta at our institution, SMS Medical College & Hospitals, Jaipur, Rajasthan. Mass was removed by left thoracotomy; endotracheal tube was advanced into the right bronchus to ventilate the right lung to improve access in the surgical field because tumour was situated on the left side. While dissecting the mass, there was considerable blood loss. This was replaced with hydroxyethyl starch and whole blood. Patient was extubated next day with uneventful recovery.

**Keywords:**
airway obstruction, endobronchial intubation, posterior mediastinal mass, shortness of breath, thoracotomy

Egypt J Cardiothorac Anesth 8:104–107

1687-9090

## Introduction

Mediastinal tumour in children comprises a heterogeneous group of lesions from a range of embryonic origin. They may present as benign cysts or malignant lesions. Mediastinal tumours in children and Adolescents result in significant morbidity and mortality. Among neurogenic tumours, lymphoma and mediastinal cysts are the most common posterior mediastinal neoplasms and they may occur at any age [1]. Patient with large mediastinal masses are recognized to be at risk for cardiorespiratory failure [2]. We report an 8-year-old male child with a large, symptomatic mediastinal mass presented with history of shortness of breath, cough and intermittent low-grade fever since 6 weeks. Mediastinal tumours are generally asymptomatic [3]; depending on their location, they may be accompanied by signs and symptoms of compression of heart, lung, large vessels and spinal cord [4]. Surgery is essential in the management of mediastinal masses, either for biopsy to establish the aetiology of the tumour and to devise a course of therapy or for curative resection.

## Case report

An 8-year-old male child was presented to paediatrician with history of shortness of breath, cough and intermittent low-grade fever since 6 weeks. A clinical diagnosis of pneumonia was made and he was put on a course of antibiotics. Upon follow-up, his symptoms were not resolved completely; a chest radiography was advised, which showed a large mediastinal mass (Fig. 1). Hence, child was transferred to Cardiothoracic Surgery Department.

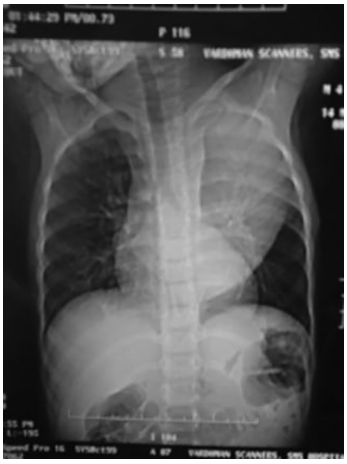
Subsequently, a computed tomography was ordered, which showed a large 6×6×10 cm smooth-margined oval posterior mediastinal mass, displacing and partially encasing the aorta. The lesion extended along the apicoposterior segment of the left upper lobe and superior segment of the left lower lobe. The mass showed no calcification or necrosis. Trachea was central and tracheal bifurcation was well defined. No significant hilar or mediastinal lymphadenopathy was seen (Figs 2 and 3).

Preanaesthetic evaluation revealed that patient had mild pallor, weighing 25 kg. Airway examination showed mallampati grade 2. Trachea was central. Systemic examination showed no significant finding. Blood investigations were within normal limits. ECG showed sinus tachycardia with a heart rate of 120 bpm. A thoracotomy for excision of the mass was planned (Fig. 4).

On the day of surgery, in the operation theatre, all monitors were attached. Preoperatively, the heart rate was 125 bpm, blood pressure 106/70 mmHg and $O_2$ saturation 96% on room air.

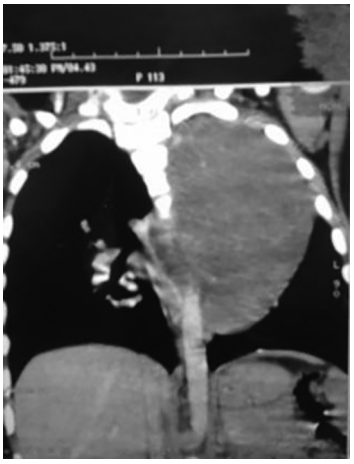
Two peripheral intravenous lines were secured. Ringer's lactate drip was started. An arterial line was inserted in

**Figure 1**



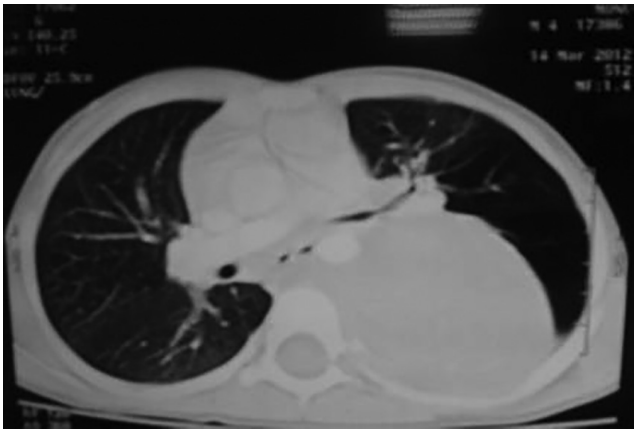
Radiography chest posteroanterior view.

**Figure 2**



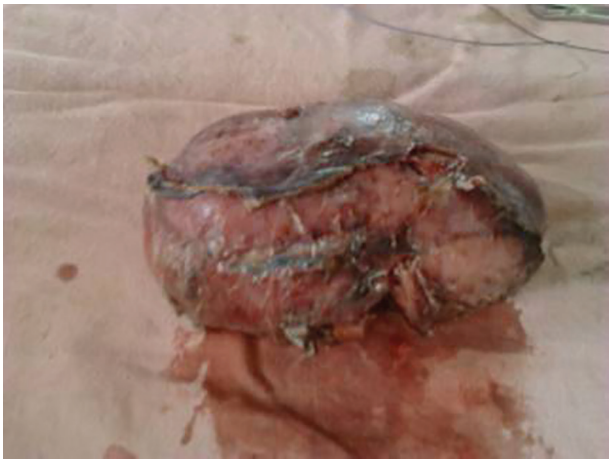
Computed tomographic scan of chest (frontal or coronal plane).

**Figure 3**



Computed tomographic scan of chest (axial or transverse plane).

**Figure 4**



Tumour after excision.

the right radial artery for monitoring invasive blood pressure and for arterial blood gas (ABG).

An ABG was performed preoperatively, which showed pH of 7.42, $PaO_2$ 76 mmHg, $PaCO_2$ 35 mmHg, $H_2CO_3$ 22, $Na^+$ 134, $K^+$ 3.4, $Cl^-$ 110, haemoglobin 9.6 g% and a haematocrit of 28%.

The patient was premedicated with glycopyrolate 0.1 mg intravenously and midazolam 0.5 mg intravenously and fentanyl 25 μg intravenously The patient was preoxygenated with 100% $O_2$ by facemask, then induced with ketamine 50 mg intravenously and succinylcholine 50 mg intravenously Positive pressure ventilation with 100% $O_2$ was delivered for 30 s and intubated with a cuffed endotracheal tube of 5.5 internal diameter. Bilateral air entry was checked and the endotracheal tube was fixed at the 17th mark. Tidal volume was kept at 10 ml/kg and respiratory rate 15 breaths/min. A bolus dose of atracurium 0.5 mg/kg intravenously was given. The patient was maintained on $N_2O$ : $O_2$ of 60 : 40, atracurium and isoflurane 0.6%.

A central venous catheter was inserted in the right internal jugular vein and child was catheterized with 12 F Foley's catheter to monitor urine output.

The patient was then put in the right lateral position. Five minutes after positioning, the $O_2$ saturation dropped to 88%, following which the patient was ventilated with 100% $O_2$ for 5 min. The $O_2$ saturation then slowly improved to 94% and $N_2O$ was resumed.

The patient remained haemodynamically stable for the first 20 min. As the mass was situated in the left posterior mediastinum, the endotracheal tube was further advanced into the right bronchus to preferentially ventilate the right lung to improve access in the surgical field because of unavailability of

paediatric double lumen endotracheal tube. The tidal volume was set at 7 ml/kg and respiratory rate 18 breaths/min. The $O_2$ saturation dropped to 80% again; the patient was ventilated with 100% $O_2$, following which it improved to 90%.

While dissecting the mass, there was considerable blood loss. This was first replaced with 300 ml hydroxyethyl starch. As the site of the mass was posterior in the mediastinum, it was quite difficult to approach the tumour for resection; hence, around 500 ml of blood was lost in dissection. The blood pressure reached 78/50 mmHg and heart rate was 140 bpm. This loss was replaced by a unit of whole blood. The patient's blood pressure slowly improved to 86/60 mmHg and heart rate was 128 bpm.

Once the mass was excised and haemostasis was achieved, the endotracheal tube was withdrawn to ventilate both the lungs. The patient's vital parameters were blood pressure 90/63 mmHg, heart rate 125 bpm and $O_2$ saturation 95%, which he maintained until the end of surgery. An ABG analysis was repeated, which showed pH of 7.32, $PaO_2$ 90 mmHg, $PaCO_2$ 32 mmHg, $H_2CO_3$ 20, $Na^+$ 132, $K^+$ 3.38, $Cl^-$ 107, haemoglobin 7.8 g% and a haematocrit of 25%. Blood transfusion (second unit) continued as per the requirement.

The patient was shifted to ICU with endotracheal tube *in situ*, as it was decided to electively ventilate the patient. Postoperatively, the patient maintained stable vital parameters and ABG analysis. At regular intervals, haemodynamic and ventilatory parameters were checked.

The patient was extubated next day. Recovery was uneventful.

## Discussion

Mediastinal masses are known to be a nightmare for anaesthesiologists [5–7]. Neurogenic tumours are the most common posterior mediastinal tumours. Approximately, 10% of patients with neurogenic tumours experience growth of the paravertebral mass through the intervertebral foramina with a portion of the tumour located intraspinaly [3].

As the thoracic cage of children is small, the compression of tumours on the heart, lung and bronchi leads to respiratory symptoms such as coughing, dyspnoea and chest distress, which are complicated by pulmonary infection and fever [8]. The sick children are initially treated at the department of paediatrics, and misdiagnosis of the disease is due to insufficient knowledge of the paediatricians and low verbal expression of young children [9].

Compression of airway or cardiovascular structures in patients with mediastinal masses depends on patient position. There may be marked improvement or deterioration after repositioning [5,6]. Decreased cardiac output and blood pressure even with effective ventilation is a risk in mediastinal mass due to the compression of the great vessels and right atrium. Others have suggested that, with positive pressure ventilation blood volume shifts from intrathoracic to the extrathoracic space leading to hypotension [8]. A highly malignant tumour in children is rare and often misdiagnosed [10]. Therefore, preoperative comfortable position experiences least symptoms of airway obstruction.

During the postoperative period, early serious complications may occur specifically related to thoracic surgery. These complications are herniation of the heart, pulmonary torsion, major haemorrhage, atelectasis and respiratory insufficiency. Atelectasis is a common postoperative complication [11].

Tumour compression leads to pulmonary atelectasis, even consolidation, if it continues to exist. Thus, the nonfunctional lung has to be removed when the mediastinal tumour is resected. If accurate early diagnosis and prompt treatment is ensured, lung function can be preserved.

## Anaesthesia challenge

After anaesthesia, the compression of the tumour may suddenly increase on the heart, great vessels and bronchi because of the use of muscle relaxant. In our case, after the right lateral position the $SpO_2$ decreased to 80%. Such reduction is explained by the gravitational effect of the tumour and relaxation of the bronchial smooth muscle giving rise to obstruction of airways. Therefore, patients with a huge mediastinal tumour must be placed in an appropriate position – that is, 45° or 60° in a recumbent position, lifting the head at 30° – to reduce the compression of the tumour on the lungs and to avoid the movement of the heart [9].

The chest should be opened immediately after anaesthesia to expose the thoracic cage, while softly lifting the tumour to reduce the compression [12]. For the patients having huge tumour, causing severe compression to the main bronchi, basal anaesthesia is given initially, and intubation with muscle relaxant is applied after the chest is open. Anaesthetic deaths have mainly been reported in children [7]. The deaths may be the result

of the more compressible cartilaginous structure of the airways in children or because of underestimation of the severity of the airway compression in children due to the difficulty in obtaining a clear history of pressure symptoms. Even with proper management, children with tracheobronchial compression greater than 50% cannot safely be given general anaesthesia [8]. Securing the distal airway with awake fiberoptic intubation and placement of an endotracheal Tube distal to tracheal obstruction, which is an option for some adults with masses compressing the midtrachea, is not an option in most children.

## Conclusion

The perioperative management of patients with mediastinal masses is a special clinical challenge in our field. General anaesthesia can lead to respiratory and haemodynamic decompensation due to tumour-associated compression syndrome (mediastinal mass syndrome). A thorough preoperative risk classification on the basis of clinical and radiological finding (in addition to chest radiograph and computed tomography) and dynamical methods (e.g. pneumotachography and echocardiography) should be applied to verify possible intraoperative compression syndromes. Conduction of anaesthesia depends on the location of tumour compression (trachea bronchial tree, pulmonary artery, superior venacava). Anaesthesiologist must be ready for simple routine anaesthetic technique to cardiopulmonary bypass with extracorporeal oxygen supply. In addition to fulfilling technical and personnel requirements, an interdisciplinary cooperation of participating fields is the most important prerequisite for the optimal treatment of patients.

## Acknowledgements

The authors thank the surgical and nursing staff of Cardiothoracic and Vascular Surgery, SMS Medical College.

### Conflicts of interest

There are no conflicts of interest.

## References

1 Strollo DC, Rosado-de-ChristensonML, Jett JR. Primary mediastinal tumors: part II. Tumors of the middle and posterior mediastinum. Chest 1997; 112:1344–1357.

2 Ferrari LR, Bedford RF. Anterior mediastinal mass in a pregnant patient: anesthetic management and considerations. J Clin Anesth 1989; 1:460–463.

3 Hosking MP, Mongon PD, Peterson RE. Removal of a large intrathoracic tumor in a child: neurogenic motor-evoked potential monitoring of spinal cord integrity and anaesthetic management. Anaesth Analg 1992; 74:460–463.

4 Maede S, Okutani R, Kono K, Fukuda T. Successful anaesthetic management of a patient with a giant mediastinal tumer [Abstract]. Masui 1993; 42:288–291.

5 Erdös G, Tzanova I. Perioperative anaesthetic management of mediastinal mass in adults. Eur J Anaesthesiol 2009; 26:627–632.

6 Slinger P, Karsli C. Management of the patient with a large anterior mediastinal mass: recurring myths. Curr Opin Anaesthesiol 2007; 20:1–3.

7 Slinger P. Management of the patient with a central airway obstruction. Saudi J Anaesth 2011;5:241–243.

8 Tempe DK, Datt V, Virmani S, Tomar AS, Banarjee A, Goel S, *et al.* Aspiration of a cystic mediastinal mass as a method of relieving airway compression before definitive surgery. J Cardiothorac Vasc Anesth 2005; 19:781–783.

9 Ding CH, Zhang LB, Sun YE, Liu Y. Diagnosis and surgery of primary neurogenic tumors of the mediastinum [Article in Chinese]. Zhonghua Yi Xue Za Zhi 2005; 85:1360–1361.

10 Furst SR, Burrows PE, Holzman RS. General anaesthesia in a child with a dynamic, vascular anterior mediastinal mass. Anaesthesiology 1996; 84:976–979.

11 Miller RD. *Anaesthesia for thoracic surgery*. 4th ed. Anaesthesia: Churchill Livingstone Inc.; 1994;2:1663–1755.

12 Morelli F, Tozzi L, Setola P, Bisceglia M, Barbini VR, Maiello E. Postchemotherapy residual masses in germ cell tumor patients: our experience. Ann Oncol 2006; 17(Suppl 7):vii132–vii136.