

## CASE REPORT

# Precise identification of the segmental anatomy of lung improves the outcome of thoracoscopic lobectomy

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### Introduction

Congenital Cystic Lung Lesions (CLL) comprises a broad spectrum of bronchopulmonary malformations of the lung encompassed in the recent terminology of Congenital Thoracic Malformations (CTM).

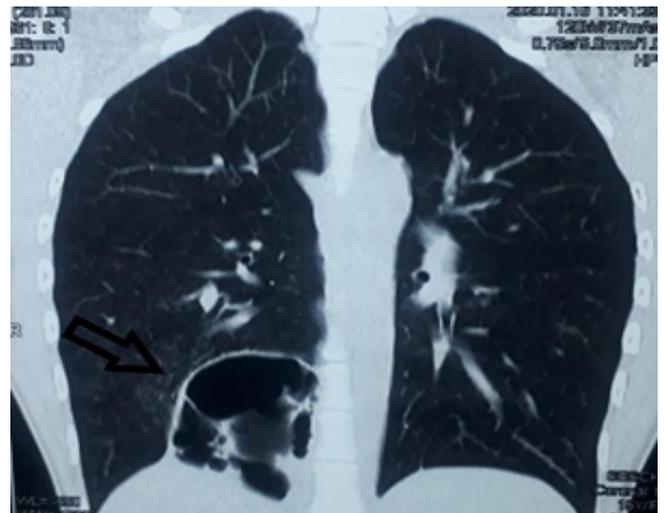
These lesions could be detected antenatally or present with respiratory distress postnatally. However, as in our case, they can remain asymptomatic until later life. Pulmonary lobectomy is the definitive surgical intervention for these lesions, which is traditionally done through posterolateral thoracotomy. Video-Assisted Thoracoscopic Surgery (VATS) has recently emerged as a technique for lung lobectomy with equivalent complication rates.

### Case presentation

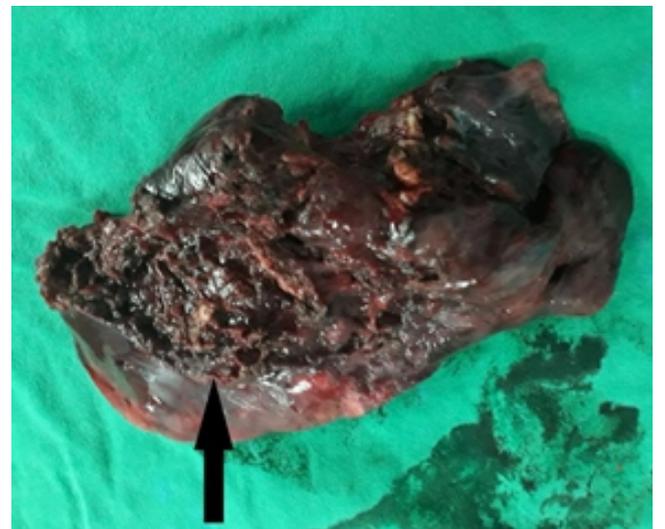
A 15-year-old girl was found to have a cystic lesion in the right lower lobe of the lung while being investigated for an acute lower respiratory tract infection. In the chest x-ray and contrast-enhanced computerised tomography (CECT) of the chest, the lesion was visible with a fluid level.

Thoracoscopic right lower lobectomy was planned as the definitive treatment for the cystic lung disease once the infection was completely treated. The procedure was done under general anaesthesia with endotracheal intubation. Lung collapse was achieved with CO<sub>2</sub> insufflation of the thoracic cavity at a pressure of 12 mmHg with a flow rate of 2l/min after the initial port placement. Progressive collapse of the right lung was achieved with CO<sub>2</sub> pneumothorax.

The objective of the operation was to remove the right lower lobe without injury to vascular and bronchial structures to the middle and the upper lobe. Division of the inferior pulmonary ligament led to the exposure of the inferior pulmonary vein. In



**Figure 1.** Contrast enhanced computerized tomography of the chest showing the right lower lobe cystic malformation. Arrow indicates the lesion.



**Figure 2.** The resected right lower lobe of the lung. The arrow indicates the cystic lesion.

our patient the major fissure was complete and there were no inflammatory adhesions.

Branches of the pulmonary artery were identified superficially on the fissure which was carefully dissected and divided before accessing the pulmonary vein and bronchial branches. The branches of the pulmonary artery, bronchus,

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and vein were taken by ultrasonic dissector, endo clips and staples where necessary. After the division of the pulmonary artery branches, bronchial branches were divided. In our patient, the superior segment bronchus was occluded and divided separately, and then the trunks to the basal segments were taken separately. Branches of the inferior pulmonary vein were occluded and divided last.

She was discharged in two weeks following the surgery. Up to now, her exercise tolerance is as well maintained as before. The histology of the resected lobe revealed a congenital pulmonary airway malformation (CPAM).

### Discussion

Clinical presentation of congenital cystic lung disease widely varies. It could be detected antenatally or postnatally. Of the babies who are born, approximately one-quarter will be symptomatic at birth with abnormal breathing and respiratory distress in whom surgical intervention is indicated [1].

Formal lobectomy is the recommended surgical treatment for the CLL [2,3]. Conventionally, lobectomy was performed as an open surgical procedure through posterolateral thoracotomy. However thoracoscopic lobectomy has emerged as a feasible, well accepted and standardised technique in children [4].

During thoracoscopic surgery, lung collapse is either achieved by single lung ventilation or insufflation of CO<sub>2</sub>. A large series by Rothenberg et al. revealed CO<sub>2</sub> pneumothorax alone could achieve satisfactory lung collapse [4]. In our patient, a similar strategy was adopted to achieve lung collapse by creating pneumothorax of 10-12 mmHg.

If the major fissure is incomplete it should be completed before accessing the vascular and bronchial branches of the fissure. Pulmonary artery branches are dissected preferably at the segmental level before the division of the bronchial and pulmonary venous branches. In some patients, the posterior segmental artery to the lower lobe arises from the posterior ascending branch to the upper lobe, which could be injured if not adequately exposed in the dissection of the fissure [5]. Inferior pulmonary vein is identified after the division of the inferior pulmonary ligament. Exposure of the inferior pulmonary vein is very important before attempting control of its tributaries, in case an inadvertent injury occurs to the vein. The division of bronchial branches before the division of venous branches gives excellent exposure for the dissection of veins [4]. If the lobar bronchus is too large, segmental bronchial branches should be taken separately. Anatomically bronchial branches follow the same anatomical arrangement as the pulmonary artery branches in the major fissure.

Thoracoscopic lobectomy for CLL is known to cause many intraoperative and postoperative complications, however, overall morbidity and complication rates have been relatively low compared to open approaches [6,7]. In the review by Rothenberg et al., the overall rate of complication was 3.3% with air leak reported in 3 patients (0.8%) [4].

Long-term functional outcomes following thoracoscopic lobectomy have been excellent in children.

### Conclusion

Thoracoscopic lobectomy for congenital cystic lung disease in children is a feasible and safe procedure. Precise spatial identification of anatomical structures of the lung and mediastinum is of vital importance for success in minimal access thoracic surgery.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

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**Learning Points:**

- Precise identification of segmental anatomy of the lung is imperative for successful completion of thoracoscopic lung lobectomy.
- Ultrasonic dissector, clips and stapling devices are necessary for control of vascular and bronchial structures in a thoracoscopic lobectomy.
- Thoracoscopic lung lobectomy is safe and feasible in children.