Respiratory Medicine Case Reports 30 (2020) 101116

Contents lists available at ScienceDirect

Respiratory Medicine Case Reports

journal homepage: http://www.elsevier.com/locate/rmcr

Lung abscess and empyema following bronchoscopy: A case report and review of the literature

Cheryl Hui Ling Khoong *, Chee Kiang Phua

Department of Respiratory and Critical Care Medicine, Tan Tock Seng Hospital, Singapore, 11 Jalan Tan Tock Seng Hospital, 308433, Singapore

ARTICLE INFO

Keywords:
Empyema
Lung abscess
Transbronchial lung biopsy

ABSTRACT

Severe pulmonary infections after bronchoscopy and transbronchial lung biopsy (TBLB) are uncommon. We report a rare case of lung abscess and empyema after a routine TBLB performed for the diagnosis of lung cancer.

1. Introduction

Diagnostic bronchoscopy is commonly performed in a variety of respiratory diseases, including the evaluation of lung lesions. It is preferred over transthoracic needle aspiration because of its favourable safety profile with lower rates of pneumothorax, and in addition, it allows minimally invasive mediastinal staging in a single endoscopic session [1]. Other uncommon complications includes severe bleeding and infections [2,3]. We report a rare case of lung abscess and empyema following transbronchial lung biopsy (TBLB) during an elective bronchosopy, and review the current literature.

2. Case Details

An 88 year-old gentleman with good performance status, presented to clinic with chronic cough. A computed tomography (CT) scan of his thorax revealed a 5.3 × 4.7 × 5.7 cm left lower lobe mass with abrupt cut off at the posterior-basal segment of the left lower lobe (Fig. 1). He underwent bronchoscopy with radial endobronchial ultrasound (EBUS)-guided TBLB via a transoral route under moderate sedation with intravenous midazolam and fentanyl. A concentric heterogenous lesion with hyperechoic dots was identified on radial EBUS in the posterior-basal segment of the left lower lobe (Fig. 2). No visible endobronchial lesions or stenosis were seen. Forcep biopsies were performed under fluoroscopy to obtain 8 tissue samples. Post-procedure chest radiograph did not reveal any pneumothorax and he was discharged home. Histology of his lung mass confirmed lung adenocarcinoma with epidermal growth factor receptor (EGFR) exon-19 mutation detected.

He was admitted 6 days after his procedure, with symptoms of fever and cough that started since his bronchoscopy. Chest radiograph showed a new left lower lobe lung collapse with left pleural effusion. He was commenced on empirical intravenous antibiotics. CT scan of his thorax, abdomen and pelvis revealed an interval development of a moderate left pleural effusion with abscess formation within the lung mass (Fig. 1). In addition, a liver lesion consistent with metastatic disease was seen. Bedside ultrasound confirmed a left loculated pleural effusion, which was drained. Pleural studies showed an exudative picture based on Light's criteria with no cell count predominance, and cytology did not reveal any malignant cells. Pleural fluid cultures grew *Streptococcus anginosus*. Peripheral blood cultures were negative for any bacterial growth. A dental review showed no signs of abscess or dental infections. Our patient subsequently opted for prolonged antibiotic therapy and pleural drainage, and declined intrapleural fibrinolysis or surgical decortication in view of his advanced age. He made a full recovery following a 6 week course of Augmentin. Erlotinib was commenced prior to discharge for stage 4 lung adenocarcinoma.

3. Discussion

Post-bronchoscopy fever is common in up to 68% of cases, with higher occurrences following bronchoalveolar lavage [4]. Infectious complications following bronchoscopy are far less common. In a retrospective study, Souma et al. reported infectious complications in 4.5% of cases following TBLB, of which, the majority were mild [3]. Severe infectious complications such as empyema and lung abscess following bronchoscopy are rare, and risk factors identified include: cavitation, intratumoral low density areas, age and abnormal bronchoscopic findings (e.g. visible tumour, bronchial stenosis, mucosal irregularity) [3,5].

* Corresponding author.
E-mail address: cheryl.khoong@mohh.com.sg (C.H.L. Khoong).

https://doi.org/10.1016/j.rmcr.2020.101116
Received 24 May 2020; Accepted 4 June 2020
Available online 5 June 2020

There have been a few hypotheses of mechanisms contributing to infectious complications post-bronchoscopy. Intubation of the vocal cords with a bronchoscope via the transoral route may transport bacteria from the oropharynx into the lower airways, as well as increase the risk of broncho-aspiration by preventing adduction of the vocal cords [4]. The contamination of the biopsy instrument as it passes through the working channel of a bronchoscope may also act a vector for microbes. Following convex EBUS-transbronchial needle aspiration (TBNA) of mediastinal lymph nodes, a higher incidence of mediastinal abscess and pericarditis was observed when avascular necrotic lymph nodes were biopsied [6,7]. It has also been thought that a breach in the pleural surface during TBLB could provide a conduit for microorganisms to enter the pleural space, predisposing to empyema [8]. Mechanical injury and inflammation to the tumour may be dependent on the number of biopsies taken, hence limiting the number of attempts once sufficient samples have been taken can be considered [3]. Spontaneous rupture of the primary lung tumor leading to empyema has also been previously described [9], but this was unlikely the cause in our case.

Ishida et al. have reported that TBLB of lung lesions >30 mm with heterogenous CT enhancement were predictive of the development of lung abscess following bronchoscopy and suggested that more robust antibiotic prophylaxis should be administered to these patients undergoing TBLB [8]. A randomised controlled trial demonstrated significant benefit of azithromycin compared to placebo following bronchoscopy when abnormal bronchoscopic findings were present, with no cases of complications of empyema or lung abscess in the azithromycin group. However, these benefits were not demonstrated in several other studies [5]. Further studies are required to identify patient subgroups who might benefit from closer surveillance and prevention. Current guidelines do not recommend routine prophylactic antibiotics for bronchoscopy and TBLB [10] due to the lack of supporting evidence.

We reviewed the literature and characteristics of patients that developed lung abscess and empyema following bronchoscopy (Table 2). Majority of cases involved lung masses that were >30 mm. Patients who underwent TBLB were more commonly associated with lung abscess or empyema complications, followed by bronchial brushings and TBNA. Fever was the most common presenting symptom, followed by cough. Interval duration from bronchoscopy to symptom onset was variable but most patients developed symptoms within the first 2 weeks. Notably, the microbes cultured in these previous cases were not necessarily oropharyngeal commensals, suggesting that multiple contributing factors may be involved.

Streptococcus anginosus is part of the normal flora of the oropharynx. It is possible that, in our case, the bronchoscope might have been a vehicle that transported the oropharyngeal microbes to the patient's lower airways, predisposing him to the development of abscess and empyema. Other predisposing factors for him include lung lesion size (>30mm) and advanced age. We did not identify any imaging evidence on CT or radial EBUS suggestive of necrosis in the lung mass or any visible airway stenosis which might have led to obstructive inflammation following biopsy. Following clinical improvement of his infection, he was commenced on tyrosine kinase inhibitors for his lung adenocarcinoma. We foresee that his oncological treatment would have been significantly delayed if there were no actionable driver mutations, since conventional chemotherapy is contraindicated in the setting of sepsis.

Fig. 2. Radial EBUS image of left lower lobe lung mass.

4. Conclusion

Bronchoscopy is a safe diagnostic modality with low complication rates. However, empyema and lung abscess are rare life threatening complications which may lead to significant delays in commencement of oncological treatment, and potentially worse long-term outcomes. Hence, early identification of patients at risk will facilitate appropriate counselling and careful follow-up post procedure, with prophylactic antibiotics being reserved for those at highest risk for severe infectious complications post bronchoscopy.

Declaration of competing interest

The authors declare that they do not have any conflicts of interest.

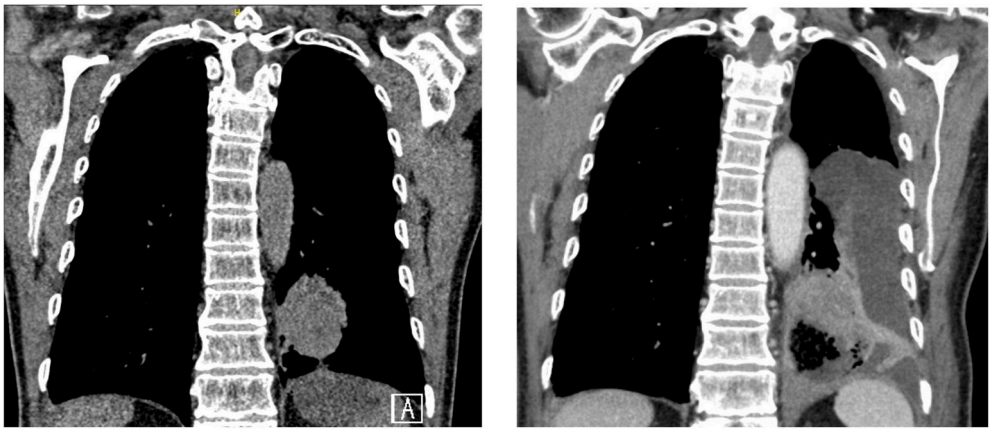

Fig. 1. Coronal CT images of the left lower lobe lung mass pre-bronchoscopy (left), and post-bronchoscopy (right) showing development of lung abscess and empyema.

Table 2
Previously reported cases of lung abscesses +/- empyema following flexible bronchoscopy.

	Year	Authors	Age/ Gender	Procedure	Size of target lesion on CT	Histology	Symptoms; Duration of symptom onset post-procedure	Bacteria Culture	Location of abscess
Lung abscess									
1	1981	Hsu, Barrett [11]	42/M	TBLB and bronchial brushing	50mm	SCC	Fever, cough, bloody sputum; 7 days	Abscess- Peptococcus species	Adjacent to tumour
2	1999	Ikeda et al. [12]	68/M	TBLB	25mm*	SCC	Fever; 3 days	Abscess- Klebsiella pneumoniae	Adjacent to tumour
3	2004	Kuze et al. [13]	74/M	TBLB and bronchial brushing	35mm	AdenoCa	Fever; 18 days	Abscess- Streptococcus intermedius	Within tumour
4	2015	Ishida et al. [8]	81/M	TBLB and bronchial brushing	32mm	SCC	Fever; 16 days	no growth	–
5			65/M	TBLB and bronchial brushing	35mm	SCC	Fever; 8 days	no growth	–
Empyema									
1	1995	Koike T et al. [14]	53/M	Broncho-scopy	–	–	Fever; 2 days	–	NA
2	1999	Harada et al. [9]	74/M	TBLB	–	SCC	Chest pain and fever; 26 days	Pleural fluid-alpha-Streptococcus and Prevotella ruminicola	NA
3	2005	Balamugesh et al. [15]	35/M	TBLB	–	Non-specific chronic inflammation	Fever; 1 day	BAL- Streptococcus pneumonia and Hemophilus influenza.	NA
4	2012	Basavaraj A et al. [16]	62/F	TBLB and TBNA	–	Non-necrotising granulomatous inflammation	Fever, shortness of breath, chest pain; 2 days	Pleural fluid-Streptococcus Pneumoniae	NA
Lung abscess and empyema									
1	2015	Ishida et al. [8]	56/F	TBLB and bronchial brushing	32mm	SCC	Fever; 8 days	no growth	–
2	***2020***	***This study***	***88/M***	***TBLB***	**53mm**	***AdenoCa***	***Fever and cough; 1 day***	***Pleural fluid-Streptococcus anginosus***	***Within the tumour***

*- measured histologically.
AdenoCa - adenocarcinoma; SCC - squamous cell carcinoma.
TBLB - Transbronchial lung biopsy.
TBNA - Transbronchial needle aspiration.
BAL - bronchoalveolar lavage.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.rmcr.2020.101116.

References

[1] J.S. Wang Memoli, P.J. Nietert, G.A. Silvestri, Meta-analysis of guided bronchoscopy for the evaluation of the pulmonary nodule, Chest 142 (2) (2012) 385–393, https://doi.org/10.1378/chest.11-1764.

[2] D.E. Ost, A. Ernst, X. Lei, et al., Diagnostic yield and complications of bronchoscopy for peripheral lung lesions. Results of the AQuIRE registry, Am. J. Respir. Crit. Care Med. 193 (1) (2016) 68–77, https://doi.org/10.1164/rccm.201507-1332OC.

[3] T. Souma, T. Minezawa, H. Yatsuya, et al., Risk factors of infectious complications after endobronchial ultrasound-guided transbronchial biopsy [published online ahead of print, 2020 mar 4], Chest S0012–3692 (20) (2020) 30346–30349, https://doi.org/10.1016/j.chest.2020.02.025.

[4] P. Rubinstein-Aguñín, Infectious complications following bronchoscopy: does sedation play a role? J Lung Pulm Respir Res 5 (4) (2018) 112–118, https://doi.org/10.15406/jlprr.2018.05.00174.

[5] H. Kanazawa, Efficacy of azithromycin administration in prevention of respiratory tract infection after bronchoscopic biopsy: a randomized, controlled trial, Respirology 12 (1) (2007) 70–75, https://doi.org/10.1111/j.1440-1843.2006.00973.x.

[6] S.K. Epstein, C.J. Winslow, S.M. Brecher, L.J. Faling, Polymicrobial bacterial pericarditis after transbronchial needle aspiration. Case report with an investigation on the risk of bacterial contamination during fiberoptic bronchoscopy, Am. Rev. Respir. Dis. 146 (2) (1992) 523–525, https://doi.org/10.1164/ajrccm/146.2.523.

[7] C.T. Huang, C.Y. Chen, C.C. Ho, C.J. Yu, A rare constellation of empyema, lung abscess, and mediastinal abscess as a complication of endobronchial ultrasound-guided transbronchial needle aspiration, Eur. J. Cardio. Thorac. Surg. 40 (1) (2011) 264–265, https://doi.org/10.1016/j.ejcts.2010.11.037.

[8] M. Ishida, T. Shimazaki, M. Suzuki, K. Ariyoshi, K. Morimoto, Case series of lung abscesses following flexible bronchoscopy, Respir Investig 53 (3) (2015) 129–132, https://doi.org/10.1016/j.resinv.2015.01.004.

[9] M. Harada, J. Yoshida, T. Yokose, Y. Nishiwaki, K. Nagai, Surgical management of primary lung cancer in an elderly patient with preoperative empyema, Jpn. J. Clin. Oncol. 29 (11) (1999) 571–575, https://doi.org/10.1093/jjco/29.11.571.

[10] I.A. Du Rand, J. Blaikley, R. Booton, et al., British Thoracic Society guideline for diagnostic flexible bronchoscopy in adults: accredited by NICE, Thorax 68 (Suppl 1) (2013), https://doi.org/10.1136/thoraxjnl-2013-203618 i1-i44.

[11] J.T. Hsu, C.R. Barrett Jr., Lung abscess complicating transbronchial biopsy of a mass lesion, Chest 80 (2) (1981) 230–232, https://doi.org/10.1378/chest.80.2.230.

[12] Y. Ikeda, M. Tamara, H. Umezu, et al., A case of squamous cell lung cancer complicated by lung abscess after transbronchial biopsy, Japan Society for Bronchology 21 (1) (1999) 38–43, https://doi.org/10.18907/jjsre.21.1_38.

[13] N. Kuze, H. Yuda, O. Taguchi, A case of pulmonary adenocarcinoma with formation of an abscess in a tumour caused by Streptococcus intermedius 20 days after bronchoscopy, J Jpn Soc Bronchol 26 (4) (2004) 367–371, https://doi.org/10.18907/jjsre.26.4_367.

[14] T. Koike, T. Takizawa, H. Akamatsu, K. Yuuzou, A. Yokoyama, T. Honma, Resection of Lung Cancer complicated by pleural empyema, Jpn. J. Thorac. Dis. 33 (1995) 670–673.

[15] T. Balamugesh, C.D. Jesudas, R. Thomas, R. Gupta, Empyema— a rare complication of trans bronchial lung biopsy, Respir. Med. Extra 1 (2005) 97–99, https://doi.org/10.1016/j.rmedx.2005.06.004.

[16] A. Basavaraj, J. Gomez-Marquez, D. Steiger, E. Dweck, Streptococcus pneumonia bacteraemia following flexible bronchoscopy, Am. J. Respir. Crit. Care Med. 185 (2012), https://doi.org/10.1164/ajrccm-conference.2012.185.1_MeetingAbstracts.A2974. A2974.