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A Comparative Study of King Vision Video Laryngoscopy and Macintosh Laryngoscopy in Routine Airway Management in Elective Surgeries - Cohort Study

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Abstract

Introduction: One of the most important anaesthesia skills is to secure the airway using an endotracheal tube. This is mostly done using a direct laryngoscope. The significant pressure response and inability to provide a satisfactory glottic view, has prompted the development of innovative intubation instruments. One such intubation tool is the video laryngoscope.

Aims

To assess and compare the application of Macintosh laryngoscopy (ML) and King Vision video laryngoscopy (KVVL) in adult patients scheduled for elective surgery while under general anaesthesia.

Objectives

The primary objectives - assess intubation time, CL (Cormack Lehane) grade, optimisation maneuvers required (bougie, cricoid Pressure) and hemodynamic changes. Secondary objectives- evaluating sore throat associated with intubation and laryngoscopy. Tertiary objective- distinction between KVVL and DL intubation techniques.

Material and Method

Study Design: Cohort study

Study Period: The study was conducted between December 2022 and June 2024 - duration of eighteen months.

Study Place: Patients who were planned for elective surgery under GA at Amala Hospital, over a period of

one and half years. Hundred patients were assigned to undergo intubation using KVVL or ML according to week days (3days for VL, 3days for – DL). An experienced anaesthesiologist with at least 40 KVVL intubations performed each intubation.

Sample Size: Total sample size 100 and divided into two groups. In ML group 50 and KVVL group 50.

Study Population: Patients scheduled for elective surgery under GA.

Sampling Method: Consecutive sampling method

Method: Macintosh or King Vision intubation was assigned for one hundred elective surgery patients at Amala Institute of Medical Sciences. All of the data were collected and statistically analysed at the conclusion of the study.

Results and conclusion

In the two groups, there was no variation in the prevalence of gender, mean age, height, weight, or BMI. All 100 participants fell into Mallampatti classes I or II.

Efficacy outcomes- The KVVL approach had a significantly longer mean time for scopy (45.56±20.15) than the ML method (23.32±11.08). In ML group, 31 (62.0%) participants were belonging to CL Grade I, 15 (62.0%) belongs to Grade II and 4 (8.0%) belongs to Grade III. Whereas in KVVL group, 47 (94.0%) were belongs to CL Grade I and 3 (6.0%) were Grade II and none in higher grades. The p-value indicated that the KVVL group had a greater laryngeal view than the ML group. Therefore, KVVL group had a better glottic visualization.

Optimization maneuver was needed in 18 (36%) participants in ML group and only 2 (4%) in KVVL group. The KVVL group showed a significantly less mean change in SBP, DBP, MAP, and HR from baseline to PT0 (at the time of intubation), PT1 (1 minute after intubation), and PT3(3 minutes after intubation) than the ML group, suggesting more stable hemodynamic alterations. Post operative sore throat -Out of 50 cases in ML group, 5 (10.0%) had severe sore throat, 14 (28.0%) experienced moderate sore throat and 18 (36.0%)- mild sore throat. The KVVL group, none of them had severe sore throat, 8 (16.0%) had moderate and 22 (44.0%) had mild sore throat. The p-value indicated that the KVVL technique produced a considerably less severe sore throat than the ML technique.

Keywords: Intubation, King Vision, Macintosh, Pressure Response, Prospective Cohort Research

Introduction

The first step in any anaesthetic technique is to ensure airway safety. Unless a functional airway is established, administering any anaesthetic drug is unsafe. One of the most important anaesthesia skills is to secure the airway with an endotracheal tube which is mostly done using a Direct laryngoscope. The significant pressure response and inability to provide a satisfactory glottic view, has prompted the development of innovative intubation instruments. One such intubation tool is the video laryngoscope. Other techniques include using fibreoptic vision system or even cricothyrotomy to put the endotracheal tube directly into the trachea.[1] Both direct laryngoscope and video laryngoscope can be used, for performing tracheal intubation on critically ill individuals. [2,3]

Tracheal intubation is currently performed using one of two types of laryngoscopes- direct laryngoscope (DL) /video laryngoscope (VL). The components of DL include-handle, blade, & light. The components of a VL are similar to that of DL, however, they also feature a camera positioned in the distal half of the blade that projects images onto a screen.[4] Direct laryngoscope is

used for around 80% of intubations carried out worldwide,[5] however currently, there is a shift seen towards video laryngoscopes usage.[6,7] Enhanced glottic vision, intubation safety, and a high success rate are the primary benefits of using a VL scope. One such VL scope is the King Vision Video laryngoscope (KVVL), which contains a stiff, disposable blade and a groove to direct the tracheal tube. The 2.4-inch reusable display makes tracheal intubation simpler and safer. This makes it possible for the anaesthesiologist to quickly and easily intubate a patient by giving them a clear image of the airway.[8]

Endotracheal intubation can produce haemodynamic alterations like hypertension, tachycardia or arrythmia which is not easily tolerated by patients with reduced cardiovascular reserve. Postoperative sore throat ranks highest among the most undesirable outcomes of the postoperative period. It can result from a variety of factors, including mucosal dehydration or edema, tracheal ischemia due to the pressure of ETT cuffs, increased suctioning, and erosion of the mucosal surface due to the friction between tissues and ETT.

Aims

To assess and compare the application of Macintosh laryngoscopy and King Vision video laryngoscopy in adult patients scheduled for elective surgery while under general anaesthesia.

Objectives

The primary objectives - assess intubation time, CL grade, optimisation maneuvers required (bougie, cricoid Pressure) and hemodynamic changes. Secondary objectives- for evaluating sore throat associated with intubation and laryngoscopy. Tertiary objective- distinction between KVVL and DL intubation techniques.

Material and Method

Study Design: Cohort study

Study Period: The study was conducted between December 2022 and June 2024, a duration of eighteen months.

Study Place: Patients who were planned for elective surgery under GA at Amala Hospital, over a period of one and half years. Hundred patients were assigned to undergo intubation using KVVL or ML according to week days (3days for VL, 3days for – DL). An experienced anaesthesiologist with at least 40 KVVL intubations performed each intubation.

Study Population: Patients scheduled for elective surgery under GA.

Sample Size: Total sample size - 100 and divided into two groups. In ML group 50 and KVVL group 50.

From a similar previous study[9] comparison of patients between the two groups were done

$$n = \frac{\{Z_{1-\alpha/2}\sqrt{2\bar{p}(1-\bar{p})} + Z_{1-\beta}\sqrt{p_1(1-p_1) + p_2(1-p_2)}\}^2}{(p_1 - p_2)^2}$$

$$\text{where,} \quad \bar{p} = \frac{p_1 + p_2}{2}$$

P1= proportion of optimization manoeuvre (10%) in king vision group

P2= proportion of optimization manoeuvre (35%) in Macintosh group

α=significance level (5%)

1-β: Power (80%)

n = 50 in each group

Sampling Method: Consecutive sampling method

Inclusion Criteria

- Age range: 20–60 years.
- ASA I and II
- Posted under GA for elective surgery
- MP classes 1 and 2

- Cases where intra operative and post-operative analgesics can be standardized (Inj. Paracetamol 15mg/Kg, Inj. Fentanyl 2mcg/Kg, Inj. Tramadol 100mg)

Exclusion Criteria

- Who declined to participate in the study.
- Patients suffering from Oral pathologies.
- Oral surgeries and neck surgeries

Procedure

A pre-anaesthetic evaluation was done. Fasting started eight hours before surgery. Previous night, tab alprazolam (0.25 mg) and tab pantoprazole (40 mg) given. On the morning of surgery - iv access was secured and RL was started. After that, the patient was moved to OT. All standard ASA monitors were attached. Following sufficient pre-oxygenation, both groups underwent conventional GA procedures, which included injections of fentanyl at doses of two mcg/kg & propofol till verbal orders were lost. Intubation was done after three minutes of 0.1 mg/kg vecuronium. The same skilled anaesthesiologist performed every intubation. Anaesthesia was maintained with Oxygen, Nitrous Oxide & sevoflurane. Neuromuscular blockade was maintained by Inj vecuronium 0.02mg/kg. After completion of the surgery neuromuscular blockade was reversed with – Inj Neostigmine 0.05mg/kg and Inj Glycopyrrolate 0.01mg/kg.

Statistical Analysis

Upon study completion, all of the data was gathered and analysed using statistical methods. Using the students t-test, the mean values between the two groups were compared, and the chi-square method was used to compare percentages. ANOVA analysis of variance was performed for comparing multiple variables at once. Considered a P value of less than 0.05 as statistically significant.

Result

Table 1: Age Comparisons among Groups

Groups	N	Age		p Value
		Mean	SD	
ML	50	43.10	13.11	0.920
KVVL	50	43.36	12.79	

For both the ML and KVVL groups, the mean age was 43.10±13.11 and 43.36±12.79 years, respectively. The p value showed that age was comparable between groups (p=0.920).

Table 2: Comparison of Sex

Sex		Groups			p Value
	ML		KVVL		
	n=50	%	n=50	%	
Male	20	40.0	20	40.0	1.000
Female	30	60.0	30	60.0	

Out of 50 cases in ML group, 20 (40%) were male and 30 (60%) were female. Whereas in KVVL group, 20 (40%) were male and 30 (60%) were female. The p value showed that sex was comparable between groups.

Table 3: Weight Comparisons among Groups

Groups	N	Weight		p Value
		Mean	SD	
ML	50	61.52	11.02	0.356
KVVL	50	63.40	9.17	

The mean weight was 61.52±11.0 kg in ML group and 63.40±9.17 kg in KVVL group. The p value showed that weight was comparable between groups (p=0.356).

Table 4: Comparison of height among groups

Groups	N	Height	p value	
		Mean	SD	
ML	50	162.34	7.28	0.980
KVVL	50	162.38	8.76	

The mean height was 162.34±7.28 cm in ML group &162.38±8.76 cm in KVVL group. The p value showed that Height was comparable between groups (p=0.980).

Table 5: BMI Comparisons among Groups

Groups	N	BMI		p Value
		Mean	SD	
ML	50	23.27	3.48	0.249
KVVL	50	24.05	3.27	

The mean BMI was 23.27±3.48 in ML group and 24.05±3.27 in KVVL group. The p value showed that BMI was comparable between groups (p=0.980).

Table 6: Comparison of ASA among groups

ASA	Groups				p Value
	ML		KVVL		
	n=50	%	n=50	%	
I	23	46.0	25	50.0	0.689
II	27	54.0	25	50.0	

In ML group, 23 (46.0%) were belonging to ASA I and 27 (54.0%) were ASA II. Whereas in KVVL group, 25 (50.0%) were belonging to ASA I and 25 (50.0%) were ASA II. The p value showed that ASA were comparable between groups (p=0.689).

Table 7: Comparison of MP class between Groups

MP Class	Groups				p Value
	ML		KVVL		
	n=50	%	n=50	%	
Class I	19	38.0	21	42.0	0.683
Class II	31	62.0	29	58.0	

In ML group, 19 (38.0%) participants were belonging to MP class I and 31 (62.0%) were belongs to Class II. Whereas in KVVL group, 21 (42.0%) were belonging to MP class I and 29 (58.0%) were belonging to Class II. It was comparable between groups (p=0.683).

Table 8: CL grade comparison between groups

CL Grade			Groups			p Value
	ML			KVVL		
	n=50		%	n=50	%	
Grade I	31		62.0	47	94.0	<0.001
Grade II	15		30.0	3	6.0	
Grade III	4		8.0	0	0.0	

In ML group, 31 (62.0%) participants were belonging to CL Grade I, 15 (62.0%) belongs to Grade II and 4 (8.0%) belonging to Grade III. Whereas in KVVL group, 47 (94.0%) were belonging to CL Grade I and 3 (6.0%) were Grade II. The p-value indicated that the KVVL group had a considerably greater laryngeal view than the ML group.

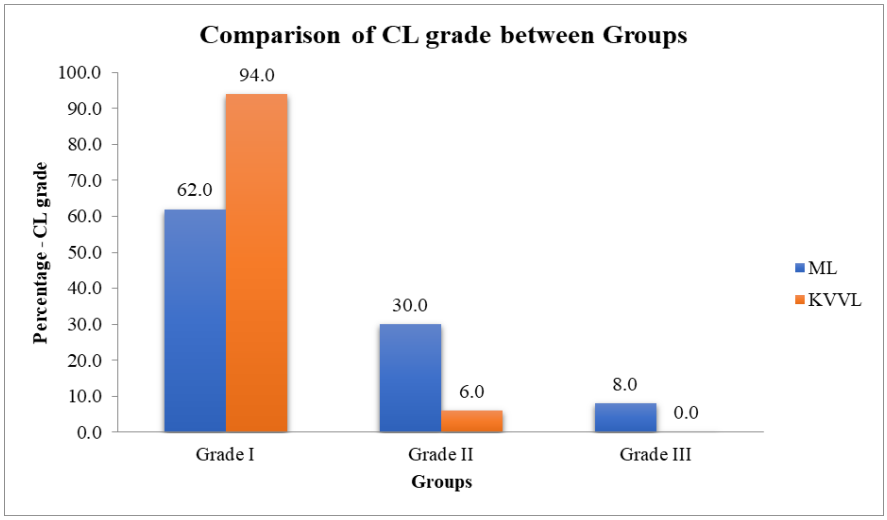


Figure 1: Multiple bar graph illustrating group differences in CL Grade

Table 9: Comparing the Scopy Durations of the Different Groups

Groups	N	Duration of Scopy		p Value
		Mean	SD	
ML	50	23.32	11.08	<0.001
KVVL	50	45.56	20.15	

In comparison to the ML approach (23.32±11.08), the mean scopy duration in the KVVL method (45.56±20.15) was much longer.

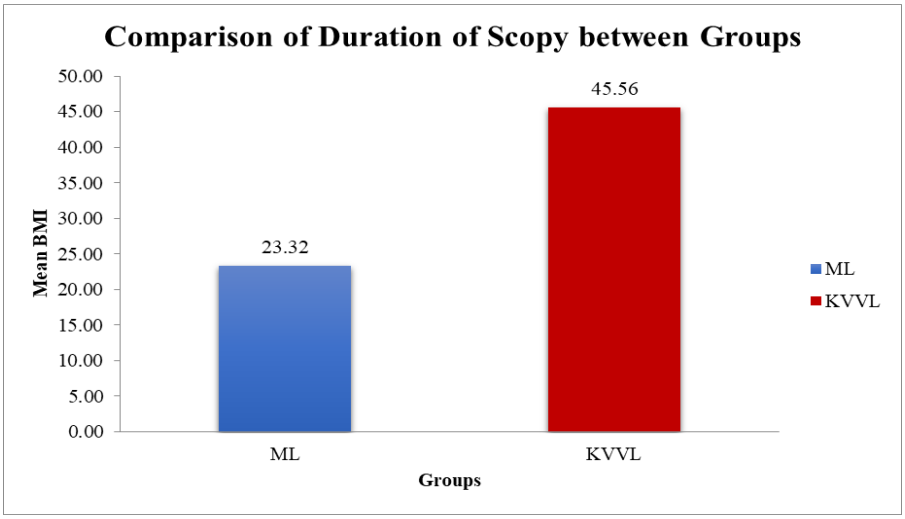


Figure 2: Simple bar diagram showing duration of scopy between groups

Table 10: Comparison of Optimization Maneuver between Groups

Optimization Maneuver	Groups				p Value
	ML		KVVL		
	n=50	%	n=50	%	
Present	18	36.0	2	4.0	<0.001
Absent	32	64.0	48	96.0	

Optimization maneuver was significantly lower in KVVL group (2.0%) than ML group (36.0%).

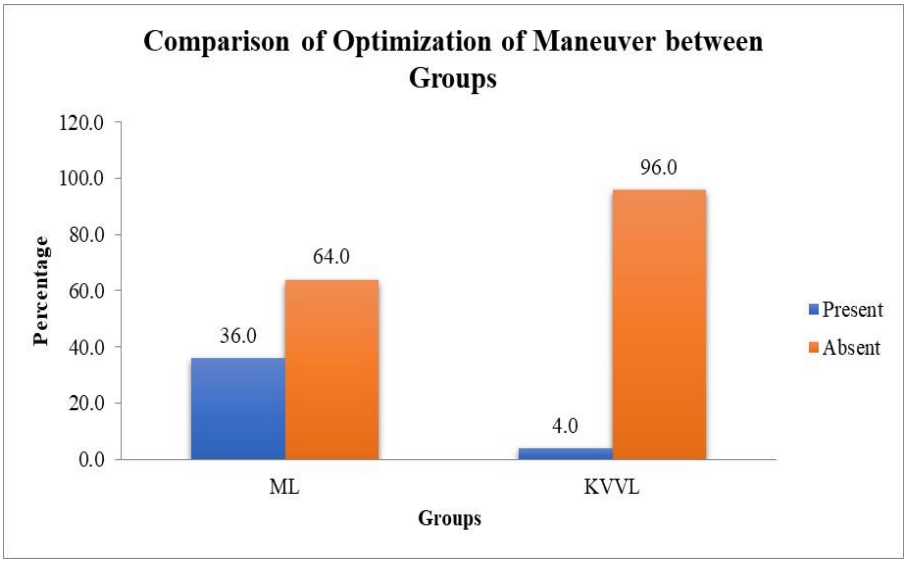


Figure 3: Multiple bar diagram showing Optimization of Maneuver between groups

Table 11: Comparison of POST between Groups

Post Operative Sore Throat	Groups				p Value
	ML		KVVL		
	n=50	%	n=50	%	
No	13	26.0	20	40.0	0.036
Mild	18	36.0	22	44.0	
Moderate	14	28.0	8	16.0	
Severe	5	10.0	0	0.0	

Out of 50 cases in ML group, 5 (10.0%) had severe sore throat, 14 (28.0%) had moderate sore throat and 18 (36.0%) had mild sore throat. Whereas in KVVL group, none of them had severe sore throat, 8 (16.0%) had moderate and 22 (44.0%) had mild sore throat. The p-value indicated that the KVVL technique produced a considerably less severe sore throat than the ML technique.

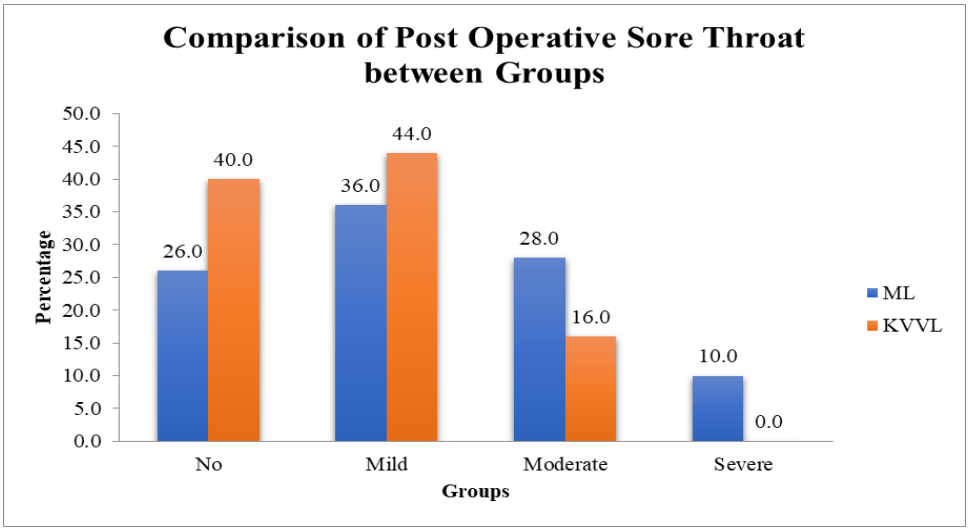


Figure 4: Multiple bar diagram showing Post Operative Sore Throat between groups

Table 12: Comparing the heart rates of the groups at various intervals

Heart Rate	ML (n=50)		KVVL (n=50)		p Value
	Mean	SD	Mean	SD	
BASAL	81.94	7.83	84.26	8.13	0.149
PP	75.74	6.63	78.20	8.16	0.101
PI	72.22	6.31	73.78	7.89	0.278
PT0	107.72	11.79	92.64	8.71	<0.001
PT1	102.12	11.00	88.18	6.94	<0.001
PT3	94.48	8.85	85.20	5.80	<0.001
PT5	84.04	9.25	82.40	5.16	0.277
PT7	80.22	7.82	80.12	5.21	0.940
PT9	78.30	8.12	77.52	5.54	0.576
PT11	76.50	8.12	75.24	5.39	0.363
PT13	75.04	7.65	73.38	5.58	0.219
PT15	73.76	7.47	71.38	5.50	0.073
PT30	72.34	6.97	70.30	5.71	0.113

In ML group, the mean heart rate was 107.72±11.79, 102.12±11.00 and 94.48±8.85 respectively at 0, 1st and 3rd minute. Whereas in KVVL group, the 0, 1st and 3rd minute HR were 92.64±8.71, 88.18±6.94 and 85.20±5.80 respectively. The p value showed that HR was significantly lower in KVVL group at 0, 1st and 3rd minute compared to ML group.

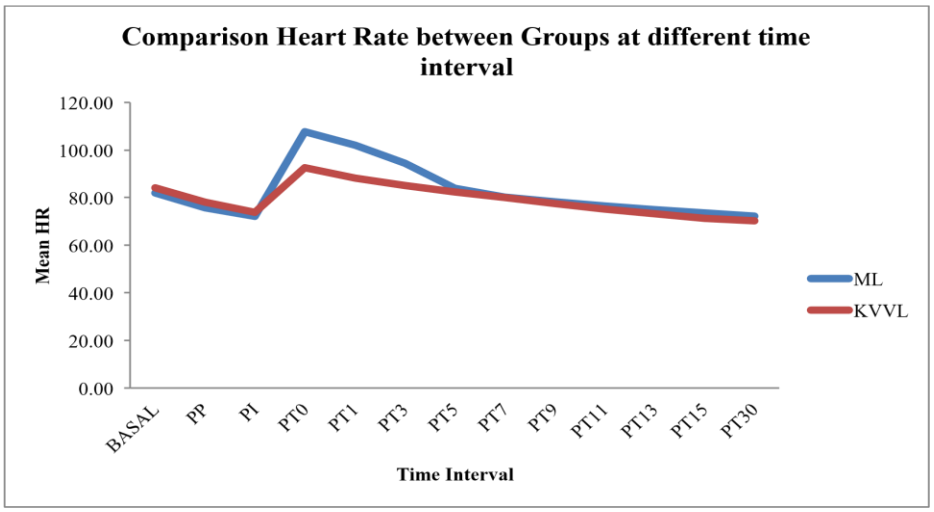


Figure 5: Line diagram for Heart rate and Groups at various time intervals

Table 13: SBP comparisons between groups at various time points

SBP	ML (n=50)		KVVL (n=50)		p Value
	Mean	SD	Mean	SD	
BASAL	135.98	13.18	134.80	11.68	0.637
PP	122.56	11.32	120.26	10.51	0.295
PI	106.04	8.89	107.08	9.38	0.571
PT0	144.64	10.83	123.76	8.63	<0.001
PT1	139.66	10.54	120.36	7.46	<0.001
PT3	136.04	9.82	119.02	7.94	<0.001
PT5	120.72	8.97	118.00	7.87	0.110
PT7	118.16	7.61	116.70	7.66	0.341
PT9	116.14	6.72	115.24	7.60	0.532
PT11	114.74	6.46	114.18	7.71	0.695
PT13	114.18	6.64	113.26	7.91	0.530
PT15	113.52	6.82	111.54	8.60	0.205
PT30	112.46	8.05	110.10	8.40	0.155

In ML group, the mean systolic blood pressure was 144.64±10.83, 139.66±10.54 and 136.04±9.82 respectively at 0, 1st and 3rd minute. Whereas in KVVL group, the 0, 1st and 3rd minute SBP were 123.76±8.63, 120.36±7.46 and 119.02±7.94 respectively.

The p value showed that BP was significantly lower in KVVL group at 0, 1st and 3rd minute compared to ML group.

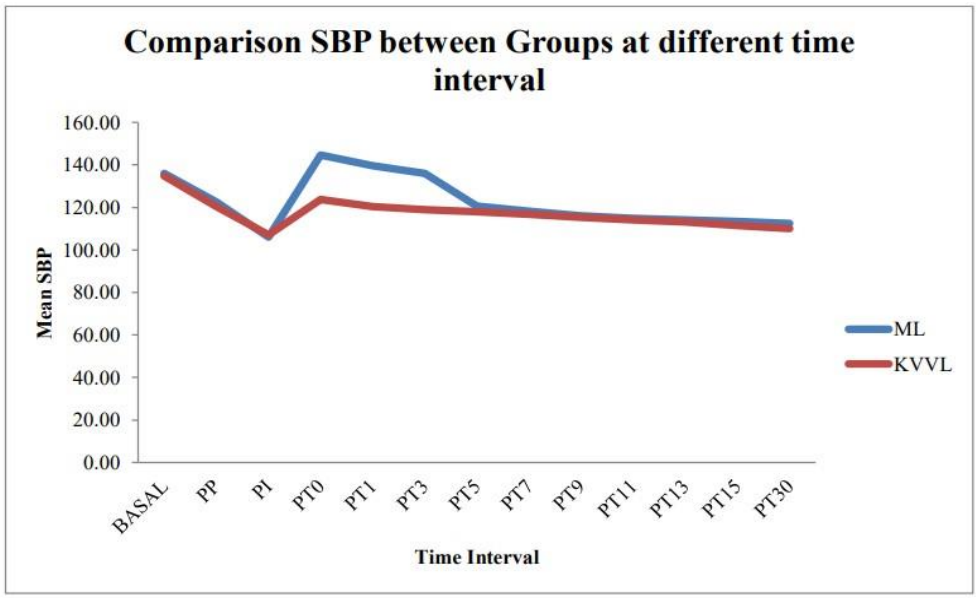


Figure 6: Line diagram for SBP

Table 14: Comparison of DBP between groups at various intervals of time

DBP	ML (n=50)		KVVL (n=50)		p Value
	Mean	SD	Mean	SD	
BASAL	90.80	9.21	89.54	10.51	0.525
PP	88.54	8.78	86.18	9.90	0.210
PI	81.12	8.53	80.10	8.42	0.549
PT0	105.46	7.62	91.98	8.11	<0.001
PT1	99.84	8.28	89.84	7.98	<0.001
PT3	97.30	8.11	88.64	8.32	<0.001
PT5	87.54	5.91	87.32	8.29	0.879
PT7	86.40	5.86	86.36	8.23	0.978
PT9	85.86	5.67	85.60	8.33	0.856
PT11	84.68	5.34	84.50	8.05	0.895
PT13	84.44	5.19	83.26	8.09	0.388
PT15	82.80	5.37	82.10	8.25	0.616
PT30	80.94	6.08	80.44	8.19	0.730

In ML group, the mean diastolic blood pressure was 105.46±7.62, 99.84±8.28 and 97.30±8.11 respectively at 0, 1st and 3rd minute. Whereas in KVVL group, the 0, 1st and 3rd minute DBP were 91.98±8.11, 89.84±7.98 and 88.64±8.32 respectively. The p value showed that DBP was significantly lower in KVVL group at 0, 1st and 3rd minute compared to ML group.

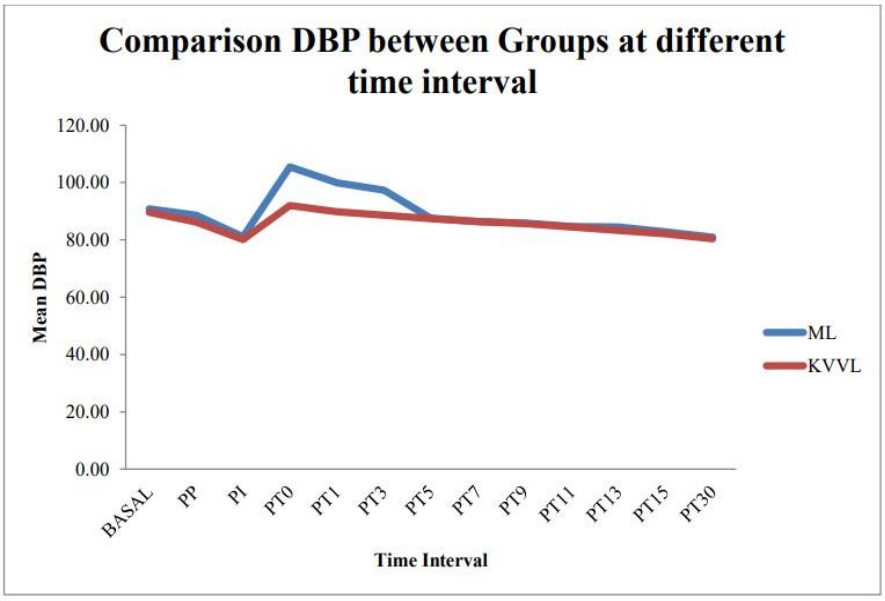


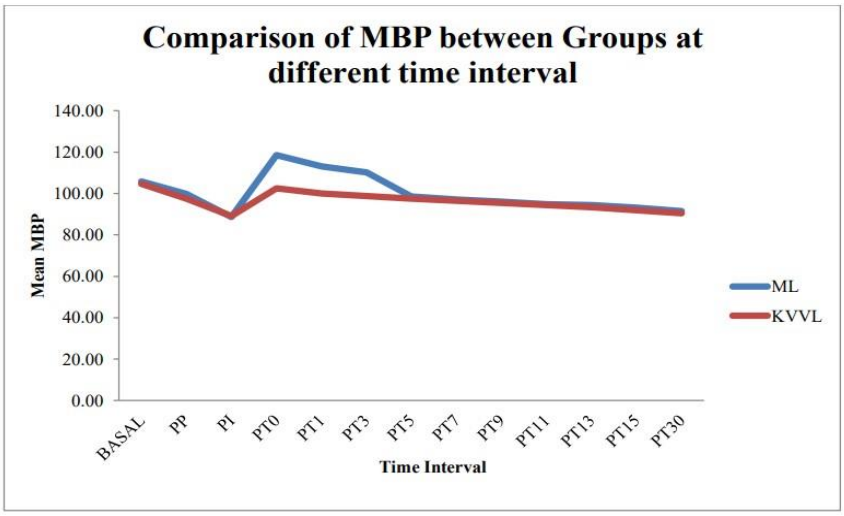
Figure7: Line diagram for DBP at various time intervals

Table 15: Comparison of MBP between groups at different time intervals

MBP	ML (n=50)		KVVL (n=50)		p Value
	Mean	SD	Mean	SD	
BASAL	105.86	10.01	104.63	9.89	0.537
PP	99.88	8.65	97.54	8.84	0.184
PI	88.63	6.92	89.09	7.02	0.742
PT0	118.52	7.57	102.57	6.28	<0.001
PT1	113.11	8.00	100.01	5.96	<0.001
PT3	110.21	7.72	98.77	6.21	<0.001
PT5	98.60	5.54	97.55	6.40	0.381
PT7	96.99	4.94	96.47	6.38	0.654
PT9	95.95	4.50	95.48	6.44	0.671
PT11	94.70	4.50	94.39	6.41	0.782
PT13	94.35	4.31	93.26	6.44	0.321
PT15	93.04	4.80	91.91	6.77	0.340
PT30	91.45	5.64	90.33	6.71	0.368

In ML group, the mean MBP was 118.52±7.57, 113.11±8.00 and 110.21±7.72 respectively at 0, 1st and 3rd minute. Whereas in KVVL group, the 0, 1st and 3rd minute MBP were 102.57±6.28, 100.01±5.96 and 98.77±6.21 respectively. The p value showed that MBP was significantly lower in KVVL group at0, 1st and 3rd minute compared to ML group.

Figure 8: Line diagram for MBP and Groups at different time intervals



Discussion

Ensuring and managing airway safety is the very first step in any anaesthetic procedure. Even though laryngoscopes were created in the early 19th century, Macintosh's introduction of a unique curved laryngoscope blade in 1943 significantly aided in the process of tracheal intubation under direct vision.

There has been evidence that the traditional direct laryngoscopes do not give a satisfactory view of the glottic area. Consequently, alternate intubation tools featuring optical, fiber-optic, or video imaging have surfaced. High-quality visual pictures from video laryngoscopes can be magnified on a monitor for better visualization. With a channelled blade, it becomes easier to intubate. Intubation can even be done in patients with the head in a neutral position and the entire operating room can visualize the progress in real time.

The clinical experiment was carried out on adult patients scheduled for elective surgery under GA in order to assess KVVL and ML. The study was conducted among 100 participants.

Sociodemographic and anthropometric characteristics: In the two groups under study, there was no variation in the prevalence of gender. Additionally, there was no difference in the two groups' mean age, height, body weight, or BMI.

Factors connected to the airway: All 100 participants fell into Mallampatti classes I or II, having a sufficient mouth opening as well as typical sterno-mental and thyromental distances.

In ML group, 19 (38.0%) participants were belonging to MP class I and 31 (62.0%) were belongs to Class II. Whereas in KVVL group, 21 (42.0%) were belonging to MP class I and 29 (58.0%) were belonging to Class II. It was comparable between groups (p=0.683).

In both groups, 100% of the intubations were performed by skilled individuals when the table was level and they were in a neutral position.

In ML group, 23 (46.0%) were belonging to ASA I and 27 (54.0%) were ASA II. Whereas in KVVL group, 25 (50.0%) were belonging to ASA I and 25 (50.0%) were ASA II. The p value showed that ASA were comparable between groups (p=0.689).

Efficacy outcomes-The mean intubation time is 23.32 seconds in ML and 45.56 seconds in KVVL. Duration of scopy was higher in KVVL method (45.56±20.15) compared to ML method (23.32±11.08). Our study showed results similar to Choudhary et al. [10] and Reena et al[11]were the time to intubation was significantly longer in the KVVL group when compared to the ML group.

Bashir et al[9], Elhadi et al[12] compared the ML and KVVL. The time to intubation was longer in the KVVL group, however not significantly longer. In their study it was found that the KVVL performed significantly better than ML in terms of CL grade and the need for optimization strategies, with the exception of intubation duration which was almost similar between the two groups.

Similar to the findings of Erdivanli et al[13], we observed that the time required to obtain the best glottic view was longer with KVVL as compared to the Macintosh laryngoscope. This was due to the prolonged time required for the introduction of the blade and the adjustment needed to align the blade with the glottis.

One of the reasons for Video Laryngoscope taking a longer time is due to difficulty in introducing the blade inside the patient’s mouth. In our study, time taken for laryngoscopy and intubation was longer in KVVL Group as compared to ML Group.

The KVVL took longer to intubate the trachea, however it offered a better laryngoscopic vision in the majority of patients when compared to direct laryngoscopy. The duration of intubation using KVVL is typically longer since the ease of glottis visibility does not equate to ease of endotracheal tube insertion. This is called the laryngoscopy paradox. Another issue with KVVL is that it can cause serious airway damage due to fogging, which obscures vision. Also, any blood or secretions that is produced can impair the depth perception in the KVVL.

With experience and skill, the time it takes to intubate a patient can be reduced. Techniques like the scissoring maneuver to open the mouth, introducing the blade with a slight lateral tilt, avoiding head extension, liberally

applying lubricant, and removing the screen in the event of an obstruction against the chest wall can all help.

In ML group, 31 (62.0%) participants were belonging to CL Grade I, 15 (62.0%) belongs to Grade II and 4 (8.0%) belongs to Grade III. Whereas in KVVL group, 47 (94.0%) were belongs to CL Grade I and 3 (6.0%) were Grade II and none in higher grades. The p value showed laryngeal view was better in KVVL group than ML group. Therefore, KVVL group had a better glottic visualization. A study by Ali et al.[14] has also shown an improvement in the CL grade using the KVVL when compared with the Macintosh laryngoscope.

A study done by Elhadi et al. [12] has shown that the King Vision scope improves the laryngoscopic view, thereby achieving a better glottic view. Similar results were seen in the studies by Bashir et al[9], Erdivanli et al[13], Kanchi et al[15] were the CL grade was much better in the KVVL.

Optimization manoeuvre was needed in 18 (36%) participants in ML group - external compression and bougie for 5 participants and external compression alone for 13 participants. Only 2 (4%) participants in KVVL group needed optimization manoeuvre. Both of them needed external compression only. Bougie was not used among any in KVVL group.

Every participant in the KVVL group displayed a binocular view of the vocal folds that was wide, enlarged, and original colour without using more force to retract (CL grade 1). When intubating using KVVL, the intubators did not stoop or become anxious. The camera was able to peep around the corner because of its close closeness to the larynx and the anatomical 93 curves of the blade. The participant's view was reduced in the ML group, which put emphasis on the intubators to look in or down, bend back or bend down, and apply a bougie or external laryngeal manipulation.

In 2016, Elhadi et al[12]. compared the need for optimization maneuvers such as BURP for visualization of glottis using Macintosh direct laryngoscopy and KVVL. KVVL was shown to require less optimization maneuvers. This is because an LCD screen may provide an oblique view of the vocal cords using video laryngoscopes. Some manipulation may be necessary because the tube must be inserted blindly until it is visible on the video laryngoscope screen. The oral, laryngeal, and pharyngeal axes must all be in a straight line when using a direct laryngoscope, which requires more manipulation. Maintaining the glottis view also requires continuing the manipulations until the endotracheal tube passes. Thus, more patients require the specific manoeuvres in the Macintosh group.

Hemodynamic result: Both groups' heart rates declined from basal to post premedication and then continued to decline until post-induction. Subsequent to the induction, both groups' heart rates increased and peaked at PT0, or 0 minutes after intubation, before progressively declining until 30 minutes following intubation in both groups.

Systolic BP, diastolic BP, HR, MBP trends in both groups demonstrate that it decreased from baseline to post-premedication and then continued to decline until post-induction. Subsequent to the induction, it increased and reached its maximum in both groups at PT0 (the point at which intubation occurs) and then progressively decreased until 30 minutes after intubation in both groups. The heart rate, SBP, DBP, MBP in the KVVL group was significantly lower than in the ML group from PI to PT0,1, and 3.

The fact that the hemodynamic changes in the KVVL group are more stable than those in the ML group emphasizes the advantages of employing KVVL for

airway management during elective surgery. Strong sympathetic discharge brought on by stimulation of the laryngopharynx and epipharynx is responsible for the hemodynamic alterations that occur during laryngoscopy and endotracheal intubation. For the anaesthesiologist, this pressor response to endotracheal intubation is especially concerning.

A comparison between the two groups' hemodynamic responses during the tubes passage from the glottic aperture to the trachea and right after intubation revealed a notable difference. When comparing group KVVL to group ML, the value was noticeably lower in the KVVL group. The trends in the MAP were also similar. In all the patients the SpO2 levels, remained stable throughout the investigation. Similar results were documented by Ahmed et al [16], Choudhary et al[10], Jain et Al [17] where KVVL showed a better haemodynamic stability. The study of Elhadi S et al[12], was also similar, where they found a significant decrease in MAP and HR in the KVL group as compared to the group ML immediately after intubation and at 10 minutes after intubation.

The main causes of hemodynamic alterations are laryngoscopy or ETT advancement-induced stimulation of the trachea and oropharyngeal tissues. A better upward lifting of the Macintosh blade was required to improve glottic visibility in patients with restricted airways. There was distortion of the oropharyngeal structures and compression of the laryngeal prominence. Additionally, in the Macintosh group, assist maneuver was often employed to help pass the ETT through the glottis. The two groups difference in the haemodynamics could be caused by any of these procedures.

Additionally, research indicates that the VL reduced the amount of force and movements required to view the glottis from the monitor, hence lessening the stimulation of the oropharyngeal tissues during intubation.

In 2017, Mogahed et al.[18] compared the efficacy of intubation with Macintosh, CMAC D blade, and KVVL in controlled hypertensive patients. They compared heart rate, MAP, SpO2, and EtCO2 in three groups. His study concluded that Video laryngoscopes need short time to achieve successful intubation and also offer better quality of glottic view and hemodynamic stability than ML in hypertensive patients.

Post operative sore throat -Out of 50 cases in ML group, 5 (10.0%) had severe sore throat, 14 (28.0%) had moderate sore throat and 18 (36.0%) had mild sore throat. Whereas in KVVL group, none of them had severe sore throat, 8 (16.0%) had moderate and 22 (44.0%) had mild sore throat. The p value showed that POST was lower in KVVL than ML technique.

This is because, video laryngoscope-aided intubations require less force to align the oral, pharyngeal, and laryngeal planes. Similar results were seen in the study by Zhu et al[19] and Najafi et al [20]. Najafi et al [20] did a comparative study on Glidescope VL and ML. The incidence and severity of sore throat and hoarseness after tracheal intubation by Glide Scope were lower than in the Macintosh laryngoscope.

Lower anterior pressure applied to the soft structures, less physical strain, and a decrease in the use of assist maneuvers may all contribute to a decrease in the incidence of sore throat and hoarseness in VL groups. The least number of sore throats were reported in the King Vision group. Compared to a Macintosh-like blade, the KVVL blade's length and angle may be more advantageous for glottis exposure, requiring less effort.

Ina study conducted by Tosh et al [21] concluded that there was a reduced incidence of POST in KVVL Group.

Repeated attempts, longer intubation time, and greater force exerted for performing the scopy are some of the important contributing factors for POST.

It has been demonstrated that when employing Macintosh laryngoscopes, a force of roughly 35 to 40 N is typically needed to expose the glottis. The force used primarily determines the associated hemodynamic stress responses, and other injury risks. Video laryngoscopes require less upward lifting force—roughly 5–14 N—to get a good picture of glottis because of their higher curvature blades. The axes do not need to line up in a straight line, which will lessen the cardiovascular stress response, reduced chance of soft tissue injury.

The present trend in the use of video laryngoscopes may require a modification in the algorithm for difficult airway management, thereby placing video laryngoscopes as the primary means of endotracheal intubation. With the help of this study, anaesthesiologists will be able to make more informed decisions about the benefits and drawbacks of video laryngoscopes and use safer, less complicated airway management approaches.

Conclusion

This cohort study found that with experienced anaesthesiologists KVVL had a better glottic view, reduced need for optimization manoeuvre, better haemodynamic stability, and reduced post-operative sore throat when compared to Macintosh laryngoscope. However, KVVL is inferior to ML in terms of duration of scopy, but this does not cause clinically significant desaturation. The classic Macintosh laryngoscopy resulted in the fastest time to effective tracheal intubation. Thus, prior expertise using this equipment in routine practice need to be highly regarded. The lack of experience with the equipment may offset any possible benefits of KVVL.

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