

## Endoscopic Cryosurgical Resection of Pulmonary Hamartoma with Flexible Bronchoscopy

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Pulmonary hamartoma is one of the most common benign lung tumors. Well-known conventional methods of treatment for lung hamartomas include VATS enucleation or wedge resection, bronchoplasty, and others. Here we present a case of endobronchial hamartoma that was successfully treated with cryosurgery by flexible bronchoscopy.

Key words: 1. Bronchoscopy  
2. Hamartoma  
3. Cryosurgery

### CASE REPORT

A 42-year-old male patient was admitted to the hospital complaining of chest pain and progressive shortness of breath. He was an active smoker (1 pack per day for 15 years) without any other notable disease history. Physical examination revealed bilateral smooth breathing sounds with no other abnormal findings. Chest X-ray revealed left upper lobe atelectasis; this was followed up with chest CT, which revealed an endobronchial mass (Fig. 1).

On flexible bronchoscopy, an endobronchial mass with a smooth shining surface was observed nearly totally obstructing the left upper lobal bronchus. A biopsy specimen was taken and the patient was diagnosed with chondroid hamartoma. Endoscopic resection of the benign endobronchial mass was planned.

General anesthesia was induced with a No. 8 single lumen endotracheal intubation tube. A flexible bronchoscope was inserted into the intubation tube while the patient was ventilated using a T-connect device. The mass was found to be

totally obstructing the bronchus. It was a sessile polypoid mass with a wide base located on the posterior wall of the bronchus (Fig. 2).

The patient underwent cryosurgery using a flexible cryoprobe (Erbokryo; ERBE, Medizintechnik GmbH, Tubingen, Germany). Repetitive 2 minute cycles of freezing and thawing were performed, after which the tumor was removed by traction as it was attached to the tip of the cryoprobe. The tumor was removed in two pieces and hemostasis of the tumor bed was achieved by a single freezing cycle.

The tumor grossly consisted of 2 pieces of soft tissue that measured 0.9×0.7 cm, and 0.9×0.5 cm, respectively (Fig. 3). The histologic diagnosis was a chondroid hamartoma that consisted of fibrous connective tissue and portions of cartilage.

On the first postoperative day, the patient expectorated small amounts of blood-tinged sputum, which stopped the following day. No other complications were noted and the patient was discharged five days after the procedure. At 6 months follow up, a bronchoscopic examination showed no

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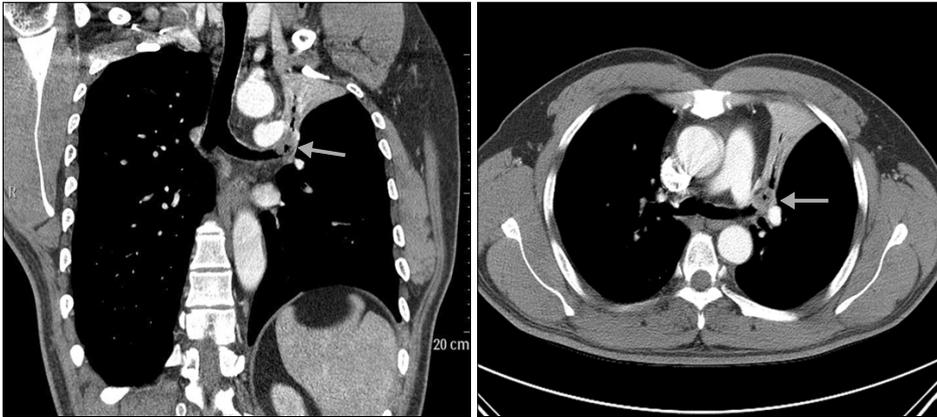


Fig. 1. The chest X-ray and chest CT show an endobronchial mass in the left upper lobar bronchus.

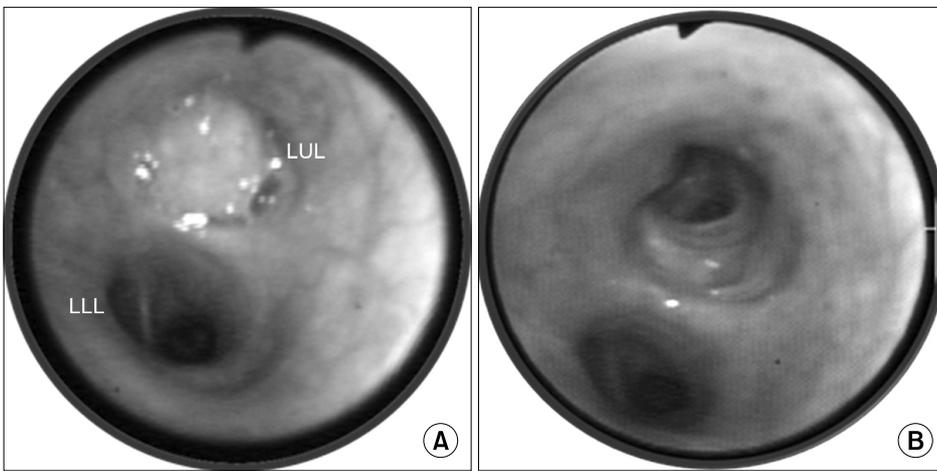


Fig. 2. Bronchoscopic findings of the endobronchial tumor. (A) Preoperative bronchoscopic view, (B) Postoperative bronchoscopic view.

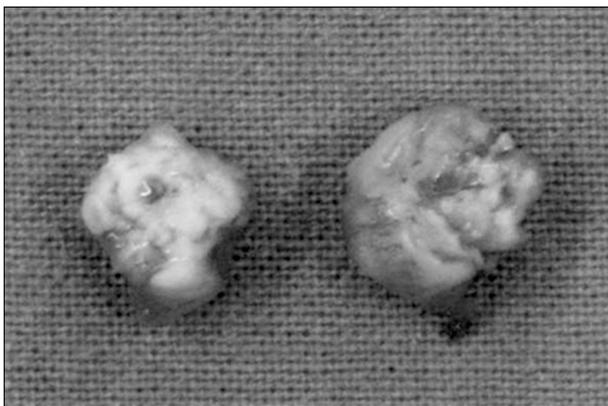


Fig. 3. The resected endobronchial tumor.

remnant of the mass lesion and no tumor recurrence (Fig. 2).

## DISCUSSION

Hamartomas are the most common benign tumors arising

in the lungs, but the reported incidence of endobronchial lesions has varied from 1.6 to 20% [1,2]. According to a review of 113 patients by Tajima et al. [3], endobronchial hamartomas arise mainly in the seventh decade of life with a male predisposition (M:F=4:1). Symptoms vary according to the tumor location. Atelectasis and pneumonia are most common, but hemoptysis, cough, chest pain, and wheezing may also be present.

Cosios et al. report that surgical treatment is necessary because respiratory symptoms are present in over 80% of the patients [1]. The conventional treatment methods consist of thoracotomy followed by bronchotomy or lobectomy to remove the offending mass. However, there have been reports of less invasive endoscopic treatment modalities such as Nd-Yag laser and electrocautery. Compared to rigid bronchoscopy, flexible bronchoscopy can be performed under local anesthesia and also allows for interventions in the more distal

parts of the bronchial tree. It also provides magnified images of the bronchus, enabling fine and delicate manipulation. However, inserting and removing the device is time consuming and in cases of hemorrhage, it can be difficult to maintain a clear field of vision. Therefore, as in our case, in which there was a sizeable tumor requiring several cycles of manipulation, a procedure through an intubation can be safe and comfortable for the patient.

In our experience, bronchoscopic resection of an endobronchial hamartoma with cryoablation is a safe and effective therapeutic option for selected patients.

There are no known appropriate size criteria or limitations based on location for cryotherapy, but we believe the size is not important. Repetitive freezing and thawing gradually breaks the tumor into pieces. We could perform the procedure even if the tumor were located in the trachea or main bronchus [4]. We have already carried out several cryosurgeries of the trachea, both main bronchi, and the second division. Wherever the cryoprobe can be introduced, cryosurgery can be performed. The limiting factor is not the location of the tumor.

Nevertheless, patients for cryosurgery should be chosen carefully. Indications for endobronchial cryotherapy were based on the following findings:

- high-grade stenosis in the area of the central respiratory tract from exophytic tumors with clinical symptoms (dyspnea or post-obstructive pneumonia)
- able to tolerate bronchoscopy under local anesthesia or general anesthesia

On the other hand, cryotherapy should be avoided when the CT scan has shown tumor involvement of large vessels in the interventional area.

Endobronchial cryoablation can be performed by using both rigid and flexible bronchoscopy. It is mainly used for recanalization of a tumor that is obstructing the airways and there are many reports of successful intervention [5]. As compared to heat based interventions, cryotherapy may be a safer endobronchial treatment modality. Because cartilage has low water content, cryotherapy results in less cartilage necrosis compared to heat therapy. Vasoconstriction and microthrombus formation brought on by tissue freezing aids in hemostasis. When the tumor is frozen, an iceball is formed that is bound-

ed by an interface between the vessel rich tumor and the bronchial cartilage, which has low water content. When the frozen tumor is pulled by traction, it is divided along this transitional zone and the normal bronchial cartilage is spared from the injury. Cryotherapy has an advantage over laser therapy in that larger amounts of tissue can be removed. Laser therapy is a useful method of endobronchial intervention. However, hemorrhage, perforation, and other serious complications have been reported even for experienced operators [6], and the smoke caused by the ablation process may cause serious problems with visualization. Cryoablation has the advantage of sparing deep tissues from injury. The visual field is easily maintained via automatic hemostasis by tissue freezing and no smoke is produced.

The most serious complication we consider during procedure is the injury of the bronchial wall. Cold causes vasoconstriction and capillary microthrombosis in the border area between frozen and non-frozen tissue. This could be prevented by identifying the border between the normal bronchial wall and the rest of the tumor under the bronchoscopy. Most importantly for avoiding this complication is that the cryoprobe tip should not be placed on the bronchial wall or membranous portion of the trachea directly. The cryoprobe could create a small point of frostbite on bronchial wall, although it would be unlikely to produce a disastrous perforation. Visual control of the ice ball under bronchoscopy is possible while the tissue is being frozen, and this allows for a relatively reliable assessment of the depth of action. Accidental freezing of larger rings of cartilage is recognizable because the probe cannot be removed from the bronchus, even if it is very strongly pulled. The probe can then readily be released from the bronchial cartilage at the end of the freezing process. The water content of cartilage tissue is low, and this is probably the reason that cold, unlike thermal energy, causes little cartilage necrosis. Blood-tinged sputum or hemoptysis are the usual symptoms of which patients complain. of the potential for bleeding or aspiration pneumonia should be kept in mind.

We believe that bronchoscopic resection of polypoid endobronchial tumors such as endobronchial hamartomas by cryoablation is a safe and effective therapeutic option for select patients.

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