# LigaSure meets endobronchial valve in a case of lung cancer with pneumoconiosis

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**Abstract:** Resection of lung cancer associated with pneumoconiosis may be difficult since fibrosis limits the exposure of hilum, and the use of stapler; yet, surgery may be complicated by persistent air leaks due to the underlying disease. In this setting, LigaSure was used to perform the tumor resection, and the postoperative treatment of air leaks in the same patient was treated with placement of endobronchial valves.

Key Words: LigaSure; endobronchial valve; pneumoconiosis; lung; cancer



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#### Introduction

Surgical treatment of lung cancer complicated with pneumoconiosis may be difficult, and prone to several complications as prolonged air leaks (1). Herein, we report the use of LigaSure<sup>™</sup> technology (LigaSure<sup>™</sup>, Valleylab/Covidien) to perform a wedge resection in a case of lung cancer associated with pneumoconiosis, and the postoperative treatment of persistent air leaks in the same patient by means of the Endobronchial valves (EBV) (Pulmox, Redwood City, CA)

#### **Clinical case**

A 61 year-old man was referred to our hospital for treatment of squamous cell carcinoma of the upper right lobe (URL) (T1N0M0-*Figure 1A*). The patient was affected by pneumoconiosis due to silicosis work-exposure. Laboratory and cardio-respiratory results were normal. A standard thoracotomy was performed. Despite the selective intubation, the right lung remained inflated; the fissures were fused with impossibility of upper lobectomy. Thus, we started a wedge resection using mechanical stapler. Surprisingly, the lung was so swollen to not allow the closure of the parenchyma into the stapling arms. Finally, the tumor resection was attended using LigaSure which allowed sealing and cutting lung tissue. A continuous over and over suture of absorbable material completed the closure which was then reinforced with fibrin glue. Despite all, the post-operative course was complicated by air leak; we applied continuous negative pressure -20 cm to the chest tube without success. A chest CT scan performed on postoperative day 27, showed the presence of air space within URL indicating alveolar leakage. The patient was reviewed for endoscopic treatment. The procedure was performed using flexible bronchoscopy under conscious sedation. The airway leading to the air leak was identified using intermittent balloon occlusion. A Fogarty catheter was advanced and inflated into the segmental and subsegmental airways of upper right lobe suspected of supplying the alveolar leakage. The air leak rate was then assessed qualitatively for reduction through the chest tube. The cessation of air leaks was obtained after complete occlusion of upper lobar bronchus (Figure 1B,C). Thus, three Zephyr valves were sequentially placed in the apical, posterior and anterior segmental bronchi of upper lobe, respectively, according to the technique reported elsewhere (2). The improvement was dramatic with permanent cessation of air-leaks 3 days later. The drainage tube was removed and the patient discharged. The length hospital stay was of 41 days. Histological findings confirmed the tumor to be

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**Figure 1** Chest CT scan showed a cancer (size <2 cm) within upper right lobe (white arrow) sorrounding by parenchyma affected by pneumoconiosis (Part A). Complete occlusion of upper lobar bronchus using a Fogarty catheter (Part B), and the view of segmental airways through yellow ballon of catheter (Part C)

a squamous cell carcinoma with presence of fibrosis in the surrounding tissue (T1N0M0). Adjuvant chemotherapy was started. A chest CT scan performed two months later showed the persistence of air space (*Figure 2*). The valves were removed 3 months later without further complications. After 6 months, patient is alive without recurrence.

#### Discussion

Pneumoconiosis has never been proven as cause of lung cancer. However, the possibility of causality in lung cancer complicated by pneumoconiosis has been gaining support (1).

If clinically indicated, resection cannot be excluded. The coexistence of pneumoconiosis does not adversely affect postoperative survival of lung cancer but surgery may be complicated with prolonged air leaks (3).

The first interesting point of the present case was how to achieve the cancer resection considering that lung fibrosis



**Figure 2** Chest CT scan performed at two months after valve implantation, showed the complete expansion of lung parenchima, but the persistence of air space. It is well evident the presence of endobronchial valve within segmental bronchi of right upper lobe (white arrow). Insert. endoscopic view of valves

prevented the collapse of the lung with impossibility of the exposing hilum or using stapler.

LigaSure is a bipolar vessels system applied with success in particular setting of thoracic surgery (4). In the present case such device allowed to seal and cut fibrotic parenchyma. The visceral pleura was opened and a dissection of anterior plane to tumor was applied. Then, the posterior plane was dissected in order to remove the tumor with margin of healthy parenchyma.

The second interesting point was how to treat the persistent air leaks after resection.

The drainage under continuous aspiration -20 cm of water failed probably for the poor ability of fibrotic lung to close fistula. Also, surgical repair was judged to be associated with high risk of failure due to the underlying lung disease. Thus, alternative therapies were reviewed. Treatment with sclerosing agents was rejected for its little efficacy and variable patient tolerance. In the light of our previous experience (5), we decided for EBV treatment; EBV is a device initially developed for the treatment of emphysema, and recently applied for the treatment of prolonged air leaks (2). EBVs blocked the offending bronchus with resolution of air leak. The CT scan performed two months later showed the persistence of air space. The absence of atelectasis, expected according the valve working, may be due to lack of elastic recoil of fibrotic parenchyma. Despite all, EBV favour the closure of alveolar fistula and no air leak occurred after their removal.

In closure, in patients with lung cancer complicated

by pnemoconiosis, Ligasure may be an useful adjunct to standard armamentarium of thoracic surgeon to attend resection. If persistent air leak complicated post operative course, EBV may be considered as first treatment. In our case, the duration of air leak prior to valve treatment was 37 days, while it resolved 3 days after valve implantation. Thus, the overall cost of the procedure (approximately 3.500 Euro per valve in Europe) also favours such treatment because it reduces the hospital stay with saving cost/benefit ratio.

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