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Does intubation while observing the glottis with a fiberoptic scope reduce postoperative sore throat?

Maho Goto[1], Masanori Tsukamoto[2*], Kazuya Matsuo[3] and Takeshi Yokoyama[1,4]

Abstract

Introduction In oral maxillofacial surgery, the nasal tracheal tube is mostly used to provide a better surgical field for oral, head and neck operations. Postoperative sore throat and hoarseness are common following tracheal intubation, with an incidence of 11–55%. Then, we previously reported advantage technique of fiberoptic scope to decrease the risk which the tip of the tube is visualized as the tube is advanced which helps avoid impingement of the tube. However, the extent to which this technique causes postoperative complications is unknown compared to traditional technique. The aim of this study was retrospectively to determine the effect of postoperative sore throat following nasotracheal intubation by tip of the tube is visualized by fiberoptic scope.

Method Anesthesia records of the adult patients with nasotracheal intubation were checked. Patients underwent oral maxillofacial surgery from January 2021 until March 2023. Facilitated with rocuronium, nasotracheal intubation was performed using the traditional or observative method by fiberoptic scope with a 4.8 mm outer diameter. Intubation was performed with a cuffed 6.5–8.0 mm ID nasotracheal tube. The following variables were recorded: gender, age, height, weight, ASA classification, anesthesia time, duration of intubation, tube size, intubation attempts, fentanyl and remifentanil. The postoperative sore throat and the incidence of hoarseness were recorded at operative day and at the day after operative day, and the time to recovery.

Result A total of 104 cases (traditional fiberoptic intubation $n=51$, observative fiberoptic intubation $n=53$) were enrolled in this retrospective study. There were no significant differences in clinical characteristics and anesthetic data. There was not significant difference in incidence of postoperative sore throat, hoarseness and recovery between the two groups ($P=0.61$, 0.44, 0.90). For subjects reporting postoperative sore throat ($n=30$), there was not a significant difference in VAS means at operative day and at the day after operative day between the two groups ($P=0.81$, 0.91).

Conclusion We found that postoperative sore throat and recovery were not influenced by observative fiberoptic scope for nasotracheal intubation.

Keywords Nasotracheal intubation, Indirect visualization, Sore throat, Fiberoptic scope, General anesthesia

*Correspondence:
Masanori Tsukamoto
tsukamoto@dent.kagoshima-u.ac.jp
[1]Department of Dental Anesthesiology, Graduate School of Dental Science, Kyushu University, Fukuoka, Japan
[2]Department of Dental Anesthesiology, Graduate School of Medical and Dental Sciences, Kagoshima University, Kagoshima, Japan
[3]Department of Control Engineering, Kyushu Institute of Technology, Kitakyushu, Japan
[4] Department of Dental Anesthesiology, Faculty of Dental Science, Kyushu University, Fukuoka, Japan

Introduction

In oral maxillofacial surgery, the nasal tracheal tube is primarily used to provide a better surgical field for oral, head, and neck surgeries [1–3]. There are various methods of intubation, such as direct or video laryngoscopy and fiberoptic scope [4, 5]. The fiberoptic scope is often used for difficult intubation, such as mouth opening disorders.

Postoperative sore throat and hoarseness are common after tracheal intubation, with an 11–55% incidence [6–9]. These adverse events, closely related to tracheal tube size and cuff pressure, may negatively affect patient satisfaction and postoperative activities [9, 10]. It was previously reported that nasotracheal intubation is more traumatic than orotracheal intubation [11–13]. Because nasotracheal intubation (traditional fiberoptic intubation) involves the insertion and passage of a tube from the naris through the nasal cavity to the nasopharynx, which is typically performed blindly and may result in tissue damage [14–16]. In addition, it has been reported that even when a fiberoptic scope is used, it could be difficult to advance the tube over the fiberoptic scope because of impediments by the epiglottis, pyriform fossa, or arytenoids [17–19].

We previously reported an advantageous technique using a fiberoptic scope (observable fiberoptic intubation), in which the tip of the tube is visualized as the tube advances, which helps avoid impingement of the tube [20]. However, the extent to which this technique causes postoperative complications is unknown compared with the traditional technique [21].

The primary aim of this study was to determine the effect of visualizing the tube tip using a fiberoptic scope on postoperative sore throat following nasotracheal intubation. The secondary aims were to compare the degree and duration of postoperative sore throat and the incidence of hoarseness associated with nasotracheal intubation between traditional and observational methods using a fiberoptic scope. We hypothesized that postoperative sore throat would be influenced by intubating conditions, especially observative fiberoptic intubation, which could reduce the incidence of sore throat.

Methods

Study design

This retrospective study was approved by Kyushu University Institutional Review Board for Clinical Research (Approval No.23229-00) on October 10, 2023, and the need for consent to participate was waived, then informed consent to participate was not obtained from all of the participants, which complies with the Declaration of Helsinki. Adult patients underwent general anesthesia using a fiberoptic scope for oral maxillofacial surgery were included. Pediatric patients, reconstructive patients and trauma patients were excluded. In addition, patients with upper respiratory tract disease, hoarseness, or sore throats were excluded from this study.

Anesthesia

The patients received no premedication and were continuously monitored using electrocardiography, pulse oximetry, noninvasive blood pressure, and a BIS monitor. General anesthesia was induced using atropine, propofol, remifentanil, and fentanyl. Facilitated with rocuronium, nasotracheal intubation was performed using the traditional or observative method by fiberoptic scope with a 4.8 mm outer diameter (Pentax, HOYA, Tokyo, Japan). Intubation was performed with a cuffed 6.5–8.0 mm ID nasotracheal tube (Portex, North Facing Nasal Soft-Seal Cuffed Polar Preformed Endotracheal Tube, Smiths Medical International, Hythe, UK). After confirming successful endotracheal positioning, the tube cuff was inflated with air to maintain 20–25 cm H_2O. Anesthesia maintenance, as determined by each anesthesiologist, was performed using an inhalational anesthetic or propofol plus oxygen or air. In addition, fentanyl 100–500 μg and remifentanil 0.05–0.5 μg/kg/min were administered for analgesia to all patients; at the end of the procedure, a diclofenac suppository of 50–100 mg was inserted. Local anesthesia with a vasoconstrictor (lidocaine containing 1:200.000 epinephrine) was administered in all patients during surgery. The dose of local anesthetic was dependent on the surgeon. All anesthetics were discontinued after tracheal or gastric suction. Mechanical ventilation was discontinued when the patient regained spontaneous respiratory effort. After regular observation of spontaneous respiration and upper airway patency, the patients were extubated awake. Once the hemodynamic and respiratory parameters stabilized, the patients were transferred back to their rooms.

The following variables were recorded: sex, age, height, weight, ASA of Anesthesiologists classification, anesthesia time, duration of intubation, tube size, number of intubation attempts, fentanyl, and remifentanil. The severity (postoperative pain as measured by the visual analog scale (VAS)) and duration of postoperative sore throat as well as the incidence of hoarseness following surgery were examined by the attending physician or anesthesiologist between the day of the operation and the following day [20].

Statistical analysis

Non-parametric methods were used to evaluate the data statistically using R version 4.0.2 (R Foundation for Statistical Computing). Fisher's exact test and Spearman's rank correlation test were used to compare groups in the univariate analysis. All values are expressed as mean ± standard deviation (SD) or number of occurrences (n) for

Table 1 Patient characteristics ($n=104$)

	Traditional fiberoptic intubation ***n*** **=51**	**Observative fiberoptic intubation** ***n*** **=53**
Gender (M/F)	28/23	26/27
Age (yrs)	60.3 ± 20.7	62.5 ± 20.0
Height (cm)	161.6 ± 10.5	160.3 ± 9.2
Weight (kg)	60.7 ± 12.1	57.3 ± 10.6
ASA classification 1/2/3 (n)	21/28/2	10/41/2

Values are means ± standard deviation or number

Table 2 Anesthesia records by traditional and observative fiberoptic scope

	Traditional fiberoptic intubation ***n*** **=51**	**Observative fiberoptic intubation** ***n*** **=53**	***P*** **value**
Anesthesia time (min)	229.7 ± 114.6	235.7 ± 139.5	0.81
Duration of intubation (min)	214.4 ± 115.4	227.2 ± 138.2	0.62
Tube size 6.0/6.5/7.0/7.5/8.0 (n)	5/19/17/9/1	5/21/22/5/0	0.42
Intubation attempt 1/2/3 (n)	43/7/1	47/4/2	0.77
Fentanyl (μg)	251.5 ± 136.2	293.4 ± 188.6	0.19
Remifentanil (μg)	2320.0 ± 1716.0	2405.6 ± 1630.5	0.79
Sore throat (n) (yes/no)	14/37 (27.4%)	16/37 (30.1%)	0.61
Hoarseness (n)	1 (7.1%)	2 (12.5%)	0.44

Values are means ± standard deviation or number, Fisher's exact test between groups

A P value < 0.05 is considered significant

Table 3 Postoperative pain (VAS) by traditional and observative fiberoptic scope

	Postoperative sore throat ***n*** **=30**		
	Traditional fiberoptic intubation $n=14$	Observative fiberoptic intubation $n=16$	P value
VAS at operative day	49.6 ± 31.2	46.9 ± 28.4	0.81
VAS at the day after operative day	26.2 ± 21.6	25.2 ± 30.5	0.91
Recovery (day)	3.4 ± 1.8	3.4 ± 1.8	0.90

Values are means ± standard deviation or number, Fisher's exact test between groups

A P value < 0.05 is considered significant

quantitative and qualitative data, respectively. Statistical significance was set at $p<0.05$.

Result

A total of 104 patients (traditional fiberoptic intubation, $n=51$; observational fiberoptic intubation, $n=53$) were enrolled in this retrospective study (Table 1). There were no significant differences in the clinical characteristics and anesthetic data (Table 2). The severity, incidence, duration of postoperative sore throat, and incidence of hoarseness are shown in Tables 2 and 3. Additionally, the recovery time for sore throat was not significantly different between the groups ($P=0.90$). Postoperative sore throat and hoarseness were also not significantly different between the two groups ($P=0.61$, 0.44). For subjects reporting postoperative sore throat ($n=30$), there was no significant difference in the VAS means on the operative day and the day after the operation between the traditional and observational methods ($P=0.81$, 0.91). There was no significant difference in VAS values on the day of surgery or the day after the operation by tube size between the traditional and observation methods ($P=0.34$, 0.10, 0.39, and 0.17, respectively) (Table 4).

Discussion

We found that intubation using traditional and observative fiberoptic scopes did not significantly affect the incidence of postoperative sore throat, hoarseness, or time to recovery.

Nasal intubation is more difficult to manipulate than oral intubation [1, 2, 11]. Various intubation techniques have been developed. In particular, difficulty in advancing the tube into the vocal cords has been reported in 20–90% of patients [4–6]. Deformity of the upper airway and distortion of the airway can also impede the passage of the tube over the fiberoptic scope [4, 7]. General anesthesia causes relaxation of the airway muscles, leading to the collapse of the airways, including the soft palate, tongue, and epiglottis, leaving little air space in the pharynx for successful manipulation of the scope tip to locate the glottis [19, 21].

Using an observative fiberoptic scope, nasal intubation was performed with minimal contact of the scope tip with the surrounding tissues while viewing the area around the glottis [20]. Therefore, we expected that the risk of injury or damage to the glottis, vocal cords, and surrounding tissues during observation intubation using the fiberoptic scope would be reduced. However, contrary to expectations, there was no significant difference in postoperative sore throat or hoarseness between the two groups. The effect of postoperative sore throat may not be related to the method of intubation but to other factors.

Limitations

This study had some limitations. A potential confounding variable of this study could be that patients were unable to distinguish between surgical pain and intubation-related sore throat pain [20]. Although pain and surgical site pain may occur at different sites, patients may judge the difference between them. Intraoperative analgesics (fentanyl/diclofenac) were administered during the procedures, which could have affected the patient's

Table 4 Comparison of tube size and postoperative pain (VAS)

(1) Traditional fiberoptic intubation						
	Tube size (mm)					
	6.0	6.5	7.0	7.5	8.0	P value
	n=5	*n*=19	*n*=17	*n*=9	*n*=1	
VAS at operative day	0.0 ± 0.0	13.6 ± 29.7	14.2 ± 26.1	21.6 ± 30.8	0.0 ± 0.0	0.34
VAS at the day after operative day	0.0 ± 0.0	3.8 ± 11.8	10.2 ± 19.0	13.4 ± 20.2	0.0 ± 0.0	0.10
(2) Observative fiberoptic intubation						
	Tube size (mm)					
	6.0	6.5	7.0	7.5	8.0	P value
	n=5	*n*=21	*n*=22	*n*=5	*n*=0	
VAS at operative day	11.0 ± 14.3	10.4 ± 24.7	17.3 ± 29.8	19.0 ± 26.3	-	0.39
VAS at the day after operative day	2.4 ± 4.3	4.0 ± 16.0	10.6 ± 25.1	14.6 ± 18.9	-	0.17

The Spearman's rank correlation test, Values are means ± standard deviation, Fisher's exact test between groups

A P value < 0.05 is considered significant

perception of sore throat and early recovery. We did not evaluate the potential impact of postoperative sore throat.

Conclusion

We found that postoperative sore throat and recovery were not influenced by the observative fiberoptic scope used for nasotracheal intubation.

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Author contributions
M. Goto contributed to the conception, data acquisition, drafted and critically revised the manuscript. M. Tsukamoto contributed to design, data acquisition, interpretation and revised the manuscript. K. Matsuo contribute to perform the statistical analyses.T. Yokoyama contributed to the conception, interpretation and revised the manuscript.

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Data availability
Data is provided within the supplementary information files.

Declarations

Ethics approval and consent to participate
The need for informed consent was waived by Kyushu University Institutional Review Board for Clinical Research.

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interests.

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