Section: Miscellaneous

Case Series

RIGID BRONCHOSCOPY IN PAEDIATRIC PATIENTS – A CASE SERIES

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Received : 19/05/2026
Received in revised form : 01/07/2026
Accepted : 14/07/2026

Keywords:
Rigid bronchoscopy, manual jet ventilation, Foreign body, Spontaneous ventilation, optical forceps.

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DOI: 10.47009/jamp.2026.8.4.102

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (4); 595-597

ABSTRACT

Background: Providing anaesthesia for rigid bronchoscopy in paediatric patients is highly challenging, requiring the balancing of adequate oxygenation and ventilation without introducing respiratory compromise. **Case Description:** This case series reviews four paediatric patients undergoing emergency rigid bronchoscopy using optical forceps for tracheobronchial foreign body removal. Ventilation strategy choices—primarily spontaneous assisted ventilation and low-frequency manual jet ventilation—were personalized based on pre-existing lung physiology, such as the presence of air trapping or ball-valve hyperinflation. All cases resulted in successful foreign body extraction and favorable clinical outcomes. **Conclusion:** Anaesthetic strategies must be tailored to the individual child's baseline clinical and radiologic status. Immediate intervention and a highly skilled team of anaesthesiologist and otolaryngologist are paramount to minimize risks.

INTRODUCTION

Foreign body aspiration into the trachea and bronchi is a critical emergency in paediatric practice. Rigid bronchoscopy with optical forceps performed under general anaesthesia remains the gold-standard preference over flexible bronchoscopy for secure and efficient foreign body retrieval in children. However, sharing the airway with the ENT surgeon while maintaining optimal oxygenation and ventilation poses significant anaesthetic hurdles. Available ventilation modalities include apnoeic oxygenation, controlled ventilation, high- or low-frequency manual jet ventilation, and spontaneous assisted ventilation. While equipment and operator expertise play a role, the patient's specific clinical and radiologic presentation is the most crucial deciding factor for the chosen technique. This case series highlights four distinct presentations managed using customized ventilation approaches.

CASE SERIES

Case 1: A 1-year-old female child presented with an acute, 1-day history of respiratory distress following history of documented peanut ingestion. On examination, she had severely reduced air entry on the left side accompanied by wheezing. Her initial heart rate (HR) was 140/min, and her oxygen saturation (SpO2) was 90% while receiving 8 L/min of oxygen via a nonrebreathing mask. An anteroposterior (AP) chest radiograph demonstrated a hyperinflated left lung field with a prominent mediastinal shift to the right side. Following optimization via salbutamol nebulisation, due to the severe left lung hyperinflation, general anaesthesia with spontaneous assisted ventilation was selected to avoid severe air trapping or barotrauma. Premedication consisted of atropine and intravenous dexamethasone. Volatile induction was achieved using 4–8% sevoflurane in high oxygen flows (6-8 L/min) via closed circuit system. The vocal cords were topically sprayed with 2% lignocaine to reduce airway reflexes. The ENT surgeon inserted the rigid bronchoscope with the help of a laryngoscope and used a 0-degree telescope to locate the foreign body. The anaesthetic circuit was secured directly to the rigid bronchoscope's side port to support spontaneous breathing. Deep surgical anaesthesia was maintained with intermittent boluses of intravenous ketamine and propofol. Following successful peanut extraction, left-sided air entry and oxygen saturation immediately normalized, with post-procedural radiographs showing resolution of the emphysema and mediastinal shift.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Case 2: A 13-month-old male child presented with a 3-day history of a persistent, continuous cough during feeds, strongly indicative of foreign body aspiration. Vitals revealed a HR of 120/min and a baseline SpO2 of 98% on 4 L/min of nasal oxygen. Initial chest radiography showed increased right-sided bronchovascular markings alongside a mild hyperinflated left lung. Given the relatively stable baseline lung volumes, low-frequency manual jet ventilation utilizing 100% oxygen was selected. Following premedication and intravenous induction, muscle relaxation was established using intravenous succinylcholine. Following introduction of the rigid bronchoscope, a jet ventilation needle was fixed into the side port of the rigid bronchoscope. Manual jet ventilation was safely delivered at a rate of 8–10 breaths/min. The entire retrieval process was completed efficiently by the ENT surgeon with optical forceps within 5 minutes. Post-procedural imaging confirmed complete right lung expansion.

Case 3: A 1-year-old female child presented with acute respiratory distress after aspirating a metallic earring while playing. Her HR was 150/min and her SpO2 was 95% on room air. An emergent chest X-ray clearly delineated a radiopaque foreign body situated in the right main bronchus, immediately distal to the carina. Standard premedication and corticosteroids were administered. Volatile induction was carried out using 4-6 % sevoflurane in 6-8 L/min of oxygen. Following induction of anaesthesia, spontaneous assisted ventilation was maintained by attaching the anaesthetic circuit directly to the limb of the rigid bronchoscope. The metallic earring was extracted in toto without fragmentation. Post-procedure radiographs demonstrated normal, bilateral lung fields.

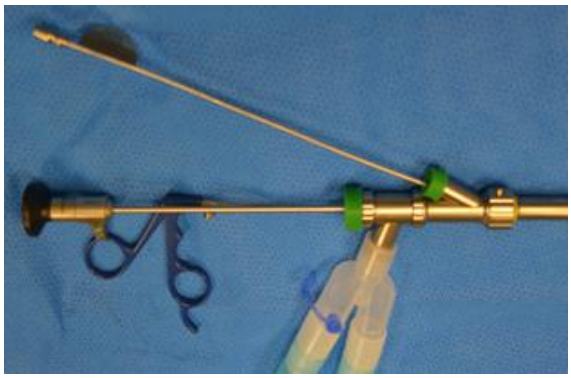
Case 4: A 11-month-old infant arrived in severe respiratory distress following a failed foreign body retrieval attempt at an outside hospital. Upon admission, vitals showed a marked tachycardia (HR 160/min), tachypnea (RR 40/min), and an SpO2 of 90% on a 8 L/min non-rebreathing mask. A chest X-ray revealed extensive atelectasis of the right middle and lower lobes paired with compensatory hyperinflation of the left lung. The patient was transferred immediately to the operating theatre for urgent rigid bronchoscopy. General anaesthesia with assisted spontaneous ventilation was employed to preserve native respiratory mechanics and oxygenation. The foreign body was safely extracted, and bilateral lung expansion was restored. Due to significant glottic and subglottic airway edema secondary to multiple instrumentation attempts, the child was kept intubated and electively ventilated in the intensive care unit for 24 hours. The patient was successfully extubated the following day without further complications.

DISCUSSION

Managing general anaesthesia for emergency paediatric rigid bronchoscopy demands meticulous coordination between the ENT and anaesthetic teams. Preoperative preparation dictates that the operating room must be fully equipped with a complete range of backup airway tools and bronchoscopes before inducing the patient. Standard American Society of Anesthesiologists (ASA) monitoring is mandatory for all cases. An anticholinergic agent (such as atropine) is universally useful in these patients to minimize airway secretions—thereby optimizing the bronchoscopist's view—and to blunt profound vagal bradycardia triggered by airway manipulation. Pharmacologically, an induction and maintenance regimen incorporating sevoflurane (4–8%) alongside boluses of propofol and ketamine proves highly effective. Ketamine provides beneficial bronchodilatation, while propofol successfully blunts hyperreactive airway reflexes. Additionally, topically spraying the vocal cords with 2% lignocaine

ISSN (O): 2687-5365; ISSN (P): 2753-6556

minimizes adverse hemodynamic pressor responses during direct scope insertion.



Spontaneous assisted ventilation remains an excellent choice for children with significant unilateral hyperinflation because it prevents the development of a tension pneumothorax or worsening air trapping. Because the working channel of a rigid bronchoscope introduces a continuous gas leak, delivering high oxygen flow rates paired with deep volatile titration is vital to maintain a SpO2 > 92%. Conversely, low-frequency manual jet ventilation offers an completely immobile surgical field, but it carries the inherent risk of high intra-airway pressures, which must be carefully weighed against clinical benefits. Clinicians must remain vigilant regarding the classic drawbacks of rigid bronchoscopy, including the total inability to accurately monitor end-tidal carbon dioxide (EtCO2), the challenges of managing an open airway circuit, and the absence of gas humidification to distal lung structures. ENT surgeon uses a 0-degree telescope in the bronchoscope with optical forceps. Furthermore, teams must be prepared to rapidly manage perioperative complications such as bronchospasm, laryngospasm, acute airway hemorrhage, ventricular arrhythmias, and post-extubation laryngeal edema.

CONCLUSION

Anaesthesia for paediatric rigid bronchoscopy is an inherently high-risk undertaking that demands seasoned medical personnel. There is no single "gold standard" technique; rather, the ventilation and maintenance strategy must be dynamically tailor-made to match the physiological status and foreign body mechanics of each individual child. Similarly, riggid bronchoscopy by ENT surgeon provides a equally efficient method of foreign body retrieval compared to flexible bronchoscopy. Ultimately, reducing door-to-procedure times yields significantly improved clinical recoveries and successful outcomes.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556