Available online at www.sciencedirect.com
SCIENCE DIRECT
ELSEVIER
203
JNMU
Journal of Nanjing Medical University, 2009, 23(3):203-206
www.elsevier.com/locate/jnmu
Research Paper

A comparison of lightwand and laryngoscopic intubation techniques in patients undergoing laparoscopic cholecystectomy

Chenglan Xie*, Congjin Ju, Jiawen Cheng, Xuejun Yan, Dengquan Guo
Department of anesthesiology, the Second People's Hospital of Huai'an, Huai'an 223002, China
Received 21 January 2009

Abstract

Objective: To assess the effects of lightwand and laryngoscopic intubation techniques in patients undergoing laparoscopic cholecystectomy (LC). **Methods:** 300 ASA physical status I and II patients, undergoing LC, were randomly assigned to two groups, with 150 cases in each group. Patients in the LS group underwent endotracheal intubation using a standard direct-suspension laryngoscopic technique. Patients in the LW group were intubated by using transillumination with a lightwand. Mean arterial pressure and heart rate were recorded before induction, and at 1, 3 and 5 min after intubation. The incidence and of sore throat, hoarseness, and dysphagia was assessed twenty-four hours after surgery. **Results:** This study demonstrated no clinically significant difference in cardiovascular variables between the two techniques. Patients had a significantly lower incidence of sore throat, hoarseness, and dysphagia when the lightwand was used for intubation. **Conclusion:** This study suggests that lightwand intubation may decrease the incidence of postoperative sore throat, hoarseness, and dysphagia, thereby potentially increasing satisfaction in surgical patients. Therefore, more frequent use of the lightwand is recommended for endotracheal intubation.

Keywords: lightwand; laryngoscopy; endotracheal intubation; laparoscopic cholecystectomy

INTRODUCTION

Lightwand endotracheal intubation by transillumination of the neck is a technique particularly useful in patients with anticipated or unanticipated difficult airways [1-5]. The technique is also useful in patients whose dentition is especially prone to damage[6]. Lightwand endotracheal intubation involves relatively simple equipment and is easy to learn.

Tracheal intubation by direct vision using a laryngoscope is frequently associated with circulatory changes. Transient hypertension and tachycardia occur after endotracheal intubation using laryngoscopy[1-5]. The blood pressure and heart rate increases that peak within one to two minutes are usually well tolerated. However, in patients with hypertension, coronary artery disease, or cerebral vascular disease, hypertension and tachycardia are of concern due to the attendant increase in myocardial oxygen demand, decrease in oxygen supply, and the possibility of a cerebral vascular accident[7-16]. Sore throat and hoarseness are common complaints after laryngoscopy and endotracheal intubation[1-3,7,8,13]. In contrast, transillumination of the soft tissue of the neck using a lightwand is a gentler intubating technique in which no direct-vision laryngoscopy is required. Attenuation of hemodynamic changes and pharyngolaryngeal complaints following tracheal intubation with a lightwand device has been attributed to the lack of stimulation by a laryngoscope[8-10,13,16].

An important goal of laparoscopic anesthesia and surgery is a prompt return to normal activity. The occurrence of prolonged and/or severe postoperative sore throat may be counterproductive in this respect, and may also decrease the patient satisfaction with the anesthetic and surgical experience.

We performed this study to compare the effects of lightwand transillumination oral endotracheal intubation with a standard suspension laryngoscopic technique

*Corresponding author.
E-mail address: xiechenglan@163.com

on the occurrence of hypertension, tachycardia, postoperative sore throat, hoarseness, and dysphagia in laparoscopic surgery patients.

MATERIALS AND METHODS

Patients

A convenience sample of 300 ASA physical status I and II patients undergoing LC were randomly assigned to one of two groups. Group LS patients underwent endotracheal intubation using a standard direct-suspension laryngoscopic technique, while Group LW patients were intubated by using transillumination with a lightwand. Patients with uncontrolled hypertension, angina, or a history of cerebral vascular disease were excluded from the study. Also excluded were those who met criteria for rapid sequence induction(i.e., more than 30% above recommended body weight), those with preexisting hoarseness, and those with a known history of a previous difficult endotracheal intubation.

Methods

All patients were required to fast for at least 8 h before surgery. Preoperatively, all patients received diazepam 10 mg and atropine 0.5 mg intramuscularly(IM). Standard intraoperative monitoring(Datex-Ohmeda Cardiocap/5, Helsinki, Finland) was used. Induction of anesthesia was accomplished with fentanyl 4 μg/kg, midazolam 0.05-0.1 mg/kg, propofol 1.0-2.0 mg/kg, and vecuronium 0.1 mg/kg to facilitate intubation. Tracheal tubes with an internal diameter of 7.0-7.5 mm were used for female patients and 8.0 mm for male patients. Two minutes after the vecuronium was administered, subjects were intubated using either the size 3 MacIntosh laryngoscope (Jossun Medical, Shanghai, China) or a lightwand (Surch-Lite™, Florida, USA). The lightwand technique has been previously described[17]. All endotracheal intubations were performed using a standardized technique by one of two certified registered anesthesiologists. The two providers had performed laryngoscopic endotracheal intubation for more than 10 years and lightwand intubation more than 50 times. Blood pressure and heart rate were recorded before induction(T1), and 1, 3 and 5 min after intubation (T2, T3, T4). Twenty-four hours postoperatively, a nurse anesthetist contacted each patient. The nurse assessed the incidence of sore throat, hoarseness, and dysphagia.

Statistical analysis

All data were evaluated by SPSS windows programs 11.0 using *t* test and *chi-square* test. Descriptive data were analyzed via a two-tailed Student's *t*-test. Analysis of heart rate and blood pressure was performed using a two-tailed independent *t*-test. The *chi-square* tests were used to analyze the incidence of sore throat, hoarseness, and dysphagia. A value of $P < 0.05$ was considered statistically significant.

RESULTS

There was no significant difference in the age, the sex, the weight, or the duration of intubation between groups. No subject was excluded from this study due to failure to intubate with the designated technique(***Table 1***).

There was no statistical difference between groups in mean heart rate and mean arterial pressure over the time course of the study, nor was there a difference in the mean heart rate and mean arterial blood between Group LS and Group LW at any single time interval during the study period(***Table 2***).

Table 1 **Demographic data** ($\bar{x} \pm s$, n=150)

Group	Age(yr.)	Weight(kg)	Sex(male/female)	Duration of intubation(s)
Group LS	57.42 ± 13.07	64.84 ± 11.38	105/45	12.82 ± 6.72
Group LW	61.04 ± 11.85	64.26 ± 10.55	110/40	14.28 ± 8.90

Group LS=laryngoscope group; group LW=lightwand group.

Table 2 **MBP and HR in two groups** ($\bar{x} \pm s$, n=150)

		T1	T2	T3	T4
MAP(mmHg)					
	group LS	90.80 ± 11.24	87.41 ± 16.73	88.72 ± 11.48	87.47 ± 11.95
	group LW	92.14 ± 7.44	89.28 ± 12.02	87.27 ± 11.33	88.85 ± 13.07
HR(bpm)					
	group LS	85.22 ± 13.48	84.15 ± 15.05	82.74 ± 13.25	81.78 ± 14.12
	group LW	83.08 ± 15.36	84.42 ± 13.20	86.63 ± 12.51	83.84 ± 13.40

Group LS=laryngoscope group; group LW=lightwand group.
T1:the time before induction; T2:1 min after intubation; T3:3 min after intubation; T4:5 min after intubation.

The incidence of sore throat was significantly lower in Group LW compared with Group LS($P < 0.01$), as was the incidence of hoarseness($P < 0.01$). The number of patients complaining of dysphagia was also significantly lower in Group LW($P < 0.01$, ***Table 3***).

Table 3 **Pharyngolaryngeal complaints in two groups**

($\bar{x} \pm s$, n=150)

Group	Sore throat	Hoarseness	Dysphagia
Group LS	10%(15)	12%(18)	8%(12)
Group LW	2%(3)*	2%(3)*	0%(0)*

Group LS=laryngoscope group; group LW=lightwand group. Compared with group LS, *$P < 0.01$.

DISCUSSION

In this study, no patient's blood pressure exceeded 10% of the pre-induction blood pressure in the five-minute period after intubation. Most patients' blood pressures fell below baseline and remained below baseline throughout the five-minute recording period. There was no significant difference in heart rate response after intubation between the two groups, which was in agreement with recent studies[11-15]. However, Kihara *et al*[8] found no attenuation of hemodynamic responses in normotensive, anesthetized, paralyzed patients. It is likely that these contrasting results are related to factors such as the duration and force used during laryngoscopy and the number of attempts taken. Nishikawa *et al*[9] found that the hemodynamic stress response using a lightwand correlated with the number of attempts. Unfortunately, we did not record the number of attempts, but the duration of intubation was similar in the two groups.

The results of our study demonstrate that lightwand endotracheal intubation is associated with a lower incidence of postoperative sore throat, hoarseness, and dysphagia in surgical patients undergoing LC compared with those intubated with a rigid laryngoscope. Our observations were in agreement with some trials[13,18]. In a comparatively large trial reported by Hung *et al*, the oropharynx of each patient was inspected for signs of mucosal bleeding, dental trauma, and lacerations. After extubation, a blinded recovery nurse asked the patients about dry throat, sore throat, or hoarseness. There was a significantly lower incidence of traumatic events and fewer postoperative sore throats in the lighted stylet group[19]. However, these findings differ from those of Ellis *et al*[20], who found no difference in the incidence and severity of sore throat between these two groups. Because all intubations in this study were performed by two experienced practitioners, the higher incidence of sore throat in the study of Ellis *et al* may be attributable to the relative inexperience of the practitioners. A rigid laryngoscope blade, whether straight or curved, may cause trauma to pharyngeal and laryngeal structures[1-7]. The use of the lightwand, with its relatively smaller size and greater flexibility, minimizes the risk of trauma, which may explain the decreased incidence of sore throat, hoarseness, and dysphagia found in this study. However, lightwand intubation is not without possible complications. The first major complication, reported in 1984, occurred when the light bulb fell out of a wand during intubation, necessitating bronchoscopy[21]. Modern fiberoptic instrumentation does not require a bulb, which thus eliminates the possibility of this complication. Arytenoid cartilage dislocation necessitating manual reduction has also been reported, and the long-term outcome was good[22].

A major objective of laparoscopic surgery is to return patients to their normal daily activities as soon as possible. Troublesome sore throat and hoarseness which impede swallowing and talking may be counterproductive to this goal. Also, as most laparoscopic procedures are not associated with prolonged operative site pain, the occurrence and persistence of postoperative sore throat may adversely affect patient satisfaction with the anesthetic and surgical experience[13]. Therefore, this study suggests that lightwand intubation may be the preferred technique for appropriate abbreviated surgical patients.

In conclusion, this study demonstrates stable cardiovascular variables after both laryngoscopic and lightwand endotracheal intubation techniques. In this laparoscopic surgical population, the use of a lightwand, rather than a rigid laryngoscope, resulted in a lower incidence of sore throat, hoarseness, and dysphagia. This may be especially important in abbreviated surgical procedures, in which an early return to normal function and activity is the goal. In experienced hands, intubation using a lightwand is quicker, more reliable, and better tolerated by the patient than tracheal intubation using direct laryngoscopy.

Acknowledgement

The authors wish to acknowledge the assistance of Shiming Li, the nurse anesthetist, with recording cardiovascular variables, the duration of intubation and the incidence of sore throat, hoarseness, and dysphagia.

References

[1] Agro F, Hung OR, Cataldo R, Carassiti M, Gherardi S. Lightwand intubation using the trachlight: a brief review of current knowledge. *Can J Anaesth* 2001; 48: 592-9.

[2] Davis L, Cook-Sather SD, Schreiner MS. Lighted stylet tracheal intubation: a review. *Anesth Analg* 2000; 90: 745-56.

[3] Inoue K. Lightwand intubation can improve airway management. *Can J Anesth* 2004; 51: 1052-3.

[4] Cheng KI, Chu KS, Chau SW, Ying SL, Hsu HT, Chang YL, *et al.* Lightwand-assisted intubation of patients in the lateral decubitus position. *Anesth Analg* 2004; 99(1): 279-83.

[5] Chen KY, Tsao SL, Lin SK, Wu HS. Double-lumen endobronchial tube intubation in patients with difficult airways using Trachlight® and a modified technique. *Anesth Analg* 2007; 105: 1425-6.

[6] Sugiyama T, Hayashi H, Amano M. Clinical experience of tracheal intubation using Trachlight in patients with unstable dentition. *Masui* 2006; 55: 999-1001.

[7] Weber S. Traumatic complications of airway management. *Anesthesiol Clin North America* 2002; 20: 503-12.

[8] Kihara S, Brimacombe J, Yaguchi Y, Watanabe S, Taguchi N, Komatsuzaki T. Hemodynamic responses among three tracheal intubation devices in normotensive and hypertensive patients. *Anesth Analg* 2003; 96: 890-5.

[9] Nishikawa K, Omote K, Kawana S, Namiki A. A comparison of hemodynamic changes after endotracheal intubation using the lightwand device and the laryngoscope in normotensive and hypertensive patients. *Anesth Analg* 2000; 90: 1203-7.

[10] Nishikawa N, Kawamata M, Namiki A. Lightwand intubation is associated with less hemodynamic changes than fibreoptic intubation in normotensive, but not in hypertensive patients over the age of 60. *Can J Anesth* 2001; 48: 1148-54.

[11] Montes FR, Giraldo JC, Betancur LA, Rincón JD, Rincón IE, Vanegas MV, *et al.* Endotracheal intubation with a lightwand or a laryngoscope results in similar hemodynamic variations in patients with coronary artery disease. *Can J Anesth* 2003; 50: 824-8

[12] Kanaide M, Fukusaki M, Tamura S, Takada M, Miyako M, Sumikawa K. Hemodynamic and catecholamine responses during tracheal intubation using a lightwand device(Trachlight) in elderly patients with hypertension. *J Anesth* 2003; 17: 161-5.

[13] Friedman PG, Rosenberg MK, Lebenbom-Mansour M. A comparison of light wand and suspension laryngoscopic intubation techniques in outpatients. *Anesth Analg* 1997; 85: 578-82.

[14] Hirabayashi Y, Hiruta M, Kawakami T, Inoue S, Fukuda H, Saitoh K, *et al.* Effects of lightwand(Trachlight) compared with direct laryngoscopy on circulatory responses to tracheal intubation. *Br J Anaesth* 1998; 81: 253-5.

[15] Takahashi S, Mizutani T, Miyabe M, Toyooka H. Hemodynamic Responses to tracheal intubation with laryngoscope versus lightwand intubating device(Trachlight®) in adults with normal airway. *Anesth Analg* 2002; 95: 480-4.

[16] Huang WT, Huang CY, Chung YT. Clinical comparisons between GlideScope video laryngoscope and Trachlight in simulated cervical spine instability. *J Clin Anesth* 2007; 19: 110-4.

[17] Wong SY, Coskunfirat ND, Hee HI, Li JY, Chen C, Tseng CH. Factors influencing time of intubation with a lightwand device in patients without known airway abnormality. *J Clin Anesth* 2004; 16: 326-31.

[18] Nishikawa K, Kawana S, Namiki A. Comparison of the lightwand technique with direct laryngoscopy for awake endotracheal intubation in emergency cases. *J Clin Anesth* 2001; 13: 259-63.

[19] Hung OR, Pytka S, Morris I, Murphy M, Launcelott G, Stevens S, *et al.* Clinical trial of a new lightwand device (Trachlight) to intubate the trachea. *Anesthesiology* 1995; 83: 509-14.

[20] Ellis DG, Jakymec A, Kaplan RM, Stewart RD, Freeman JA, Bleyaert A, e*t al.* Guided orotracheal intubation in the operating room using a lighted stylet: a comparison with direct laryngoscopic technique. *Anesthesiology* 1986; 64: 823-6.

[21] Stone DG, Stirt SA, Kaplan MJ, McLean WC. A complication of light wand guided nasotracheal intubation. *Anesthesiology* 1984; 61: 780-1.

[22] Szigeti CL, Baeurle JJ, Mongan PD. Arytenoid dislocation with a lighted stylet intubation: case report and retrospective review. *Anaesth Analg* 1994; 78: 185-6.