Difficult airway management in a patient with unexpected laryngeal deformities

ABSTRACT

We report an experience with difficult airway management due to unexpected laryngeal deformities. A 69-year-old man who had been diagnosed with left vocal cord paralysis was scheduled for eye surgery. After the induction of anesthesia, mask ventilation was inadequate and intubation was impossible, so an emergency tracheostomy had to be performed. In the larynx examination, the left vocal cord was paralyzed close to the midline and the left corniculate tubercle was enlarged and partially blocked the rima glottidis. Laryngeal deformities may cause unexpected difficult airway management. Clinicians always have to pay close attention to the potential risk and prepare for emergency situations including an invasive approach to the airway.

Key words: Airway management, airway obstruction, vocal cord paralysis

Introduction

Difficult airway management is a significant cause of morbidity and mortality during anesthetic care. Of the various risk factors, the presence of upper airway pathologies or anatomical deformities is the most important cause of difficult airway management.[1,2] However, such problems may not be identified before the initiation of anesthetic care. We report an experience with difficult airway management due to unexpected laryngeal deformities.

Case Report

This case report was approved by the Institutional Review Board of Jeju National University Hospital (IRB No. 2020-06-013), and the requirement for obtaining informed consent was waived.

A 69-year-old man, 172-cm tall and weighing 60 kg, was diagnosed with a macular hole in the left eye. He was scheduled for pars plana vitrectomy with intraocular lens implantation under general anesthesia.

Ten years earlier, he had a total thyroidectomy and neck dissection for thyroid cancer, followed by radiation therapy. He had been diagnosed with left vocal cord paralysis after the surgery. In the preoperative evaluation, his voice was a little hoarse, but he had no problem speaking and no difficulty breathing. His airway showed a normal throat, mandible, and mouth opening with Mallampati grade II. The thyromental...
distance was normal and neck movement was moderately limited.

When the patient entered the operating room, routine monitoring including electrocardiogram, pulse oximetry, and non-invasive blood pressure was initiated. After preoxygenation, anesthesia was induced with 300 mg of intravenous thiopental sodium and 50 mg of rocuronium. Mask ventilation (MV) was tried, but excessive resistance to the ingress of gas was encountered. MV was attempted again with an oral airway, but the ventilation was still barely sustained with excessive resistance. Then, intubation was tried with a direct laryngoscope and a Glidescope® videolaryngoscope (Saturn Biomedical Systems Inc., Burnaby, British Columbia, Canada), but a proper laryngeal view could not be obtained. We called for help and two anesthesiologists attempted MV again with a nasopharyngeal airway. However, adequate MV was still not attainable.

The patient’s pulse oxygen saturation decreased to 90% and an otolaryngologist began to perform an emergency tracheostomy. When pulse oxygen saturation decreased to 50%, an emergency tracheostomy with a 6.0-mm ordinary endotracheal tube was successfully performed. Positive pressure ventilation was carried out and his vital signs stabilized rapidly. We decided to wake the patient up from anesthesia and muscle relaxation was reversed with 200 mg of sugammadex. After confirming that he had recovered sufficiently from anesthesia, he was extubated and had no difficulty breathing.

The day after surgery, the patient was examined by an otolaryngologist via flexible fiberoptic laryngoscopy. The movement of the right vocal cord was normal, but the left vocal cord was paralyzed close to the midline. Additionally, the left corniculate tubercle was found to be enlarged and partially blocked the rima glottidis [Figure 1]. We asked about his medical condition in more detail and found that he tolerated ordinary life activity but felt some shortness of breath during exercise. He also felt some discomfort in his throat.

It was supposed that, because his right vocal cord could be abducted in breathing, his airway patency could usually be maintained despite the left vocal cord paralysis. However, if he underwent anesthesia, his right vocal cord was relaxed and positioned in a neutral position. This position could make the rima glottidis, which was already partially blocked by the enlarged left corniculate tubercle, narrower. These changes could make both MV and intubation difficult [Figure 2].

Two weeks later, his eye surgery was scheduled again. After discussion with the patient and the surgeon, we decided to try awake intubation first rather than retrobulbar block. After applying lidocaine spray, awake fiberoptic nasotracheal intubation with a 6.0-mm reinforced endotracheal tube was successfully performed. The remaining anesthetic care and surgery were performed as usual. After the surgery was complete and the patient was fully awake, extubation was done uneventfully and he was discharged without sequelae.

**Discussion**

Airway management is a fundamental component in delivering anesthetic care. Adequate MV is especially essential to securing rescue time during unsuccessful intubation attempts and unexpected difficult airway situations. Difficult MV is defined as a clinical situation in which MV delivered by a physician trained in anesthesia care cannot provide adequate ventilation because of various problems such as an inadequate mask seal, excessive gas leak, or excessive resistance to the ingress or egress of gas. The incidence of difficult MV inadequate for maintaining oxygen saturation or requiring two practitioners was reported to be 1–5%.

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Figure 1: Laryngeal view when breathing. The left vocal cord was paralyzed close to the midline. The left corniculate tubercle was enlarged and partially blocked the rima glottidis

Figure 2: Schematic drawing of the laryngeal view. (a) Awake state. The right vocal cord is abducted in breathing, so airway patency can be maintained. (b) Under general anesthesia. The right vocal cord is relaxed and positioned in a neutral position. This position can make the rima glottidis, which was already partially blocked by the enlarged left corniculate tubercle, narrower. *Left vocal cord, **Right vocal cord
Also, the incidence of impossible MV noted by the absence of end-tidal carbon dioxide and the lack of perceptible chest wall movement was reported to be 0.05–0.16%.

Before the initiation of anesthesia care, airway evaluation is crucial to identify the presence of upper airway pathologies or anatomical anomalies. The commonly reported risk factors for difficult MV include obesity, a beard, Mallampati classification III or IV, old age, limited jaw protrusion, short thyromental distance, and limited head and neck movement. However, no single characteristic has been identified as consistently more predictive and there is a diversity of opinions on the determination of a common set of predictors. In fact, the prediction of difficult MV was not accurate, with low sensitivity. According to previous research, only 6–17% of the patients with difficult MV could be predicted in daily routine practice.

One of the most important causes of unexpected difficult MV is a laryngeal mass or deformities such as lingual tonsillar hypertrophy, lingual thyroid, thyroglossal cysts, and tumors. Patients with these abnormalities could have some symptoms, such as sore throat, a feeling of a lump in the throat, dysphagia, snoring, and obstructive sleep apnea. However, he or she could be asymptomatic, and it could be difficult to identify the abnormalities through routine external physical evaluation of the airway. In the present case, we preoperatively recognized that the patient’s voice was a little hoarse but missed that he felt some shortness of breath during exercise and some discomfort in his throat. Clinicians should pay close attention to the potential risk of difficult MV in a patient with these ambiguous symptoms as well as the well-known risk factors of a difficult airway.

In the present case, it is supposed that right vocal cord relaxation into the neutral position under general anesthesia made the rima glottidis, which was already partially blocked by the enlarged left corniculate tubercle, narrower and these changes made MV difficult. In general, when the patient cannot be mask-ventilated or intubated, a supraglottic airway is recommended to provide rescue ventilation. We did not try to use a supraglottic airway because we could not prepare it quickly. However, even if we used it, MV might not be adequate because the level of anatomic deformities was vocal cord. Our case highlights the importance of always being prepared for surgical airway management such as emergency cricothyroidotomy or tracheostomy.

In conclusion, laryngeal deformities may cause unexpected difficult airway management. Clinicians always have to pay close attention to the potential risk and prepare for emergency situations including an invasive approach to the airway.

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Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

References
1. Davies S, Ananthanarayan C, Castro C. Asymptomatic lingual tonsillar hypertrophy and difficult airway management: A report of three cases. Can J Anaesth 2001;48:1020-4.
2. Ovassapian A, Glassenberg R, Randel GI, Klock A, Mesnick PS, Klafta JM. The unexpected difficult airway and lingual tonsillar hyperplasia: A case series and a review of the literature. Anesthesiology 2002;97:124-32.
3. Apfelbaum JL, Hagberg CA, Connis RT, Abdelmalak BB, Agarkar M, Dutton RP, et al. 2022 American society of anesthesiologists practice guidelines for management of the difficult airway. Anesthesiology 2022;136:31-81.
4. Kheterpal S, Han R, Tremper KK, Shanks A, Tait AR, O’Reilly M, et al. Incidence and predictors of difficult and impossible mask ventilation. Anesthesiology 2006;105:885-91.
5. Langeron O, Masso E, Huraux C, Guggiari M, Bianchi A, Coriat P, et al. Prediction of difficult mask ventilation. Anesthesiology 2000;92:1229-36.
6. Han R, Tremper KK, Kheterpal S, O’Reilly M. Grading scale for mask ventilation. Anesthesiology 2004;101:267.
7. Norskov AK, Rosenstock CV, Witterslev J, Astrup G, Afshari A, Lundstrom LH. Diagnostic accuracy of anesthesiologists’ prediction of difficult airway management in daily clinical practice: A cohort study of 188 064 patients registered in the Danish Anaesthesia Database. Anaesthesia 2015;70:272-81.
8. Jones DH, Cohle SD. Unanticipated difficult airway secondary to lingual tonsillar hyperplasia. Anesth Analg 1993;77:1285-8.
9. Ramachandran K, Kannan S. Laryngeal mask airway and the difficult airway. Curr Opin Anaesthesiol 2004;17:491-3.