

A comparative study of use of Macintosh Laryngoscope versus light wand with respect to duration and number of attempts required and failure rate in general anaesthesia

Poonam Shriram Thakur^{1*}, Rajendra D Patel²

¹Senior Resident, Department of Anaesthesiology, ESIC PGIMSR cum model hospital, Andheri, Mumbai, Maharashtra, INDIA.

²Professor, dept of Anaesthesiology, Seth GS Medical College and K.E.M. Hospital, Mumbai, Maharashtra, INDIA.

Email: drpoonamthakur1186@gmail.com

Abstract

Introduction: The anaesthesiologists play a very important role in health care, rendering patient free from pain either in the form of regional anaesthesia, local anaesthesia or general anaesthesia to facilitate surgical procedure. The primary responsibility as a clinician is to safeguard the airway i.e. to preserve and protect it during induction, maintenance and recovery from the state of anaesthesia and in the event of loss of the airway, it should be promptly re-established before the individuals suffers irreversible injury from inadequate or compromised oxygenation. Failure to maintain a patent airway for more than a few minutes results in hypoxia, hypercarbia, metabolic alterations, brain damage or death. More than 85% of all respiratory related closed malpractice claims involve a brain damaged or dead patient. Difficult intubation remains one of the major risks in anaesthesia practice. **Aims and Objective:** To compare the ease of intubation using Macintosh Laryngoscope and Lightwand device in terms of: Duration of intubation, Number of attempts. **Methodology:** Our study was a randomized prospective study consisting of 180 patients (90 in each group) posted for surgical procedures under general anaesthesia. The Ethics Committee approval was obtained to conduct the study. 180 patients were scheduled. They were randomly assigned to each group of intubation device: The Macintosh Laryngoscope (LS) and The Lightwand (LW) group. **Result:** . The mean total time taken for intubation (T=T1+T2) in Lightwand group was 58.78 ± 17.86 seconds whereas in the Macintosh group it was 36.17 ± 9.75 seconds. The P value is 0.000*. P value is <0.05 and is statistically significant. In Lightwand group 5.6% (6) patients" required optimizing maneuvers like jaw lift and hyper-extension of neck, while in Macintosh group no patients required optimizing maneuvers like External laryngeal pressure. P value is 0.045. P value is <0.05 and it is statistically significant. The mean number of attempts in Lightwand group was 1.34 ± 0.48 whereas in McIntosh group was 1.11 ± 0.32 . P value is 0.000. P value is <0.05 and it is statistically significant. **Conclusion:** Overall the mean duration and attempts of intubations are more in the Lightwand group as compared to McIntosh group.

Keywords: Macintosh Laryngoscope, Lightwand.

*Address for Correspondence:

Dr. Poonam Shriram Thakur, Senior Resident, Department of Anaesthesiology, ESIC PGIMSR cum model hospital, Andheri, Mumbai, Maharashtra, INDIA.

Email: drpoonamthakur1186@gmail.com

Received Date: 22/07/2015 Revised Date: 30/08/2015 Accepted Date: 19/09/2015

Access this article online

Quick Response Code:	Website: www.medpulse.in
	DOI: 03 October 2015

INTRODUCTION

The anaesthesiologists play a very important role in health care, rendering patient free from pain either in the form of regional anaesthesia, local anaesthesia or general anaesthesia to facilitate surgical procedure. The primary as a clinician is to safeguard the airway i.e.to preserve and protect it during induction maintenance and recovery from the state of anaesthesia and in the event of loss of the airway, it should be promptly re-established before the individuals suffers irreversible injury from inadequate or compromised oxygenation. Failure to maintain a patent

airway for more than a few minutes results in hypoxia, hypercarbia, metabolic alterations, brain damage or death. More than 85% of all respiratory related closed malpractice claims involve a brain damaged or dead patient^{1,2} Difficult intubation remains one of the major risks in anaesthesia practice. During anaesthesia airway catastrophes can occur due to variety of reasons such as respiratory obstruction difficult intubation or esophageal intubation. So airway assessment is one of the tools to anticipate difficult airway and manage accordingly. Therefore, parameters like Inter-incisor gap (mouth opening), Temporomandibular joint function i.e. subluxation, Mallampatti classification³, Thyromental distance⁴, Mento-sternal distance⁵, assessment of Atlanto-Occipital joint extension^{6,7} and neck flexion, Mandibular space (includes Thyromental distance and the horizontal length of mandible), receding mandible; buck teeth⁸, neck swelling are helpful in anticipating difficult intubation. In a difficult airway situation all conditions should be optimized. Many newer devices are now available for securing airways during normal and difficult intubation⁹. The Lightwand^{10,11} is a simple technique which helps in less manipulation of cervical spine movement during tracheal intubation without an increase in intubation time. It is a stylet with a light bulb at the end that glows bright through the soft tissues of the anterior neck when it is placed inside the glottis. The tip of the wand is bent in a “hockey stick” configuration before insertion with a jaw lift. After the confirmation of transillumination, the threaded tracheal tube can be passed blindly into the trachea the Lightwand involves a blind technique.

AIMS AND OBJECTIVE

To compare the ease of intubation using Macintosh Laryngoscope and Lightwand device in terms of: Duration of intubation, Number of attempts.

RESULT

Study parameter (sec)	LW Group		LS Group		P Value
	Mean	Std. Dev.	Mean	Std. Dev.	
T1	8.8	1.11	7.51	0.72	0.000*
T2	49.98	17.85	28.66	9.65	0.000*
Total Time (T)	58.78	17.86	36.17	9.75	0.000*

Unpaired T test applied P values* are significant <0.05

In Light wand group T1 was 8.80 ± 1.11 seconds whereas in Macintosh group T1 was 7.51 ± 0.72 seconds. The P value with an unpaired T test is 0.000*. P value is <0.05 and is statistically significant In Light wand group T2 was 49.98 ± 17.85 seconds whereas in Macintosh group T2 was 28.66 ± 9.65 seconds. The P value with an unpaired

MAERIAL AND METHODS

Our study was a randomized prospective study consisting of 180 patients (90 in each group) posted for surgical procedures under general anaesthesia. The Ethics Committee approval was obtained to conduct the study. 180 patients were scheduled. They were randomly assigned to each group of intubation device: The Macintosh Laryngoscope (LS) and The Lightwand (LW) group.

Inclusion Criteria

Patients in the age group of 18-65 years, Patients belonging to ASA grade I and II, Patients with MPC grade I and II, Patients undergoing any elective surgical procedure under general anaesthesia with endotracheal intubation.

Exclusion Criteria

Patients refusal for consent for study, Patients with anticipated difficult intubation i.e. MPC grade III and IV, Thyromental distance < 6cm or inter- incisor distance < 4 cm, Patients at risk of pulmonary aspiration of gastric contents, Patients with pathology in neck, upper respiratory tract, laryngeal pathology and upper alimentary tract and anatomical abnormalities of the upper airway such as tumours, polyps, infection, foreign bodies or upper airway trauma in case of Lightwand as it is a blind technique. Patient coming for emergency surgery. Pregnant patients. In our study, 180 patients were selected undergoing surgical procedure under general anaesthesia according to the inclusion and exclusion criteria. The statistical analysis of the study was carried out by SPSS and Graph Pad Instat, Chi square test, students-t test wherever applicable. All quantitative data were expressed as mean ± standard deviation (SD). A P value less than 0.05 was considered statistically significant.

T test is 0.000*. P value is <0.05 and is statistically significant. The mean total time taken for intubation (T=T1+T2) in Light wand group was 58.78 ± 17.86 seconds whereas in the Macintosh group it was 36.17 ± 9.75 seconds. The P value is 0.000*. P value is <0.05 and is statistically significant

Table 2: Comparison of Number of attempts required for intubation between the groups

Number of attempts	Lightwand		Macintosh		P value
	N=90	%	N=90	%	
1 st	59	65.55	80	88.88	0.000
2 nd	31	34.44	10	11.11	

Table 3: Comparison of mean number of attempts required for intubation between the groups

Study parameter	LW group		LS group		P value
	Mean	SD	Mean	SD	
Number of attempts (mean)	1.34	0.48	1.11	0.32	0.000

In Light wand group 65.55% (59) patients were intubated in 1st attempt where as 34.44% (31) required 2nd attempt. In Macintosh group 88.88% (80) patients were intubated in 1st attempt whereas only 11.11% (10) required 2nd attempt. Pearson Chi-Square test was applied. P value is 0.000. P value is <0.05 and is statistically Significant (Table 2).

In Lightwand group mean numbers of attempts required were 1.34 ± 0.48 whereas in Macintosh group mean number of attempts required were 1.11 ± 0.32. With an unpaired T test, P value is 0.000. P value is <0.05 and is statistically significant (Table 3).

Table 4: Comparison of Optimizing Maneuver (OM)

OM		Device		Total	P Value
		LW	LS		
YES	Count	6	0	5	0.045
	Percent	5.6%	0.0%	2.8%	
NO	Count	84	90	174	0.045
	Percent	93.3%	100.0%	96.7%	
Total	Count	90	90	180	0.045
	Percent	100.0%	100.0%	100.0%	

Pearson Chi-square test applied P value is significant <0.05

In Lightwand group 5.6% (6) patients“ required optimizing maneuvers like jaw lift and hyper-extension of neck, while in Macintosh group no patients required optimizing maneuvers like External laryngeal pressure. P value is 0.045. P value is <0.05 and it is statistically significant.

DISCUSSION

Duration of intubation (Table 1): Matheus Felipe de Oliveira Salvalaggio, Rogério Rehme *et al*⁶³ did a comparative study between the laryngoscope and Lighted Stylet in tracheal intubation in 98 patientsThe mean time of intubation was 22 ± 16 seconds in, Group Lightwand, and 18 ± 7 seconds, in Group laryngoscopy (p = 0.11), which was not statistically significant P>0.05In the study conducted Hung, Orlando R., Pytko, Saul *et*¹³ al the total intubation time was less with the Trachlight compared with the laryngoscope (16 ±11 vs. 20 ±24 s). Close to 95% of all Lightwand intubations were performed within

30 s where as approximately 85% of all laryngoscopic intubations were performed within 30s (P>0.05 not significant).For laryngoscopic intubation, the time of tracheal intubation was longer for patients with limited mandibular protrusion and mentohyoid distance, with a larger circumference of the neck, and with a high classification according to Mallampatti *et al*. However, there was no relation between the time of tracheal intubation (TTI) and any of the airway parameters for Trachlight.

Total duration of intubation using Lightwand (T): Where, [T = T1+T2]. T1: The time taken from removal of face mask and insertion of Lightwand device from the base of the tongue till the glow of the bulb is seen on either side of thyroid prominence which is then withdrawn approximately till submentum and rotated towards midline till glow is seen just above thyroid prominence. T2: The time taken from visualization of the glow of the bulb seen in midline just above thyroid prominence and passing the endotracheal tube in the trachea and confirmation by passing the glow in trachea till suprasternal notch also by appearance of mist in the endotracheal tube, chest wall movements, etc. Total duration of intubation using MacIntosh(T): where [T= T1+T2]. T1: The time taken for removal of face mask and insertion of Macintosh laryngoscope between the teeth (oral cavity) to visualization of vocal cords. T2: The time taken from visualization of vocal cords & passing the ETT in the trachea and ETT is connected to circuit for confirmation of its tracheal placements. In the study conducted Hung, Orlando R., Pytko, Saul *et*¹³ al the total intubation time was less with the Trachlight compared with the laryngoscope, whereas in our study the total intubation time was more with Lightwand (Trachlight) as compared with the Macintosh Laryngoscope. This may be attributed to the fact that Lightwand is a new device and requires technical skill and experience, whereas intubation with Macintosh laryngoscope is a standard technique in practice since many years.

Number of attempts (Table 2)

S. Kihara, Brimacombe *J et al*¹⁴ had similar number of intubation attempts in both groups. All direct

laryngoscopic intubations were successful at the first attempt, while in Lightwand group only one case out of 50 required a second attempt. P value was > 0.05 which is not statistically significant. Kohki Nishikawa, Omote K *et al* found that mean number of attempts in direct laryngoscopy group were 1.2 and 1.6 in Lightwand group. P value was > 0.05 which is not statistically significant. Ka-young Rhee, Lee JR *et al* found that number of attempts (1/2/3 or more) in direct laryngoscopy group was 24/4/2 and 29/1/0 in Lightwand group. P value was > 0.05 which is not statistically significant. Felix Montes, Juan Giraldo *et al*¹⁵ intubated 39 subjects using a laryngoscope, and 41 were intubated using Lightwand. One patient in the trachlight group required more than 3 attempts, so was excluded from the study. Nishikawa, Keiichi Omote *et al* found that the mean numbers of attempts in direct laryngoscopy were 1.2 and 1.6 in Lightwand group. Soth C R, Kong CF *et al* compared tracheal intubation in direct laryngoscopy and Lightwand by novice staff. 51 out of 54 (94%) of direct laryngoscopic intubations were successful compared with 36 out of 54 (67%) of Lightwand intubations. 45 out of 54 (83%) of all the direct laryngoscopic intubations were successful at first attempt versus 15 out of 54 (28%) in Lightwand group. Shrikantshrinivasan, CK Dua, Kirti Nath Saxena *et al* found in their study that the success rate was comparable with both the groups (100%). Of all the successful Lightwand intubations 95% were successful after the first attempt. Only in 1 case, a second attempt was required. All the patients of the laryngoscopy group were intubated successfully in the first attempt. In our study, number of attempts for intubation required with Lightwand were significantly more as compared to that with Macintosh. We did not come across failed intubation using either of the device and so we did not apply crossover technique during our study.

REFERENCES

1. Caplan RA, Posner KL, Ward RJ, Cheney FW. Adverse respiratory events in anaesthesia: a closed claims analysis. *Anesthesiology*. 1990 May; 72(5):828-33.
2. Cheney FW, Posner KL, Caplan RA. Adverse respiratory

- events infrequently leading to malpractice suits. *Anesthesiology*. 1991 Dec; 75(6):932-9.
3. Miller RA: A new laryngoscope. *Anesthesiology* 1941; 2:317
4. Macintosh RR. Ralph M. Waters Memorial Lecture. *Anaesthesia* 1970; Jan 25: 4-13
5. Jephcott A. The Macintosh laryngoscope. A historical note on its clinical and commercial development. *Anaesthesia*. 1984 May; 39(5):474-9.
6. Dorsh JA, Dorsh SE. Laryngoscopes. In: *Understanding Anaesthesia Equipment*, 4thedn. Baltimore: Williams and Wilkins, 1998: 50-56
7. Mallampati SR, Gatt SP, Gugino LD, Waraksa B, Freiburger D, Liu PL. A Clinical sign to predict difficult intubation; a prospective study. *Can Anaesth Soc J* 1985; 32: 429-34.
8. Patil VU, Stehling LC, Zauder HL. Predicting the difficulty of intubation utilizing an intubation guide. *Anesthesiology review* 1983; 10: 32-3.
9. Hung OR, Stewart RD, *Illuminating stylet (Lightwand)*: Benumof JL (Ed.) *Airway management*, Mosby, 1996: 342-52.
10. Hung OR, Pytka S, Morris I, Murphy M, Stewart RD. Lightwand intubation: ii. Clinical trial of a new Lightwand for tracheal intubation in patients with difficult airways. *Can J Anaesth* 1995; 42: 826-30.
11. Argo F, Hung OR, Cataldo R, *et al*. Lightwand intubation using the Trachlight: a brief review of current knowledge. *Can J Anaesth* 2001; 48:592-9.
12. Salvalaggio MF, Rehme R, Fernandez R, Vieira S, Nakashima P.: A comparative study between the laryngoscope and Lighted Stylet in tracheal intubation. *Rev Bras Anesthesiol*. 2010 Mar-Apr; 60(2).
13. Hung, Orlando R; Pytka, Saul; Morris, Ian; Murphy, Michael; Launcelott, Gordon MD; Stevens, Sarah; MacKay, William ; Stewart, Ronald D. :the effectiveness and safety Lightwand device in intubating the trachea of elective surgical patients. *Anaesthesiology* 1995; 83: 509-14.
14. S Kihara MD, J Brimacombe, FRCA, MD, Y Yaguchi MD, S Watanabe MD, PhD, N Taguchi MD and T Komatsuzaki MD *et al*. Hemodynamic responses among three tracheal intubation devices in normotensive and hypertensive patients. *Anaesth Analg* 2003; 96:890-895.
15. Felix R. Montes MD, Juan C. Giraldo MD, Luis A. Betancur MD, Jose D. Rincon MD, Ismael E, Maria V, vanegas MD, HernanCharris MD.

Source of Support: None Declared
Conflict of Interest: None Declared