

# Successful removal of an intractable mucoid impaction in the bronchus using a Fogarty catheter with flexible bronchoscopy

### ABSTRACT

Rigid bronchoscopy is commonly used as the standard method to diagnosis and remove obstructive material from the tracheobronchial tree. However, a rigid bronchoscope has limitations when removing a foreign body with surface properties that make it difficult to grasp. We experienced a case that involved the removal of a mucoid impaction, which was accompanied by a near-total unilateral lung collapse, using a Fogarty catheter with flexible bronchoscopy.

**Key words:** Bronchoscopy; Fogarty catheter; mucoid impaction

### Introduction

A tracheobronchial foreign body with respiratory compromise requires prompt removal in pediatric patients. Although the rigid bronchoscope is solely used for the diagnosis and removal of obstructive material,<sup>[1]</sup> it has the potential risk of interrupting ventilation which leads to hypoxemia and dislocation of a foreign body could bring about a disastrous total airway occlusion. Its use also has limitations in its approach to the distal airway due to poor flexibility and for materials that are different to grasp. Herein, we present a case using a Fogarty catheter through a flexible bronchoscope for the retrieval of a mucoid impaction with total unilateral lung collapse.

### Case Report

An 8-year-old boy, weighing 53 kg, was admitted to the hospital with severe dyspnea. He presented with a 2-week history of rhinorrhea, cough, and fever. His medical

history was not significant. On his arrival at the emergency room, his left lung sounds were very weak, and wheezing was detected in the left lung. Immediately, he received oxygen at 5 L/min through a nasal cannula, and an arterial blood gas analysis (ABGA) revealed the following results: pH 7.43, PCO<sub>2</sub> 29.5 mmHg, PO<sub>2</sub> 51.8 mmHg, and oxygen saturation (SpO<sub>2</sub>) of 85.8%. Chest radiograph showed near total collapse of the left lung parenchyma [Figure 1], and chest computed tomography showed complete bronchial obstruction and consolidation in the left lung [Figure 2]. Although he was receiving oxygen support, his dyspnea gradually worsened. Endotracheal intubation for mechanical ventilation was planned. During this procedure, his heart rate (HR) decreased to <30 beats/min, and his SpO<sub>2</sub> acutely decreased. Cardiopulmonary resuscitation was started, and epinephrine (1 mg) was injected. After 5 min, when the electrocardiogram waveform returned to a sinus rhythm, the resuscitation was stopped, and mechanical ventilation was started. Airway exploration with a fiberoptic bronchoscopy

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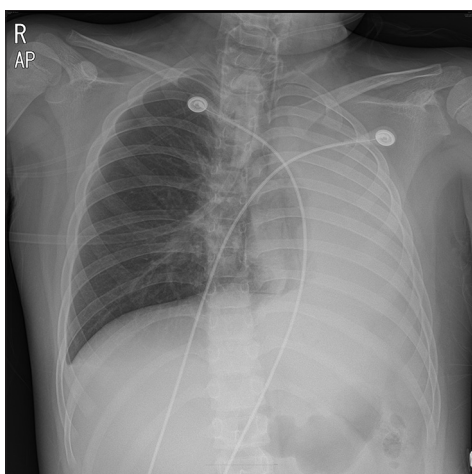
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**Figure 1: Chest radiograph showed a near total collapse of the left lung parenchyma**

under sedation was performed to find the suspected bronchial lesion; however, the nature of lesion or foreign body in the left main bronchus was unclear. Therefore, he was transferred to the operating room for an accurate diagnosis and treatment.

On arrival to the operating room, his vital signs showed a blood pressure, HR, and peripheral SpO<sub>2</sub> of 110/60 mmHg, 122 beats/min, and 77%, respectively. Rocuronium was used as the paralytic agent, and anesthesia was maintained with sevoflurane in 100% oxygen and remifentanyl. After a few minutes, SpO<sub>2</sub> increased to 92%, and the endotracheal tube was removed for a rigid bronchoscopy. During the rigid bronchoscopy procedure, the grasping forceps could not grip the mucoïd plug because it was friable. In addition, ventilation was interrupted leading to a SpO<sub>2</sub> of 72%. Taking into consideration the mucoïd property of the obstruction, a 5-Fr Fogarty catheter (Edwards Lifesciences Corporation of Puerto Rico, Irvine, CA, USA) with fiberoptic bronchoscopy was planned [Figure 3], and he was reintubated. The catheter was inserted through the suction channel of the flexible bronchoscope and passed through a slit between the mucoïd plug and the bronchial wall. The balloon of Fogarty catheter was inflated, and the mucoïd impaction was carefully withdrawn over several passes [Figure 4]. There was no bleeding or damage to the tracheal mucosa. After successful retrieval of the impacted mucus, his SpO<sub>2</sub> was maintained at 85%–90% and breath sounds were heard on both sides. The patient was transferred to the Intensive Care Unit (ICU) intubated.

In the ICU, mechanical ventilation was maintained. His chest radiograph revealed re-expansion of the left lung parenchyma and atelectasis in the right upper lobe [Figure 5]. ABGA with a FiO<sub>2</sub> showed the following results: pH 7.35, PCO<sub>2</sub> 43 mmHg,



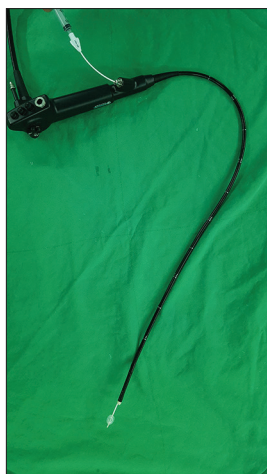
**Figure 2: Chest computed tomography showed a complete bronchial obstruction and consolidation of the left lung**

PO<sub>2</sub> 57.1 mmHg, and SpO<sub>2</sub> 89.1%. On postoperative day (POD) 1, he was transferred to the general ward with improved respiratory parameters and then discharged on POD 6 with no complications.

## Discussion

In this case, a Fogarty catheter through a flexible bronchoscope was successfully used to remove the mucoïd impaction as a cause of a near total unilateral lung collapse. Even though a rigid bronchoscope is used as the standard method to remove an intrabronchial foreign body, its optical forceps could not grasp the mucoïd plug because of its soft and friable properties.<sup>[1]</sup> We considered the alternative technical method of using a Fogarty catheter with a flexible bronchoscope for the removal of the intractable mucous impaction.

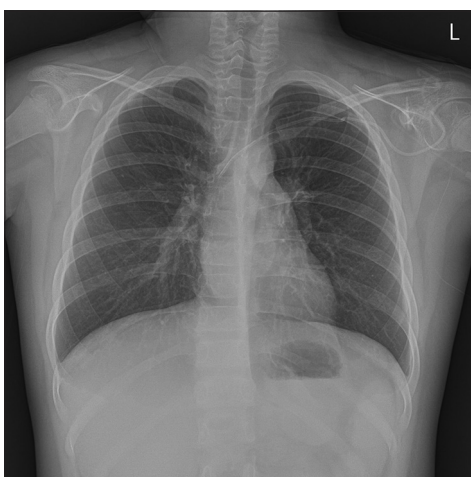
A mucoïd impaction is generally the result of the inspissation of copious mucus and other secretions in the tracheobronchial tree.<sup>[2]</sup> It is commonly observed in patients with respiratory diseases, such as asthma or chronic bronchitis, which is accompanied by an excessive production of viscous mucous.<sup>[3]</sup> A mucoïd impaction with atelectasis is common in the pediatric airway because of the small caliber of the airway and incomplete collateral ventilation. These mucoïd impactions can lead to subsequent complications such as pneumonia, atelectasis, bronchiectasis, and abscess formation.<sup>[4]</sup> Optical bronchoscopies, such as the rigid and flexible bronchoscopies, are the most sensitive diagnostic methods. In this study, the patient had no history that was suspicious for an airway obstruction. However, based on the history of a respiratory tract infection, pulmonary signs, such as unilateral wheezing and weak breath sounds, and radiologic abnormalities of a unilateral near total collapse, the possibility of impacted material could not be excluded.



**Figure 3: A 5-Fr Fogarty catheter with fiberoptic bronchoscopy: A Fogarty catheter was inserted through the suction channel of the flexible bronchoscope**



**Figure 4: Large muroid impaction**



**Figure 5: A chest radiograph showed the resolution of the near total collapse of the left lung parenchyma**

Subsequently, a large muroid plug in the left main bronchus was identified with flexible bronchoscopy.

Rigid bronchoscopy is commonly used to definitively diagnosis and remove obstructive material within the tracheobronchial tree.<sup>[1]</sup> However, the potential complications of rigid bronchoscopy include airway edema, mucosal laceration, bleeding, infection, as well as hypoxia, resulting in failed bronchoscopic removal.<sup>[5]</sup> Moreover, rigid bronchoscopy has a limited approach to the distal airway due to its poor flexibility. A flexible bronchoscope has a smaller diameter, and greater flexibility compared to the rigid bronchoscope and is becoming more popular for the removal of airway obstructing.<sup>[6]</sup> According to a study by Tang *et al.*, flexible bronchoscopy was successfully used to remove foreign bodies in 91.3% children.<sup>[6]</sup> In this study, we initially attempted to use the rigid bronchoscope to remove the muroid impaction but failed because the muroid plug could not be grasped, which resulted in oxygen desaturation. Therefore, we used alternative equipment, which included a Fogarty catheter through a flexible bronchoscope for the retrieval of the muroid impaction.

The Fogarty catheter has been used for the extraction of a foreign body from various body parts including the urethra, nose, or esophagus.<sup>[7-9]</sup> However, its use carries the following risks: catheter disruption, dislodgement of tip, and incomplete removal. There are some cases related to removal of an intrabronchial foreign body using a Fogarty catheter. Wankhede *et al.* removed a spherical bead in the right bronchus using of C-arm-guided Fogarty catheter, which is difficult to grip with conventional forceps.<sup>[10]</sup> Bawa *et al.* extracted a rounded plastic bead with a smooth surface using a Fogarty catheter with a rigid bronchoscope.<sup>[11]</sup> However, to the best of our knowledge, this is the first report of removing an intrabronchial muroid impaction using a Fogarty catheter with flexible bronchoscopy. The use of a Fogarty catheter can be a technical rescue in difficult clinical situations such as our case, where the removal of a foreign body could not be achieved with forceps because of its surface properties.

In conclusion, a muroid impaction may produce a total unilateral airway occlusion with disastrous respiratory compromise. Therefore, a Fogarty catheter inserted through a flexible bronchoscope could be performed to remove a friable muroid impaction.

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#### **Conflicts of interest**

There are no conflicts of interest.

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