An Unusual Cause of Breathlessness After Lobectomy for Lung Cancer

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Localized bronchomalacia as a cause of breathlessness after lobectomy is an unusual complication. This condition was diagnosed with bronchoscopy and delineated by spiral computed tomographic scan. Stenting the lesion resulted in a successful outcome.

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Several articles have documented lung collapse [1], pneumonia [2], and pulmonary embolism [3] as well-known causes of breathlessness after lobectomy. However, secondary bronchomalacia as a cause of breathlessness after lobectomy has not been previously reported. Bronchomalacia after pneumonectomy and lung transplantation has been described in the literature [4, 5], and the proposed causes have been chronic compression and ischemia. We report the presentation and subsequent management of a patient with localized bronchomalacia after a lobectomy.

A 73-year-old man with known chronic obstructive pulmonary disease underwent right upper lobectomy for a T1N0M0 squamous cell carcinoma of the lung followed by adjuvant radiotherapy (5 Gy in divided doses) for positive resection margin. No routine mediastinal node dissection was done during surgery. One year later he presented with deterioration of his exercise tolerance due to shortness of breath. Immediately after surgery he was able to walk 200 yards, which then deteriorated to 20 yards during a 12-month period. He had no other symptoms, and clinically he had no stridor. The breathlessness was not improved with oral steroids or inhalers.

On clinical examination there was no evidence of recurrence or metastases. Chest auscultation revealed good bilateral air entry. Chest roentgenogram showed findings consistent with right upper lobectomy. Spirometry showed forced expiratory volume in 1 second of 1.21 L (41% predicted) and forced vital capacity of 2.43 (63% predicted). Flow volume loop was consistent with chronic obstructive pulmonary disease. A fiberoptic bronchoscopy was performed while the patient was awake. There was no evidence of endobronchial lesion; however the right main bronchus was found to be completely collapsed on expiration (Fig 1). The fiberoptic bronchoscope was easily passed through the collapsed area and revealed patent distal airways. To rule out extrinsic compression, a spiral computed tomographic scan with three-dimensional reconstruction was performed. This showed a localized area of narrowing in the right main bronchus, 4 cm distal to the carina and proximal to the middle lobe take-off (Fig 2). There was no evidence of extrinsic compression. It was concluded that the surgical resection and radiotherapy altered the bronchial architecture locally leading to bronchomalacia of that segment causing dynamic airway obstruction leading to shortness of breath.

A decision was made to stent the area causing airway obstruction. A 4-cm Ultra flex noncovered stent (Microvasive, Boston Scientific Ireland Ltd, Galway, Ireland) was deployed to the collapsed segment under general anesthesia with fluoroscopic control. Immediate fiberoptic bronchoscopy confirmed the correct position of the stent with a patent airway (Fig 3). However, the proximal ends of the stent were not fully open and flush to the bronchial wall. An ARNDT endobronchial blocker balloon (COOK, William Cook Europe, Bjaeverskov, Denmark) was used to expand the proximal end of the stent for good results. The patient also showed marked clinical improvement after the procedure and was discharged the following day. Follow-up bronchoscopy showed patent airways with good symptom relief.

Comment

Lobectomy is a common operation for the treatment of lung cancer. Several large series of lobectomies and sleeve lobectomies for lung cancer have been reported in the literature [5], and airway complications after these operations are not uncommon. There has been no report of bronchomalacia causing dynamic airway obstruction after a lobectomy.

Our patient suffered from progressive shortness of breath after lung resection. Clinical and initial radiographic assessment was inconclusive. Fiberoptic bron-
choscopy performed while the patient was awake clearly demonstrated that the lumen of the right main bronchus collapsed on expiration. Spiral computed tomographic scan with three-dimensional reconstruction ruled out extrinsic compression and delineated the extent of the lesion; this is the favored investigation to resolve this problem [6, 7]. The proposed cause for bronchomalacia after pneumonectomy and lung transplantation includes external compression [4] and ischemia [5] leading to anatomical weakness of the bronchial ring. Anatomically the cartilaginous plates in the extrapulmonary bronchi become more irregular as compared with the trachea where they are arranged in regular stacks [8]. Each cartilage is enclosed in perichondrium, continuous with a dense fibrous membrane situated between the adjacent cartilages and filling in the back of the trachea. The perichondrium and membrane are mainly composed of collagen with some elastic fibers; these fibers cross each other diagonally, allowing changes in luminal diameter. After a lobectomy, if the cartilaginous ring that supports the configuration of the airway is lost, there may be areas of bronchial wall without adequate support. Further radiotherapy may cause weakness to the cartilage, collagen structure, and elastic fibers. This may explain the dynamic change in the airway on expiration.

Nitinol stents have become an accepted modality of treatment for malignant and benign airway obstructions [9]. We used a stent with a proximal release system; however we encountered a problem with the proximal end of the stent not being fully flush with the bronchial wall. We used the balloon of the bronchial blocker system at the proximal end of the stent to dilate the stent. This balloon is advantageous because the balloon is designed to mold to the bronchial wall. This resulted in a satisfactory outcome.

In conclusion, bronchomalacia after lobectomy remains a very rare cause of breathlessness in postlobectomy patients. Bronchoscopy and spiral computed tomographic scan are essential in identifying and delineating the extent of the condition. Endobronchial stenting treatment is easy and less invasive with good immediate results. The balloon of the bronchial blocker system is a useful tool if further dilation of the stent is required.

References