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CLINICAL REPORT

Retrograde intubation during laryngeal cleft repair on cardiopulmonary bypass

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Abstract Retrograde intubation is part of the difficult airway algorithm in the American Society of Anesthesiologists, but its usage is rare in small pediatric patients with the advent of new intubation techniques. We present our experience of retrograde intubation for a 4-month-old patient who presented for laryngeal cleft repair on cardiopulmonary bypass. This case highlights the unique place for retrograde intubation in small patients in the current era.

Keywords Retrograde intubation · Pediatric · Laryngeal cleft

Introduction

Retrograde intubation was reported by Butler and Cirillo [1] in 1960 as an alternative tool to conducting unplanned preoperative tracheostomies. Over time, this technique has evolved and is now an alternative in the American Society of Anesthesiologists difficult airway algorithm. Its usage has been described in the pediatric population as young as a 30-month-old patient [2]. With the advent of new intubation techniques and devices, and its relative invasiveness, it is now rarely used, especially in small pediatric patients. We present the case of retrograde intubation during laryngeal cleft repair in a 4-month-old patient. This case illustrates the unique place of retrograde intubation among airway management of small children in the current era.

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Case report

A 4-month-old, 4-kg baby boy was transferred to our institution for the management of laryngeal cleft (type III), which was diagnosed in the setting of several failed extubation attempts after Nissen fundoplication at an outside hospital. His other past medical history included tetralogy of Fallot, for which he previously underwent repair with a transannular patch.

On arrival to the intensive care unit (ICU), his heart rate (HR) was 140/min, blood pressure (BP) was 82/40 mmHg, and his SpO_2 was 100% with FiO_2 30%, pressure control 22 cmH_2O, positive end-expiratory pressure 5 cmH_2O, and respiratory rate 14/min. He was sedated with lorazepam and methadone. The preoperative echocardiogram showed good biventricular function, small patent foramen ovale, and severe pulmonary regurgitation. To optimize surgical exposure as well as maintain cardiorespiratory stability, the decision was made to perform the repair on cardiopulmonary bypass (CPB). After transfer to the operating room and placing standard noninvasive monitors, anesthesia was induced with ketamine. He was maintained on spontaneous breathing and was extubated for a direct laryngoscopy and bronchoscopy. The diagnosis of laryngeal cleft type III extending 2.5 cm inferior to the inferior aspect of the

cricoid was confirmed. It was also noted that his airway was severely edematous. He was then reintubated and was maintained with isoflurane, lorazepam, methadone, and fentanyl. Following right ulnar arterial catheter and right femoral double-lumen venous catheter placement, surgery was started. Cannulation for CPB was performed through the right common carotid artery and right internal jugular vein to avoid a repeat sternotomy. A separate incision was made on the anterior neck to access the laryngeal cleft. Once CPB was initiated, the endotracheal tube (ETT) was removed. Through the opening of the anterior side of trachea, the cleft was repaired with a superficial temporalis fascia graft. Just before closure, a 8 Fr. airway exchange catheter (G07833; Cook Medical, Bloomington, IN, USA) was inserted through the anterior trachea opening into the mouth in a retrograde fashion. Then, the 3.0 cuffed ETT was orally inserted over it. The trachea was closed, and he was weaned off CPB. He was kept intubated and transferred to the ICU.

Discussion

Our case report describes retrograde intubation for the smallest patient reported in the literature as well as the value of this technique even in small patients in the current era. Described as an alternative in airway management, retrograde intubation is rarely a technique of choice [3]. Currently, it seems to be utilized for patients with cervical/facial trauma or very limited mouth opening [3, 4]. Although it is reported as a simple and reliable method in experienced hands [5], it was associated with a low success rate and a significant risk of complications in the study by Gill et al. [4]. Its documented complications include laryngeal fracture [6], subcutaneous emphysema [7], and bleeding [8, 9].

In our case, retrograde intubation was preferable for several reasons. Access to the airway was limited because the entire face of the patient was covered with surgical drapes because of the proximity of the surgical site and neck cannulation. Additionally, any head manipulation needed meticulous attention because of the possibility of accidental dislodgement or kinking of the cannula. It was also thought that the presence of blood in the airway secondary to the fresh surgical wound in an anticoagulated patient might have made the fiberoptic intubation very difficult. Given these circumstances, intubation by direct laryngoscopy or fiberoptic intubation would have been challenging.

In this patient, the anterior trachea was already opened for surgical exposure and it was easy to intubate over the airway exchanger catheter, inserted directly in a retrograde fashion. Technically, an uncuffed ETT could have also been inserted retrograde through the anterior opening of the trachea to the mouth with the connector detached. However, it was believed by both the anesthesia and surgical team that the patient needed a cuffed ETT to optimize the mechanical ventilation postoperatively. The retrograde insertion of a cuffed ETT is impossible because of the indwelling pilot balloon, making the use of an exchange catheter essential.

In summary, this case illustrates the beneficial scenario of retrograde intubation in the small pediatric population. As various new intubation techniques and devices have been developed, we suspect that this technique, especially for small pediatric patients, will be used rarely and mainly in particular situations.

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