

Using The Chartis System To Guide Endobronchial Valve Placement For The Treatment Of Persistent Air Leak: Case Series

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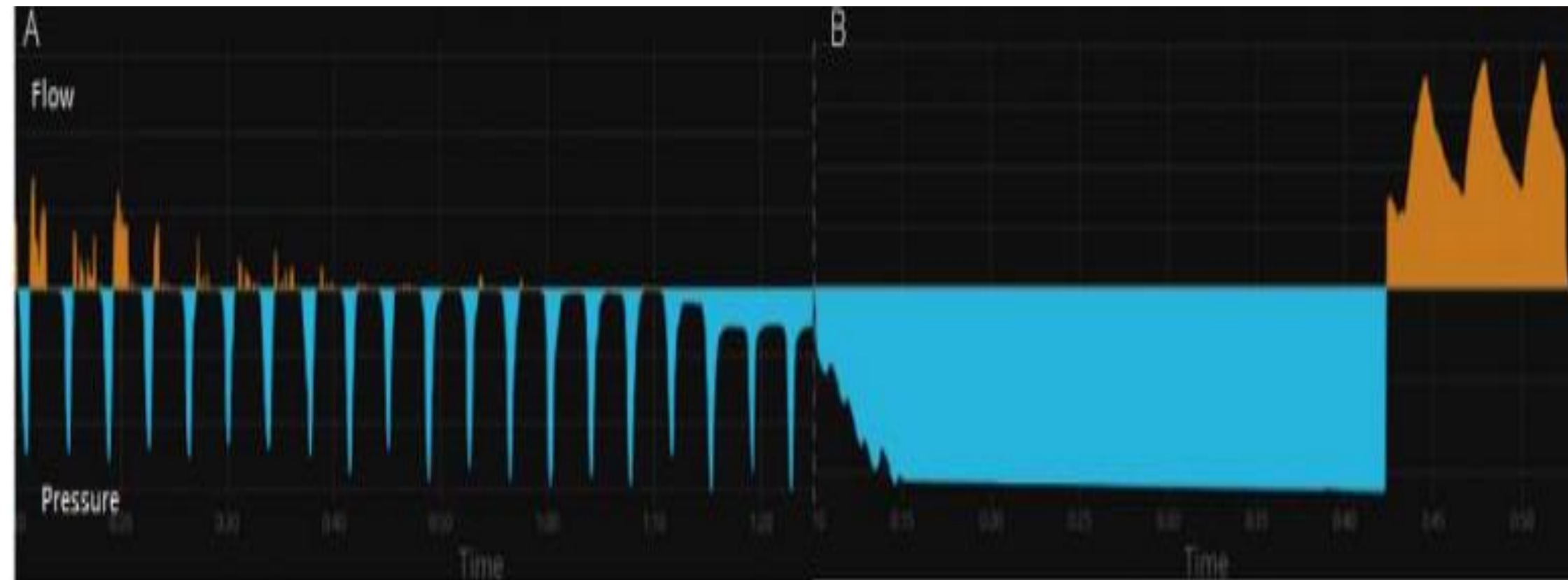
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Introduction

Persistent air-leak (PAL) is caused by alveolopleural fistula (APF) that lasts more than 5 days. PAL is associated with significant morbidity and prolonged hospitalization.² Management includes prolonged chest catheter placement, surgical repair, and pleurodesis.³⁻⁴ One-way endobronchial valves (EBVs) have been used to treat PAL.⁵⁻⁶ Several methods are used to localize APF including balloon occlusion, air insufflation and Methylene blue injection. Measurement of the negative pressure distal to the occlusion balloon using the Chartis system offer a more accurate way to identify the location of an APF.

Figure 1



A. Occlusion of the right upper lobe showed disappearance of the airflow (orange) and negative pressure (blue) created by inspiratory phase and pleural suction.

B. Occlusion of anterior airway segment of the right upper lobe showed constant negative pressure displayed by the Chartis system confirming the air leak from the airway segment.

Results

Five patients were males (n=5). Four patients had secondary spontaneous pneumothorax. Two patients had PAL following lobectomy and wedge resection. The mean number of valves placed per patient was about 4 (range, 2-5). Valves were placed in the left upper lobe (n=10), right lower lobe (n=5), right middle lobe (n=2), right upper lobe (n=3). The mean duration of air leak prior to valve placement was 25.5 days (range, 7-72 days). The mean time to the resolution of air leak and chest tube removal was 6 days (range, 3-11 days). Air leak resolved in all six patients.

Conclusion

Balloon occlusion, the most common method used to localize APF cannot be used when air-leak disappears upon induction of anesthesia. Air insufflation is not helpful when the procedure is performed under positive pressure ventilation. The Chartis system helps accurately identify the APF site and overcome the shortcomings of the other methods

Methods

This is a case series of six patients at a teaching hospital who underwent EBVs placement for PAL from March 2021 to February 2022. We used the Chartis system to identify the target lobe or segment as seen in Figure 1. We reported the etiology of the pneumothorax, duration of chest catheter drainage, hospital length of stay, number and locations of EBVs deployed seen in table 1.

Table 1

| No. | Cause of PAL | Duration of chest tube placement prior to valves placement (days) | Location of valve placement | Number of valves | Duration of chest tube placement after to valves placement (Days) | Co-morbidities | Resolved (Y/N) |
|-----|--|---|-----------------------------|------------------|---|---|----------------|
| 1 | Spontaneous pneumothorax, COPD | 8 | LUL | 5 | 7 | COPD, HTN, DM, HLD, Gout | Y |
| 2 | Spontaneous pneumothorax, COPD | 20 | RML | 3 | 3 | COPD, A-FIB | Y |
| 3 | Secondary spontaneous pneumothorax, COVID-19 | 36 | RUL/RML | 3 | 8 | COPD, COVID-19 | Y |
| 4 | Lobectomy and wedge resection for malignancy | 72 | RML, RLL | 2 | 3 | Lung cancer | Y |
| 5 | Wedge resection for lung mass | 7 | LUL | 5 | 4 | Cocaine abuse, HTN | Y |
| 6 | Secondary spontaneous pneumothorax, COVID-19 | 10 | RML, RLL | 5 | 11 | DM-1, ESRD, PAD, PVD, Chronic respiratory failure requiring trach, COVID-19 | Y |

PAL=Persistent air leak, COPD=Chronic obstructive lung disease, LUL=Left upper lobe, RML=Right middle lobe, RUL=Right upper lobe, RLL=Right lower lobe, HTN=Hypertension, DM=Diabetes mellitus, DM-1=Diabetes mellitus type 1, HLD=Hyperlipidemia, A-Fib=Atrial fibrillation, ESRD=End stage renal disease, PAD=peripheral arterial disease, PVD=Peripheral vascular disease, COVID-19=Coronavirus disease 2019

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