Anaesthetic management for the child with a mediastinal mass

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Summary
Administering anaesthesia to a child with an anterior mediastinal mass may lead to respiratory or circulatory collapse, even in those without symptoms. Institutions should have algorithms to manage children with mediastinal masses. Preoperative evaluations should include computed tomography, echocardiography and flow-volume studies. Anaesthesia may be induced with inhalation agents and maintained with spontaneous respiration via facemask or laryngeal mask airway. Alternatively, positive-pressure ventilation may be used, including tracheal intubation without muscle relaxants. Rigid bronchoscopy may be life-saving in the event of tracheal or bronchial collapse under anaesthesia.

Keywords: anterior mediastinal mass; child; algorithm; anaesthesia management; preoperative evaluation

Introduction
Administering anaesthesia to a child with an anterior mediastinal mass is associated with a high risk of morbidity and mortality. Severe cardiovascular and/or respiratory collapse may occur following induction of anaesthesia. The outcome may be fatal despite expeditious use of all appropriate resuscitative manoeuvres. This presentation describes the causes of anterior mediastinal masses in children and anaesthetic management of the child with such a mass.

Causes of anterior mediastinal masses in children
The most common causes of anterior mediastinal masses in children are tumours of the lung, mediastinum and pleura. They may be primary or metastatic (1), although primary tumours of the chest are uncommon in children. Perhaps the most common are lymphoblastic lymphoma, a form of non-Hodgkin’s lymphoma and Hodgkin’s disease. These neoplasms may present as an anterior mediastinal (thymic) mass with pleural effusion, dyspnoea because of airways obstruction, pain and/or superior vena cava syndrome (swelling of the upper arms, face and neck) (2,3).

Other lesions producing anterior mediastinal masses in children include vascular malformations, neurogenic tumours, germ cell tumours and cysts (e.g. bronchogenic or enteric) (3,4).

Anaesthetic management of the child with an anterior mediastinal mass
Many patients with an anterior mediastinal mass present with respiratory or circulatory complaints. The absence of significant signs and symptoms,
however, does not preclude the possibility of circulatory or airways collapse under anaesthesia (5,6). Preoperative pulmonary function tests may help define the severity of a patient’s respiratory compromise and the consequent risk of adverse events under anaesthesia (7,8). Specifically, flow-volume studies demonstrating limitation of expiratory flow may be predictive of airway collapse under anaesthesia.

Recommended anaesthetic techniques for children with anterior mediastinal masses include inhalation induction with maintenance of spontaneous respiration (9). The use of continuous positive airway pressure may help to maintain functional residual

Figure 1
Algorithm for anaesthetic management at Lucile Packard Children’s Hospital of the child with an anterior mediastinal mass. CBC, complete blood count; CPB, cardiopulmonary bypass; CT, computed tomography; CXR, chest X-ray; LP, lumbar puncture; PICU, paediatric intensive care unit; SVC, superior vena cava.
capacity that is otherwise reduced under anaesthesia (10). Keeping the head of the bed elevated may decrease the deleterious effects of supine positioning, including cephalad displacement of the diaphragm and secondary reduction of thoracic volume (11). Keeping the patient in a partial or even full right lateral decubitus position may help to maintain airway patency and reduce cardiac and vascular compression.

Performing tracheal intubation under deep inhalational anaesthesia without the use of muscle relaxants and positive pressure ventilation may result in a more normal transpulmonary pressure gradient and improved flow through conducting airways (12,13). The decrease in chest wall tone associated with neuromuscular blockade is thought to increase the risk of severe airways compression (7). As an alternative to tracheal intubation, the use of a laryngeal mask airway has been described (14). The use of a helium–oxygen mixture has been advocated to allow laminar flow and decrease resistance to gas flow in the conducting airways (14,15).

In the event of tracheal or bronchial collapse under anaesthesia, rigid bronchoscopy may be life saving. Performing a median sternotomy and cardiopulmonary bypass in this situation has been recommended but may be impractical.

Algorithm for management

Institutions should have an algorithm in place for the evaluation (including preoperative computed tomography scanning, echocardiography and flow-volume studies) and treatment of children with mediastinal masses. The algorithm in use at our institution is given in Figure 1. Careful consideration should be given to perform a biopsy under local anaesthesia or initiating chemotherapy and/or limited radiation therapy prior to subjecting the child to general anaesthesia in order to effect a decrease in tumour mass and life-threatening airway or vascular occlusion.

References