Section: Anaesthesiology

Original Research Article

A PROSPECTIVE RANDOMIZED STUDY TO COMPARE KING VISION VIDEOLARYNGOSCOPE AND MCGRATH VIDEOLARYNGOSCOPE AMONG ADULT PATIENTS FROM NORTHERN INDIA

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Received : 30/04/2019
Received in revised form : 02/06/2019
Accepted : 20/06/2019

Keywords:
King Vision videolaryngoscope; MacGrath videolaryngoscope; Intubation; Percentage of glottis opening.

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DOI: 10.29228/jamp.40229

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2019; 1 (1); 27-31

Abstract

Background: Endotracheal intubation as a method of definitive airway management is considered to be gold standard. New devices, especially video laryngoscopes may improve intubation time, glottic view and success rate as there is no need to align the three axis. **Materials and Methods:** A prospective randomized control design was used among 70 participants aged between 20-60 years. Individuals complying with American Society of Anesthesiologists (ASA) grade I and II were selected. Thirty subjects each were divided into KV (King Vision) and MV (McGrath) group respectively. The main aim was to determine the rate of successful intubation. Secondary objectives were intubation time, adjustment maneuvers, percentage of glottis opening (POGO) scores and complications if any. **Result:** First attempt success rate was found to be 93.33% among KV while it was 70% in MV (p=0.041). The mean time for intubation among participants of group KV was 12.56±3.24 seconds whereas it was 22.2±6.68 seconds for MV (P=0.0001). There was significant difference in the number of adjustment maneuvers between the two groups. **Conclusion:** King Vision videolaryngoscopes (VLs) is better than McGrath VLs with respect to the ease of intubation, number of first attempts related to successful intubation and adjusting maneuvers needed and the former also offered better visualisation of laryngeal anatomy.

INTRODUCTION

Intubation facilitates to maintain the patient's airways open while they are medically sedated, unconscious or anaesthetized, and controlled ventilation by anaesthesia machine can regulate their respiration, so that necessary amount of oxygen can be supplied during surgery, subsequent to severe trauma, during serious illness and after cardiac arrest. Conditions where there is difficulty in intubation creates potentially life threatening situation during anaesthesia.[1] A difficult airway is described as the condition in which a qualified anaesthesiologist faces difficulties with the ventilation of the facemask and tracheal intubation or both. Diverse factors those are responsible for the above situation includes patient factors, the clinical environment as well as the practitioner's skills. Analyzing the relationship of these variables involves careful data collection and stratification.

Failure to manage airway have potentially significant consequences, as poorly controlled upper airways can lead to extreme morbidity or death in a matter of minutes. Following recent developments in airway management strategies, laryngoscopes are equipped to visualize vocal cords and maintain endotracheal tubes (ETT) under clear vision into the trachea.[2] The most widely used blades comprises the Macintosh curved blades and the Miller straight blades. While visualization of the vocal cords has become simpler, even with skilled hands the insertion of the intubation tube can be tricky. Macintosh direct laryngoscope (DL) has a comparatively unfavorable learning curve, with one study showing a requirement of more than 55 intubations to achieve a success rate of 90 percent in the operating room managed setting.[3] In addition, the widely used bedside screening tests for predicting difficult laryngoscopy and intubation have limited diagnostic power.[4]

During last two decades, a variety of videolaryngoscopes (VLs) have developed that offers several advantages during direct laryngoscopy, including ease of use of the tool, higher success rate in regular, as well as difficult airway situations and improved learning curves in

ISSN (O): 2687-5365; ISSN (P): 2753-6556

VLs.[5-7] The indirect view of the upper airways enhances glottic visualization, even in suspected or encountered difficult intubation.[8] That is why there is increasing trend for use of video laryngoscopy in patients with difficult airways or as a rescue device in failed intubation attempts.[9-11] The Difficult Airway Society recommended use of video laryngoscopes as one of the first aid devices for the management of difficult airway.[12]

However, these devices are sold without sufficient backup of clinical proof of their efficacy, theoretically a newer model may mean better. Two meta-analysis which compared DL to VL found improved visualization of glottis but hardly any improvement in intubation time with VL.[13,14] King Vision ® videolaryngoscope (KVVL; King Systems, Noblesville, Indiana, USA) is noted for its portability and cost-effectiveness and therefore a suitable tool for use in emergency medicine. The McGrath MAC ® (McGrath; Aircraft Medical Ltd, United Kingdom) is a moderately curved Macintosh VL providing the advantage of clinicians who are familiar with the traditional Macintosh blade. The present study aimed to evaluate the King Vision videolaryngoscope with McGrath videolaryngoscope in terms of intubation time, success rate, ease of tracheal intubation among other parameters within adult patients undergoing surgery.

MATERIALSANDMETHODS

This prospective randomized controlled study was conducted after approval from Institutional Ethical Committee (CTRI: 012378) at Jawaharlal Nehru Medical College and Hospital between November 2015 and September 2017.

Study participants: Seventy participants aged between 20-60 years of either sex undergoing surgery were selected for this study after their informed written consent. The exclusion criteria comprises head and neck surgery, valvular heart disease, uncontrolled hypertension, elevated intracranial pressure, cervical spinal injury, mouth opening <2.0 cm.

Study procedure: Patients were divided into two classes based on computer generated random number tables. Out of seventy participants five declined to participate and five were excluded. Finally 60 patients were divided into two groups of 30 each. Group KV was intubated with King Vision channeled blade videolaryngoscope and group MV were intubated with McGrath video laryngoscope. Blinding to Anaesthesiologist was not possible due to completely different design of two laryngoscopes. Learning curve was accomplished by using 15 intubations with each device on manikin before beginning the analysis or familiarizing with the use of these tools. Heart rates along with oxygen saturation were monitored using pulse oxymeter and multi channel monitor, Capnography, electrocardiography and non-invasive blood pressure were also monitored. After inducing anaesthesia, intubation time was measured from the insertion of the (King Vision or McGrath) system into the mouth till confirmation by capnographic tracing. External adjustments manauvers such as head position modification, external laryngeal manipulation, jaw thrust or a maleable stylet or bougie were used when necessary and is to be considered. Number of adjustment manauvers graded as Grade 0-no use of adjustment manauvers, Grade I-use of either, head position, external laryngeal manipulation, jaw thrust and stylet or bougie use and Grade II-use of two or more than two adjustment manauvers as described above. An attempt was defined as one in which the intubating device was withdrawn from the mouth irrespective of the outcome of procedure. Maximum three attempts with device were allowed, in case of failed intubation supraglottic airway device was used. Grading of ease of intubation done through use of external manipulation of larynx as Grade I-no external manipulation required, Grade II-external manipulation of larynx required intubating the patient and Grade III- failed intubation as well as use of rescue device. Change in heart rate and mean arterial blood pressure were recorded immediately after laryngoscopy and intubation at pre induction, immediately post intubation, 3 minutes post intubation, 5 and 10 minutes later. POGO score noticed as 0, 33 and 100% based on visualization of glottis structure through video laryngoscope.

Statistical Analysis: Parametric data like age, weight, intubation time were analysed using the unpaired t-test. Numbers of attempts, ease of intubation were evaluated using Fisher's exact test. An α level for all analysis established at 0.05 and $P<0.05$ was considered statistically significant. All data were interpreted using IBM SPSS Statistics version 22 (New York, United States).

RESULTS

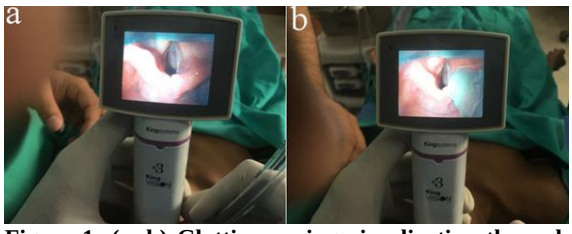

Figure 1: (a, b) Glottic opening visualization through King Vision Videolaryngoscope

Sixty participants were included in the study with 30 each in the KV and MV group. Table 1 describes the demographic and other key parameters of inclusion about the subjects among groups. Both the groups were comparable in relation to their age with the mean age being 37.5±13.95, 39.2 ±11.78 years in the KV and MV group respectively. The bodyweight of the participants was 60.33±7.58 Kg in the KV group whereas it was 58.7±7.35 Kg in the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

MV. There was no significant difference between distribution of the subjects across any of the grouped parameters except that across grade I and II categories between groups KV and MV, which was statistically significant (P=0.03). As far as the number of attempts of intubation concerned, a significant difference was found between the groups (P=0.041), also the time taken was significantly higher within MV (22.2±6.68 seconds) compared to the KV (12.56±3.24 seconds) (P=0.0001) as shown in table 2 and figure 1. Table 3 describes the nature of complications during the procedure in both the groups. The number of subjects with complications was six (20%) in KV and 13 (43.33%) in MV. Concerning the type of complications, blood tinged ETT was noticed in two (6.67%) subjects among KV and within five (16.67%) subjects in MV [Figure 2]. Sore throat was reported in four (13.33%) and nine (30%) subjects respectively in KV and MV group. Hoarseness of voice was found in three (10.0%) and four (13.33%) subjects respectively.

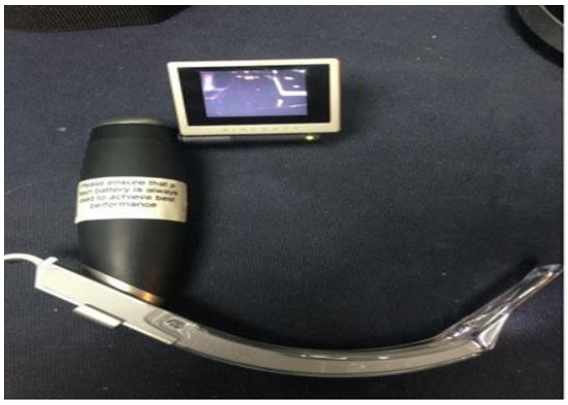

Figure 2: Side view of McGrath Videolaryngoscope

Table 1: Distribution of patients according to age, gender, weight, Mallampati and ASA grade

Parameters	King Vision (N=30)	McGrath (N=30)	P-value
Age*	37.5±13.95	39.2±11.78	0.99
Gender N (%)			
Male	10(33.33)	7(23.33)	0.56
Female	20(66.67)	23(76.67)	
Weight*	60.33±7.58	58.7±7.35	0.99
Mallampati (MP) Grade (%)			
MP I	4 (13.33)	11(36.67)	0.155
MP II	15(50)	13(43.33)	
MP III	11(36.67)	5(16.67)	
MP IV	0(0)	1(3.33)	
ASA Grade (%)			
I	23 (76.67)	21(70)	0.77
II	7(23.33)	9(30)	
Grade (%)			
I	27(90)	19(63.33)	0.03
II	3(10)	11(36.67)	

*Mean ± Standard Deviation

Table 2: Distribution of patients according to number of attempts, time taken for intubation and adjustment maneuvers

Parameters	King Vision (N=30)	McGrath (N=30)	P-value
Attempts			
I	28(93.33)	21(70)	0.041
II	2(6.67)	9(30)	
Time (Seconds)			
Up to 10	9(30)	0(0)	1.00
11-15	17(56.67)	4(13.33)	
16-20	4(13.33)	10(33.33)	
>20	0(0)	16(53.33)	
Time*	12.56±3.24	22.2±6.68	0.0001
Number of Adjustment Maneuvers			
0	3(10)	1(3.33)	0.0061
1	24(80)	15(50)	
>2	3(10)	14(46.67)	
POGO Score			
0% Score	0(0)	0(0)	0.33
33% Score	4(13.33)	8(26.67)	
100% Score	26(86.67)	22(73.33)	

*Mean ± Standard Deviation, # Values in brackets are percentage

Table 3: Distribution of patients with complications among both the groups

Complications	King Vision (N=30)	McGrath (N=30)	P-value
Overall complications	6(20)	13(43.33)	0.0946
Blood tinged ETT	2 (6.67)	5 (16.67)	0.424
Sore throat	4 (13.33)	9 (30)	0.117
Hoarseness	3 (10.0)	4 (13.33)	1.000

Values in brackets are percentage

ISSN (O): 2687-5365; ISSN (P): 2753-6556

DISCUSSION

The time taken to intubate with KV videolaryngoscope was 12.56±3.24 seconds as compared to 22.2±6.68 seconds with MV videolaryngoscope. The difference of mean intubation time between the two groups was 9.64 seconds which is statistically significant. The reason behind this difference could be due to better hand eye coordination, panoramic view and higher quality screen resolution in KV VLs as compared to MV VLs. Ease in using KV VLs is attributable to its durability during handling as compared to MV VLs. Ali et al reported less time taken by King Vision Videolaryngoscope as compared to other devices which is comparable to our study.[15] Murphy et al,[16] Kamal et al,[17] and Raza et al,[18] reported that MV VLs need good hand eye coordination to intubate the patient because laryngoscopy is performed by one hand whereas stylet mounted ETT is passed through glottis by means of other hand while maintaining glottis view.[16] Main reason behind more time taken by McGrath VLs is due to poor hand eye coordination and incomplete glottis visualization as compared to KV VLs. Jeon et al,[19] also reported similar findings after comparing MacGrathVLs to Glidescope.

Incidence rate of first attempt intubation in King Vision (KV) and McGrath (MV) were 93.33 and 70% respectively. But after two attempts incidence rate were 100% within both the groups. These findings are statistically significant. Main reason is due to ease in handling the King Vision instrument, less use of additional adjustable maneuver and good vision of glottic structure as compared to McGrath videolaryngoscope group. These findings were supported by Murphy et al,[16] Ali et al,[15] Kleine-Brueggeney et al,[20] and Bidkar et al,[21] they reported higher first attempt successful intubation by King Vision videolaryngoscope. Sharma et al,[22] and Ng et al,[23] reported increased number of attempts for successful intubation by McGrath videolaryngoscope. Incidence of 100% POGO score in King Vision and McGrath groups were 86.66 and 73% respectively. Thirty three percent POGO Score in King Vision and McGrath Videolaryngoscope groups were 13.33 and 26.66% respectively. Both the groups were comparable on the basis of POGO Score distribution. These results were also supported by Shimada et al,[24] Escott et al,[25] Ray et al,[26] and Reyhan et al,[27] they reported better POGO scoring both in King Vision and McGrath video laryngoscope. Major factors behind this might be due to jaw thrust maneuver applied among both the groups and glycopyrrolate employed as premedication which resulted in drying of secretion that leads to better view of glottis opening.

CONCLUSION

The findings showed that King Vision VLs is better than McGrath VLs in terms of intubation ease, number of first attempts to successfully intubate and change maneuvers required. King Vision keeps the hemodynamic responses better than McGrath video laryngoscope. The King Vision usually provided clearer representation of the laryngeal anatomy. Nonetheless, more clinical trials with a larger sample size need to be examined especially with regard to expected challenging intubation scenarios and in patients with coexisting morbidity.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556