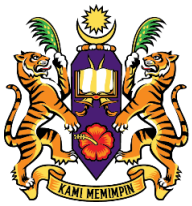
COMPARISON OF EASE OF INTUBATION IN PATIENTS USING C-MAC D-BLADE BETWEEN SIMULATED CORMACK LEHANE 1 AND 2 VIDEOLARYNGOSCOPIC VIEW: A RANDOMISED CONTROLLED TRIAL

DR AHMAD SHAMIL BIN SEMANAT

DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF MEDICINE (ANAESTHESIOLOGY)



UNIVERSITI SAINS MALAYSIA

2020

ACKNOWLEDGEMENTS

All Praise be to Allah, the Almighty for without his Blessings I might not have completed this thesis as part of the requirement for the Degree of Medicine (Anaesthesiology).

I like to express my sincere gratitude to Associate Professor Dr Rhendra Hardy bin Mohamad Zaini for the assistance throughout the study period. Without his help, I might have stumbled more often than not along the way. To Dr Mohamad Hasyizan bin Hassan, thank you for the continuous advice and guidance whenever is required.

To my colleagues and others who have helped with the study directly or indirectly, thank you very much. I will always remember your kind help and cooperation.

I am also thankful to my father Haji Semanat bin Abu Bakar, my mother Hajjah Siti Marina binti Sulaiman, as well as my immediate family for helping me during this journey. I am lucky to have a family like you. Thank you for supporting me through trying times, always believing in me, and for giving me strength.

Last but not least, I would like to thank my beloved wife, Dr Tengku Noor Farhana Binti Tengku Khalid for your everlasting support and understanding. Your joy, wisdom, kindness, and strength have carried me through so many hard times. To Ahmad Ilham and Ahmad Ikram, I promise we will spend more time together soon inshallah.

Thank you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

ASA	American Society of Anaesthesiologists
BMI	Body Mass Index
CL	Cormack Lehane Grade
HUSM	Hospital Universiti Sains Malaysia
IV	Intravenous
OT	Operation theatre
SPSS	Statistical Analysis Software Package
=	equal to
±	standard deviation
p	*p*-value
°	degree
%	percent
<	less than
$kg.m^{-2}$	kilogram per metre square
cm	centimetre

APPENDICES

ABSTRAK

Pengenalan: Kesukaran intubasi trakea boleh menyebabkan morbiditi dan kematian. Penggunaan perkakas videolaringoskop seperti C-MAC D-Blade mampu mengurangkan risiko komplikasi berkaitan dengan kesukaran intubasi. Namun begitu, bentuk laringoskop yang unik boleh menyukarkan proses intubasi walaupun glotis jelas kelihatan. Menggunakan pandangan glottis yang kurang jelas mungkin boleh memudahkan proses intubasi. Kajian yang dijalankan ini membandingkan tahap kesenangan intubasi menggunakaan perkakas C-MAC D-Blade di antara simulasi Cormack Lehane gred 1 dan 2 pesakit yang menjalani pembedahan elektif.

Kaedah: 94 orang pesakit tanpa ciri-ciri kesukaran intubasi yang menjalani pembedahan elektif di Hospital Universiti Sains Malaysia Kelantan di pilih dan di tempatkan secara rawak ke dalam kumpulan A untuk Cormack Lehane 1 (n=46) atau kumpulan B untuk Cormack Lehane 2 (n=48). Maklumat yang di catat termasuk tempoh intubasi, bilangan percubaan dan tahap kesukaran intubasi.

Keputusan: Tempoh intubasi bagi kumpulan B (7.7 ± 1.93s) adalah lebih cepat berbanding kumpulan A (9.2 ± 2.49s) dengan perbezaan sebanyak 1.4s (95% CI=0.53, 2.35, ***p*=0.002**). Tiada perbezaaan statistic di antara dua kumpulan tersebut dari segi bilangan percubaan (*p*=0.322) atau tahap kesukaran intubasi (*p*=0.780).

Kesimpulan: Tempoh intubasi C-MAC D-Blade adalah lebih cepat jika menggunakan pandangan Cormack-Lehane 2 berbanding Cormack-Lehane 1.

Kata kunci: Cormack-Lehane, C-MAC D-Blade, Videolaringoskopi, Intubasi, tempoh

ABSTRACT

Background: Difficult intubation could result in both morbidity and mortality. Current surging popularity with videolaryngoscope such as C-MAC D-Blade can reduce the risk of complications associated with difficult intubation. Despite showing good glottis view, the unique laryngoscope shape could pose a problem during tracheal intubation. Having a lesser appearance of the glottis may hypothetically ease the endotracheal tube delivery. This study compares the ease of intubation in patients using C-MAC D-Blade between simulated Cormack Lehane 1 and 2 videolaryngoscopic view among adult patient undergoing elective surgery.

Methods: 94 adults with no features of difficult intubation undergoing elective surgical procedures in Hospital Universiti Sains Malaysia Kelantan were recruited and randomly assigned to two groups either A for Cormack Lehane 1 (n=46) or B for Cormack Lehane 2 (n=48) videolaryngoscopic view. The outcome measured include duration of intubations, number of intubation attempts, and easiness of intubations.

Results: Duration of intubation was less (7.7 ± 1.93s) in Group B than in Group A (9.2 ± 2.49s) with a mean difference of 1.4s (95% CI=0.53, 2.35, ***p*=0.002**). There is no significant difference between the two groups in terms of the number of intubation attempts (p=0.322) and easiness of intubation (p=0.78).

Conclusion: Cormack-Lehane 2 videolaryngoscopic view significantly reduce time to intubation compared to Cormack-Lehane 1 videolaryngoscopic view when using C-MAC D-Blade.

Keyword: Cormack-Lehane, C-MAC D-Blade, Videolaryngoscope, Intubation, duration

CHAPTER 1 : INTRODUCTION

1.1 Introduction

Difficult and failed laryngoscopy and tracheal intubation are known to cause an increase in morbidity and mortality among patients (1). Failure to intubate can result in hypoxia, airway trauma, and even cardiorespiratory arrest.

Generally, there are two types of laryngoscope available to visualise larynx and facilitate tracheal intubation. The larynx can be viewed directly using conventional Macintosh laryngoscope or indirectly via Videolaryngoscope. Laryngeal view on direct laryngoscopy is usually described with the Cormack Lehane Classification with grade 1 showing a full view of the glottis, and grade 4 as neither glottis nor epiglottis can be seen. Grades 3 and 4 usually represent the most frequent difficulties in tracheal intubation (2).

The Macintosh laryngoscope is based on the original English blade from the early 1960s. Intubation with the direct laryngoscope requires skills and experience as it requires exact alignment of the oropharyngeal– laryngeal axis to visualise the glottic opening and intubate the trachea. It also requires careful head positioning and consistent anatomy. When these conditions are not met, the failure rate of intubation with conventional direct laryngoscopy increases (3).

Many studies have shown that a limited laryngeal view with direct laryngoscope can be improved by using videolaryngoscope. It allows adequate exposure of the glottis without the need to have that exact alignment. Videolaryngoscope can be divided into those with classically shaped laryngoscopy blades (e.g., Macintosh design) and those that feature acute angle blades such as GlideScope™ (Verathon, Bothell, WA) and C-MAC® with D-

Blade™ (Karl Storz, Tuttlingen, Germany). Oro-tracheal intubation has been used successfully with videolaryngoscope in various anticipated difficult airway scenarios such as morbid obesity, immobilisation of the cervical spine and restricted mouth opening (3).

‘D' is the name for Volker Doerges, the co-inventor and may also denote 'difficult'. It was designed with pronounced elliptical curvature with the distal end facing distinctly upward to facilitate intubation (3). Due to its considerably different design from the conventional blade, the D-Blade supposedly offer a better solution for anatomically difficult patients with Cormack-Lehane grade 3-4.

A study comparing D-Blade with McCoy Laryngoscope states that the use of the D-Blade resulted in more appearance of modified Cormack-Lehane grade 1. In contrast, the use of the McCoy laryngoscope resulted in more appearance of grade 2b and grade 3. However, although the number of successful first attempt intubation is better with D-Blade, the duration of intubation was statistical significantly longer in the D-Blade group than in the McCoy group (4).

Thus, although D-Blade does provides a better view, its acute angulation from 18° in C-MAC (size 3) to 40° could make it difficult to direct the endotracheal tube within the mouth for successful intubation (5). This can happen because despite the whole glottis is fully visible; the endotracheal tube tip could repeatedly hit the area posterior to the glottis rather than entering the glottis directly. Aziz et al., (2016) supported this observation in their study which reported a higher first-time success with Glidescope (Verathon) which can achieve more Grade 2 Cormack Lehane compared with the C-MAC D-blade which provide more Cormack Lehane 1 view (7).

Despite current evidence, it remains unclear whether the lesser appearance of glottic view such as Cormack-Lehane 2 will result in easier intubation using D-Blade. To provide this evidence, this study compares the ease of intubation between simulated Cormack-Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan.

1.2 Study Rationale

When reviewing articles from many journals, there is a knowledge gap in the best videolaryngoscopic view when using D-Blade. While this difference in laryngoscopic view may not be as crucial for classically shaped laryngoscope, the users of acute angle laryngoscope may find it difficult to navigate the endotracheal tube despite having a good view of the glottis. This is supported by the study by Sabry et al., (2016) which reported the duration of intubation was longer in the D-Blade group than in McCoy Group despite good glottic view (4). Jain et al., (2014) also noted this patent with other angulated blades (8).

Thus, by determining the optimum glottic view, it can reduce the time to intubation thus reduce the risk for complications associated with using D-Blade such as desaturation, multiple intubations attempts and traumatic insertion of the endotracheal tube.

In current practise, we have observed that Cormack Lehane 2 laryngoscopic view for D-Blade has resulted in smoother intubation process compared to Cormack Lehane 1 view. This study aims to prove this hypothesis with a randomised controlled trial comparing the ease of intubation between simulated Cormack-Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan.

1.3 Literature Review

1.3.1 Ease of Intubation

In a randomised clinical trial done by Shravanalakshmi et al., (2017) which compare intubation success and glottic visualisation using King Vision and C-Mac video laryngoscopes in patients with cervical spine injuries with cervical immobilisation, they reported difficulty in endotracheal tube insertion of C-MAC D-Blade (9). The study compared ease of intubation using 5 points Likert Scale and D-Blade was regarded as requiring higher grades of difficulty for insertion of the endotracheal tube as compared to other groups (Graded easy in 80% of C-Mac Macintosh Blade Group, 73% in King Vision Group and 35% in C-MAC D-Blade Group).

This is supported by Kılıçaslan et al., (2014) which graded the D-Blade laryngoscope as more difficult to use than the C-MAC with Macintosh Laryngoscopes in simulated easy and difficult airways (10).

1.3.2 Duration of intubations

Duration of intubation can significantly affect the risk of morbidity and mortality. The study by Shravanalakshmi et al., (2017) showed that the mean time of intubation was longer in group with C-MAC D-Blade as compared to C-MAC Macintosh Blade (p=0.04 and 0.04).

This is supported by the study from Sabry et al., (2016) which further compare C-Mac D-Blade and McCoy Laryngoscopes in intubating patients during cervical immobilisation (4). The study states that the use of C-MAC D-Blade has resulted in more appearance of

modified Cormack Lehane 1; however, the duration of intubation was statistically longer in the D-Blade group than in the McCoy group.

Similarly, post hoc comparison by Kılıçaslan et al., (2014) revealed no difference in intubation time between C-MAC and Macintosh laryngoscopes (p=0.1). However, both intubation time is faster than D-Blade group (p<0.01).

Jain et al., (2014) on a manikin study likewise noted longer intubation time using C-MAC D-Blade in comparison to the Macintosh, McCoy and CMAC with Macintosh blade group (8).

CHAPTER 2 : STUDY OBJECTIVES

2.1.1 General

To compare the ease of intubation between simulated Cormack-Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan

2.1.2 Specific

- To compare the ease of intubation between simulated Cormack-Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan.

- To compare the mean difference of intubation time between simulated Cormack-Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan.

- To compare the mean difference of the number of intubations attempts between simulated Cormack-Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan.

2.1.3 Null Hypothesis

- There is no difference in the ease of intubation in patients using C-MAC D-Blade between simulated Cormack Lehane 1 and 2 videolaryngoscopic view

using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan..

- There is no difference in the mean difference of intubation time in patients using C-MAC D-Blade between simulated Cormack Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan..

- There is no difference in the mean difference of number of intubations attempts in patients using C-MAC D-Blade between simulated Cormack Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult population undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan..

CHAPTER 3 : MANUSCRIPT

3.1 Title Page

Title

Comparison of ease of intubation in patients using C-MAC D-Blade between simulated Cormack Lehane 1 and 2 videolaryngoscopic view: A Randomised Controlled Trial

Running head:

To compare the ease of intubation in patients using C-MAC D-Blade between simulated Cormack Lehane 1 and 2 videolaryngoscopic view.

Authors:

Ahmad Shamil SEMANAT[1], Rhendra Hardy MOHAMAD ZAINI[1], Mohamad Hasyizan HASSAN[1]

Institutional Affiliations:

[1] Department of Anaesthesiology and Intensive Care, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia.

Correspondence:

Dr. Ahmad Shamil bin Semanat

Department of Anaesthesiology and Intensive Care,

School of Medical Sciences, Health Campus,

Universiti Sains Malaysia

16150 Kubang Kerian, Kelantan, Malaysia

Email: shamil.semanat@gmail.com Mobile +60148267670

No conflict of interest between the authors and other research parties should be declared

3.2 Abstract

Background: Difficult intubation could result in both morbidity and mortality. Current surging popularity with videolaryngoscope such as C-MAC D-Blade can reduce the risk of complications associated with difficult intubation. Despite showing good glottis view, the unique laryngoscope shape could pose a problem during tracheal intubation. Having a lesser appearance of the glottis may hypothetically ease the endotracheal tube delivery. This study compares the ease of intubation in patients using C-MAC D-Blade between simulated Cormack Lehane 1 and 2 videolaryngoscopic view among adult patient undergoing elective surgery.

Methods: 94 adults with no features of difficult intubation undergoing elective surgical procedures in Hospital Universiti Sains Malaysia Kelantan were recruited and randomly assigned to two groups either A for Cormack Lehane 1 (n=46) or B for Cormack Lehane 2 (n=48) videolaryngoscopic view. The outcome measured include duration of intubations, number of intubation attempts, and easiness of intubations.

Results: Duration of intubation was less (7.7 ± 1.93s) in Group B than in Group A (9.2 ± 2.49s) with a mean difference of 1.4s (95% CI=0.53, 2.35, ***p*=0.002**). There is no significant difference between the two groups in terms of the number of intubation attempts (p=0.322) and easiness of intubation (p=0.78).

Conclusion: Cormack-Lehane 2 videolaryngoscopic view significantly reduce time to intubation compared to Cormack-Lehane 1 videolaryngoscopic view when using C-MAC D-Blade.

Keyword: Cormack-Lehane, C-MAC D-Blade, Videolaryngoscope, Intubation, duration

3.3 Introduction

Difficult and failed laryngoscopy and tracheal intubation are known to cause increased morbidity and mortality among patients with a reported incidence of major adverse airway events were 1 in 22000 anaesthesia patients (1). Generally, there are two types of laryngoscope available which are direct such as Curve-Macintosh blade and indirect, which utilised videolaryngoscope. Videolaryngoscope is a device that contains a camera at the blade tip to visualise the glottis indirectly (11). The use of videolaryngoscope does not necessitate strict alignment of the oropharyngeal-laryngeal axis to visualise glottic opening. Thus it is being used successfully in various anticipated difficult airway scenarios such as morbid obesity, cervical spine immobilisation, and patients with limited mouth opening (3).

Videolaryngoscope such as C-MAC D-Blade which utilise acute angle blade could, however, present some difficulty during intubation. D-Blade was designed with pronounced elliptical curvature with the distal end facing distinctly upward to facilitate intubation (3). While D-Blade does provide a better image, Ömür et al., (2017) suggested that its peculiar shape can make it challenging to direct the endotracheal tube within the mouth for successful intubation, and thus may lengthen the duration of intubation. This assertion is supported by a study by Sabry et al., (2016) which reported longer period of intubation using D-Blade compared to McCoy laryngoscope despite more appearance of Cormack-Lehane 1 in D-Blade Group. Aziz et al., (2016) meanwhile reported a higher first-time success with Glidescope (Verathon) which can achieve more Grade 2 Cormack Lehane compared with the C-MAC D-blade which provide more Cormack Lehane 1 view.

Despite current evidence, it remains unclear whether the lesser appearance of glottic view such as Cormack-Lehane 2 will result in easier intubation using D-Blade. To provide this evidence, we compare the ease of intubation between simulated Cormack-Lehane 1 and 2 videolaryngoscopic view using C-MAC D-Blade in adult patients undergoing elective surgery in Hospital Universiti Sains Malaysia, Kelantan.

3.4 Methodology

3.4.1 Study Designs, Respondents and Randomisation

The study was conducted after we received approval from the Ethics Committee of Universiti Sains Malaysia (USM/JEPeM/19010063). Patients aged 18 to 60 years old with a BMI of less than 35 $kg.m^{-2}$ undergoing elective surgery were chosen based on the inclusion criteria. Our exclusion criteria include pregnancy, oro-facial surgery or anticipated difficult intubation and mask ventilation.

Patients were randomized to 2 groups which are Cormack-Lehane 1 (Group A, n=51) and Cormack-Lehane 2 (Group B, n=51) according to stratified randomization. These patients underwent a thorough pre-anaesthetic evaluation, including detailed airway assessment, clinical history, and examinations. Both anaesthetic and study consent was taken from eligible patients. All medical information related to the patients were kept confidential.

An envelope containing the group that the patients allocated to was given to the intubating anaesthesiologist just prior to induction for each patient. All intubations were performed by anaesthesiology trainee with prior experience with C-MAC D-Blade.

In the operating theatre, peripheral intravenous access was secured, and standard monitoring applied, including non-invasive blood pressure, pulse oximetry (spO2), end-

tidal carbon dioxide (etCO2) and electrocardiography (ECG). An appropriate endotracheal tube according to patient size and gender, was prepared with adequate lubrication with lignocaine gel. A standardised curved stylet (GlideRite® Rigid Stylet) was inserted into the endotracheal tube.

After three minutes of pre-oxygenation, induction of general anaesthesia began with the injection of fentanyl 2 $mcg.kg^{-1}$ bodyweight, propofol 2 $mg.kg^{-1}$ bodyweight in titrated doses until loss of verbal contract. Then an injection of rocuronium 1 $mg.kg^{-1}$ bodyweight was given for neuromuscular blockade.

After three minutes, the operator used C-MAC D-Blade videolaryngoscope to perform endotracheal intubation. The blade was introduced from the centre of oral cavity over the tongue while directly looking inside the mouth. Then while looking at the display screen, blade tip was introduced further to achieve simulated Cormack Lehane 1 or 2 glottic view by adjusting the tip of the blade at vallecular. Duration of intubation was then recorded from the time of holding the endotracheal tube in hand to the time black line on the tube crossed the vocal cord. A maximum of 60s for each intubation attempt was allowed.

If any difficulty is encountered, manoeuvres can be used either with external laryngeal manipulation, rotation of tube, partial inflation of the cuff, or the use of Magill/Boedeker forceps. If intubation is still unsuccessful, then intubation attempt can be repeated after adequate mask ventilation. Withdrawal of the laryngoscope or endotracheal tube from the mouth at any time is counted as one attempt. A maximum of three attempts is allowed. If still unsuccessful, intubation is declared as failed and recorded. Reason for failure of intubation will be obtained from the anaesthesiologist involved. Saturation below 90% at any moment is considered as a failure to intubate with that device, and institutional protocol for difficult airway management is to be followed.

After intubation, the intubating anaesthesiologist was asked to label the ease of intubation according to Likert Scale 1 to 5 (Please refer to Table 3.1). An independent observer made all recordings, and at no point of time, the intubating anaesthesiologist can know the timings.

Table 3.1: Ease of ETT insertion using 5-point Likert scale

Scale	Description
1	Very easy
2	Easy
3	Do not know
4	Difficult
5	Very difficult

3.4.2 Measurement of Primary and Secondary Outcomes

The primary outcome for this study was the ease of intubation. Ease of intubation is graded using a 5-point Likert Scale (according to Table 3.1) with 1 being very easy and 5 as being very difficult.

The secondary outcome for this study were duration of intubation, and the number of intubation attempts. Duration of intubation is defined from the time of holding the endotracheal tube in hand to the time black line on the tube crossed the vocal cord. Number of intubation attempts are defined as the number of endotracheal tube withdrawals from the mouth at any time.

3.4.2.1 Sample Size

We used *t*-test function to calculate the sample size with significance level was set to 0.05 with the power of study 80%. The difference in the time of intubation is five seconds the standard deviation for the time of intubation in all classes is 8.51 (4). The group ratio of Cormack Lehane 1 and 2 was set to 1. Therefore, the estimated sample size for each group is 46 patients. Assuming the drop-out rate to be 10%, we concluded that 51 patients per group were required to prove the hypothesis.

3.4.2.2 Statistical Analysis

All data were entered and analysed using Statistical Package for Social Science (SPSS) version 24.0. Demographic and clinical characteristic of the patients were presented using descriptive statistics in Mean ± Standard Deviation for numerical data and number (percentage, %) for categorical data. We used independent *t*-test to determine the mean between the two groups. The significance level was set to *p*-value below 0.05.

3.5 Results

A total of 102 patients were assessed for eligibility for recruitment into this study. Out of that number, eight patients refused to participate in this study. Therefore, 94 patients were randomised for Cormack Lehane 1 and Cormack Lehane 2. All subjects received the allocated intervention of Cormack Lehane 1 or Cormack Lehane 2. No subjects were lost to follow up, and all subjects were included for analysis. Flow of subject's recruitment were presented in Figure 3.1.

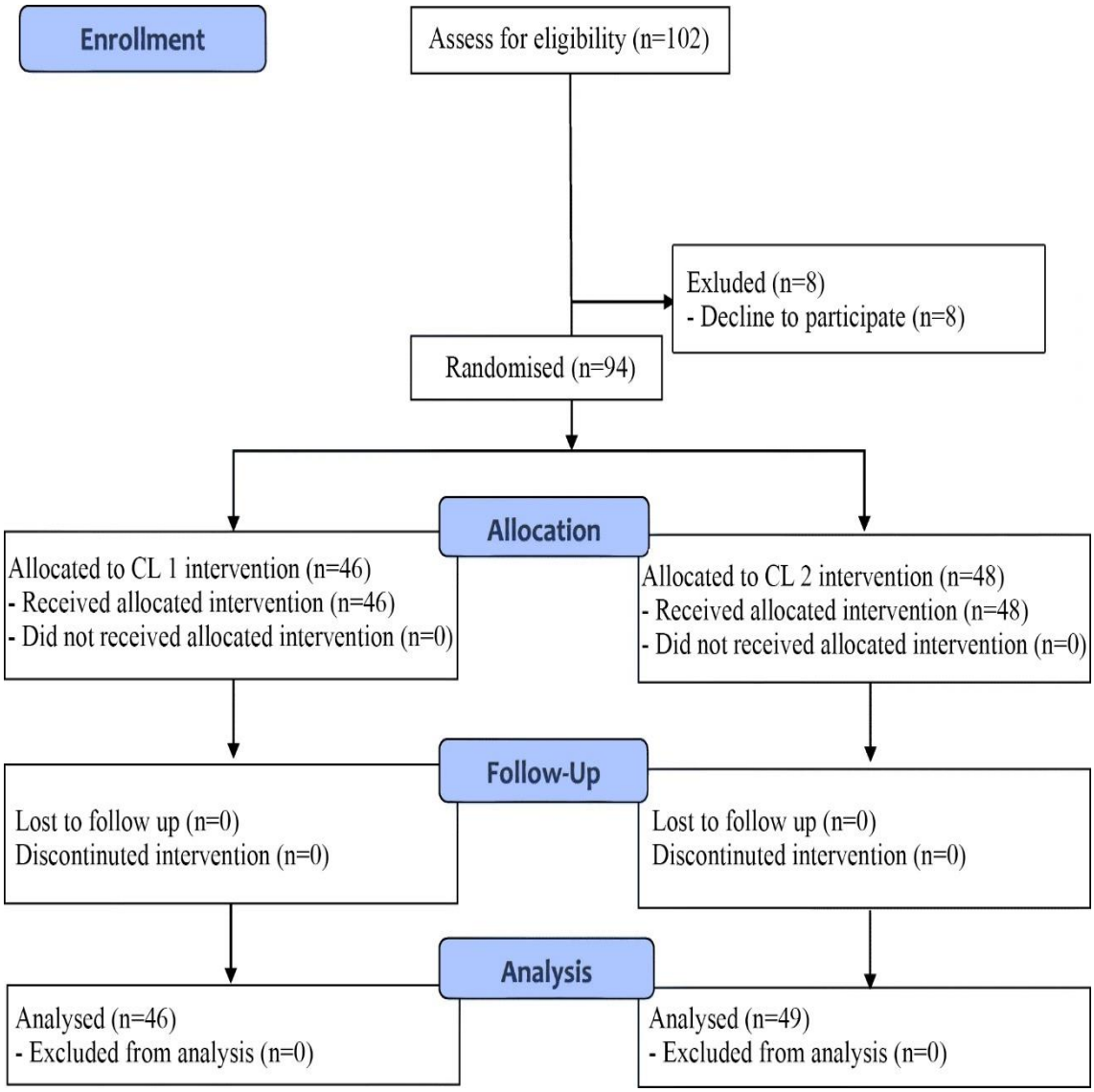


Figure 3.1: Flow chart of subject's recruitment

Characteristics of elective surgical patients requiring general anaesthesia in Hospital Universiti Sains Malaysia were presented in Table 3.2. More than half of the subjects were female (58.5%), and the majority were among the Malay population. Subjects blinded for Cormack Lehane 2 had a higher mean BMI (26.0 ± 4.67 $kg.m^{-2}$) value compare to subjects blinded for Cormack Lehane 1 (24.6 ± 4.92 $kg.m^{-2}$). However, there is no significant difference between the two groups (p=0.147). Majority of the subjects had more than six centimetres (cm) of thyromental distance and interdental gap of more than four cm. No subjects had restricted neck movement. The majority had Malampati score of 1 (60.6%). No subjects with anticipated difficult intubation were recruited. All subjects were successfully intubated on the first attempt. No external manoeuvre was required during intubation for any subjects. No complications were reported from both groups.

Table 3.3 shows that there is significant difference for mean duration of intubation between subjects allocated for Cormack Lehane 1 (mean ± SD = 9.2 ± 2.49s) and Cormack Lehane 2 (mean ± SD = 7.7 ± 1.93s) with mean difference of 1.4s (95% CI:0.53, 2.35, ***p*=0.002**). There is no significant difference between the two groups in terms of number of intubation attempts (*p*=0.322) and easiness of intubation (*p*=0.780).

3.6 Discussion

Videolaryngoscope facilitates intubation in patients with suspected difficult intubation and simulated difficult airway scenarios by improving the laryngeal view as compared with direct laryngoscopy (12). Newer videolaryngoscope such as C-MAC D-Blade utilise acute angle laryngoscope, which was developed to improve glottic view during intubation (5). D-Blade provides 40° view angle compared to conventional C-MAC laryngoscope, which provides 18° view (8). Despite showing a better glottic view, this increased angulation could cause difficulty navigating endotracheal tube due to the crowded oropharyngeal space (9,10). Thus, the endotracheal tube must be angulated to prevent hitting the arytenoids or the ventral tracheal wall during intubation (13). In our study, a standardised curved stylet (GlideRite® Rigid Stylet) was inserted into the endotracheal tube for both groups to reduce intubation difficulty and thus optimised tube delivery. All subjects were successfully intubated without any external laryngeal manoeuvre applied. This is in line with the study by Ömür et al., (2017) which support the use of appropriate stylet to ease the passage of endotracheal tube past the vocal cords and reduce the duration of intubation (5).

Lesser visualisation of glottis during intubation will in theory change the angle which the plane of laryngeal inlet makes with the endotracheal tube tip, thus reducing the risk of hitting arytenoids or ventral tracheal (14). We tested the hypothesis with simulated

Cormack Lehane 1 and 2 view and found there is no difference in the number of attempts and easiness of intubation between the views. All intubations were on the first attempt and were rated 1 to 2 on 5-point Likert Scale. Our result is consistent with other study which reported a very low failure rate of intubation using acute angle videolaryngoscope (6).

However, there is a statistically significant difference in the mean duration of intubation between both groups. Intubation with Cormack Lehane 2 videolaryngoscopic had a faster intubation time of 1.4s (95% CI:0.53, 2.35, ***p*=0.002**). This finding supports our hypothesis that a lesser appearance of glottic view such as Cormack-Lehane 2 would result in easier intubation using D-Blade. Our study which excluded patients with features of difficult intubation may not benefit from the small-time difference but for patients with difficult intubation, every second taken to try and manipulate endotracheal tube may save them from further airway trauma. Further study is required to ascertain this observation.

Complications including oesophageal intubation, airway trauma and desaturation were not seen during the study. This could be due to providers familiarity with the device or our patient selection which excluded cohort of patients with anticipated difficult intubation (15). This, however, is consistent with other studies involving acute angle videolaryngoscope which reported a very low risk of tissue trauma injury (6,14,15).

One major limitation with this study is the inability to blind the anaesthesiology trainee performing the tracheal intubation. However, to reduce bias, all recordings were made by an independent observer. The data were also analysed by a statistician who was not part of the study.

3.7 Conclusion

In patients without features of difficult intubation, the Cormack-Lehane 2 videolaryngoscopic view significantly reduce time to intubation compared to Cormack-Lehane 1 videolaryngoscopic view when using C-MAC D-Blade.

3.8 References

1. Cook TM. Strategies for the prevention of airway complications - a narrative review. Anaesthesia [Internet]. 2018 Jan 1 [cited 2020 Oct 15];73(1):93–111. Available from: http://doi.wiley.com/10.1111/anae.14123

2. Arné J, Descoins P, Fusciardi J, Ingrand P, Ferrier B, Boudigues D, et al. Preoperative assessment for difficult intubation in general and ENT surgery: Predictive value of a clinical multivariate risk index. Br J Anaesth. 1998 Feb 1;80(2):140–6.

3. Hazarika H, Saxena A, Meshram P, Kumar Bhargava A. A randomized controlled trial comparing C Mac D Blade and Macintosh laryngoscope for nasotracheal intubation in patients undergoing surgeries for head and neck cancer. Saudi J Anaesth [Internet]. 2018;12(1):35–41. Available from: http://ezproxy.usm.my/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=mdc&AN=29416454&site=ehost-live

4. Sabry L, Shaarawy S, Ellakany M, Elmasry A. Comparison between C-MAC D-blade and McCoy laryngoscopes in intubating patients during cervical immobilization. Res Opin Anesth Intensive Care [Internet]. 2016;3(3):122–8. Available from: http://www.roaic.eg.net/article.asp?issn=2356-9115;year=2016;volume=3;issue=3;spage=122;epage=128;aulast=Sabry

5. Ömür D, Bayram B, Özbilgin Ş, Hancı V, Kuvaki B. Comparison of different stylets used for intubation with the C-MAC D-Blade® Videolaryngoscope: a randomized controlled study. Brazilian J Anesthesiol (English Ed [Internet].

2017;67(5):450–6. Available from: http://www.sciencedirect.com/science/article/pii/S010400141630094X

6. Aziz MF, Abrons RO, Cattano D, Bayman EO, Swanson DE, Hagberg CA, et al. First-Attempt Intubation Success of Video Laryngoscopy in Patients with Anticipated Difficult Direct Laryngoscopy: A Multicenter Randomized Controlled Trial Comparing the C-MAC D-Blade Versus the GlideScope in a Mixed Provider and Diverse Patient Populati. Anesth Analg. 2016;122(3):740–50.

7. Aziz MF, Bayman EO, Van Tienderen MM, Todd MM, Brambrink AM. Predictors of difficult videolaryngoscopy with GlideScope® or C-MAC® with D-blade: secondary analysis from a large comparative videolaryngoscopy trial. Br J Anaesth [Internet]. 2016;117(1):118–23. Available from: http://www.sciencedirect.com/science/article/pii/S0007091217314083

8. Jain D, Dhankar M, Wig J, Jain A. Comparison of the conventional CMAC and the D-blade CMAC with the direct laryngoscopes in simulated cervical spine injury—a manikin study. Brazilian J Anesthesiol (English Ed. 2014;64(4):269–74.

9. Shravanalakshmi D, Bidkar P, Narmadalakshmi K, Lata S, Mishra S, Adinarayanan S. Comparison of intubation success and glottic visualization using King Vision and C-MAC videolaryngoscopes in patients with cervical spine injuries with cervical immobilization: A randomized clinical trial. Surg Neurol Int [Internet]. 2017 [cited 2020 Oct 16];8(1):1–6. Available from: /pmc/articles/PMC5309444/?report=abstract

10. Kılıçaslan A, Topal A, Erol A, Uzun ST. Comparison of the C-MAC D-Blade, Conventional C-MAC, and Macintosh Laryngoscopes in Simulated Easy and

Difficult Airways. Turkish J Anaesthesiol Reanim [Internet]. 2014;42(4):182–9. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4894146/

11. Jiang J, Ma D, Li B, Yue Y, Xue F. Video laryngoscopy does not improve the intubation outcomes in emergency and critical patients - a systematic review and meta-analysis of randomized controlled trials. Crit Care [Internet]. 2017;21(1):288–98. Available from: http://ezproxy.usm.my/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=mdc&AN=29178953&site=ehost-live

12. Maldini B, Hodžović I, Goranović T, Mesarić J. Challenges in the use of video laryngoscopes. Acta Clin Croat. 2016;55(Supplement 1):41–50.

13. Serocki G, Neumann T, Scharf E, Dörges V, Cavus E. Indirect videolaryngoscopy with C-MAC D-Blade and GlideScope: a randomized, controlled comparison in patients with suspected difficult airways. Minerva Anestesiol. 2013;79(2):121–9.

14. Shah SB, Hariharan U, Bhargava AK. C Mac D blade: Clinical tips and tricks. Trends Anaesth Crit Care. 2016;6:6–10.

15. Kleine-Brueggeney M, Greif R, Schoettker P, Savoldelli GL, Nabecker S, Theiler LG. Evaluation of six videolaryngoscopes in 720 patients with a simulated difficult airway: A multicentre randomized controlled trial. Br J Anaesth. 2016;116(5):670–9.

16. Chen C. Random digits [Internet]. 2020 [cited 2019 Nov 1]. Available from: http://people.uncw.edu/chenc/STT215/ips6e_table-b.pdf

3.9 Tables and Figures

Table 3.2: Characteristics of elective surgical patients requiring general anaesthesia in Hospital Universiti Sains Malaysia (n = 94)

Characteristics	CL1 (n = 46)		CL2 (n = 48)		*p*-value
	Mean (SD)	n (%)	Mean (SD)	n (%)	
Sociodemography					
Age (years)	42.4 (11.30)		40.2 (12.51)		0.369[a]
Gender					
Male		18 (39.1)		21 (43.8)	0.650[b]
Female		28 (60.9)		27 (56.2)	
Race					
Malay		45 (97.8)		47 (97.9)	0.742[c]
Indian		1 (2.2)		0 (0.0)	
Chinese		0 (0.0)		1 (2.1)	
Body-mass index (kg/m^2)	24.6 (4.92)		26.0 (4.67)		0.147[a]

[a] Independent t-test
[b] Pearson's chi-square test
[c] Fisher's exact test