

Spontaneous Respiration with Dexmedetomidine for Removal of Subglottic Airway Foreign Body in an Infant: A Case Report

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Abstract

Anesthesia risks for surgery of airway foreign body removal are very high. A safe way to anaesthetize the patients is important. This report presented a case of an infant with a foreign body in the subglottic area, which was ultimately removed by rigid laryngoscopy under spontaneous respiratory using dexmedetomidine (DEX). A loading dose of DEX $4 \mu\text{g}\cdot\text{kg}^{-1}$ and sevoflurane 2 MAC could provide adequate depth of anesthesia during inserting the rigid bronchoscopy, and DEX $3 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$ was suitable for the maintenance of anesthesia with spontaneous respiratory. We considered that the maintenance of spontaneous respiration is one of the key points.

Keywords

Airway Foreign Body, Anesthesia, Rigid Bronchoscopy, Dexmedetomidine, Spontaneous Respiration

1. Introduction

Children younger than 3 years' old are at high risk of airway foreign body (FB) aspiration [1] [2]. A time series observation of children undergoing rigid bronchoscopy for an inhaled foreign body revealed that the incidence of pneumothorax and death was 0.3% and 0.1% [3]. Subglottic airway foreign body is especially a life-threatening emergency. Rigid bronchoscopy under general anesthesia is the usual surgical technique for foreign body removal [4] [5] [6]. Anesthesia risks for surgery of airway foreign body removal are very high, and also the mortality is very high. Haemorrhage, post-procedure laryngeal oedema and tracheo-bronchial

lacerations can occur during rigid bronchoscopy [7]. Tension pneumothorax is one of the most serious consequences of rigid bronchoscopy [8]. The baby would die within several minutes if not handled promptly when tension pneumothorax occurred. Spontaneous respiratory has lower risk to cause tension pneumothorax compared with manual jet ventilation. Here we reported a sharp subglottic airway foreign body removed undergoing rigid bronchoscopy under spontaneous respiratory with DEX.

2. Clinical Presentation

A 10 kg 9-month-old boy was undergoing rigid bronchoscopy because of sticking a fish bone for four days. X-ray indicated the foreign body was just lodged subglottic (**Figure 1(A)**). The baby was breathlessness and wheezing, and both of his lungs were filled with rales during auscultation.

After the baby entered the operating room, he was continuously monitored for heart rate (HR), pulse oxygen saturation (SpO_2), and noninvasive blood pressure (Bp) every 5 minutes. After monitor being connected, it showed HR128 bpm, Bp 88/50 mmHg and SpO_2 98%. The anesthetic circuit was precharged with 8% sevoflurane in 100% oxygen at $8 \text{ L}\cdot\text{min}^{-1}$ for 2 minutes. Then the baby was induced with 5% sevoflurane in 100% oxygen at $5 \text{ L}\cdot\text{min}^{-1}$ and intravenous access was obtained. DEX $4 \mu\text{g}\cdot\text{kg}^{-1}$ was intravenously injected within 10 minutes and then the dose was changed to $3 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$. Methylprednisolone 20 mg and atropine 0.05 mg were also intravenously administered. The baby maintained spontaneous breath with the tidal volume ranged from 40 - 60 mL and the respiratory rate ranged from 25 - 30 bpm. After a loading dose of DEX infusion was completed and sevoflurane was above 2 MAC, a rigid bronchoscope was successfully inserted.

Stop inhalation of sevoflurane and anesthesia was continued with DEX still at the rate of $3 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$. 100% oxygen was delivered at a flow rate of $8 \text{ L}\cdot\text{min}^{-1}$ by connecting the respiratory circuit to the side arm of the bronchoscope. The fish bone was very sharp and the otolaryngologists tried carefully to avoid scratching the airway. It was difficult to pull it out. The otolaryngologist repeatedly adjusted the bronchoscope for three times and the surgery lasted for 23 minutes. The baby maintained spontaneous breath during the surgery and SpO_2 maintained above 95%. After the fish bone was removed and the bronchoscope was with draw an, the baby was placed in lateral position and closely monitored. All the vital signs were normal. After 35 minutes, the baby woke up and returned to the ward safely.

This case showed an urgent subglottic airway foreign body (fish bone) (**Figure 1(B)**) and the bone was successfully removed undergoing rigid bronchoscopy with spontaneous respiratory. Spontaneous respiratory effort is particularly helpful in identifying the presence of tracheal obstruction because respiratory excursion and breath sounds are minimal or absent if such obstruction is present. With spontaneous ventilation, there is less chance of pushing a foreign body into the distal airway [9]. So in this case, we chose spontaneous ventilation

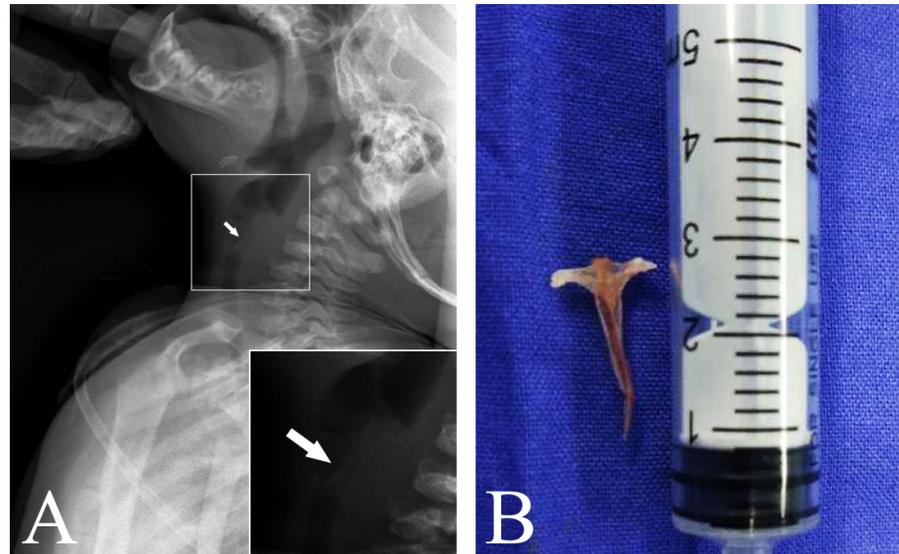


Figure 1. X-ray examination and the foreign body fish bone. X-ray examination before surgery, small white arrow indicates the foreign body, and the lower right square was the magnified square in the main photo (A). The foreign body fish bone was removed under rigid bronchoscopy (B).

instead of other ventilation mode. However, if the anesthetic depth is inadequate, intraoperative body movement, breath holding, bronchospasm, and laryngospasm may occur [10], while deep anesthesia increases the risk of respiratory depression. DEX produces sedation, analgesia and amnestic effects, and has anti-sialagogue properties [11]. DEX uniquely provides analgesia without causing respiratory depression [12]. It has been reported DEX provides appropriately deep anesthesia and ideal conditions for rigid bronchoscopy for airway foreign body removal without respiratory depression or hemodynamic instability [13]. This case showed a loading dose of DEX $4 \mu\text{g}\cdot\text{kg}^{-1}$ and sevoflurane 2 MAC could provide adequate depth of anesthesia during inserting the rigid bronchoscopy and DEX $3 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$ was suitable for the maintenance of anesthesia with spontaneous ventilation. This case may be helpful for the anesthesia of urgent subglottic airway foreign body removal in clinic.

3. Conclusion

Spontaneous respiratory could lower anesthesia risks associated with airway foreign body removal surgery, especially the risk of tension pneumothorax which could cause the baby die within minutes if not handled promptly. DEX combined with induction with sevoflurane could well keep spontaneous respiration during airway foreign body removal surgery.

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