

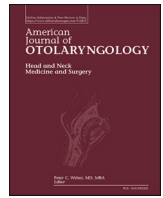


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Emergency videoendoscopic endonasal tracheal intubation for severe upper airway stenosis^{☆, ☆ ☆}

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ABSTRACT

Purpose: Upper airway stenosis is one of the most formidable situations in medicine and is frequently encountered in the ENT clinic. We introduce here our method of emergency endonasal endotracheal intubation under videoendoscopic observation.

Methods: Transnasal endoscopic observation was done, and the region of airway stenosis was detected. Then, the endotracheal tube was prepared and the endoscope was inserted into the tube. The endoscope with tube was inserted up to the larynx. Immediately after the administration of lidocaine to the larynx, the endoscope with tube was inserted to the endolarynx and then to the trachea. The endotracheal tube was tightly held in the nostril, and the endoscope was removed.

Results: We have encountered four cases this year. The primary disease developing airway stenosis was acute epiglottitis due to pharyngeal and deep neck abscesses in three cases and laryngeal edema due to Ludwig's angina. All patients underwent uneventful intubation, and dyspnea was immediately ceased.

Conclusion: In cases showing severe suffocation, the clinician should perform airway maintenance even in an outpatient setting apart from a more monitored setting like the operation room. This technique resembles the usual nasal endoscopic laryngeal observation and is done even in the usual ENT office and/or emergency room. The supine position tends to worsen airway stenosis in patients with upper airway stenosis; however, this technique can be performed in a sitting or semi-sitting position. This method is less invasive for patients and also reduces the risk to the medical staff, especially in this COVID-19 era.

1. Introduction

Upper airway stenosis develops suffocation and is one of the most formidable situations in medicine. Especially for ENT clinicians, upper airway stenosis is frequently encountered due to infection in the otolaryngological field. In such cases, emergent airway maintenance is required, otherwise the patient will die or have severe sequelae even in the ENT outpatient clinic. The most common region causing upper airway stenosis is the larynx. In these situations, endotracheal intubation, cricothyrotomy, or tracheostomy is performed to prevent suffocation [1]. However, these techniques have potential risks of nosocomial infection from the patient's coughing, sputum, and blood. In addition, these techniques are usually done in a supine position; however, this

position tends to worsen airway stenosis in patients with upper airway stenosis. Currently, coronavirus disease 2019 (COVID-19) infection is a serious problem for otolaryngologists, and tracheostomy is strongly avoided, especially for suspicious COVID-19 carriers [2–4]. Transoral intubation itself is also hazardous in such situations. In this report, we introduce our method for acute airway stenosis in an ENT outpatient clinic.

2. Methods

Before the observation of a patient, an N95 mask, face shield, cap, gloves, and protective wear were prepared [3,4]. The patient wore a surgical mask, and only the nostrils were open. Transnasal endoscopic

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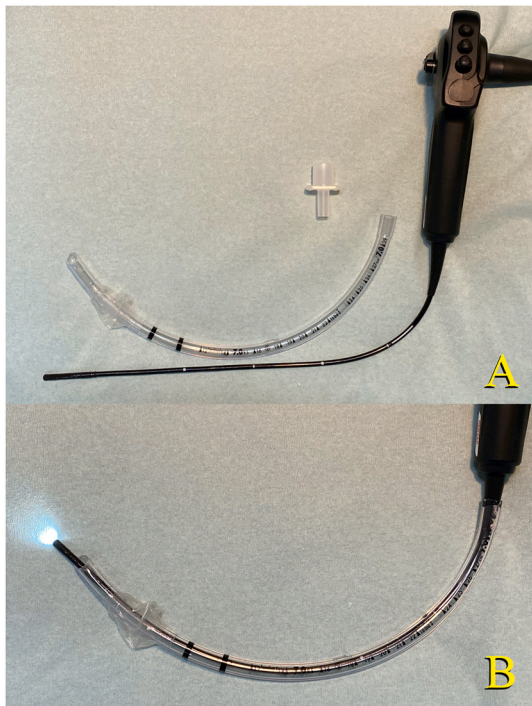


Fig. 1. A 7.0 mm endotracheal tube and a video endoscope (A). Due to both lengths, the attachment of the endotracheal tube is detached and the endoscope is inserted into the tracheal tube (B). The tip of the endoscope protrudes 2 cm, and it facilitates endoscopic manipulation and also the observation of the larynx and trachea.

observation was done as usual. Once airway stenosis was detected, the nasal cavity was dilated and anesthetized by epinephrine and lidocaine. After the nasal cavity was widened, the endotracheal tube was prepared and the adapter was removed (Fig. 1A). The endoscope was inserted into the tube, and the tip of the endoscope was removed from the endotracheal tube (Fig. 1B). The endoscope with tube was inserted up to the larynx (Fig. 2). Then, 8% lidocaine spray (Aspen Japan®, Tokyo, Japan) was applied from the other side of the nostril to the larynx. Otherwise, 4% lidocaine was injected through the endoscopic channel. Immediately after the administration of lidocaine, the endoscope with tube was inserted to the endolarynx and then to the trachea (Fig. 2). The endotracheal tube was tightly held in the nostril, and the endoscope was removed. The position of the tube could be adjusted under endoscopic

observation through the endotracheal tube. This procedure is presented on Video. The Ethical Institutional Review Board of Juntendo University Nerima Hospital approved this report (S 20-02).

3. Results

We had four cases this year. The primary disease developing airway stenosis was acute epiglottitis due to pharyngeal and deep neck abscesses in three cases (77- and 79-year-old males and 71-year-old female). The last case was laryngeal edema due to Ludwig’s angina (87-year-old female). Two patients used a 7.0 mm tube, and the other two patients used a 6.0 mm tube. All patients underwent uneventful intubation, and dyspnea was immediately ceased. Three cases with accompanying pharyngeal and deep neck abscess required surgical drainage. These cases underwent tracheotomy, so the tube was extubated. The patient with Ludwig’s angina was extubated 2 days after intubation under endoscopic observation. The patient’s nose showed mucosal damage but was gradually healed within a week.

4. Discussion

After the advent of antibiotics, the frequency of encountering severe upper airway infections causing airway stenosis has decreased; however, this condition leads to life-threatening situations. To save patients from suffocation, emergency airway maintenance is required even in the ENT office. Tracheotomy and cricothyrotomy are performed in such situations. However, as mentioned, the risk of nosocomial infection inevitably increases [2–4]. In addition, neck extension facilitates the surgical management of both tracheotomy and cricothyrotomy. However, neck extension during supine position is very difficult for patients with upper airway stenosis. In such cases, surgery should be performed on a sitting position. In contrast, surgery on a sitting position is very difficult for the surgeon.

Transnasal intubation is widely applied for oral and pharyngeal surgery [5]. Compared to surgical intervention or transoral endotracheal intubation, transnasal intubation is much more comfortable for patients. This technique allows patients to keep their sitting position, and this position is also familiar to ENT doctors. Using an endoscope, transnasal intubation becomes much easier and safer. The method is performed in the same fashion as the usual use of a flexible endoscope, so it is familiar to ENT doctors. The size of the tracheal tube is an important factor. An 8 mm tube is too bold to use for endonasal intubation for most patients. We recommend a 7.0 mm endotracheal tube, but a 6.0 mm tube is also usable. Our method is much easier for clinicians and less invasive for patients. However, this technique should be

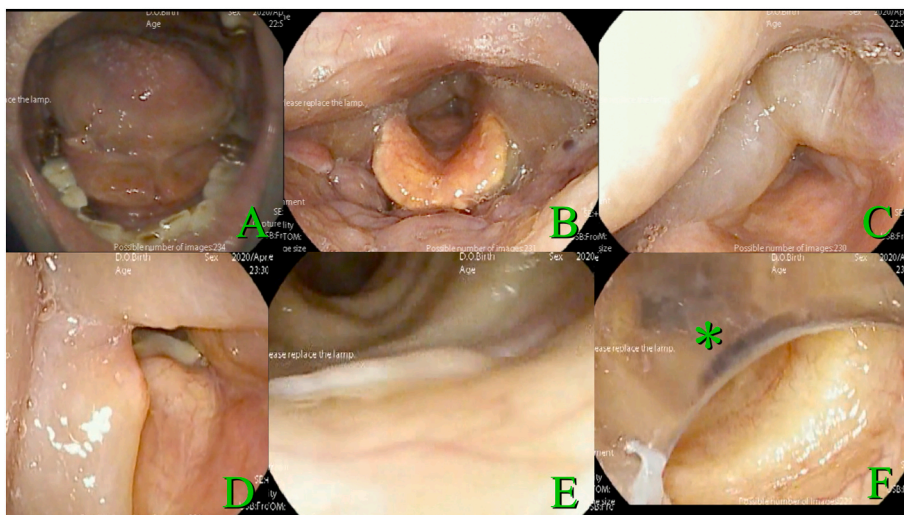


Fig. 2. Procedure of intubation. An 87-year-old woman with Ludwig’s angina showing swelling of the oral floor (A). Inflammation of the oral floor spread to the pharynx and larynx. She complained of hoarseness and mild dyspnea (B and C). Under endoscopic observation, the endoscope was inserted into the endolarynx, and once the glottis was observed, the endoscope with tube was carefully inserted (D). Once the endoscope was inserted into the trachea, the tube was left and the endoscope was immediately drawn (E and F). The asterisk indicates bifurcation of the trachea.

performed in limited situations as follows:

1. In very urgent situations to prevent suffocation;
2. At the least, the vocal cords are visible; and.
3. Alternate methods for airway maintenance, such as cricothyroidotomy, are ready.

Although this method is applied in extreme situations, we are convinced that our method reduces the risk to both the patient and the medical staff, especially during this COVID-19 era.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amjoto.2020.102779>.

CRedit authorship contribution statement

Atsunobu Tsunoda and **Yuko Kobayashi**: Conceptualization, Methodology, Writing-original draft preparation, Writing-reviewing and editing.

Miri Tou, Kenji Sonoda, Shinpei Arai, Takahi Anzai, and Fumihiko Matsumoto: Investigation.
Fumihiko Matsumoto: Supervision.

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