# Novel Bronchoscopic Drainage Technique in Multiple Drug Resistant Acinetobacter Lung Abscess: A Case Report

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**KEY WORDS:** bronchoscopic drainage, infectious disease, lung abscess, multiple drug resistance, pulmonology

*IMAJ* 2022; 24: 679–681

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The primary treatment for lung abscesses is antibiotics, but the effect is often insufficient and additional treatment is required in many cases [1,2]. When patients fail to respond to antibiotics, they may require percutaneous catheter drainage (PCD) or surgical intervention [3]. PCD, usually guided by computed tomography or ultrasound, is considered a less invasive alternative to surgical drainage or resection. However, PCD might be complicated by pneumothorax, empyema, hemothorax, and bronchopleural fistula [1]. Bronchoscopy has also been used to obtain cultures, and to exclude the presence or treat of obstructive lung abscess lesions [4]. Endoscopic drainage has emerged as an alternative to PCD, with potential advantages in select patients, especially those with a central abscess or with an abscess that is anatomically located near a proximal airway [1,4]. To the best of our knowledge, this case communication is the first reported case of lung abscess infected with multiple drug resistance (MDR) *Acinetobacter baumannii* that failed to respond to antibiotic treatment and underwent bronchoscopic drainage (BD) with a successful extraction of the abscess by using a pigtail catheter.

## PATIENT DESCRIPTION

### CASE STORY

A 57-year-old man and a known intravenous drug user was found unconscious and hypotensive at home by emergency medical services in May 2019. He was intubated and transferred to the emergency department. On admission, the patient presented with the following vitals: blood pressure 90/60 mmHg, heart rate 130 beats per minute, temperature 39°C, and oxygen saturation 92%. On physical examination, there appeared to be no head trauma or rash, and lung sounds were normal to auscultation. Laboratory tests revealed leukocytosis of 18 (normal range 4.8–10.8 $\times 10^3$/ul), C-reactive protein (CRP) of 34.02 (normal 0–0.5 mg/dl), acute renal failure with creatinine of 2.8 (normal 0.6–1.17 mg/dl), and acute respiratory acidosis with secondary metabolic acidosis pH 7.19, $HCO_3$ 40.3mmol\L and $P_{CO2}$ 60 mmHg. Chest radiography showed no evidence of pneumonia or pleural effusion. The patient was initiated on treatment with intravenous antibiotic (IVAB) ceftriaxone (2 grams once per day). He was hospitalized with hypothesized sepsis of unknown origin. Despite treatment with IVAB, the patient's fever remained unchanged. Initial urine cultures were negative, but 3 days later blood cultures grew gram positive cocci in clusters. IVAB was then changed to piperacillin/tazobactam 2.25 g (3 times per day) according to the laboratory-guided sensitivity testing. Eventually, chest radiography exhibited pneumonia with consolidation in the right middle lobe. Again, despite the IVAB treatment, the patient still had fever, leukocytosis, elevated CRP, and no improvement on chest radiography. Four days after the start of new treatment, sputum cultures were positive for *A. baumannii* with a MDR profile. It was suspected that the patient acquired *A. baumannii* from the hospital and was subsequently started on IV colistin (2.250.000 units twice per day) and meropenem (1 g three times per day). After another 4 days, sputum and blood cultures remained positive for only *A. baumannii* and no longer grew gram positive cocci. Therefore, the initial infection was suspected to be resolved. Both IVAB treatments resulted in no clinical improvement, so the treatment was upgraded to tigecycline (100 mg as a single first dose, then 50 mg twice a daily) and colistin (2.250.000 units twice per day). Serial chest radiographies showed lung abscess formation.

A multidisciplinary meeting including an intensive care unit team, pulmonologists, interventional radiologists, chest surgeons, and infectious disease experts

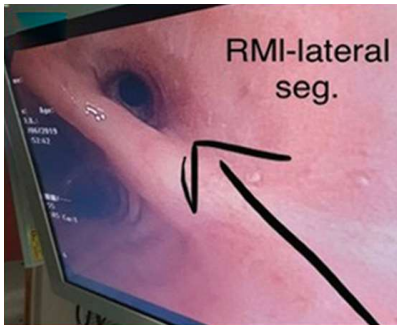
suggested several ways to treat the patient. Suggested treatments options included continuation with IVAB, changing to another medication, surgical drainage with an incision through the thorax, or endoscopic drainage surgery. The team decided to try endoscopic drainage after considering the patient's poor response to antibiotics, the microbiology profile, and the hemodynamic state of the patient.

## PROCEDURE

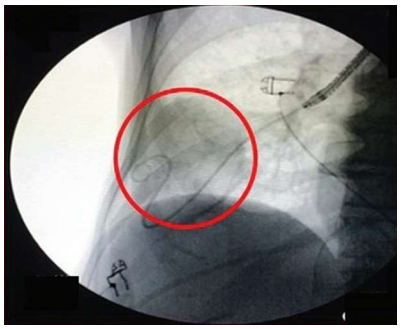
Flexible bronchoscopy was completed at the institute of pulmonology at Soroka University Medical Center, Beer Sheva, Israel. The endoscopist performed the procedure under general anesthesia via tracheostomy. Using fluoroscopic imaging, a guidewire was inserted into the abscess cavity, which was located at the lateral segment of right middle lung [Figure 1A] through the working channel of the bronchoscope. Once the guidewire was in place, the bronchoscope was removed. A 6F (2.1 mm) pigtail catheter for endovascular use, with a length of 110 cm (Boston Scientific, USA), was passed over the guidewire into the cavity, and the wire was then removed [Figure 1B]. The correct position of the pigtail catheter was confirmed with the injection of contrast medium [Figure 1C]. Pus from the abscess cavity was drained through the catheter [Figures 1D and 1E] and was sent for culture. At the end of the procedure, the catheter was secured at the nose and remained in place for several days. It was flushed two to four times daily with normal saline (0.9%). The catheter remained open for gravity drainage.

**Figure 1.** Flexible bronchoscopy using fluoroscopic imaging

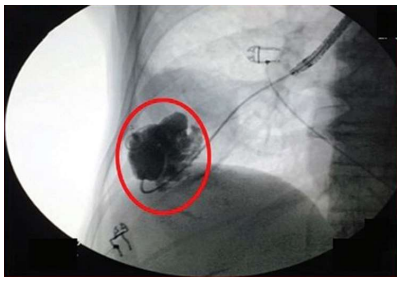
[A] Right middle lobe of the lateral segments (RML-lateral seg.) via bronchoscopy




[B] Wire insertion in the abscess (red circle)



[C] Injection of the contrast media into the abscess (red circle)



[D] [E] The pus extracted from the abscess with a pigtail catheter

## OUTCOME

Following the procedure, the patient was admitted to the intensive care unit (ICU) for monitoring and continued to receive systemic IVAB treatment, which was adjusted according to pus culture results. After 5 days of drainage the patient unintentionally self-extracted the pigtail catheter. After the procedure there was radiological improvement and blood inflammatory markers, including leukocytes and C-reactive protein, were decreasing gradually to normal ranges. The patient was discharged from the ICU to the rehabilitation institution with continued antibiotic treatment. Blood cultures became negative while sputum cultures remained positive, indicating carriage status.

## COMMENT

*Acinetobacter* is a strictly aerobic, gram-negative coccobacillus that has become an important nosocomial infectious worldwide, favorably infecting those receiving respiratory therapy [5]. As *Acinetobacter* is ubiquitous in hospital environments, and there is widespread use of antibiotics in the hospital setting, it has gained the ability to accumulate diverse mechanisms of resistance, leading to the emergence of strains that are resistant to most commercially available antibiotics [5]. *Acinetobacter* may colonize patients without causing infection and is frequently found in normal oro-

pharyngeal flora; however, it is considered to be an opportunistic infection and may cause severe disease [5], such as pneumonia with abscess formation and blood seeding, as seen in our case. Our patient's *Acinetobacter* lung abscess was likely secondary to his hospitalization, and his primary infection with gram positive cocci and intravenous drug use status created a weakened immune state for opportunistic infection.

BD of lung abscesses in an emerging treatment, as patients may fail to respond to antibiotics. Many are not ideal candidates for surgical drainage [1-3]. Unterman and colleagues [3] performed 16 BD procedures on patients who did not respond to antibiotic treatment and were able to successfully drain the lung abscesses in 13 procedures. They achieved clinical improvement in 10 patients. Our patient also failed to respond to antibiotic treatment and was not eligible for surgical drainage due to his clinical status and because transthoracic drainage with MDR bacteria raises the risk for an empyema and further respiratory complications. As such, we decided to utilize the bronchoscopic procedure outlined by Unterman and colleagues involving a 110 cm-long endovascular pigtail catheter to extract the pus from the abscess [3].

Complications may arise as a result of performing a lung abscess BD. In a case series reported by Herth et al. [4] there were no intraoperative complications in all 42 patients studied; however, 2 required mechanical ventilation for 24 hours postoperatively. In the 16 procedures conducted by Unterman et al. [3] there were two procedure-related adverse events including a pulmonary hemorrhage in one case, and a pneumothorax and empyema in another, although the abscess in the latter case was located peripherally near the pleura. In addition, two patients unintentionally extracted the pigtail catheter early during the recovery period [3], which was also a complication in our case. Fastening the pigtail catheter in multiple locations, such as the nose and elsewhere on the face, may limit the accidental extraction in future cases. More research is required to develop robust clinical guidelines and to prevent adverse events intraoperatively and postoperatively in BD. Nevertheless, BD has immense clinical value in treating lung abscesses, especially for MDR bacteria.

## CONCLUSIONS

BD is a relatively novel alternative to surgical and percutaneous drainage in patients with lung abscesses that fail to respond to antibiotic therapy. Our case confirms that BD is a viable option in patients with MDR abscesses that are accessible by a leading airway and can elicit both laboratory and clinical improvement. Our results complement the existing literature on the topic of BD; however, more research must be done to develop guidelines for identifying optimal patient populations for the procedure, and to improve perioperative safety.

## ACKNOWLEDGEMENTS

The authors thank David B. Geffen MD for his critical review of the manuscript.

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Capsule

## Nirmatrelvir use and severe COVID-19 outcomes during the Omicron surge

**Arbel** and co-authors obtained data for all members of Clalit Health Services who were 40 years of age or older at the start of the study period and were assessed as being eligible to receive nirmatrelvir therapy during the Omicron surge. A total of 109,254 patients met the eligibility criteria, of whom 3902 (4%) received nirmatrelvir during the study period. Among patients 65 years of age or older, the rate of hospitalization due to COVID-19 was 14.7 cases per 100,000 person-days among treated patients as compared with 58.9 cases per 100,000 person-days among untreated patients (adjusted hazard ratio [aHR] 0.27, 95% confidence interval [95%CI] 0.15–0.49). The aHR for death due to COVID-19 was 0.21 (95%CI 0.05–0.82). Among patients 40–64 years of age, the rate of hospitalization due to COVID-19 was 15.2 cases per 100,000 person-days among treated patients and 15.8 cases per 100,000 person-days among untreated patients (aHR 0.74, 95%CI 0.35–1.58). The aHR for death due to COVID-19 was 1.32 (95%CI 0.16–10.75). The authors concluded that among patients 65 years of age or older, the rates of hospitalization and death due to COVID-19 were significantly lower among those who received nirmatrelvir than among those who did not. No evidence of benefit was found in younger adults.

*N Engl J Med* 2022; 387: 790
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