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Case Report

Perioperative Management Challenges for Post-Tuberculous Stage-III Empyema with Massive Pneumothorax Mimicking Vanishing Lung Syndrome: A Case Report

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ABSTRACT

Surgical resection is frequently the intervention required for post-tuberculous empyema or other sequels. However, pneumonectomy may not be feasible in some situations, and video-assisted thoracoscopic surgery (VATS) plays a role in such a scenario. Whether a patient undergoes open resection of VATS, isolation of infected lung is integral to one-lung ventilation and better access to the surgical field, and a double-lumen tube (DLT) remains the preferred choice. Difficulties in DLT placement after pneumonectomy are reported; however, failure to isolate a lung by appropriately placed DLT is scarce or absent. A 28-year cachectic gentleman with poor preoperative lung function was suffering from endobronchial tuberculosis. He also had one episode of tuberculosis twelve-year back. At presentation, he had a massive pneumothorax and stage-III empyema as a sequel, including a rare finding of plastered mediastinum mimicking vanishing lung syndrome. He underwent uniportal-VATS under general anesthesia using one-lung ventilation. Complete lung destruction from active tuberculosis and its sequel leading to the plastered mediastinum and deformed airway pose a significant lung isolation challenge. U-VATS can be considered for therapeutic purpose where standard thoracotomy and pneumonectomy is contra-indicated. However, lung isolation in such patients is tricky and poses a risk. The present case highlights the challenges faced with lung isolation using a DLT and discusses the probable remedy to these problems.

Introduction

Securing the airway and isolating infected lungs is integral to one-lung ventilation (OLV) for thoracic surgeries. However, it might be difficult for cases where the lower airway anatomy is distorted from previous surgery [1]. Pulmonary tuberculosis is a well-known cause of sequelae of the varied spectrum, including caseation, necrosis, cavitary lesions, and secondary pneumothorax. Tuberculosis-associated unilateral lung destruction is an irreversible injury often associated with anatomical distortion [2]. However, the opposite lung often increases in size with the mediastinal shift as plastered mediastinum is rare [2].

Surgical treatment like decortication and pneumonectomy is indicated in post-tuberculous complications or sequel [3]. However, video-assisted thoracoscopic surgery (VATS) also plays a role and gaining popularity [4]. A double-lumen tube (DLT) is considered the gold standard for lung isolation during surgery. It usually provides an effective seal when

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appropriately placed. The report of appropriately placed DLT failing to isolate lung is rare or absent. This case report describes a rare massive tubercular pneumothorax and empyema with plastered mediastinum mimicking vanishing lung syndrome; the challenges we faced with lung isolation using a DLT. We also discuss the probable remedy to these problems in such cases.

Case Report

A 28-year-old man, 161 cm in height and body mass index of 15kg/m^2, was diagnosed with stage-III empyema with massive pneumothorax of the left side. Twelve-year back, he received a six-month anti-tubercular treatment for pulmonary tuberculosis. Examination revealed absent chest movement, hyper-resonant percussion notes in the upper and dull notes in the middle and lower zone, and absent breath sounds on the left side. The pneumothorax was noted two years ago on computed tomography (Figure 1), but the patient refused any active intervention due to a lack of signs and symptoms.

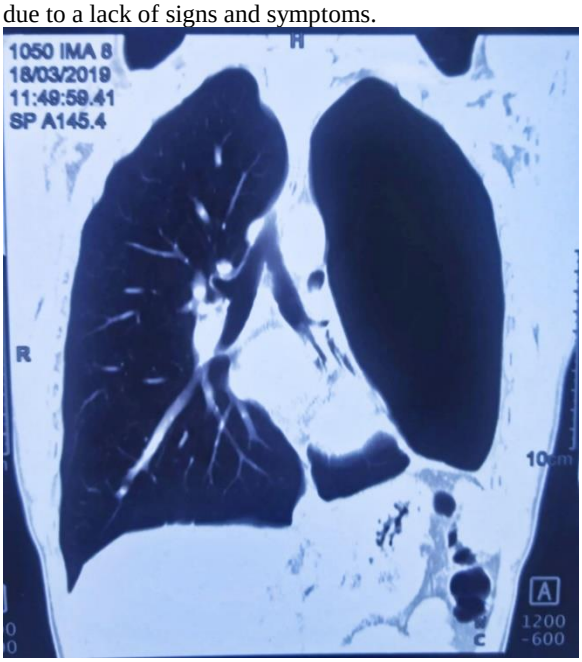

Figure 1- Coronal section computed tomography slice showing a massive pneumothorax in the left side occupying nearly entire hemithorax.

Over the last two years, his functional capacity decreased, and he started to get dyspnoeic. For the last week, he has had an on and off fever and increased shortness of breath. An urgent chest radiograph (CXR) showed a left-sided air-fluid level (Figure 2). A further preoperative bronchoscopic examination was not done, and urgent Uniportal-VATS (U-VATS) was planned because of continued symptoms, FEV1 of 40%, very low BMI, and endobronchial TB, where thoracotomy and pneumonectomy are not preferable. The patient had metabolic equivalents of five and New York Heart Association class-II dyspnoea with stable hemodynamics. Airway and other systemic examinations were unremarkable. CXR also revealed a slight deviation of the trachea towards the right with a slightly smaller left bronchus size (Figure 2). No clinical and radiological feature suggestive of broncho-pleural connection was present.

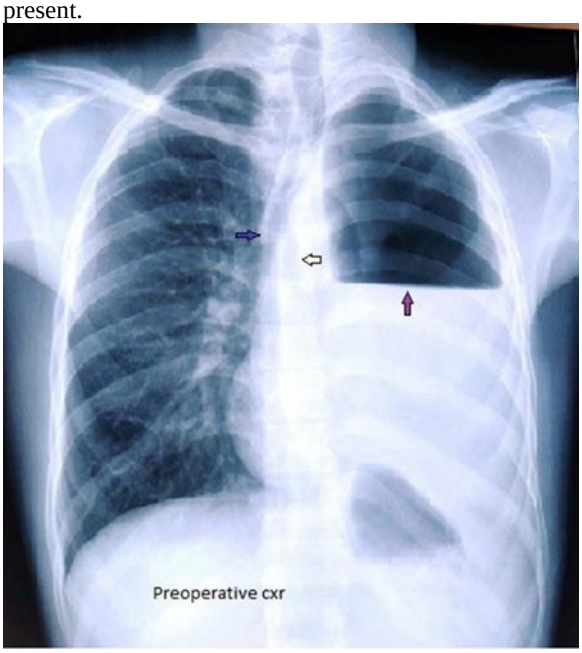

Figure 2- Showing deviated trachea and right bronchus (blue arrow), small and short left bronchus (white arrow), massive pneumothorax with an air-fluid level (pink arrow) in preoperative chest x-ray.

The case was taken under the American Society of Anesthesiologists' standard monitoring, invasive blood pressure, and agent monitoring facility with informed consent. A thoracic epidural was placed, and after preoxygenation, general anesthesia was induced with fentanyl 70 mcg propofol 60 mg. Succinylcholine 75mg was used for the facilitation of tracheal intubation. A 39-F DLT was used to secure the airway and isolate the left lung. The DLT got placed on the right side and was taken out for repositioning. However, the same happened next time despite rotating the tube towards the left, even in the senior anaesthesiologist's hand. The position was confirmed with a fiber-optic and auscultation. It was decided to proceed, considering the distorted anatomy and lack of connection with the bronchial tree with pleural space. The right internal jugular vein was catheterized under ultrasound guidance, and the patient was handed over to the surgical team to start the procedure.

Once the patient was positioned to right lateral decubitus, purulent discharge was noted in both bronchial and tracheal lumen of the DLT, airway pressure raised, minute ventilation was not achieved, and the patient started desaturating within minutes. The patient was made supine, the tube was withdrawn to the trachea, and through suctioning of both the lumens, ventilation became possible, and saturation improved. The DLT was

removed, and a new DLT was placed with the bronchial lumen in the left main bronchus; the position was reconfirmed using fibreoptic, which showed a bronchial cuff just beyond the carina. However, negotiation of DLT further was not possible due to resistance. A similar incident happened when the patient was repositioned in the right lateral and managed similarly. After stabilizing the patient, DLT was removed, and instead, a 7.5-sized cuffed endotracheal tube was used for right endobronchial intubation; the cuff was inflated, and the position was confirmed using fibreoptic, and OLV initiated. The patient was repositioned, and the surgical procedure was started. Intraoperatively, around 600mL of thick, purulent, and caseous material was removed, and a pleurectomy was done. Decortication was impossible because of dense adhesions between lung parenchyma and visceral pleura; the lung appeared completely collapsed, fibrotic, and mediastinum fixed. At the end of the procedure, intercostal drainage (ICD) tube was placed in the left pleural cavity, and the rest of the anesthesia and surgical course remained uneventful.

Postoperative CXR revealed left-sided persistent pneumothorax with ICD in situ, and the pneumothorax persisted till one-month postop (Figure 3). The lung parenchyma of the left side could not be visualized. The patient received regular chest physiotherapy, deep breathing exercises, and incentive spirometry. Pleural histopathology and other examination did not reveal active tuberculosis.

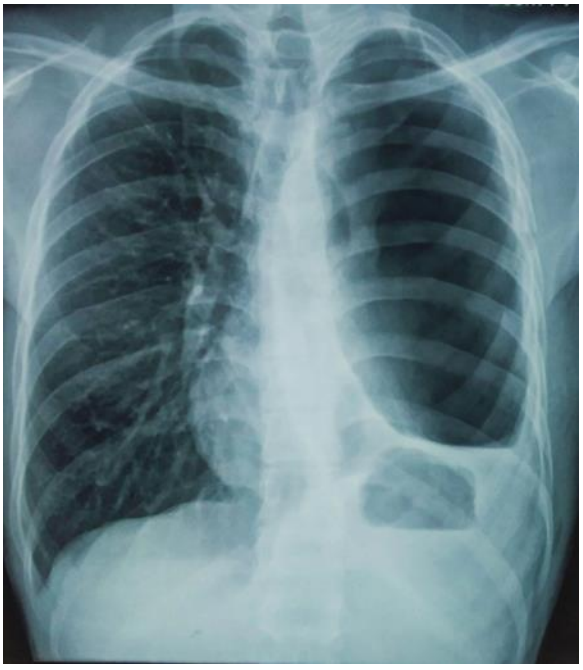

Figure 3- Postoperative one-month follow-up CXR showing unresolved pneumothorax, and no lung expansion.

Discussion

The present unique case posed surgical and anesthesia management challenges, including the preoperative optimization viewpoint. We decided to proceed with U-VATS in place of pneumonectomy through thoracotomy as the patient had endobronchial TB and empyema, which can lead to stump dehiscence. Further, his FEV1 was 40% predicted, and his BMI was 15kg/m2, regarded as a contraindication for pneumonectomy [3]. Further, radiological investigation hardly showed any lung tissue on the affected side, and the case mimicked vanishing lung syndrome (VLS). Classically VLS or giant bullous emphysema is a lung's primary bullous disease, occupying at least one-third of a hemithorax and compressing surrounding normal lung parenchyma; report of massive pneumothorax and bullous emphysema as VLS mimicker is also available in the literature [5]. While the preoperative CXR indicated massive air with minimal fluid level, which indicated tube drainage, ultrasound-guided wide-bore needle aspiration failed to aspirate the content, so the tube drainage plan was abandoned. Further, the value of preoperative chest tube insertion in VLS is debatable [6]. Furthermore, our patient was hemodynamically stable despite having the pneumothorax, and there was no sign of air leak, which constitutes the treatment principles of pneumothorax by needle or tube thoracostomy.

Lung isolation using a DLT or a bronchial blocker is indicated in conditions where one lung needs protection from contralateral contamination; DLT provides better isolation [7]. Our present case had pyo-pneumothorax on the left side as a sequel to post-primary tuberculosis. A risk resulting from possible communication between the parenchyma/alveoli and cavity is well-known. We avoided bag-mask ventilation and minimized the dual-lung ventilation to confirm the DLT position, which was also done with the adjustable-pressure limit valve set at 10-cmH2O. The absolute need for lung isolation was well-realized, and it was planned to use the time-tested technique, i.e., DLT placement. However, it could not achieve isolation due to anatomical distortion of the left-sided main bronchus and the right main bronchus' adaptation (Figure 2). The left main bronchus had become short and narrowed because of fibrosis and plastering of the destroyed left lung to the mediastinum as a pathological sequela over the last decade. As a result, the bronchial lumen could not be negotiated well into the left main bronchus.

On the other hand, the right main bronchus has grown in width, and the desired seal could not be achieved, leading to the soiling of the healthy lung with purulent content and desaturation. A postoperative chest radiograph showing the same pneumothorax even after ICD placement suggests the failure of re-expansion of the

left lung due to complete fibrosis and plastering of the lung to the mediastinum (Figure 2).

Arguably and when thought retrospectively, it appears that the sequelae could have been prevented by isolating the left lung using a bronchial blocker and electively intubating the right main bronchus using a single lumen or uninvent tube. However, this management type is not routinely planned as it is likely to block right upper lobe ventilation. Nevertheless, failure of a DLT when appropriately placed in the bronchus to isolate the lung, as in our case for the right-side placement, is hardly reported. We could not choose a larger DLT as the trachea was deviated and narrowed in the upper part (figure 2). However, the present case taught us that placement of an endotracheal tube in normal bronchus with a bronchial blocker in the diseased bronchus might be a safer alternative to DLT and can be planned as first-line in such rare cases. In addition, the distorted and conical shape of the bronchi makes bronchial blocker placement non-efficient. Possibilities of intra-operative dislocation of the blocker into the trachea can cause trouble for the operation team.

The other way to mitigate contralateral lung contamination might be to perform the surgery in the supine position. While U-VATS has been performed in the supine position for bilateral pathologies or thymectomy, we are unaware of supine U-VATS in stage-III empyema cases. Pleurectomy is challenging to perform in the supine position. As a bronchopleural fistula was not anticipated or diagnosed beforehand, we proceeded with a conventional lateral approach, but the present case hints us to think about the supine approach in cases with a high risk of contamination.

Conclusion

Post-tuberculosis long-standing pyo-pneumothorax might lead to plastered mediastinum. Gross anatomical distortion, including atrophy and adaptive growth of bronchus should be considered in such cases, and preoperative bronchoscopy and CT might be essential for disease evaluation and proper planning of lung isolation. Further, DLT might not be the best option in such a situation.

References

[1] Campos JH. Update on selective lobar blockade during pulmonary resections. CurrOpinAnaesthesiol. 2009; 22(1):18-22.

[2] VaronaPorres D, Persiva O, Pallisa E, Andreu J. Radiological findings of unilateral tuberculous lung destruction. Insights Imaging. 2017; 8(2):271-277.

[3] Yablonskii PK, Kudriashov GG, Avetisyan AO. Surgical Resection in the Treatment of Pulmonary Tuberculosis. Thorac Surg Clin. 2019; 29(1):37-46.

[4] Tseng YL, Chang JM, Liu YS, Cheng L, Chen YY, Wu MH, et al. The Role of Video-Assisted Thoracoscopic Therapeutic Resection for Medically Failed Pulmonary Tuberculosis. Medicine (Baltimore). 2016; 95(18):e3511.

[5] Lai CC, Huang SH, Wu TT, Lin SH. Vanishing lung syndrome mimicking pneumothorax. Postgrad Med J. 2013; 89(1053):427-8.

[6] Aujayeb A. Please do not put a chest drain in my chest! Vanishing lung syndrome. Afr J Emerg Med. 2020; 10(4):261-265.

[7] Lederman D, Easwar J, Feldman J, Shapiro V. Anesthetic considerations for lung resection: preoperative assessment, intraoperative challenges and postoperative analgesia. Ann Transl Med. 2019; 7(15):356.