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Journal of Anesthesia and Therapeutics

CASE REPORT

Two Dilemmas in Pediatric Difficult Airway: Types of Laryngoscopes and Blades

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Citation: Yorukoglu GC, Okuyucu KA, Yilmaz M, Bagdacicek G, Selcuk A, et al. (2018) Two Dilemmas in Pediatric Difficult Airway: Types of Laryngoscopes and Blades. J Anesth and Ther 1: 101

Abstract

Laryngomalacia is the most common cause of upper airway obstruction in children. The course of laryngomalacia is mild in many cases and limits itself but the serious symptoms need further examination. Supraglottoplasty is a preferred surgical treatment of laryngomalacia in serious symptomatic patients. Surgical treatment is needed in 5% to 10% of patients. In this case report, we aimed to discuss the essentials of airway management in patients undergoing different surgical interventions due to laryngomalacia. We managed the difficult airway method anticipated in both of the newborn and infant cases, successfully by using a curved blade videolaryngoscope.

Keywords: Laryngomalacia; Pediatric difficult airway; Videolaryngoscope

Introduction

Laryngomalacia is the most common cause of upper airway obstruction in children [1]. Stridor is a wheezing sound that occurs as a result of turbulent airflow based on collapse of the upper airway. Laryngomalacia has been distinguished with a stridor in 70% of the infants [2]. Stridor in laryngomalacia generally occurs in the first two weeks of life. Symptoms are apparent especially during feeding and in supine position. The course of laryngomalacia is mild in many cases and limits itself but the serious symptoms need further examination. Collapse of supralaryngeal structures mainly occur in inspiration. Epiglottis is folded on itself and appeared in omega shape. Gastroesophageal reflux and resultant recurrent pneumonia are generally accompanied with this [3]. Supraglottoplasty is a preferred surgical treatment of laryngomalacia in serious symptomatic patients [4,3]. Surgical treatment is needed in 5% to 10% of patients [5]. In this case report, we aimed to discuss the essentials of airway management in patients undergoing different surgical interventions due to laryngomalacia.

Case Report

Case-1

Fifty-five days old, 2500 gr weight (<3% percentile) and 53 cm length (<3% percentile) patient was followed up in pediatric intensive care unit for 43 days due to laryngomalacia, pneumonia, respiratory distress and feeding difficulty, having additional anomaly including micrognathia and cleft palate. The patient was planned to undergo supraglottoplasty surgery by otorhinolaryngology because of worsening his general condition. During preoperative anesthesia examination, pectus excavatum was detected. There was reflux and stridor in suprasternal, sternal and xiphoid regions during inspirium and rale in bilateral lower zones. Other systems were normal in examination. Laboratory findings were also in normal limits. The patient was evaluated as ASA IV. For the patient anticipated with difficult airway, a difficult airway table was prepared in operation room according to age and weight of the case.

After the informed consent was taken from his family, the patient was brought to the operation room. Standard monitorization was maintained for heart rate, electrocardiography, noninvasive blood pressure, oxygen saturation and temperature follow-up. Maintenance of crystalloid fluid treatment was performed with 35 ml/kg 1/3 Isomix solution. Hourly maintenance with 10 ml/h fluid was added to this amount.

Initial SpO_2 of the patient was 93%, heart rate was 130 beats/min, noninvasive blood pressure (NIBP) was 80/40 mmHg and the body temperature was 36.7 °C. Prior to induction, 0.2 mg/kg dexamethasone was injected. Following preoxygenation about three minutes, 6% sevoflurane and 100% O_2 were used for anesthesia induction. After sufficient depth of anesthesia, direct laryngoscopy with a Miller straight blade No. 0 was applied by an experienced anesthetist. Due to laryngomalasia and mucosal folds on arytenoids, optimal image could not taken. Cormack-Lehane score was 3b. Direct laryngoscopy was applied for the second time by a Macintosh curved blade No. 0 but optimal image could not taken again. Laryngoscopy was re-performed by using the GlideScope Cobalt AVL (Verathon Inc., Bothell, WA, USA) blade No.1 by another anesthetist who was more experienced for airway management; since the intubation trial was unsuccessful by an endotracheal tube cuffed no.3 placed in stile, 10Fr x 70 cm pediatric gum elastic bougie was placed by using GlideScope. Afterwards $EtCO_2$ was monitored and the place of bougie was verified. The airway of the patient was controlled by pushing the endotracheal tube cuffed no.3 on bougie.

Anesthesia was maintained by 2.5% sevoflurane in 50% air+O_2. During surgery, there was not any problem in hemodynamic follow-up of the patient. Subsequent to the surgical interventions lasted for 45 minutes; the patient was transferred intubated to pediatric intensive care unit.

The patient with a stable general condition, observed to have regressing airway edema was accepted to the operation room again for the purpose of controlled extubation at postoperative 5th day. Preparations were provided for reintubation. After cuff leakage test, a pediatric bougie was placed into the tracheal tube. With sufficient spontaneous respiration, the patient was gently extubated. Subsequent to close observation for 30 minutes, the patient was transferred to the pediatric intensive care unit as extubated. No complication occurred.

Case-2

46 days old patient in 3900 gr weight (5% percentile) and 55 cm length (5% percentile) was followed up in pediatric intensive care unit for 15 days due to pneumonia and stridor was planned to undergo tracheostomy due to the diagnosis for laryngomalacia.

In preoperative anesthesia examination, reflux and stridor in suprasternal, sternal and xiphoid regions during inspirium and bilateral rale and the presence of rhonchi were observed. Other systems were normal in examination. Laboratory findings were also in normal limits. The patient was evaluated as ASA IV.

After the informed consent of his family was taken, the patient was accepted to the operation room. Standard monitorization was supplied for hear trate, electrocardiography, noninvasive blood pressure and oxygen saturation. The fluid treatment was started with 56 ml/h with 1/3 Isomix through available vascular access. Anticipated to have a difficult airway, a difficult airway trolley was ready for the patient in the operation room.

Initial SpO_2 of the patient was 98%, heart rate was 140 betas/min, NIBP was 78/56 mmHg and the body temperature was 37.0 °C. Prior to induction, 0.2 mg/kg dexamethasone was injected. After preoxygenation about three minutes, 6% sevoflurane and 100% O_2 were used for anesthesia induction. Achieving sufficient depth of anesthesia, direct laryngoscopy with a Miller straight blade no. 0 was applied by an experienced anesthetist, an optimal image could not be taken in spite of a longitudinal external manipulation. Head-neck position was re-evaluated and optimized. Cormack-Lehane score was detected as 3. Direct laryngoscopy was applied for the second time by a Macintosh curved blade no. 0 but optimal image for intubation could not be taken again. Laryngoscopy was performed by using Glidescope blade no.1 by another anesthetist who was more experienced for airway management; a successful intubation was provided by a tracheal tube cuffed no.3 placed in stile. In both cases, Cormack-Lehane score was declined from grade 3 to grade 1 by Glidescope. After taking this image by videolaryngoscopy, 0.6 mg/kg dose of rocuronium was administered iv and vocal cords were passed. No complication occurred.

Maintenance of anesthesia was performed using 2.5% sevoflurane in 50% air+O_2, while respiration continued to be controlled manually. Subsequent to the surgical interventions lasted for 60 min, the patient was transferred to pediatric intensive care unit along with tracheostomy. In pediatric intensive care unit, postoperative follow-up and treatment of the patient proceeded.

Discussion

In this case report including two cases, we managed the anticipated difficult airway in both of the newborn and infant cases successfully by using videolaryngoscope. The common characteristic of our cases was a difficult intubation with Cormack-Lehane score grade 3. A direct laryngoscopy was initially performed. Unable to be successful in direct laryngoscopy, however, successful intubations were to be performed by using videolaryngoscope. Since the tracheal intubation was unsuccessful although a good image was taken by videolaryngoscope at the first case, intubation was attempted and succeeded by the help of a pediatric bougie. In unanticipated difficult tracheal intubation guideline recommended by Difficult Airway Society (DAS), if the placement of a supraglottic airway device (SAD) was not favorable and subsequent surgery proceeding with SAD was not convenient for one to eight years old children, a tracheal intubation mediated by a fiberoptic scope through the SAD is suggested [6].

Devices for airway management are more limited for newborn or infant cases anticipated to have difficult intubation. Recently, POGO intubation scores by using a Macintosh or Miller bladehas been compared in children under age of two years and it is concluded that there is not any significant difference between blades in terms of laryngoscopic images [7]. However, there is not

any study about which blade is the superior for newborns and infants in the literature. Besides, our previous study has reported that Miller blades can be more advantageous than Macintosh in simulated pediatric difficult intubation [8]. Therefore, in these cases, we firstly tried intubation by Miller and then Macintosh blade but we could intubate by videolaryngoscope with curved blade. In DAS guideline, direct or indirect laryngoscope is recommended for adult patients of anticipated difficult intubation cases, while there is no recommendation for pediatric patients [9].

Repeated unsuccessful intubation trials can cause an edema in soft tissue, resulting in impossible ventilation. Both cases had no laryngeal edema but we consider that we could save time if we would start with videolaryngoscopy. Although fiberoptic intubation has been a gold standard in anticipated difficult airway management in young infants for years, different types of laryngoscopes produced recently have subrogated this in large extent [10]. On the other hand, although there are articles reporting that videolaryngoscopes enhance the laryngeal image, in our first case, taking a good image may not guarantee for tracheal intubation. When Glidescope and direct laryngoscopes in 23 pediatric patients applied a cervical spine immobilization manually have been compared in terms of glottis opening score percentages, 50% (1%-87%) was obtained by Glidescope whereas 90% (60%-100%) was for direct laryngoscope [11]. This study shows us that there is no requirement to start with videolaryngoscopy in anticipated pediatric difficult intubation cases.

Another common characteristic of these two cases was the maintenance of spontaneous respiration by sevoflurane anesthesia. After taking an active laryngeal image, muscle relaxation was provided by rocuronium before passing the vocal cords by bougie or tracheal tube. Our aim here was to provide airway maintenance of the patient and intact airway reflexes. However, to prevent laryngospasm also in period of passing vocal cords, rocuronium was applied. This method has been suggested by Walkers et al to maintain pediatric difficult airway [12].

Conclusions

Direct and indirect laryngoscopes and the different types of blades have been a dilemma for difficult pediatric airway management. As a result, in pediatric patients with inevitable continuous dilemma of difficult intubation cases, the first choice is the use of direct or indirect laryngoscope and firstly Miller or Macintosh blade can be preferred. In these two infant cases, we started indirect laryngoscopy by Miller blade but when we failed, we achieved a success by using a curved videolaryngoscope blade. We concluded that there is a need for further studies from a large number of pediatric series in this issue.

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