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Case report

Case report on peri-operative surgical and anaesthetic management of ruptured humongous lung abscess

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ABSTRACT

Introduction: Early thoracic empyema is usually treated through video-assisted thoracoscopic (VATS) decortication. Patient selection is important for decortication if an effective surgical outcome is required. Lung isolation techniques are required to provide anesthesia for these patients to facilitate the surgeon while operating on the affected lung. The ultimate target is to protect the non-diseased contra-lateral lung from contamination.

Presentation of case: We are presenting a unique case of 20-year-old female, resident of Karachi, who was brought to the emergency room (ER) with signs of sepsis, hypotension, and multi-organ failure. She was brought to the operating room to undergo video-assisted thoracoscopy (VATS) for lung abscess decortication when her medical therapy had failed. On table decision of right upper lobe resection was made and ventilation strategy had to be modified accordingly.

Discussion: The main anaesthetic aim was to protect the healthy parts of the lung from the abscess. Regular suctioning of secretions during surgery via the double lumen tube (DLT) lumen on the diseased side is recommended. While performing VATS, the lung abscess got ruptured and immediate measures to isolate the lung was taken to assist with surgical resection of the affected lobe. Lobectomy can only be done once the lung was completely isolated and maintaining perfusion and ventilation of the relatively healthy lung help in managing hypoxia.

Conclusion: Peri-operative management of ruptured lung abscesses required thorough pre-op evaluation, intra-operative lung isolation and ventilation, and postoperative analgesia with combined team effort both surgical and anaesthetic, are vital fundamentals to consider in guaranteeing the best outcome.

1. Introduction and importance

Early thoracic empyema is usually treated using broad spectrum or culture sensitive antibiotics. However, in chronic empyema, surgical intervention might be necessary. Careful patient selection is important for decortication if an effective surgical outcome is required. The pre-operative workup should be thorough, and the surgery should be performed at a specific timed interval [1,2].

While providing anesthesia to these patients, lung isolation techniques has required. This is done to make it easier for the surgeon to operate on the affected lung. Lung isolation has usually required in a condition of massive bleeding, pus, and bronchopleural fistula. The ultimate target is to protect the non-diseased contra-lateral lung from contamination [3].

2. Case presentation

A 20-year-old female was brought to the emergency room (ER) with signs of sepsis, hypotension, and multi-organ failure. She was a known case of insulin-dependent diabetes mellitus and was diagnosed with pulmonary tuberculosis 6 days prior to the day she presented to the ER. She had a history of productive cough, weight loss and fever for the last month. She was kept on anti-tuberculous medicines, but her condition deteriorated. Her CT scan was done which showed multiple cavitary lesions in the right lung (Fig. 1). She was moved to the intensive care unit (ICU). Insulin infusion for the treatment of diabetic ketoacidosis (DKA) was started in the ER. During her stay in the ICU, she developed hypoxia, acidosis and then a brief episode of pulseless ventricular tachycardia. Patient was revived after performing advance cardiac life support (ACLS) protocol. She was intubated using a size 7 mm endotracheal tube and shifted to the operating room for VATS and evacuation

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of the abscess.

She was brought to the operating room. Clinical monitoring was applied including ECG, End-tidal CO₂ and pulse oximeter. Central venous pressure (CVP) in the right internal jugular vein and left radial artery cannulation of invasive blood pressure were also done. The patient was connected to the anesthesia machine and was kept on Isoflurane at a MAC between 0.8 and 1.0. FiO₂ was kept between 0.5 and 1.0. Air was used to mix with oxygen and nitrous oxide was avoided. The patient was made left lateral for VATS and decortication. Infusion of cisatracurium was started at 2 µgm/kg/min. For analgesia, morphine was given intravenously at 0.2 mg per kg. After the evacuation of the abscess, a major air leak was observed, and the patient started to develop hypoxia. We were unable to ventilate the patient with a ventilator, and oxygen saturation gradually went down to 60 % and jet ventilation was started using Sander's Manu jet Ventilator. The patient was started to desaturate again after a modest increase in oxygenation. At that point, surgeon found a large, ruptured lung abscess at the right upper lobe which was causing a major air leak causing inability to ventilate using positive pressure ventilation (Fig. 2).

The surgeon immediately asked for lung isolation, and a left sided 32Fr Mallinckrodt double lumen tube was passed through the trachea using a C-Mac Video Laryngoscope in the lateral position. The tracheal lumen was immediately clamped, and the left lung was ventilated differentially. After recruitment maneuver at a pressure of 30 cm H₂O, the oxygen saturation rises to 92 % after which it was decided to go for right upper lobe lobectomy. During the surgery, one packed red blood cell was transfused. For the management of hypotension, boluses of phenylephrine 100 µgm were given. After lobectomy, the wound was closed, and a chest drain was kept in place. The double-lumen endotracheal tube was replaced with a single lumen PVC tube size 7 mm using a video laryngoscope before shifting the patient to the ICU in stable condition. Bronchoscopy was performed at 24 h after surgery to check the stump site and no residual defect was found. All the steps of the operation procedure are in accordance to the SCARE 2020 criteria [4].

3. Discussion

Lung abscesses are uncommon, but they have a high mortality rate if untreated. Normally, they can be addressed without the need for surgery. If a surgical approach is required, a risk for the formation of

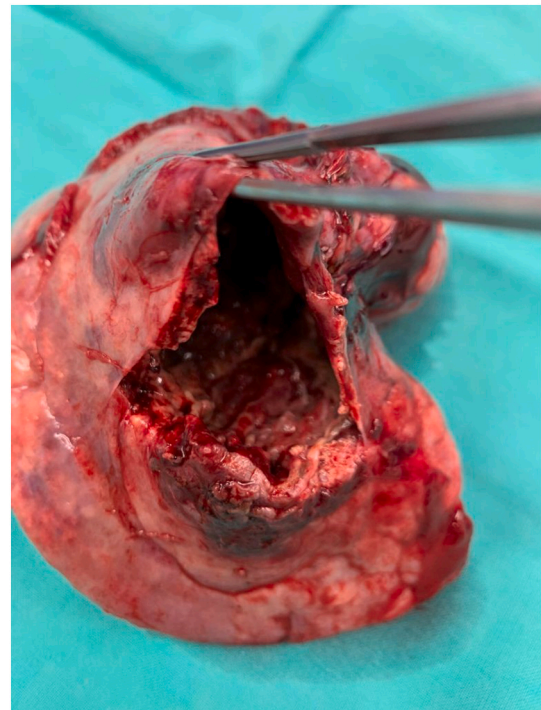


Fig. 2. Resected part of the ruptured right upper lobe of lung abscess.

bronchopleural fistula is imminent. Patients with sepsis secondary to long-standing lung abscess pose a challenge to both surgeons and anaesthetists when they are brought to the operating room for evacuation of abscess as they frequently necessitate one-lung ventilation. Not only ventilation is challenging, but the overall management of the patient with respect to the management of airway, maintaining oxygenation, and switching to an alternative airway in case of a change in surgical plan can all be part and parcel while giving anesthesia.

Thoracic surgeries often require modified ventilation either to facilitate the surgeon or to protect the healthy lung to get contaminated from the infected lung. Bronchopleural fistula or a single-sided damage to the airway or lung often causes difficulty in ventilation while using



Fig. 1. CT scan of the patient showing multiple cavitation and right-sided empyema.

positive pressure. Lung isolation, where possible and indicated, can be performed using double-lumen tubes, bronchial blockers, or selectively intubating one lung using a fiberoptic technique [5].

Surgical care of a lung abscess has become more complicated in recent years, as neither the timing nor the indication for a related surgical surgery is well established. Numerous factors complicate surgical care and outcomes, with existing comorbid, severity of lung injury, and type of interventions. Surgery indicated in refractory to medical therapy, life-threatening hemoptysis, cavitary lesion more than 6 cm in diameter, bronchopleural fistula, and ruptured abscess pleural cavity with pleural empyema [6].

The purpose of surgical handling for localized infection is to eradicate necrotic lung abscess debris that could serve as a reservoir for recurrent infection [7]. Lobectomy is usually proposed for a large cavity of lung abscess [8]. Atypical pulmonary resection or segmentectomy is enough if it could eradicate the affected lesions of abscess completely [9].

The main aim of anaesthetic part is to protect the healthy parts of the lung from the abscess. The regular suctioning of the secretions during surgery via the DLT lumen on the diseased side is the standard recommendation. Furthermore, until the risk of contamination is eliminated, differential ventilation is suggested so as not to ventilate the diseased lung. Management of airway must be tailored according to the patients' requirement and oxygenation should always be the main priority in every form of surgery [10].

In this case, the situation was rapidly changed when lung abscess was ruptured and immediate measures to lung isolation and surgical resection was done without any dilemma. Lobectomy can only be done once the lung was completely isolated and maintaining perfusion and ventilation of the relatively healthy lung help in managing hypoxia.

A key element in this case report is to point out the challenges faced in handling a unilateral lung abscess which was further complicated by sepsis and DKA. Patients with lung abscess are usually kept on oxygen support without positive pressure ventilation unless there is type I or type II failure. If the patient requires intubation, inserting a double lumen tube with differential ventilation is the most desired method, however this technique is difficult to be applied in the ER or ICU due to lack of trained staff. Another, unique thing was the placement of the DLT in lateral position during the surgery. The surgeon was competent in promptly clamping the bronchus to stop spillage into the trachea and resecting the abscess.

4. Conclusion

Lung abscess is still a life-threatening ailment with a high mortality rate, mainly it is managed by medically. Surgical interventions are indicated when medical therapy has failed. Surgical options including open drainage, decortication, or pulmonary resection, still play an important role for complicated lung abscess. The basis of surgical therapy is early diagnosis of medical therapy failure and adequate management of the septic focus through pulmonary excision of all necrotic tissue.

Peri-operative management including pre-op evaluation, intra-operative anaesthetic management, and postoperative analgesia with combined team effort both surgical and anaesthetic, are vital fundamentals to consider in guaranteeing the best outcome.

Ethical approval

Not applicable.

Guarantor

On behalf of all the contributors, Dr. Khalid Siddiqui will act as guarantor and will correspond with the journal from this point onward.

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

KMS conceptualized, wrote the original draft and reviewed the final manuscript; SY, and AA participated in literature review and edited the manuscript; AA taken the photograph, SY; revised and edited the manuscript.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Research registration

Not applicable.

Declaration of competing interest

The authors have no conflict of interest to declare.

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