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CASE REPORT

POSTPNEUMONECTOMY EMPYEMA FOLLOWING SARS-COV-2 INFECTION IN A PATIENT WITH METASTATIC LUNG CANCER

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Abstract. *We present a case of a male patient who underwent right-sided pneumonectomy due to central low-grade squamous cell carcinoma of the right lung, chemo-, radio-, and immunotherapy. However, the disease progressed. In addition the patient got SARS-CoV-2 pneumonia in the left lung, followed by postpneumonectomy empyema. Right-sided uniportal video-assisted thoracoscopy, debridement, and definitive drainage of the pleural cavity were performed.*

Key words: *postpneumonectomy empyema, SARS CoV-2 pneumonia, lung cancer, chemotherapy, radiotherapy, immunotherapy*

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One of the life-threatening complications after pneumonectomy is the development of post-pneumonectomy empyema (PPE).

CASE PRESENTATION

A 62-year male patient was re-admitted to the Thoracic Surgery department with complaints of right chest pain, shortness of breath, cough, fatigue, and fever up to 38.5 degrees, lasting for 2 months. Right pneumonectomy had been performed two years previously due to central low-differentiated non-keratinizing squamous cell carcinoma, staged as $T_2N_2M_0$, IIIA. Ten sessions of radiotherapy (RT), 8 sessions of immunotherapy (IT), and 1 of chemotherapy (CT) were applied. Despite the multimodal approach, the disease had been progressing. The patient had been admitted to the Intensive Care Unit 45 days earlier due to SARS-CoV-2 positive left-sided pneumonia and acute respiratory failure. Thoracocentesis had been performed and 800 ml of pus evacuated. The medical history included five vascular reconstructions of the left lower extremity due to chronic arterial insufficiency and thrombosis, together with arterial hypertension, insulin-dependent diabetes mellitus, and chronic obstructive pulmonary disease. He was an alcohol abuser and ex-smoker.

Lab tests showed anemia (hemoglobin 96 g/l, hematocrit 0.281, erythrocytes 3.59 $x10^{12}$) and leukocytosis (12.04 $x10^9$). Other notable abnormalities were ESR 140 mm/h; INR 9.76; serum glucose 7.5 mmol/l; total protein 64.6 g/l; albumin 28 g/l. Arterial blood-gas analysis showed mild hypoxemia with marked hypocapnia (pCO_2 25.6 mm Hg; pO_2 72.2 mm Hg; $SatO_2$ 96.1%).

The plain chest x-ray showed massive right-sided hydrothorax. The observed air-fluid level was due to the previous thoracentesis (Fig. 1).



Fig. 1. Chest x-ray showing a high air-fluid level and displacement of the mediastinum to the right side

Positron emission tomography/computed tomography (PET/CT) had been performed three months before the development of PPE and showed right pneumonectomy with a right mediastinal displacement. New emerging small-nodular, partly confluent peribronchial thickening loci with increased metabolic activity, SUV max 1.96, score 2, with suspected inflammatory genesis were visualized dorsally in the left lung. Increased activity with ground-glass opacities was also observed in the subpleural space of the left lung at the level of the 3rd right rib. Compared to the previous exam (3 months earlier), an increased volume and metabolic activity of previously described metastatic lymph nodes (paratracheal, paraesophageal, right parasternal, retrocrural) were noted. Soft tissue formations in the right hemithorax with visible involvement of the adjacent 7th right rib and subcutaneous infiltration as well as local swelling of the chest wall, and new active foci on the right at the level of an intestinal loop (retrocrurally and subhepatically) were also detected (Fig. 2).

Computed tomography (CT) one week before admission to the Thoracic Surgery department showed air-fluid level in the right hemithorax and small subpleural infiltrates, as seen in SARS-CoV-2 infection (Fig. 3).

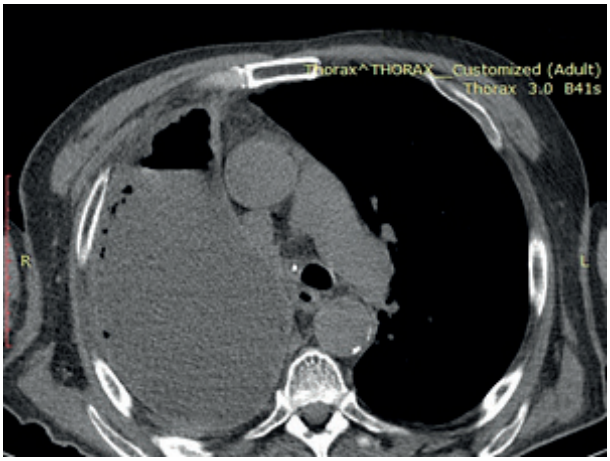


Fig. 3. CT scan one week before admission to the Thoracic Surgery department

Bronchoscopy showed tumor infiltration in the area of the right paratracheal lymph nodes including 2 cartilaginous rings. The postoperative bronchial scar showed no endoscopic signs of a fistula. Transbronchial fine-needle aspiration biopsy and endobronchial biopsies revealed the presence of low-differentiated non-keratinizing squamous cell carcinoma.

Under epidural anesthesia, a right-sided uniportal video-assisted thoracoscopy (VATS) was performed with evacuation of 2600 ml purulent pleural fluid. The parietal pleura was covered with fibrin deposits and four nodular highly vascularized lesions were noted (Fig. 4). Lavage was performed several times with diluted Braunol solution, followed by debridement, and a pleural catheter was inserted. Biopsy from nodules was not performed, because the relapse of the disease had been confirmed by the bronchoscopy two days ago.

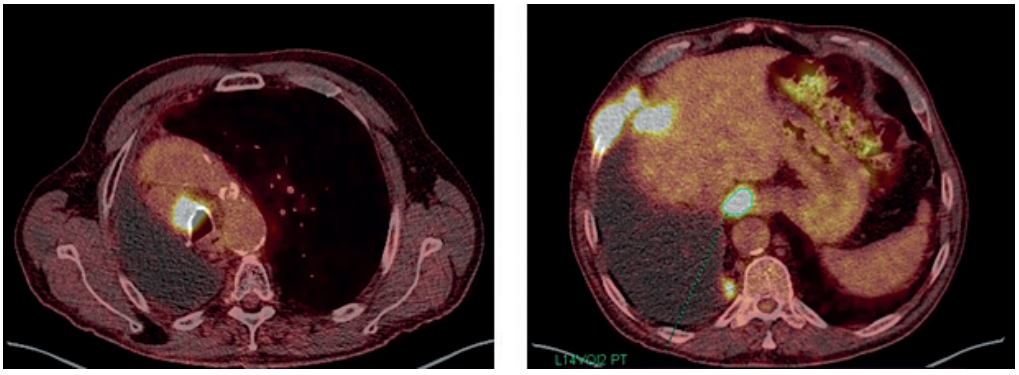


Fig. 2. PET/CT showing multiple lesions

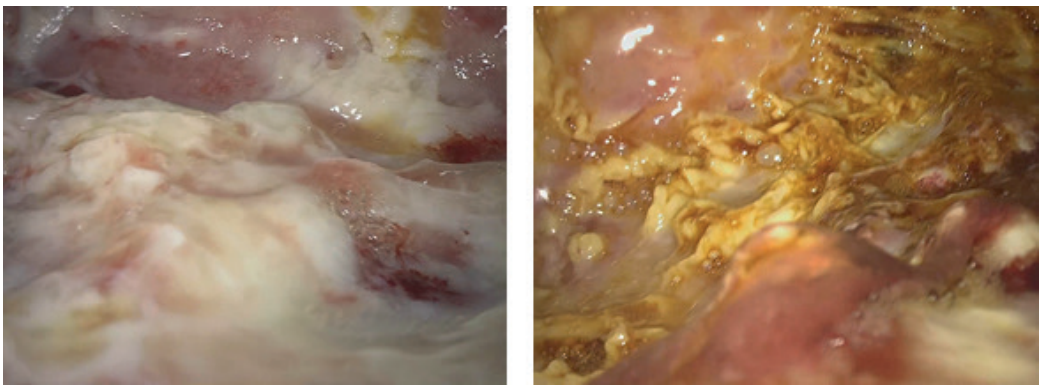


Fig. 4. Intraoperative view of fibrinopurulent pleural deposits and nodular well-vascularized lesions

Pleural effusion showed disintegrating segmental neutrophils as seen in empyema. The microbiological result reported presence of Enterococcus faecium.

The chest x-ray image following surgery demonstrated a fluid-free pleural cavity (Fig. 5). The postoperative period was uneventful. The patient was discharged on the 8th postoperative day with permanent chest tube drainage and was further referred for immunotherapy.



Fig. 5. Chest x-ray after surgery, showing a fluid-free right hemithorax

DISCUSSION

We present a case of right-sided PPE following right pneumonectomy due to squamous cell carcinoma in the context of COVID-19 infection. Uniportal VATS was performed with lavage, debridement and a permanent pleural drainage was inserted.

By definition, empyema implies infection of the pleural space, usually by bacteria and/or fungi and its incidence after pneumonectomy varies between 2 and 12%. The majority of these patients also present with a bronchopleural fistula [1].

The cause of late-onset PPE in the majority of cases is the hematogenous spread of bacteria or bronchial/esophageal fistula, especially in recurrent carcinoma [2]. In the presented case PPE developed two years following surgery most probably due to the hematogenous spread of SARS-CoV-2 infection and Enterococcus faecium superinfection. Coronavirus infection is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which is known to cause severe respiratory dysfunction and leading rarely to formation of a bronchopleural fistula [3]. Our case with SARS-CoV-2 during hospitalization for a pneumonectomy, was further complicated by empyema and a bronchopleural fistula. The patient died 14 days later due to pulmonary embolism [4].

The diagnosis of late-onset PPE is difficult as clinical symptoms (fever, anorexia, weight loss, chest pain) are nonspecific, and particularly in a patient with a lung cancer history, they may be misinterpreted as a recurrence [5].

The management of PPE ranges from minimally invasive surgical techniques such as VATS debridement, fenestration, to extensive open procedures involving myoplastic techniques and thoracoplasty [6]. In the absence of a bronchopleural fistula, aggressive surgery is a questionable option because of the related high morbidity and common recurrences. In the presented case we decided to perform uniportal thoracoscopic surgical debridement, lavage, and persistent tube drainage. More aggressive surgery such as open-window thoracostomy should be avoided due to the impaired overall status, advanced oncological disease, poor prognosis, and high expected mortality. The mortality from PPE ranges from 23% to 50% and the mortality from the surgical intervention itself was expected to be 10% [7].

CONCLUSION

Hematogeneous spread of a bacterial infection creates a high risk for developing empyema in patients with pneumonectomy regardless of the interval from initial surgery. Management should be as sparing as possible in such patients, because of poor prognosis and short life expectancy.

Disclosure Summary: *The authors have nothing to disclose.*

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