

Anesthetic challenges for rigid bronchoscopy in an infant with congenital lobar emphysema

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Key points

Congenital lobar emphysema characterized by over distension and air-trapping in the affected lobe is one of the rare causes of severe infantile respiratory distress. The key anesthetic concern during management of such cases, one has to not only avoid barotrauma and its difficulty but also take care to maintain adequate oxygenation and ventilation.

Abstract

Congenital lobar emphysema (CLE) is a rare entity which depending on the severity presents in a neonate with respiratory distress. Rigid bronchoscopy even in a normal neonate is challenging, but when superadded with the pathophysiology of CLE it becomes deleterious and life threatening. A 4 month old child who presented with a sudden onset of respiratory distress showing signs of probable CLE on chest radiography and on CT scan is reported herewith. Anesthetic management for rigid bronchoscopy to rule out superadded foreign body aspiration is discussed. Maintenance of adequate oxygenation and hemodynamic parameters balancing with adequate depth of anesthesia while sharing the airway with otolaryngologist needs vigilant monitoring throughout the procedure.

Keywords: Anesthesia; infant; rigid bronchoscopy; congenital lobar emphysema

Introduction

Management of an infant with an established diagnosis of Congenital lobar emphysema (CLE) by therapeutic

operative lobectomy, in the hands of an experienced surgical team, at a well equipped modern healthcare centre, is not only life saving but also appears simple and is indeed gratifying. But a similar case presenting at a peripheral centre with all its limitations, not only challenges the clinicians because of pitfalls in diagnosis but also its improper management may be life threatening. CLE is a rare entity with an incidence of 1 in 70,000 to 1 in 90,000 live births. It is characterized by postnatal overdistension of one or more lobes of a histologically normal lung leading to compression atelectasis on ipsilateral/contralateral side with mediastinal shift resulting in V/Q mismatch and hypoxia. Anesthetic management of such an infant with suspected foreign body aspiration for emergency diagnostic bronchoscopy is reported here.

Case report

A four months male infant, weighing 7 kg was referred from a local nursing home with history of progressively worsening respiratory distress of about 30 hours duration. Detailed history from the mother revealed that the

infant intermittently used to have fatigability and sweating while breast feeding. Present complaints started when a next door 3 yr old boy was eating groundnuts and playing with the infant. Chest radiography revealed increased lucency of the left lung, widened left intercostal spaces, tracheal and mediastinal shift to right and reduced right lung volume (Figure 1, 2).

CT Thorax revealed hyperinflated and hyperlucent left lung field with shift of trachea and the mediastinum towards right along with herniation of left lung to right side and crowding of broncho-vascular marking in the right lung field. Reduced lung marking with multiple irregular air lucencies in left upper lobe and lingular lobe suggested confluent centrilobular emphysema. Inhomogeneous opacification in right upper lobe and lower lobe segments suggested collapse consolidation (Figure 3, 4).

CLE was suspected but emergency diagnostic bronchoscopy was planned by otolaryngologist to rule out a superadded foreign body (ground nut) aspiration.

Prior to the procedure, the child was irritable, with beads of sweat on the forehead, HR 148/ min, RR 56/ min, SpO₂ 88% on air and SpO₂ 96 % with oxygen supplementation. Air entry was markedly diminished on the left side with ABG Findings of PaO₂ 80 mmHg and PaCO₂ 48 mmHg.

Inhalational induction was done by Sevoflurane 2% to 4 % along with 100% oxygen while maintaining spontaneous respiration. Simultaneously minimal doses of glycopyrolate and fentanyl were administered. Topical 4% lignocaine sprayed over epiglottis and glottic inlet with direct laryngoscopy after achieving sufficient depth of anesthesia. Anesthesia was maintained by halothane with 100% oxygen after discontinuing sevoflurane.

Close monitoring of chest and abdominal movements for spontaneous respiration, auscultation of heart sounds and Spo₂ was done. T-piece circuit was connected to the sidearm of the bronchoscope after Karl-Storz ventilating bronchoscope was introduced. Delivered halothane concentration was carefully titrated between 1% to 3.5% to

maintain oxygen saturation above 80-85% under spontaneous respiration. Despite thorough bronchoscopy bilaterally, lasting for about thirty minutes, no foreign body could be located.

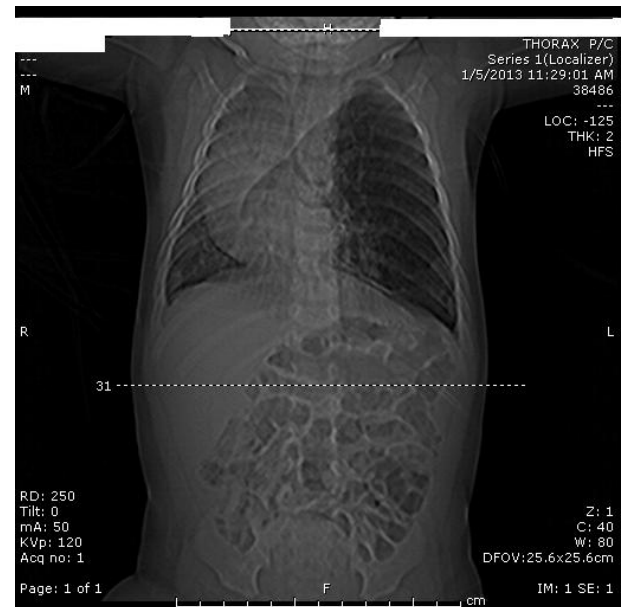


Fig. 1 and Fig. 2: Hyperinflation of the left lung with increased translucency with herniation of left lung to right side; tracheal and mediastinal shift towards right side

Post procedure, humidified oxygen was administered and 2 ml 1:2,00,000 adrenaline was nebulized to reduce

wheezing which was noticed. Dexamethasone 250 mcg/kg given at the time of induction and repeated eight hourly post operatively. Hydrocortisone 20 mg IV and 20 mg IM was also given intraoperatively. After 24 hours when the infant stabilized, parents were advised to take the child to a higher center (where a dedicated paediatric surgical team was available) for further operative intervention.

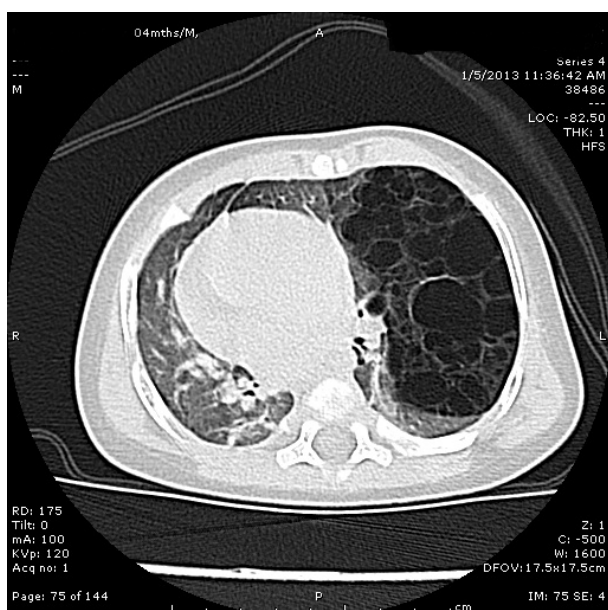
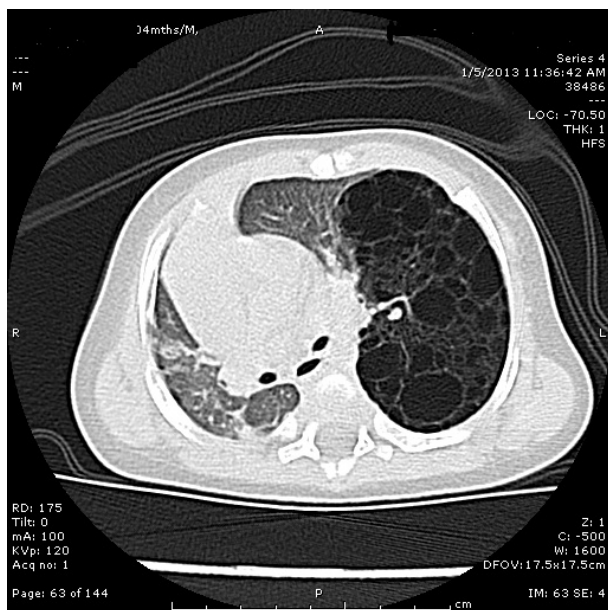


Fig. 3 and Fig. 4: Multiple irregular air lucencies in left upper lobe and lingular lobe; inhomogeneous opacification in right upper lobe and lower lobe segments

Discussion

CLE was first described by Nelson in 1932 and Gross & Levis performed the first successful lobectomy in 1945 [1, 2]. The exact etiology of the disease is still not known and several intrinsic and extrinsic causes have been postulated [3]. Associated congenital heart disease or vascular anomalies may occur in 12%-14% of these patients [4]. In approx 50% of cases of CLE, the etiology is unknown and can be attributed to polyalveolar lobe, bronchial stenosis, bronchial cartilage deficiency, segmental bronchiomalacia, membranous bronchial septum and pulmonary artery aneurysm [5, 6]. Establishing correct etiology is important to formulate the treatment plans. Traditionally, CLE has been managed by lobectomy but case reports about conservative management in selected cases with the availability of better diagnostic and therapeutic modalities including a flexible bronchoscope are encouraging [6, 7]. Less than fifty percent of these patients are symptomatic in first few days of life. Presenting features may be dyspnea, tachypnea, coughing, wheezing, chest retraction, diminished air entry and cyanosis in severe cases.

A plain chest X-ray shows overinflation with air trapping in the affected lobe (left upper lobe in 41%, right middle lobe in 34% and right upper lobe in 21% of cases [8]). Increasing intrathoracic pressure causes compression of surrounding lung, displacement of mediastinum and herniation of ipsilateral lung to the opposite side. Depending on the severity, disruption of anatomy, loss of elasticity, impaired venous return, and compression atelectasis leads to V/Q mismatch and gross impairment of lung function. CT scan helps to confirm the diagnosis, but a confounding diagnosis of pneumothorax (closed/tension) should be kept in mind. [9] Inhalation of foreign body is a potentially life threatening event with resultant airway hyper reactivity and mucosal edema. It also increases the airflow resistance causing high Oxygen consumption and prolonging the time taken for inhalational induction. There is a high risk of aggravation of CLE with increasing hypoxia during induction if

one resorts to high inflation pressures to overcome severe fall in SpO₂, in which case one should be prepared for emergency thoracotomy, to allow affected lobe to herniate through the incision.^[10]

Anesthesia for paediatric bronchoscopy not only needs special equipment but also a sound knowledge of the anatomy, physiology and pathophysiology of paediatric airway. A good understanding between the anesthesiologist and endoscopist to ensure maintenance of adequate oxygenation via the shared airway along with vigilant monitoring throughout the procedure is essential for a successful outcome.^[8]

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