CASE REPORT

A Case Report on Anesthesia Management of a Giant Thymoma Excision with a Lateral Thoracotomy Approach

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Received on: 02 January 2024; *Accepted on:* 11 February 2024; *Published on:* xxxx

Abstract

Giant thymomas pose a challenge to surgeons and anesthetists alike due to their size and proximity to vessels and organs. Here we would like to report on the anesthetic management of a case of giant thymoma. This 51-year-old lady presented with left-sided pectoralgia and progressive breathlessness of 4 months duration. Computed tomography (CT) thorax showed a large defined heterogeneously enhancing mass lesion {[180 mm [craniocaudal (CC)] × 142 mm [transverse (TR)] × 152 mm [anteroposterior (AP)]} in the left anterior, middle, and posterior mediastinum extending to the left thoracic cavity displacing the mediastinum to the right side with no obvious invasion of adjacent structures. This giant thymoma was entirely resected under general anesthesia with adequate preparations using a left posterolateral thoracotomy surgical approach.

Keywords: Case report, Giant thymoma, Mediastinal mass syndrome, Posterolateral thoracotomy.

Panamerican Journal of Trauma, Critical Care & Emergency Surgery (2024): 10.5005/jp-journals-10030-1438

Background

Thymomas are slow-growing epithelial neoplasms that account for 20–30% of all mediastinal tumors.[1] Giant thymomas are rare and pose a unique challenge to anesthetists due to cardiovascular and respiratory compromise. In this paper, we would like to highlight the importance of categorizing patients based on the severity of mediastinal mass syndrome and the anesthetic challenges in an interdisciplinary approach.

Case Description

A 51-year-old lady presented to the emergency department with complaints of left-sided pectoralgia for the past 4 months and progressive breathlessness. The pain was insidious in onset, dull aching, moderately severe, and diffusely felt over the left side of the chest wall. She had associated breathing difficulty which had gradually progressed to New York Heart Association (NYHA) grade IV. The breathlessness worsened while lying flat on her back and over her right side. She felt better when lying on her left side. She also had on-and-off low-grade fever along with cough and occasional posttussive vomiting. She had a significant loss of weight and appetite over the past 4 months.

There was no significant past medical history of diabetes, hypertension, bronchial asthma, thyroid problems, or coronary artery disease.

On arrival, she was dyspneic with a respiratory rate of 34/minute and a saturation of 92% on room air which improved to 100% on placing a Hudson mask with 4 L of O_2. On examination, there was no anemia, clubbing, significant lymphadenopathy, or signs of right heart failure. Auscultation revealed decreased air entry over the left chest. Her blood investigations revealed normal complete blood count and renal and liver function tests. Electrocardiogram (ECG) was normal and a chest X-ray was done which showed a large left-sided opacity involving the middle and lower zones of the left lung pushing the trachea and mediastinum to the right (Fig. 1). Only a part of the upper lobe of the left lung could be visualized.

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How to cite this article: George KK, Sivaram KB, Thomas J, *et al.* A Case Report on Anesthesia Management of a Giant Thymoma Excision with a Lateral Thoracotomy Approach. Panam J Trauma Crit Care Emerg Surg 2024;https://doi.org/10.5005/jp-journals-10030-1438.

Source of support: Nil

Conflict of interest: None

Patient consent statement: The author(s) have obtained written informed consent from the patient for publication of the case report details and related images.

Blood gases revealed an acute type 1 respiratory failure with a decrease in pO_2 and pCO_2 values.

A computed tomography (CT) thorax was advised which showed a large well defined heterogeneously enhancing mass lesion 180 mm [craniocaudal (CC)] × 142 mm [transverse (TR)] × 152 mm [anteroposterior (AP)] in left, anterior, middle, and posterior mediastinum extending to the left thoracic cavity (Fig. 2). The lesion caused complete collapse of left lung lingula and lower lobe and partial collapse of upper lobe. Mediastinum was displaced to right side with no obvious invasion of adjacent structures. Mild pleural effusion was noted. Echo done showed normal left ventricular function with mild tricuspid regurgitation.

She was planned for emergency thoracotomy operation under high risk. After discussion with the cardiac surgeon, a decision of right thoracotomy ± sternotomy was considered with an option

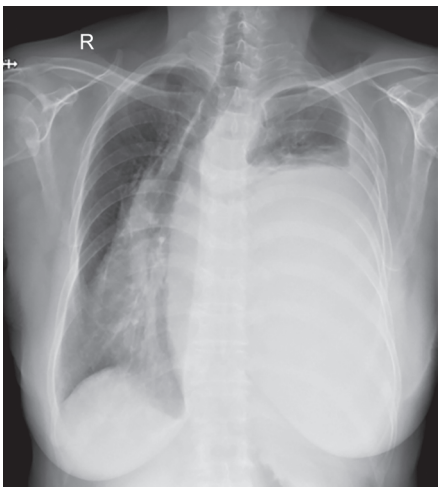

Fig. 1: Preoperative chest X-ray shows a giant mass in the left chest

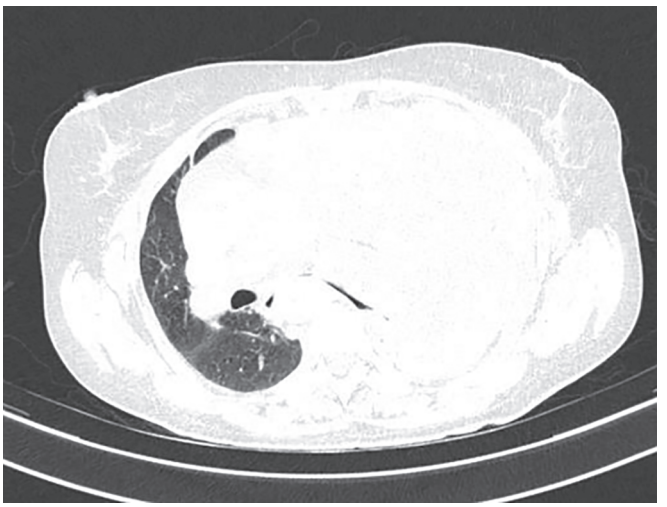

Fig. 2: Preoperative CT thorax shows mass measuring 180 mm (CC) × 142 mm (TR) × 152 mm (AP) in left anterior, middle, and posterior mediastinum extending to left thoracic cavity

for femoral bypass if patient hemodynamics' collapsed following anesthesia induction.

The patient was premedicated with ondansetron 4 mg and ranitidine 150 mg oral tablets. A conscious decision to withhold sedatives was done. She was shifted with oxygen to the operation theatre in left lateral position with the head propped up. Following insertion of two large bore 14G intravenous (IV) cannulas on right hand and left foot, an 18G thoracic epidural catheter was placed at T6-T7 level in the sitting position to assist post-op analgesia. A left femoral triple lumen central venous and arterial line catheters were placed keeping in mind the tumor location and difficulty in positioning the patient.

Right femoral area was kept prepared for femoral bypass access if needed. For this purpose, a bypass machine was primed and a perfusionist was on standby.

After preoxygenation with 100% oxygen for 3 minutes, patient was administered intravenous glycopyrrolate 0.2 mg as antisialogogue agent and fentanyl 100 µg as analgesic. She was induced with etomidate 20 mg IV and paralyzed with short-acting muscle relaxant succinylcholine 100 mg IV after ensuring mask ventilation was possible.

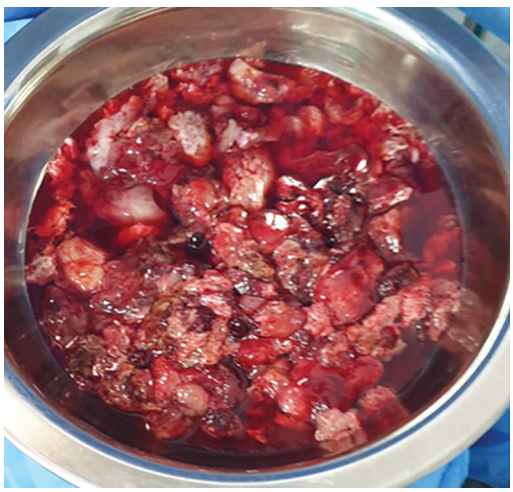

Fig. 3: Surgical specimen weighing 1.7 kg

For want of lung isolation, patient was intubated with a right-sided double-lumen tube (Robert Shaw) 35 fr and fixed at 29 cm. Upon confirmation of the tube position by auscultation and fiberoptic bronchoscopy, the patient was positioned in the right lateral following which the right lung was isolated. A bolus dose of muscle relaxant vecuronium 6 mg was administered. Anesthesia was maintained with an O_2 air ratio of 50% along with sevoflurane 2% inhalation and half-hourly intravenous doses of 1 mg vecuronium for the duration of surgery. There was a significant fall in blood pressure post induction for 30 minutes which was managed by high noradrenaline support through the central line.

Mechanical ventilation under pressure control mode was initiated with the peak airway not exceeding 30 cm H_2O at any point of time. A left posterolateral thoracotomy incision at the fifth intercostal space was made and operation commenced.

The tumor was a large mass with varying consistency situated in the left anterior, middle, and posterior mediastinum compressing and adhering the left lung and pericardium encasing the phrenic nerve and pushing the heart toward right causing hemodynamic instability. A few large hilar lymph nodes were noted. The tumor was excised piecemeal and airway pressure and hemodynamics gradually improved with lowering of noradrenaline support as the operation progressed. The tumor weighed a total of 1.7 kg (Fig. 3).

During the course of the operation, there was significant blood loss which was replaced with crystalloids, colloids, and a unit of packed red blood cells.

After hemostasis and aerostasis were ensured, apex and base drains were placed, the ribs approximated, and incision site sutured. Toward the end of the operation, the collapsed left lung expanded to full capacity and blood pressure improved with minimal noradrenaline support (Figs 4 and 5). The double-lumen endotracheal tube was changed to a single-lumen tube, epidural was initiated, and the patient was shifted to the intensive care unit where she was weaned and extubated on the same day. She was discharged in a week and the pathology report was consistent with a thymoma.

Discussion

Thymomas and thymic carcinomas are part of thymus epithelial tumors (TETs) that occur on the outer thymic surface.[2] Thymomas are the most common cause of anterior mediastinal tumors in adults.[3] They may present as relatively indolent to extremely

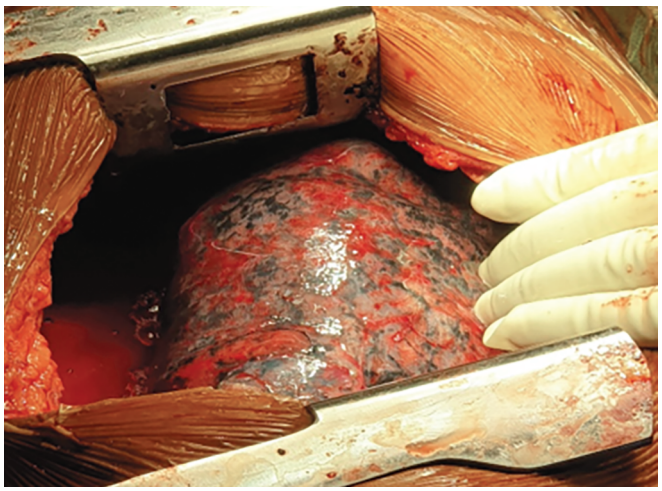

Fig. 4: Expanded lung post tumor excision

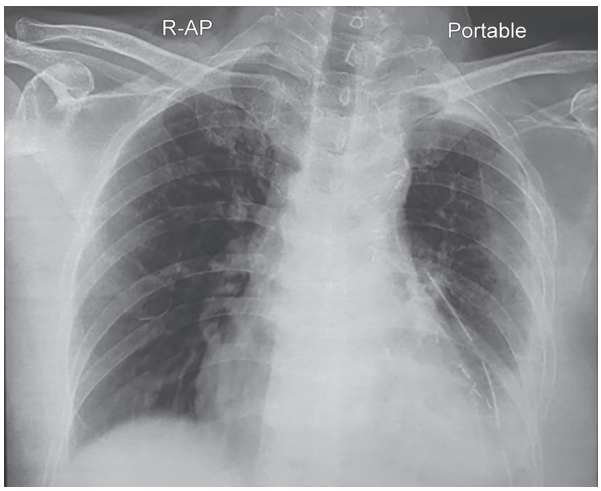

Fig. 5: Chest X-ray shows left lung expansion post tumor removal

Table 1: Grading scale for symptoms in patients with mediastinal mass syndrome

Asymptomatic	Can lie supine without symptoms
Mild	Can lie supine with some cough/pressure sensation
Moderate	Can lie supine for short periods but not indefinitely
Severe	Cannot tolerate supine position

aggressive tumors causing symptoms like cough, dyspnea, hoarseness of voice, phrenic nerve palsy, or signs suggestive of superior vena cava (SVC) syndrome. On many occasions, they are incidentally detected on chest X-rays.[4]

Thymomas may be associated with myasthenia gravis and other paraneoplastic diseases. Other types include lymphoma or germ cell tumors.

Incidence

Thymus epithelial tumors (TETs) represent 0.2–1.5% of all malignancies. Thymomas are slow-growing epithelial neoplasms with an incidence of about 0.15 per 100,000 population.[5] It accounts for 20–30% of all mediastinal tumors.

Giant Thymomas

Fukui et al. described the median size of mediastinal tumors to be 4.9 cm with the subclassifications of median thymoma, thymic carcinoma, and neuroendocrine tumor sizes to be 4.8, 5.7, and 5.8 cm, respectively.[6] Giant thymomas are very rare and difficult to operate upon because of the tumor size and involvement of surrounding structures.

The use of biopsy or fine-needle aspiration and CT-guided true cut biopsy has few benefits in giant thymomas as only relatively small portion of tissue is obtained for evaluation which cannot firmly rule out malignant tumor and the associated risk of tumor cell dissemination and bleeding involved. Post-op pathological diagnosis is the only definitive approach, especially in giant thymomas.

The main treatment especially for early-stage disease is surgery. Multimodality therapy like chemotherapy and radiation is used to treat locally advanced disease and systematic therapy alone is used for metastatic disease. About one in five thymic epithelial tumors is a thymic carcinoma which is more difficult to treat than thymoma.[7]

Table 2: Possible anesthetic mediastinal mass syndrome-risk classification

Safe	Asymptomatic adults (CT and dynamic evaluation with negative results)
Unsafe	Symptomatic adults (meningoencephalitis clinical signs present and positive diagnostic evaluation)
Uncertain	Adults with moderate clinical symptoms Asymptomatic adults with obstruction of tracheobronchial tree (CT tracheal/bronchial diameter

Median sternotomy is the standard approach for thymomas. However, for giant thymomas due to inability to access the hilum and posterior thorax, anterolateral thoracotomy with extension to the posterolateral chest or a hemiclamshell approach is advocated. For our patient, a posterolateral approach was used to access the tumor.

Challenges during Induction of Anesthesia

Mediastinal masses present a significant challenge to the anesthetist due to the pressure effects they present in patients by causing significant cardiovascular or respiratory collapse or both, especially upon induction of anesthesia.[8] These changes are affected by the positioning of the patient, an increase in airway pressure during induction as a result of the decrease in the transverse diameter of thorax along with the cephalad push by the diaphragm, a decrease in the respiratory muscle tone, and a simultaneous reduction of thoracic volume by 500–1000 mL due to increase in size of the well-vascularized mediastinal mass.[9]

Erdös and Tzanova classified patients with mediastinal mass syndrome risk shown in Tables 1 and 2, classification shown as safe, unsafe, or uncertain for patients posted for surgery.[9]

Table 1 shows the symptoms that are classified as asymptomatic, mild, moderate, and severe.

Based on this, the patient is categorized, staff are assigned, and appropriate measures are initiated after discussion with the surgeon. The measures include deciding upon awake fiberoptic intubation, avoiding muscle paralysis before intubation, or establishing femoral bypass lines under local anesthesia preinduction.

As our patient presented with severe breathlessness, dynamic evaluation such as pulmonary function tests and awake fiberoptic

tracheobronchoscopy could not be performed. Based on severity of symptoms, our patient was categorized under the uncertain category and it was decided to induce the patient with backup femoral bypass.

In the event of hemodynamic collapse or difficult ventilation during anesthesia induction, it is imperative to know the most comfortable position of the patient pre-op as a rescue maneuver to position the patient to facilitate ventilation and reduce compression on the heart. Another technique that can be tried in patients with a huge mediastinal mass is by placing them in a 45–60° recumbent position with the head elevated at 30° to reduce the compression of tumor on lungs and heart.[10] The chest should be opened immediately to expose the thoracic cage and slowly lift up the tumor to reduce the compression in case of hemodynamic instability. In situations where pre-op evaluation reveals tumor causing greater than 50% tracheobronchial compression, securing distal airway with awake fiberoptic intubation and placement of ET tube should be considered.

Postsurgical complications include hemothorax, pneumothorax, phrenic nerve palsy resulting in diaphragmatic elevation, and operative site edema causing tracheal obstruction post extubation.[11] Long-term tumor compression may cause pulmonary consolidation and atelectasis and if it persists may warrant removal of the nonfunctional lung along with the tumor.

Conclusion

Among mediastinal tumors, giant thymomas are rare and pose exceptional challenges to both surgeons and anesthetists. The risks of hemodynamic collapse and ventilation difficulties need to be tackled. Anesthetists must be prepared for a whole host of anesthetic requirements as the situation evolves. An interdisciplinary approach fulfilling technical and manpower requirements helps to make this surgery relatively safe.

References

1. Zhao W, Fang W. Giant thymoma successfully resected via hemiclamshell thoracotomy: a case report. J Thorac Dis 2016;8(8):E677–E680. DOI: 10.21037/jtd.2016.06.41
2. Marx A, Chan JK, Coindre JM, et al. The 2015 World Health Organization Classification of Tumors of the Thymus: Continuity and Changes. J Thorac Oncol 2015;10(10):1383–1395. DOI: 10.1097/JTO.0000000000000654
3. Almeida PT, Heller D. Anterior Mediastinal Mass. Treasure Island (Florida): StatPearls Publishing; 2022.
4. Minervini F, Kocher GJ. When to suspect a thymoma: clinical point of view. J Thorac Dis 2020;12(12):7613–7618. DOI: 10.21037/jtd-2019-thym-05
5. Engels EA, Pfeiffer RM. Malignant thymoma in the United States: Demographic patterns in incidence and associations with subsequent malignancies. Int J Cancer 2003;105(4):546–551. DOI: 10.1002/ijc.11099
6. Fukui T, Fukumoto K, Okasaka T, et al. Prognostic impact of tumour size in completely resected thymic epithelial tumours. Eur J Cardiothorac Surg 2016;50(6):1068–1074. DOI: 10.1093/ejcts/ezw178
7. Kelly RJ, Petrini I, Rajan A, et al. Thymic malignancies: from clinical management to targeted therapies. J Clin Oncol 2011;29(36):4820–4927. DOI: 10.1200/JCO.2011.36.0487
8. Goh MH, Liu XY, Goh YS. Anterior mediastinal masses: an anaesthetic challenge. Anaesthesia 1999;54(7):670–674. DOI: 10.1046/j.1365-2044.1999.00961.x
9. Erdös G, Tzanova I. Perioperative anaesthetic management of mediastinal mass in adults. Eur J Anaesthesiol 2009;26(8):627–632. DOI: 10.1097/EJA.0b013e328324b7f8
10. Saiyed. Anaesthetic management of posterior mediastinal mass: a case report (Internet). (cited 2022 Jan 27). Available from: https://www.ejca.eg.net/article.asp?issn=1687-9090;year=2014;volume=8;issue=3;spage=104;epage=107;aulast=Saiyed
11. Saito T, Makino T, Hata Y, et al. Giant thymoma successfully resected via anterolateral thoracotomy: a case report. J Cardiothorac Surg 2015;10(1):110. DOI: 10.1186/s13019-015-0321-y