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TRACHEAL INTUBATION DURING MANUAL INLINE STABILISATION: COMPARISON OF INTUBATING LARYNGEAL MASK AIRWAY™ VERSUS TRACHLIGHT®

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ABSTRACT **Introduction:** Airway management with unstable cervical spine is a major challenge to anesthetist. Conventional direct laryngoscopy causes substantial movement of cervical spine and can cause neurological deficit. Newer devices like Intubating Laryngeal Mask Airway(ILMA) and Trachlight avoid cervical spine movement. **Aim:**To compare rate of successful tracheal intubation with Intubating Laryngeal Mask Airway™ with Trachlight® in anaesthetised and paralysed adults with manual in line stabilization **Method and Materials:** 50 patients were included in the study and allocated in two groups. In the ILMA group ,patients were ventilated and then intubated through the ILma. IN the Trachlight group, patients were intubated using trachlight. Success rate , time taken for intubation and post operative sore throat and hoarseness of voice were compared between the two groups.**Results:** In the ILMA group,21 patients could be adequately ventilated in the first attempt and 4 in second attempt. 12 patients could be successfully intubated. 9 patients could be intubated in the first attempt and 3 patients in second attempt. In the Trachlight , 24 patients could be intubated in the first attempt and one patient in second attempt. Intubation time was 14.08 ± 2.23 seconds in the ILMA group whereas in Trachlight group it was 26.48 ± 9.13 seconds(p value of <0.0001) **Conclusion:** In healthy anaesthetized,paralysed adults with manual in line stabilization Trachlight assistance at tracheal intubation provides high first attempt success.ILMA is an effective ventilation device, but an unacceptably high failure rate at blind tracheal intubation.

KEYWORDS :

INTRODUCTION

Cervical spine (C-spine) injuries occur in 1.5%–3% of all major trauma cases and are associated with major morbidity and mortality.[1] The fear of cervical spine movement precipitating or aggravating neurological injury during intubation looms large.[2,3,4] Direct laryngoscopy, although a reliable and familiar method for securing the airway, is known to cause extension of the cervical spine. Several airway devices have been described in literature that require minimum cervical spine movement during intubation such as Intubating laryngeal mask airway (ILMA), Trachlight, fibreoptic guided intubation.[5,6]

The ILMA is a modification of the laryngeal mask airway and is designed to serve as a conduit for orotracheal intubation. ILMA can be inserted in neutral position of head and neck avoiding movement at the cervical spine.[7,8]

The Trachlight is an illuminated stylet, which is a useful instrument for oral intubation. It relies on transillumination of the anterior neck tissues to facilitate the correct placement of an endotracheal tube. It avoids hyperextension of occipito-atlanto axial complex and cervical spine.[9,10]

There is paucity of studies in literature comparing ILMA with Trachlight in patients with unstable cervical spine. This study was undertaken with an aim to compare rate of successful tracheal intubation with Intubating Laryngeal Mask Airway™ with Trachlight® in anaesthetised and paralysed adults with manual in line stabilization. Cervical spine immobilisation was simulated by using manual in line stabilisation.

METHODS AND MATERIALS

The study was a prospective randomised controlled trial. After obtaining ethical clearance from Departmental Dissertation Committee, 50 adult patients scheduled for elective surgical procedures were enrolled for the study. Patients were allocated to one of the two groups using computer generated randomised sequence

1. ILMA group: Patients in this group were intubated through the Intubating Laryngeal Mask Airway
2. Trachlight group: Patients in this group were intubated using the Trachlight .

Patients aged between 18-65 years of either gender belonging to ASA physical status I or II with body weight ranging between 30 to 70 kg and scheduled for elective surgery under general anaesthesia requiring endotracheal intubation were included.

Patients with known or predicted difficult airway, upper airway obstruction or pharyngeal pathology , Ischemic heart disease, raised Intracranial tension and history suggestive of obstructive sleep apnoea were excluded from the study.

Informed consent was taken one day prior to surgery. Patients were kept NPO as per standard fasting guidelines.

Study included three investigators. Investigator 1, took consent from patients and ensured all inclusion and exclusion criteria were met and provided manual inline stabilization (MILS), by standing to the right side of the patient, holding the sides of the patient's neck in the palms of hands and avoiding any movement of the neck on the shoulder whilst the fingers grasped the mastoid process on either side preventing any movement at the atlanto - occipital joint.[11]Investigator 2 was anaesthesiology consultant with prior experience with both ILMA and Trachlight, who performed intubations. Investigator 3 timed the intubation sequences and assessed for postoperative hoarseness of voice and sore throat

On entering the operating room intravenous access of the patient was secured and suitable infusion of iv fluids initiated. Patients were monitored continuously using the electrocardiogram (lead II and V5), pulse oximetry, non invasive blood pressure and capnography. Patients were positioned supine with head in neutral position with no pillow under occiput. Patients were preoxygenated for 3 minutes with 100% oxygen and 1.5ug/kg of injection fentanyl was given intravenously (i.v) slowly. Induction was done with 2mg/kg of propofol i.v and ability to mask ventilate was confirmed, patients were then paralysed with 0.1 mg kg^{-1} of vecuronium bromide .All patients were ventilated with 1.5% isoflurane in O_2. Complete neuromuscular blockade was ensured by TOF count of 0/4 on peripheral nerve stimulator.

In the ILMA Group A, size 3 ILMA was used for patients weighing< 50 kg and size 4 ILMA for patients weighing between 50-70kgs[12].With investigator 1 providing MILS, ILMA was inserted by investigator 2 with a single handed rotational technique. Once inserted cuff was inflated. Adequate ventilation was confirmed by observing good chest expansion and appearance of a square wave capnogram. ILMA was removed if ventilation was inadequate. Patients were then ventilated with 1.5 % isoflurane in oxygen. ILMA insertion was reattempted. In

case of inadequate ventilation even in second attempt it was considered as failure.

If adequate ventilation was achieved, lubricated reinforced cuffed silicone tube of size 7.0 mm ID with a curved tip specially designed for ILMA was inserted through the ILMA till 16 cm mark. Tracheal intubation was then attempted gently, by advancing the tube further.

If resistance was encountered, tube was pulled out, ILMA cuff deflated and removed. This was considered as failed attempt. Patients were then ventilated with 1.5 % isoflurane in O_2. A second attempt at insertion of ILMA and intubation was then allowed. Inability to intubate at second attempt was considered as failure.

Once tube was successfully passed, position was confirmed by capnography and bilateral chest auscultation. After confirming tube position, ILMA was removed using a stabilising tube and manual inline stabilisation released.

Ventilation time was defined as time from the insertion of ILMA in oropharynx till appearance of square wave capnography trace.

Intubation time was defined as time from insertion of the silicone tube in the ILMA till appearance of square wave capnography trace.

In the Trachlight group a PVC cuffed endotracheal tube of size 7.0 mm ID was used for females and size 8.0 mm ID for males. The endotracheal tube was mounted on the Trachlight and adequately lubricated. The lights of the operating room were dimmed. With investigator 1 providing MILS, the Trachlight assembly was introduced in the oral cavity. When the glow was seen in midline, the tip was gently advanced 1-2 cm until resistance was felt. The stylet was retracted slightly and the tube advanced till glow was seen in the suprasternal notch.Holding the tube firmly, Trachlight was removed and correct placement of endotracheal tube was confirmed by capnography and bilateral chest auscultation.MILS was then released.

Intubation time was defined as the time from insertion of Trachlight assembly into oropharynx till the appearance of capnography trace. Failed attempt was described as oesophageal intubation an attempt time more than 120 seconds

In case of 2 failed attempts, it was considered as failure. MILS was released and trachea was intubated using direct laryngoscope. If the patient showed any signs of light anaesthesia, iv propofol boluses were given as required and ventilated if saturation dropped below 92%.

Patients were followed for evidence of sore throat or hoarseness of voice immediate post op and before shifting from PACU

Sore throat was graded as: none- no sore throat, mild- less severe than a cold, moderate-similar to that noted in a cold, severe- more severe than a cold

Hoarseness of voice was graded as-none: no hoarseness, mild: noted by the patient, moderate: obvious to observer, Severe: aphonia.

Statistical analysis

- Qualitative data were compared using Fisher's exact test and Chi square test. Quantitative data with normal distribution were compared using unpaired student's t test.
- P value <0.05 was considered statistically significant.
- Power of study calculated retrospectively using PASS software was 98.71%.

RESULTS

A total of 50 patients were studied, 25 in each group.The average age (mean ± SD) of the patients was 39.20 ± 12.7 and 39.36 ± 10.8 years in Trachlight group and ILMA group respectively. The average weight (mean ± SD) of the patients was 57.44 ± 9.7 kg and 53.88 ± 8.3 kg in Trachlight group and ILMA Group respectively. There were sixteen males and nine females in both the groups.

The age, weight and gender in both the groups were comparable and there was no statistically significant difference between the two groups.(Table 1)

TABLES

Table 1: Demographic data

	Group Trachlight n=25 (MEAN±SD)	Group ILMA n=25(MEAN±SD)
Age (years)	39.20 ± 12.7	39.36 ± 10.8
Weight (kg)	57.44 ± 9.7	53.88 ± 8.3
Gender (M/F)	16 / 9	16 / 9

In the ILMA group, out of 25 patients, 21 patients could be adequately ventilated in the first attempt. In 3 patients second attempt was required for insertion and achieving adequate ventilation. One patient in the ILMA group could not be ventilated adequately despite two attempts at insertion.

In the Trachlight group all 25 patients could be successfully intubated. 24 patients could be intubated in the first attempt and one patient was successfully intubated in the second attempt. Hence the overall success rate of intubation with the Trachlight was 100%.(table 2)

Table 2: Success rate of intubation

GROUP	FIRST ATTEMPT	SECOND ATTEMPT	FAILURE	SUCCESS RATE	P VALUE
TRACHLIGHT (n=25)	24	1	0	100%	<0.0001*
ILMA (n=25)	9	3	13	48%	

*Fisher's *e*xact test, p value <0.0001, statistically very significant

In the ILMA GROUP, 12 patients could be successfully intubated out of 24 patients in whom ILMA was successfully placed. 9 patients could be intubated in the first attempt and 3 patients were intubated in the second attempt. Hence an overall success rate of 48% was achieved with the ILMA.(Table 2)

Fischer`s exact test was used to compare the data. A P value of <o.ooo1 was achieved, which is statistically very significant.

Total time (insertion and intubation time) was comparable in both the groups. Unpaired t test was used to compare and a p value of 0.550 was achieved which is statistically insignificant.(table 3)

Table 3: Total time

GROUP	Time (seconds) MEAN± SD	P VALUE
Trachlight (n=25)	26.48 ± 9.134	0.550*
ILMA (n=12)	28.25±1.882	

n is the number of successful intubations,
* unpaired t test, p value 0.550 , statistically insignificant

Intubation time was 14.08 ± 2.23 seconds in the ILMA group whereas in Trachlight group it was 26.48 ± 9.13 seconds. Unpaired t test was used to compare and a p value of <0.0001 was achieved which is statistically significant.(table 4)

Table 4: Intubation time

GROUP	Time (seconds) MEAN± SD	P VALUE
Trachlight (n=25)	26.48 ± 9.134	<0.0001*
ILMA (n=12)	14.08 ± 2.234	

n is the number of successful intubations
* unpaired t test, p value <0.0001, statistically very significant

5 patients in each group complained of mild sore throat in the post op period (p value 1.0). 1 patient in the Trachlight group and 3 patients in the ILMA group complained of mild hoarseness in the post op period. A p value of 0.6092 was achieved which is statistically insignificantly. (table 5)

1 patient in the Trachlight group and 3 patients in the ILMA group complained of mild hoarseness in the post op period. (table 6). A p value of 0.6092 was achieved which is statistically insignificantly

Table 5: Post operative sore throat

Group	Mild	Moderate	Severe	Total
TRACHLIGHT (n=25)	5	0	0	5*
ILMA (n=25)	4	1	0	5*

*Fisher's exact test, p value: 1.00 -- statistically not significant

Table 6: Post operative hoarseness of voice

Group	Mild	Moderate	Severe	Total
TRACHLIGHT (n=25)	1	0	0	1*
ILMA (n=25)	3	0	0	3*

*Fisher's exact test, p value: 0.6092 -- statistically not significant

DISCUSSION

Securing airway in the early management and resuscitation of patients who have sustained cervical spine injuries has been one of the biggest challenges faced by anaesthesiologists around the world. Preventing movement of the cervical spine is crucial during the process of intubation.[13] Manual inline stabilisation (MILS), is one such technique to prevent excessive movement of the cervical spine but at times can make intubation difficult.[14]

In this study, we compared the utility of ILMA with Trachlight for endotracheal intubation in anaesthetised and paralysed adults with normal cervical spine whose cervical spine had been immobilised using manual inline stabilisation.

Asai et al[15] compared the adequacy of ventilation and ease of placement ILMA with conventional laryngeal mask airway in anaesthetised and paralysed patients during manual in line stabilisation. Adequate ventilation was possible in all patients with ILMA in a single attempt. Placement of ILMA was significantly faster (mean time of 9.9 vs 14.4 seconds) and easier than that of conventional laryngeal mask airway. In our study, out of 25 patients in the ILMA group we could successfully ventilate 24 patients. Adequate ventilation was achieved in 21 patients in the first attempt and in 3 patients on second attempt. We were unable to ventilate one patient even after two attempts. Mean time for placement of ILMA was 14.07 seconds with a range of 5 – 29 seconds. An overall success rate of 96% with the placement with the ILMA in our study compares favourably with the above mentioned study. Unlike in the earlier study where they used adequate ventilation as end point, we used capnographic trace as end point for successful placement of ILMA.

The success rate of blind intubation through the ILMA has been reported to be 50% without the use of manoeuvres and 99% with the use of manoeuvres by Brain et al[8]. The different manoeuvres used to readjust the ILMA position were shown to increase the pressure over the cervical spines.

Inoue et al[34] conducted a similar prospective randomized study in 148 adults. In the Trachlight group, intubation was successful at the first attempt in 67 of 74 (90.5%) cases and at the second attempt in 5 (6.8%) cases. In contrast, in 74 patients in ILMA group, ventilation was acceptable within two attempts for insertion in 59 (79.8%) cases, and blind tracheal intubation through the device was possible in only 42 (56.8%) cases with first attempt. In 12 out of 17 (70.6%) patients in whom ventilation was acceptable but blind tracheal intubation through ILMA was impossible. As compared to this study we had a comparable success rate in the Trachlight group and in the ILMA group. Though in the ILMA group, we had a better success rate of insertion 96% as compared to 79.8% percent in the above mentioned study, we could intubate 48% successfully through the ILMA as compared to 56.8% in their study. There was no mention of maintaining MILS during the intubation process.

Saha et al[17] reported a success rate of 100% in the first attempt for Trachlight assisted endotracheal intubation by trained personnel in 20 adult anaesthetised and paralised patients with manual in line stabilisation. In our study we achieved a success rate of 100% with Trachlight assisted intubation. All 25 patients in the Trachlight group could be successfully intubated, 24 patients in the first attempt and one patient in the second attempt. Our results compare favourably with the above mentioned study.

Our study had a few limitations as well. All patients in our study were healthy patients with simulated cervical spine immobilization with no neurological deficit. Neither the movement of cervical spine during intubation was assessed fluoroscopically nor, neurological outcome in any of the patients could be assessed as it was a simulated study. We cannot predict the usefulness of each instrument in a true clinical scenario on the basis of our study.

We visited all our patients in the postoperative period and looked for sore throat and hoarseness of voice. This was not blinded and hence the possibility of bias cannot be ruled out.

Both the airway devices we used to facilitate intubation had certain limitations. Both ILMA and trachlight are inserted blindly hence if the upper airway is traumatised then it may not be safe to use these techniques. Trachlight may be difficult to use in obese patients or in situations where transillumination is difficult.

We thus conclude that in healthy anaesthetised and paralysed adults with manual in line stabilization Trachlight assistance at tracheal intubation provides high first attempt success with negligible failure rate. Although ILMA is an effective ventilation device, it has an unacceptably high failure rate at blind tracheal intubation.Time taken for successful intubation is clinically acceptable and comparable with both Trachlight and ILMA guided techniques.

REFERENCES

1. American College of Surgeons Committee on Trauma: Advanced Trauma Life Support Student Manual. Chicago, American College of Surgeons 1993, pp 17-46
2. Criswell JC, Parr MJA. Emergency airway management in patients with cervical spine injuries. Anaesthesia 1994; 49:900-3.
3. Rhee KJ, Green W, Holcroft JW, Mangili JAA. Oral intubation in the multiply injured patient: The risk of exacerbating spinal cord damage. Ann Emerg Med 1990; 19:511-4.
4. Todd MM. Cervical spine anatomy and function for the anesthesiologist. Can J Anesth 2001; 48(6): R1-R5.
5. Majernick TG, Bieniek R, Houston JB, Hughes HG. Cervical spine movement during orotracheal intubation. Ann Emerg Med 1986; 15: 417–20.
6. Turkstra TP, Craen RA , Pelz DM, Gelb AW. Cervical Spine Motion: A Fluoroscopic Comparison During Intubation with Lighted Stylet, GlideScope, and Macintosh Laryngoscope. Anesth Analg 2005;101:910–5.
7. Brain AIJ, Verghese C, Addy EV, Kapila A, Brimacombe J. The intubating laryngeal mask II: a preliminary clinical report of a new means of intubating trachea. Br J Anaesth 1997;79:704-709.
8. Brain AIJ, Verghese C, Addy EV, Kapila A, Brimacombe J. The intubating laryngeal mask I: development of a new device for intubation of the trachea. Br J Anaesth 1997; 79: 699-703.
9. Hung OR, Saul P, Ian MO, Murphy M, Ronald DS. Lightwand intubation: II - Clinical trial of a new lightwand for tracheal intubation in patients with difficult airways Can J Anesth 1995;42:9, pp 826-30.
10. Hung OR, Saul P, Morris M, Ian MO, Launcelott MG, Stevens S; MacKay W, Ronald DS Clinical Trial of a New Lightwand Device (Trachlight) to Intubate the Trachea. Anesthesiology 1995;83:509-14.
11. Heath KJ. The effect on laryngoscopy of different cervical spine immobilisation techniques. Anaesthesia 1994; 49: 843-45.
12. Brain AIJ, Verghese C. LMA-Fast-trach Instruction manual. San Diego, LMA-North America,1998.
13. Waltl B, Melischek M, Schuschnig C, Kabon B.Tracheal intubation and cervical spine excursion: direct laryngoscopy vs. intubating laryngeal mask. Anaesthesia 2001; 56: 221-26.
14. Walls RM. Airway management in the blunt trauma patient. How important is the cervical spine? Canadian Journal of Surgery 1992; 35: 27-9.
15. Asai T, Koichi AU, Wagle and M Stacey. Placement of the intubating laryngeal mask is easier than the laryngeal mask during manual in line stabilization. Br J Anaesth 1999; 82: 712-
16. Inoue Y , Koga K, Shigematsu A, A Comparison of Two Tracheal Intubation Techniques with Trachlight™ and Fastrach™ in Patients with Cervical Spine Disorders Anesth Analg 2002;94:667–71.
17. Saha AK, Higgins M, Walker G, Badr A, Berman L. Comparision of endotracheal intubation in patients with cervical spine disease: The lighted intubating stylet versus the fibreoptic bronchoscope . Anesth Analg 1998; 87: 477-9.