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Anterior Mediastinaland Thyroid Mass in a Patient for Fracture Humerus Surgery: an Anesthetic's Challenge

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Abstract: *Anterior mediastinal mass and a thyroid mass in the same patient is very uncommon and more so in a patient coming for an orthopaedic surgery as was the case in our patient.Mediastinal mass could be absolutely benign to highly malignant and hence require prompt diagnosis. When presenting for diagnostic/definitive surgery or an unrelated surgery they pose serious challenges for the anaesthetist depending on its size, anatomical situation and involvement ofand pressure exerted on the various structures of the mediastinum. By nature of their anatomical location, mediastinal masses can cause compression of the heart, large vessels, carina and main bronchi. A large thyroid mass causes difficulty in securing airway due to deviation and compression of trachea. Successful management requires assessment of the effects produced by the mass and preparedness for a difficult airway .A foresight of the problems that may arise because of both these masses on induction of anaesthesia,muscle relaxation and the lateral position required for fracture humerus is important. Complications' resulting from the surgical procedure also requires good intraoperative vigilance.*

Keywords:*Mediastinal mass, thyroid mass, interscalene block,difficult airway, peak airway pressure*

I. Case Report

A 54 year old female with pathological fracture of right upper third of humerus was posted for open reduction and internal fixation. She had undergone radical mastectomy for carcinoma breast, three years ago which was followed by radiotherapy and chemotherapy. She had developed a swelling in the neck since 2 yrs which was increasing in size.She complained of mild respiratory discomfort on lying supine but was comfortable when semi-prone at night.There was no history suggestive of hypo or hyperthyroidism, syncope, palpitation, stridor or dysphagia. Physical and systemic examinationsrevealed a large swelling on left side of neck extending up to the suprasternal notch displacing the trachea to right. Airway examination showed modified Mallampati grade 2.Haematological and biochemical examination including thyroid function were within normal limits.X-ray neck confirmed the physical findings and X-ray chest showed a opacity in the upper right mediastinum.IDL confirmed bilateral vocal cord mobility.

A pre-operative thoracic computed tomography (CT) scan demonstrated a large lobulated mixed solid cystic lesion involving left lobe of thyroid (5.6 x6.2x5 cms) with multiple central non-enhancing cystic/necrotic areas, probably a colloid nodule of neoplastic etiology. The thyroid nodule was extending up to suprasternal notch causing tracheal deviation to right; with resultant displacement of right carotid artery and internal jugular vein. Also noted was a right pleural metastatic mass (9.9 x5.4 x 8 cms) in mediastinum encasing right pulmonary artery and its bifurcation and also causing left displacement and luminal narrowing of the trachea. Considering chances of massive blood loss because of large bony defect in the humerus and impossibility of tourniquet application the patient was sent for embolisation of the feeding vessels a day prior. Awake fiberoptic intubation was decided upon because of the thyroid swelling with tracheal deviation and also because spontaneous ventilation would be best till the airway was secured to avoid pressure symptoms after general anesthesia and muscle relaxant by the mediastinal mass. The Cardiothoracic unit was informed and told to be ready in case some intervention was required. High risk consent and consent for fibre optic intubation was taken. After preparing the airway, awake fibreoptic intubation with number 6.5cuffed portex tube was done. After confirming bilateral expansion, air entry and no resistance on manual ventilation patient was given IV propofol 120 mg followed by atracurium 25mg , midazolam 1mg and fentanyl 100 mcg.Anaesthesia was maintained with O2, N2O and Isoflurane.A left lateral position was given.The patient was put on volume controlled ventilation with tidal volume (TV) of 500 mL, respiratory rate of 10/min and positive end expiratory pressure (PEEP) of 5cms. There was a increase in peak airway pressures to 40 cm H2O probably due tothe right sided mediastinal mass falling down with relaxation and compressing the trachea and right bronchi in the left lateral position.There was no desaturation or rise in ETCO2.

The ventilation was changed to pressure mode with peak inspiratory pressures of 25cms and PEEP of 5 cms.This gave a TV of 500ml and the end tidal carbon dioxide was maintained between 32-34 mm Hg. There

was no evidence of pulmonary hypertension and SpO2 was maintained.Rest of the surgery was uneventful and patient was reversed, observed on spontaneous ventilation for desaturation and extubated in a slight upright position successfully.

II. DISCUSSION

In Patients coming with complex multiple problems an Anaesthetic plan has to be formulated.
Regional anaesthesia, an inter-scalene block with patient breathing spontaneously would have been ideal for our patient keeping the mediastinal mass in mind but shealso had a huge thyroid mass with distorted anatomy of the neck making it challenging.Complications like phrenic nerve palsy[3] could further reduce , forced vital capacity by 27%, forced expiratory volume in 1 second by 26%, and peak expiratory flow rate by 15%.[4] Epidural or Intrathecalinjection is also a known complication and could cause dyspnoea and circulatory collapse.
Ultrasound guided blocks are rapidly becoming the gold standard for such patients and has improved safety and efficacy of regional anaesthesia [3].Because of unavailability of USG machine & expertise general anaesthesia was decided.

Our patient had a large thyroid swelling extending up to suprasternal notch with tracheal deviation which made us anticipate difficult mask ventilation after induction of general anesthesia and muscle relaxation secondary to partial or complete airway collapse which could cause severe hypoxia and warrant a urgent tracheal intubation which could have been difficult and time consuming due to the distorted anatomy.[3,4,5]
A conventional tracheostomy was also not possible due to the suprasternal extension and would prove futile as the distal mediastinal obstruction would still remain. Hence an awake fibre optic intubation was considered safest.

The most common lesions in the anterior mediastinum include mass arising from thymus,thyroid,pleura,lungs or lymphoma and germ cell tumors.In the middle mediastinum, lymphadenopathy is most common, and is usually related to sarcoid lymphomaor metastatic lung cancer. Neurogenic tumours are the most common cause of posterior mediastinal lesions. Most mediastinal masses are initially suspected based upon chest x-ray findings, with additional imaging (especially contrast-enhanced CT) being the primary modality to provide additional information about the nature and extent of the pathologic process. The degree of compression and other features on the CT scan can help predict the risk. Patients can be categorised as high risk if tracheal compression>50% or has associated bronchial compression, pericardial effusion or superior vena cava syndrome[6-7], Intermediate risk if tracheal compression<50% and low risk if no significant compression of structures. [6,7]

The major goal of the preanesthesia consultation in patients with mediastinal mass coming for other surgery is to estimate the presence and degree of obstruction of the tracheobronchial tree and hemodynamic instability due to mass effect on major cardiovascular structures and circulation. Serious consideration should be given to avoiding general anaesthesia and possible adverse consequences of anesthetic induction due to loss of the awake patient's compensatory mechanisms. Delayed compression and adverse consequences despite an uneventful stepwise induction of general anesthesia is a possibility.

General anaesthesia causes reduction in lung volume, relaxation of bronchial smooth muscle leading to greater compressibility of the airway from the overlying mass, loss of spontaneous diaphragmatic movement due to the paralysis induced by muscle relaxants, reduction in the transpleural pressure gradient which normally dilates the airway.[8]

This decreases the calibre of the airways and enhances the effect of extrinsic compression. Complete airway obstruction and cardiovascular collapse are the most-feared complications that can occur during general anesthesia in patients with mediastinal masses [9]Ventilation after intubation depends on whether the endotracheal tube is distal to the tracheobronchial obstruction.[10]If that is certain, one can gradually take over the ventilation manually, and if this is well tolerated, positive pressure ventilation with or without short-acting muscle relaxants can be employed. If there is doubt about certainty of distal intubation or ability to ventilate, maintenance of spontaneous ventilation seems reasonable, with occasional assisted ventilation.

There are many case reports of patients with pre-diagnosed or undiagnosed anterior mediastinal masses in whom airway obstruction on induction of anaesthesia and induced muscle relaxation was not anticipated and they became impossible to ventilate and ultimately died [11]

In our case intubation took care of the proximal tracheal shift but the distal mediastinal shift remained and worsened with left lateral position.There was a rise in airway pressures due to the mass falling on and compressing the right bronchus partially though SpO2 and ETCO2 remained WNL In case there would be difficulty in ventilation with fall in SpO2 and rise in ETCO2 the patient would have to be made supine.If the airway was compromised even in supine position because of relaxation of structures then a right sided DLT could be helpful in stenting the right bronchus.

The rise in peak airway pressures in our patient to 40cm H2O could have caused some barotrauma or hemodynamic consequences from raised intra-thoracic pressuresas the surgery was going to take few hours. It could also result in inadequate ventilation. Hence we shifted the patient to pressure control ventilation.

III. Conclusion

Anaesthesiologists must anticipate the potential life threatening complications of anterior mediastinal mass and a huge thyroid mass.Preoperative discussions regarding the surgical plan are necessary to develop an anaesthetic plan that includes type of anaesthesia, airway management strategies, hemodynamic and ventilation monitoring, and preparation for management of respiratory and hemodynamic compromise.Proper pre-operative clinical as well as radiological assessment can predict the problems under anaesthesia and tailoring the anaesthesia accordingly helps avoid mishaps.

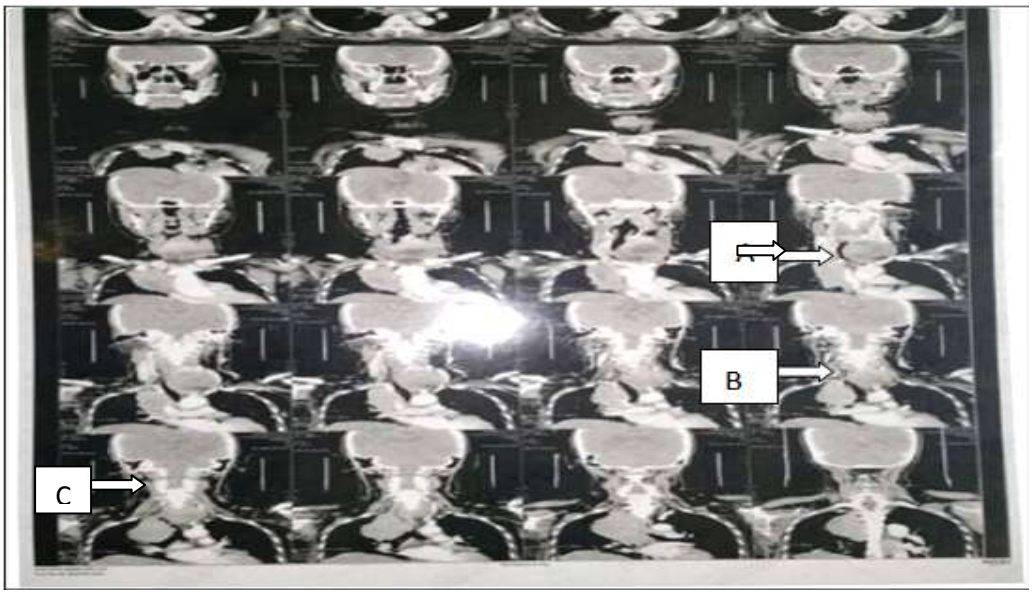

Figure 1: CT Scan showing Thyroid and Mediastinal masses and the distorted anatomy

A-Thyroid swelling shifting trachea to right, B-Mediastinal mass shifting trachea to left
C- Ant mediastinal mass causing tracheal narrowing

Figure 2: X-Ray Chest AP view showing anterior mediastinal mass

Figure3: X-Ray neck Lateral view showed no tracheal compression

Figure 4 : X-Ray showing # of Rt Humerus

Figure 5: Monitor showing rise in Peak airway pressures to 40cm H2O

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