

## ORIGINAL ARTICLE

## Tracheal intubation by novice staff: the direct vision laryngoscope or the lighted stylet (Trachlight)?

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**Objective:** To compare the ease of use of the direct vision laryngoscope and the lighted stylet (Trachlight) by novice staff.

**Methods:** Ten novice medical officers (MOs) performed orotracheal intubations using either the conventional direct vision laryngoscope (DL) or a lighted stylet device (Trachlight). They performed their DL intubations during the first phase of the study, followed by the Trachlight intubations in the subsequent phase.

**Results:** 51 of 54 (94%) of the DL intubation attempts were successful compared with 36 of 54 (67%) of the Trachlight intubations ( $p < 0.001$ ). The mean (SEM) time for intubation was 44 (7) seconds in the DL group and 66 (13) seconds in the Trachlight group ( $p = 0.004$ ). In addition 45 of 54 (83%) of the DL intubations were successful at the first attempt versus 15 of 54 (28%) in the Trachlight group ( $p < 0.001$ ).

**Conclusion:** The results show that the use of the conventional direct vision laryngoscope in novices is associated with significantly shorter mean intubation times and higher success rates on the first attempt compared with the Trachlight.

Transillumination of the tissues of the neck using a lighted stylet (light wand) to facilitate intubation was first described by Yamamura *et al* in 1959.<sup>1</sup> Since then it has been used with variable success rates as an alternative to conventional laryngoscopy.<sup>2</sup> The Trachlight consists of a reusable handle, a flexible wand, and a stiff retractable stylet (fig 1). The improvements in this device over other light wands include a brighter light source, a conveniently placed light switch, a longer stylet, a side clip to hold the tracheal tube in place, a variable length shaft, and a retractable internal stylet. The simplicity of the device and its lack of complications suggest that it might be a valuable instrument for use outside the operating theatre setting.<sup>3</sup> The improved light source permits intubation under ambient light, which may be useful for paramedics or other medical personnel performing intubation in the field.<sup>3</sup> The aim of this study is to compare ease of use of both devices by novices in an operating theatre setting.

## METHODS

Conduct of the study was approved by the local ethics committee. Ten novice medical officers (MOs) were recruited



Figure 1 The Trachlight.

to perform orotracheal intubation using either the direct vision laryngoscope (DL) or the Trachlight method over a period of six months. The MOs were starting their anaesthesia posting. Inclusion criteria for the MOs included no previous training in airway management and little prior experience with direct vision laryngoscopy or intubation (less than six previous intubation attempts). Those who have had six or more previous attempts at intubation (for example, those previously posted to anaesthesia or accident and emergency departments) were excluded. The study included consenting ASA I to III patients undergoing elective surgery that required general anaesthesia with orotracheal intubation. Patients aged between 10 and 85 years were recruited. Exclusion criteria for the patients included those who were unable to cooperate with airway assessment, those with poor dentition, those who were at risk of aspiration, those with cervical spine disease, tumours, polyps or foreign bodies in the upper airway, those undergoing major cardiovascular, thoracic, neurological surgery, and those with documented or suspected difficult airways.

The 10 MOs were first shown a 30 minute video demonstrating the use of the Trachlight device. A demonstration of both direct vision laryngoscopy and the use of the Trachlight were then conducted using a manikin. They were then allowed to practise on the manikins until they were able to perform five successful intubations using both techniques.

The thyromental distance and mouth opening of the patients were recorded by the MOs before induction. The patients were intubated by the MOs using either the DL or the Trachlight. The intubations were supervised by one of the six investigators. Only one method of intubation for each patient was performed. The MOs performed all the DL intubations in the first phase of the study followed by the Trachlight intubations in the subsequent phase.

For the DL group, the patient's head was placed in the sniffing position with the neck flexed with respect to the chest and

**Abbreviations:** DL, direct vision laryngoscope; MO, medical officer

**Table 1** Patient characteristics

	DL	Trachlight
Number of patients	54	54
(male/female)	(26/28)	(23/31)
Age (y) (SD)	47 (5)	42 (3)
Weight (kg) (SD)	58 (4)	64 (4)*
Height (cm) (SD)	164 (3)	167 (3)
Body mass index (SD)	21 (1)	23 (1)
ASA score (mode/median)	(1/1)	(1/1)

\*Statistically significant difference ( $p=0.03$ ).

**Table 2** Upper airway parameters (mean (2 SEM))

	DL	Trachlight
Thyromental distance (cm)	5.8 (0.5)	5.9 (0.4)
Mouth opening (cm)	4.4 (0.3)	4.7 (0.3)

the head extended at the atlanto-occipital joint. Before induction of anaesthesia, the patient was preoxygenated for at least three minutes. The induction technique was left to the discretion of the anaesthetist. After intravenous induction, muscle relaxation was achieved using a non-depolarising neuromuscular blocker. The patient was then hand ventilated until adequate relaxation for intubation was achieved. Orotracheal intubation was then performed by the MO.

For the Trachlight group, the device was first prepared by the supervisor. This included making a 90° bend at the premarked end of the tube after inserting the Trachlight into the endotracheal tube. For the Trachlight intubation, the head was placed in the neutral position. Induction of anaesthesia and muscle paralysis was achieved in the same manner as for the DL group. Orotracheal intubation was then performed using the method described by Hung and Stewart.<sup>4</sup>

Failure to intubate was defined as instances requiring more than three attempts. A maximum of 30 seconds was allowed for each attempt. Ventilation was permitted in between attempts. The total time taken to intubate was the time from mouth opening to confirmation of correct placement by capnography. Time taken to ventilate the patient between attempts was excluded. If the supervisor felt that there would be a high likelihood of trauma to the oropharynx, further attempts by the MO were aborted. In this case, the supervisor would take over the task of intubation. The number of attempts, the total time to intubation, and complications such as hypoxia or trauma were recorded.

The data were reported as mean (2 SEM). All continuous data were analysed using unpaired *t* test. Nominal data were analysed using  $\chi^2$  contingency table. Ordinal data were analysed using the Mann-Whitney U test. Statistical significance was taken at  $p<0.05$ .

## RESULTS

The patients' ages ranged from 14 to 79 years. The two groups were well matched in terms of patient characteristics (table 1)

**Table 3** Success rates for intubation ( $p<0.001$ )

	Success	Failure	Total
DL (n, %)	51 (94)	3 (6)	54
Trachlight (n, %)	36 (67)	18 (33)	54
Total	87	21	108

**Table 4** Number of attempts required for successful intubation ( $p<0.001$ )

	1	2	3	Failure	Total
DL (n, %)	45 (83)	6 (11)	0	3 (6)	54
Trachlight (n, %)	15 (28)	17 (31)	4 (7)	18 (33)	54
Total	60	23	4	21	108

and upper airway parameters (table 2) although the patients in the Trachlight group were heavier than those in the DL group.

The results in table 3 show the success rates for both groups. The mean (SEM) time for intubation was 44 (7) seconds in the DL group and 66 (13) seconds in the Trachlight group ( $p=0.004$ ). Table 4 shows that the number of successful intubations at the first attempt was higher in the DL group ( $p<0.001$ ).

## DISCUSSION

Our data demonstrate shorter times to intubation and higher success rates for intubation using the DL compared with the Trachlight. Both were statistically significant. The difference between the mean times was 22 seconds, which is clinically significant.

The technique of orotracheal intubation was not randomised because it was necessary to expose the MOs to as many intubations using direct vision laryngoscopy as early as possible in their posting. Otherwise a delay in acquiring this essential skill could hamper their ability to function independently later in the posting. Although the patients in the Trachlight group were heavier, there was no statistically significant difference in the BMI (body mass index) in both groups. Smith and Jackson found that during early fiberoptic intubation training, irrespective of whether trainees learn nasal or oral endoscopy first, their performance times when learning the second type of endoscopy were significantly improved. They observed that there was no apparent advantage in teaching nasal intubation (or oral intubation) first, as total endoscopy performance times are similar, whichever technique is taught first. They subsequently concluded that proficiency in one type of endoscopy is readily transferred to the other type.<sup>5</sup> We believe that the experience obtained from performing the DL before the Trachlight intubations improves proficiency in intubations for the Trachlight group. However, this has not translated to higher success rates in the Trachlight group. Conversely, it can be argued that the MOs may find it more difficult to perform the Trachlight intubations after becoming familiar with DL intubations but this is unlikely given the small number of DL intubations performed by the MOs.

Thus the results seem to suggest that orotracheal intubation using the Trachlight is not superior to conventional direct vision laryngoscopy in the hands of novices. This is consistent with findings of the study by Wik *et al* study, which compared the Trachlight to the direct vision laryngoscope in paramedic students using cadavers as intubation subjects.<sup>6</sup> However, other studies using the Trachlight have demonstrated shorter times to intubation compared with direct vision laryngoscopic intubations. Hung *et al* compared the Trachlight to the direct vision laryngoscope for intubation and recorded 1% failure rates with the Trachlight, and 92% of the intubations were successful on the first attempt, compared with a 3% failure rate and an 89% success rate on the first attempt with the laryngoscope ( $p\geq 0.05$ , not significant). The total time to intubation in their study was significantly less with the Trachlight compared with the laryngoscope (15.7 (10.8) versus 19.6

(23.7) seconds) ( $p < 0.01$ ).<sup>7</sup> However, these operators had much more experience with the Trachlight.

The apparent dichotomy in the results for novices versus experienced intubators seems to suggest that the benefits of the Trachlight only come with its regular use and better appreciation of upper airway anatomy. Thus we express reservations about recommending the Trachlight as the intubating technique of choice in novices.

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### Contributors

Dr C R Soh helped formulate the study protocol, collected and analysed the data, and participated in the writing and editing of the paper. Dr C F Kong helped formulate the study protocol, collected the data and participated in the editing of the paper. Dr C S Kong helped formulate the study protocol, coordinated the study, collected the data and participated in the editing of the paper. Dr P C Ip-Yam initiated the study, helped formulate the study protocol, collected and analysed the data, participated in the writing and editing of the paper. He is the guarantor of this paper. Dr E Chin coinitiated the study, helped formulate the study protocol, collected the data, and participated in the editing of the paper. Dr M H Goh collected and analysed the data and participated in the editing of the paper.

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