

Anesthetic Challenges In A Child With A Metallic Spring In The Left Main Stem Bronchus: A Case Report

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Abstract

Background: Foreign body aspiration (FBA) in children can lead to delayed diagnosis and serious airway complications, particularly when the aspiration event is unwitnessed. We report a case of a 4-year-old male with a chronically retained metallic spring in the left mainstem bronchus, managed successfully with rigid bronchoscopy under general anesthesia.

Case presentation: The child had persistent cough and fever for 2 months after an unwitnessed aspiration. Imaging revealed a metallic spring lodged in the left mainstem bronchus with surrounding granulation tissue. Rigid bronchoscopy under general anesthesia with spontaneous ventilation was planned. After retrieval, the child had an episode of bronchospasm, which was promptly managed, and the airway was secured with an endotracheal tube to prevent postoperative complications. The child was monitored in the Pediatric Intensive Care Unit (PICU) and extubated the following day without further complications.

Conclusion: This case highlights the importance of high suspicion for FBA in children with persistent respiratory symptoms, the role of rigid bronchoscopy as the gold standard for complex airway foreign bodies, and the need for a dynamic anesthetic strategy with planned postoperative critical care in high-risk airway cases.

Keywords: foreign body aspiration, rigid bronchoscopy, pediatric anesthesia, airway management, bronchospasm.

INTRODUCTION

Foreign body aspiration (FBA) is a major cause of morbidity and mortality in children, especially between 1 and 4 years of age. (1) When the aspiration event is unwitnessed, diagnosis may be delayed, leading to secondary pathology such as pneumonia and granulation tissue formation. Metallic or spring-shaped foreign bodies present unique anesthetic and surgical challenges due to their rigid structure, potential for partial airflow, and propensity to cause mucosal injury. We present a case of a chronically retained metallic spring in the left mainstem bronchus, removed under general anesthesia with a dynamic airway management approach.

CASE PRESENTATION

PATIENT INFORMATION:

A 4-year-old male child, weighing 20 kg, was brought to our hospital with complaints of fever and recurrent cough associated with thick mucopurulent sputum for the past one week. He had been apparently well until two months earlier, after which he developed a persistent cough that worsened over the last two weeks and was accompanied by intermittent fever spikes. He had a normal developmental history, his birth history was uneventful, and he was immunized up to date. There was no history of recurrent upper or lower respiratory tract infections, and the parents did not give a history that was suggestive of aspiration. There was no past surgical history. The child had received two courses of antibiotics from an outside hospital, where he was initially treated as a case of pneumonia.

Chest radiography at the outside hospital revealed a radiopaque foreign body in the left mainstem bronchus, with the shape and density suggesting a coiled metallic spring, as shown in Figure 1. An attempt to remove the foreign body using a flexible bronchoscopy was made under IV sedation at the outside hospital, but the

procedure was abandoned due to poor child compliance, an episode of desaturation, and the inability to retrieve the foreign body, which was confirmed to be a spring but with surrounding granulation tissue. The child was then discharged on POD1 and was brought to our hospital.

On preoperative evaluation, the child was active, playful, and in no respiratory distress. Vital signs were within normal limits. Systemic examination revealed reduced air entry over the left hemithorax without added sounds. Routine blood investigations were within normal range.

The anesthetic plan was to perform rigid bronchoscopy under general anesthesia with maintenance of spontaneous ventilation until the foreign body was removed to minimize the risk of distal migration. Induction was achieved with fentanyl (2 µg/kg) and graded propofol dosing (up to 1 mg/kg). Anesthesia was maintained with an air-oxygen mixture and sevoflurane, titrated to a MAC of 0.9-1, supplemented with propofol boluses. Oxygenation was provided via the side port of the rigid bronchoscope.

During the procedure, the metallic spring was successfully retrieved, with minimal bleeding noted from surrounding granulation tissue. After bronchoscope removal, bag compliance decreased, and wheezing was noted on auscultation in the left side of the chest, suggesting bronchospasm. This was managed promptly with a bolus of propofol to deepen anesthesia, 100% oxygen, and positive pressure ventilation, resulting in rapid improvement in compliance and resolution of wheeze.

Given the airway reactivity and potential for postoperative complications, the decision was made to secure the airway with an uncuffed PVC endotracheal tube (5.0 mm ID) after administration of 30 mg succinylcholine, and neuromuscular blockade was maintained with atracurium 5 mg. The patient was shifted to the Pediatric Intensive Care Unit (PICU) for close observation. He was extubated uneventfully on postoperative day one and discharged home on postoperative day two without further adverse events.



Figure 1: Chest X-ray of the 4-year-old child showing a cylindrical coiled spring in the left mainstem bronchus

DISCUSSION

Foreign body aspiration is a life-threatening emergency in children, with the highest incidence between 1 and 4 years of age due to immature airway protective reflexes, lack of molar teeth, and oral exploration habits. (2) While organic foreign bodies (e.g., nuts, seeds) are most common, metallic objects, especially spring-shaped devices, are rare and pose distinctive challenges.

In our patient, the unwitnessed aspiration and prolonged retention allowed granulation tissue to form around the spring, increasing the risk of airway trauma and bleeding during removal. Metallic springs can partially maintain airflow due to their hollow or coiled design, leading to less acute initial obstruction but a higher risk of chronic airway inflammation, infection, and local mucosal injury.

Unusual foreign body aspirations in children, although rare, present unique diagnostic and management challenges. Goyal and Shukla reported a case of an inhaled bulb, emphasizing the importance of considering

atypical objects in the differential diagnosis of persistent or unexplained respiratory symptoms in children (3). Similar to their experience, our patient had an uncommon airway foreign body—a metallic spring—that is rarely encountered in pediatric bronchoscopy practice.

Anesthetic challenges include providing the surgeon an unobstructed view of an immobile surgical field while maintaining oxygenation and ventilation and also preventing foreign body migration, which could lead to complete airway obstruction, and managing adverse events such as laryngospasm or bronchospasm that can occur during and after extraction due to mucosal irritation. (4)

Two broad strategies exist for foreign body bronchoscopy:

Spontaneous ventilation until retrieval minimizes positive pressure-induced distal displacement but risks hypercarbia if airway obstruction becomes significant.

Controlled ventilation with muscle relaxation offers stable conditions but increases the risk of pushing the foreign body distally if positive pressure is applied before securing control of the object.

In this case, we employed a hybrid, dynamic approach: spontaneous ventilation was maintained during retrieval to minimize migration risk; however, during retrieval, the patient had developed bronchospasm, likely precipitated by mechanical stimulation, granulation tissue, and reactive airway mucosa, but it was recognized promptly. The plane of anesthesia was deepened with a propofol bolus, 100% oxygen was administered, and gentle positive pressure ventilation was applied, resulting in rapid resolution of wheeze and restoration of normal compliance. Considering the history of prolonged foreign body retention and the presence of granulation tissue and the potential for complications such as airway edema or post-obstructive pneumonia, the decision was made to intubate the patient with an uncuffed endotracheal tube, and the patient was sent to the Pediatric Intensive Care Unit for close monitoring and further management. This timely and effective management not only prevented hypoxemia but also facilitated safe subsequent intubation to protect the airway against postoperative complications. The favorable outcome in this case underscores the value of a flexible perioperative plan that adapts to evolving clinical conditions, with particular emphasis on early recognition and decisive management of bronchospasm as a critical determinant of safety in complex pediatric airway foreign body removals.

CONCLUSION

This case highlights the importance of high suspicion for foreign body aspiration in children with persistent respiratory symptoms, the role of rigid bronchoscopy as the gold standard for complex airway foreign bodies, and the need for a dynamic anesthetic strategy with planned postoperative critical care in high-risk airway cases.

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