



Use of Intrabronchial One-Way Valves for Treatment of Alveolar-Abdominal Fistula: A Case Report

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Abstract

A 28-year-old male with a history of alcohol abuse was admitted for chronic alcoholic pancreatitis with finding of new left lower lobe lung mass. He underwent a CT-guided Transthoracic Needle Aspiration (TTNA) of the lung mass with subsequent development of an alveolar-abdominal fistulous tract crossing the left hemi-diaphragm, connecting the left lower lobe and the abdominal cavity. Interventional Pulmonology was consulted and placed four, one-way Spiration intrabronchial valves (Olympus, Redmond, WA, USA) in the left lower lobe. There was adequate closure of the alveolar-abdominal fistula. Intrabronchial valves were able to be removed endoscopically 7 weeks later without complications. This report further demonstrates the ability of endoscopically placed intrabronchial valves to allow for minimally invasive and lung sparing management of alveolar-abdominal fistula.

Keywords: Alveolar-abdominal fistula; Intrabronchial valve; Bronchial valve

Case Presentation

A 28-year-old male with a history of alcohol abuse was admitted for chronic alcoholic pancreatitis. A diagnostic Computer Tomographic (CT) scan of the abdomen revealed an incidentally found left lower lobe lung mass. The left lower lobe lung mass was new when compared to a CT scan of the abdomen and pelvis performed two weeks earlier. He underwent a CT-guided Transthoracic Needle Aspiration (TTNA) of the lung mass revealing organizing pneumonia with fibrosis. No immediate complications were noted after the TTNA.

Over the following 10 weeks, he presented to the emergency room with left upper quadrant abdominal on three occasions. Serial chest X-rays showed persistence of the lung mass with an associated pleural effusion. After 11 weeks, he presented to the emergency room again with fever, abdominal pain, and shortness of breath. A CT chest, abdomen, and pelvis revealed an alveolar-abdominal fistulous tract crossing the left hemi-diaphragm, connecting the left lower lobe and the abdominal cavity (Figure 1). Interventional Pulmonology was consulted. Four, one-way Spiration (Olympus, Redmond, WA, USA) valves were bronchoscopically placed in the left lower lobe (#9 in LB6, #9 in LB7-8, #7 in LB9, #9 in LB10) (Figure 2).

The patient had clinical improvement in pain and dyspnea, with resolution of his fever. On post-procedural day three, a CT scan of the chest showed complete collapse of the left lower lobe, without pneumothorax, along with significant reduction in the size of the alveolar-abdominal fistula. The patient continued to improve and was discharged home after one week. At seven weeks follow up, a CT scan of the chest showed complete closure of the alveolar-abdominal fistula and the valves were removed *via* flexible bronchoscopy. Fifteen-week follow-up from placement of the intrabronchial valves, a CT chest revealed minimal reticular changes of the left lower lobe base (Figure 3).

Discussion

Intrabronchial valves are approved by the Food and Drug Administration (FDA) for the treatment of severe emphysema by providing a lower-cost, less-invasive alternative to lung volume reduction surgery. Additionally, intrabronchial valves are commonly used for the treatment of persistent-air leaks under a humanitarian device exemption. Use of one-way valves for the treatment of persistent air leak was first documented in 2004 for closure of a persistent broncho-cutaneous fistula despite multiple surgical procedures [1]. Since that time the use of one-way bronchial valves for treatment of persistent air leaks of various etiologies has been reported including such

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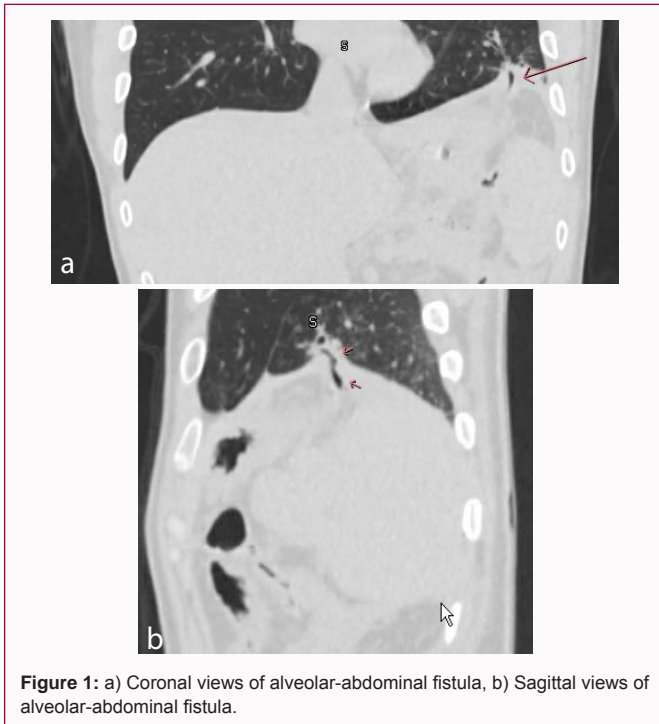


Figure 1: a) Coronal views of alveolar-abdominal fistula, b) Sagittal views of alveolar-abdominal fistula.

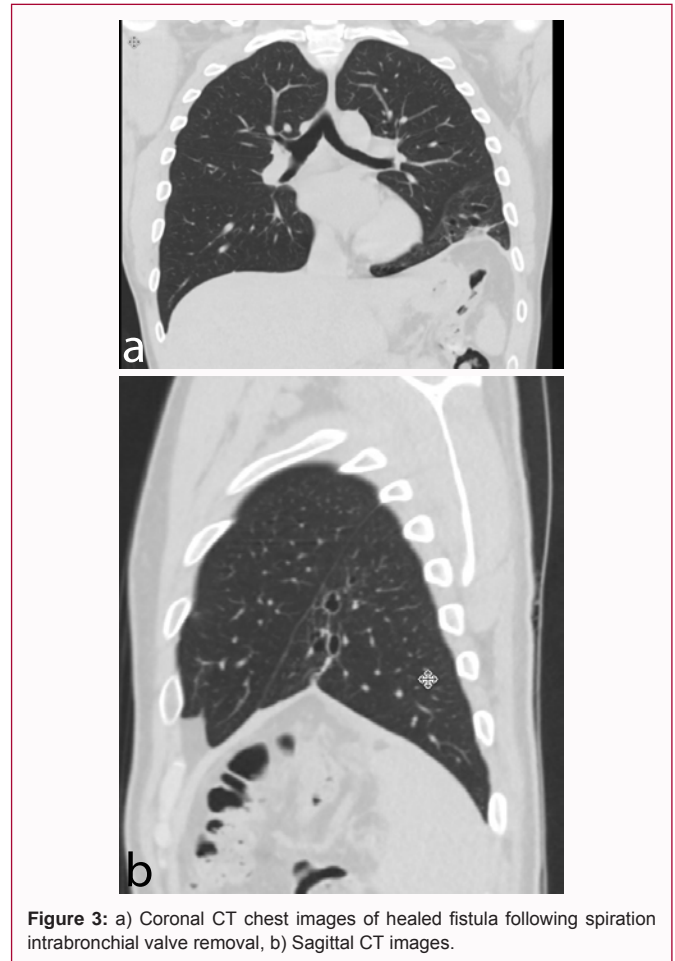


Figure 3: a) Coronal CT chest images of healed fistula following spiration intrabronchial valve removal, b) Sagittal CT images.

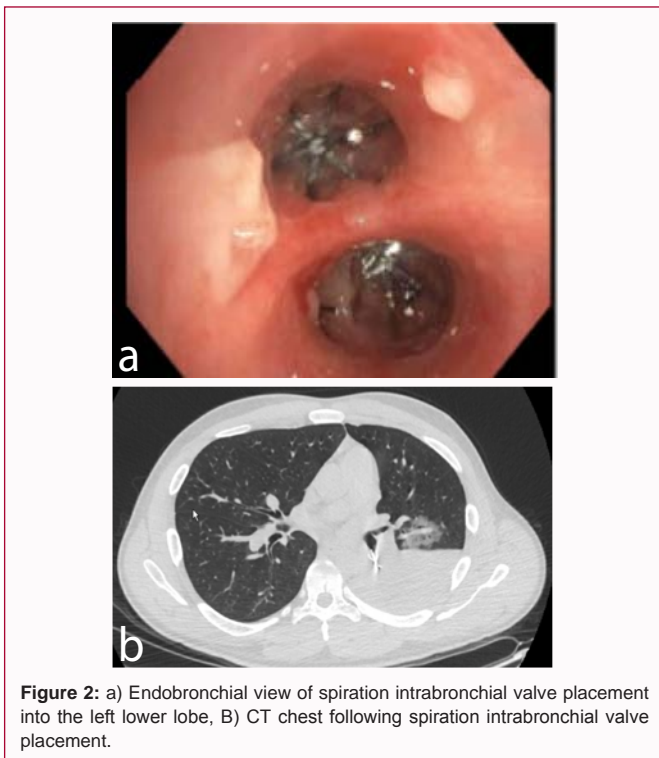


Figure 2: a) Endobronchial view of spiration intrabronchial valve placement into the left lower lobe, B) CT chest following spiration intrabronchial valve placement.

cases as iatrogenic alveolar pleural fistula after nasogastric tube placement [2], life-threatening air leak into the subcutaneous tissue after radiofrequency ablation of lung cancer [3], and persistent air leak after surgical decortication of empyema [4]. Comprehensive systematic review of this use of intrabronchial valves show a high rate of success with relatively few complications [5]. Recent reviews of the topic have further established the role of the intrabronchial valves for use in persistent air leak [6-7]. By allowing continued egress of air and mucus from the occluded portions of lung, endobronchial valves offer a theoretical advantage over prior occlusive measures such as

sponges or glue, while their removable nature offers the opportunity for future lung re-expansion compared to surgical resection. While use for air leaks is now well established, the possibility of application of this technology to even more conditions, such as in our patient, is raised.

Acquired transdiaphragmatic fistula, a rare condition which can be caused by infectious, traumatic, neoplastic, post-surgical, or as a sequela of acute pancreatitis represents another potential use for intrabronchial valves [8]. Traditionally, treatment has required surgical repair of the diaphragm with or without lung resection. One case report of the conservative management of acquired transdiaphragmatic fistula required prolonged use of antibiotics paired with abdominal drain placement [9]. Currently there has only been one additional case reported of the use of retrievable one-way valves for transdiaphragmatic fistula [10], with positive outcome like our patient. In both cases, the placement of the bronchial valves allowed for complete healing of the diaphragm without the need for surgical intervention. In both the previously reported case and for this patient, valve removal was uneventful and follows up imaging demonstrated resolution of the alveolar-abdominal fistula.

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