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Comparison of King Vision and McGrath MAC Videolaryngoscopes for Airway Management in Adult Patients Undergoing Elective Surgery: A Prospective Observational Study

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Abstract: ***Background: Videolaryngoscopes have changed contemporary airway practice by offering an indirect view of the glottis without the need to align the oral, pharyngeal and laryngeal axes. The King Vision (a channelled device) and the McGrath MAC (a non-channelled, Macintosh-shaped device) follow two different design philosophies, and a direct head-to-head comparison during routine intubation is therefore of practical value. Aim: To compare the King Vision and McGrath MAC videolaryngoscopes with respect to ease of intubation, glottic visualisation, haemodynamic response and intubation-related complications in adult patients with a normal airway. Methods: Sixty adult patients (ASA I–III, 18–60 years) scheduled for elective surgery under general anaesthesia were allocated into two equal groups- Group K (King Vision) and Group M (McGrath MAC). Number of attempts, intubation time, optimisation manoeuvres, Cormack–Lehane grade, Intubation Difficulty Scale (IDS) score, serial haemodynamic variables and complications were recorded. Results: First-attempt success was 100% in Group M versus 86.66% in Group K ($p<0.05$). Mean intubation time was markedly shorter with the McGrath MAC (13.93±3.50 s) than the King Vision (30.07±9.70 s) ($p<0.05$). Group M provided a higher proportion of Cormack–Lehane grade I views (93.33% vs 80%) and lower IDS scores, and showed significantly more stable heart rate and blood pressure across all post-intubation time points. Conclusion: In adult patients with a normal airway, the McGrath MAC videolaryngoscope outperformed the King Vision videolaryngoscope, offering faster intubation, a better glottic view, lower intubation difficulty and superior haemodynamic stability with fewer complications.***

Keywords: King Vision; McGrath MAC; videolaryngoscope; endotracheal intubation; Cormack–Lehane grade; Intubation Difficulty Scale; haemodynamic response

1. Introduction

Securing the airway through tracheal intubation remains one of the most frequently performed and most critical procedures in the operating theatre and the intensive care unit. For decades the Macintosh laryngoscope has been the standard tool for direct laryngoscopy; however, it depends on a forced alignment of the oral, pharyngeal and laryngeal axes to expose the glottis. When this alignment cannot be achieved, glottic visualisation is poor and intubation becomes difficult, which can lead to repeated attempts, airway trauma and exaggerated stress responses.

Videolaryngoscopy was developed to overcome these limitations. By placing a camera at the tip of the blade, these devices deliver an indirect, magnified view of the larynx on a screen and remove the need to line up the three airway axes. The result is improved intubating conditions, reduced lifting force, and a lower likelihood of dental and soft-tissue injury compared with conventional laryngoscopy.

The King Vision videolaryngoscope is a relatively newer two-piece system consisting of a reusable anti-reflective organic light-emitting diode (OLED) display that attaches to single-use blades. It is available in a channelled form, in which a guiding channel directs the endotracheal tube towards the glottis, and a standard non-channelled form. The McGrath MAC videolaryngoscope, by contrast, uses a non-channelled Macintosh-shaped blade with a camera mounted on a camera stick, so its handling closely resembles the familiar direct laryngoscope and is reported to achieve a high success rate across varied clinical settings.

Because the two devices embody fundamentally different blade philosophies- channelled versus non-channelled- a direct comparison during routine airway management is clinically relevant. The present study was therefore undertaken to compare the King Vision and McGrath MAC videolaryngoscopes in adult patients with a normal airway undergoing elective surgery, with respect to ease of intubation, glottic view, haemodynamic stability and complications.

2. Aim and Objectives

The aim of this study was to compare the McGrath MAC and King Vision videolaryngoscopes as intubation devices for airway management in adult patients.

Primary objectives- to compare ease of intubation in terms of:

- Number of attempts required for successful intubation.
- Time taken for intubation.
- Number of optimisation manoeuvres required during laryngoscopy and intubation.
- Intubation Difficulty Scale (IDS) score.

Secondary objectives:

- To compare the haemodynamic variations occurring during intubation.

- To list and compare the complications related to laryngoscopy and intubation.

3. Materials and Methods

After obtaining approval from the institutional human research ethics committee, this prospective observational study was conducted on 60 patients undergoing routine airway management at a tertiary-care teaching hospital. Written informed consent was obtained from every patient. Participants were divided equally into two groups of 30 each: Group K, intubated with the King Vision videolaryngoscope, and Group M, intubated with the McGrath MAC videolaryngoscope.

Inclusion criteria

- Patients scheduled for elective surgery under general anaesthesia requiring intubation with either device.
- ASA physical status grade I, II or III.
- Age between 18 and 60 years, with valid written informed consent.

Exclusion criteria

- History of difficult intubation or anticipated airway difficulty.
- Any oral-cavity pathology obstructing device insertion, or mouth opening less than 2.5 cm.
- Patients at risk of a full stomach (trauma, morbid obesity, pregnancy, gastric regurgitation) or with severe cardiorespiratory or hepato-renal dysfunction.

Sample size was determined by the inclusion and exclusion criteria together with the feasible study duration, permitting enrolment of approximately 60 patients. A detailed pre-anaesthetic evaluation was carried out a day before surgery, and baseline pulse rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and oxygen saturation (SpO_2) were recorded before premedication.

As per departmental protocol, patients received intravenous glycopyrrolate 0.004 mg/kg and tramadol 2 mg/kg thirty minutes before surgery. Following preoxygenation with 100% oxygen for three minutes, intravenous lignocaine (2%) 1–2 mg/kg was given 90 seconds before intubation to attenuate the pressor response, and anaesthesia was induced with thiopentone sodium (2.5%) 3–7 mg/kg and vecuronium 0.12 mg/kg to achieve neuromuscular blockade. All intubations were performed by an experienced consultant anaesthesiologist using the assigned device. Intra-operative monitoring included pulse oximetry, non-invasive blood pressure, electrocardiography and capnography.

Ease of intubation was assessed by the number of attempts (a maximum of two attempts was permitted; more than two was recorded as a failure), the time taken for intubation (defined as the interval from blade insertion past the incisors to confirmed endotracheal tube placement by bilateral chest rise and capnography, with a ceiling of 120 seconds), the optimisation manoeuvres required (head repositioning, external laryngeal manipulation, or assistance), and the IDS score derived in part from the Cormack–Lehane grade. Haemodynamic variables (heart rate, SBP, DBP, MAP and SpO_2) were recorded before and after premedication, before and after induction, and at 0, 1, 3, 5 and 10 minutes after intubation. Complications such as hypoxia, lip injury, mucosal or dental trauma, oral bleeding, hypertension, hypotension, tachycardia, bradycardia, oesophageal intubation and laryngospasm were noted and managed symptomatically.

Data were compiled and analysed statistically. Quantitative variables are expressed as mean ± standard deviation and were compared using Student's t-test, while categorical variables were compared using the chi-square test. A p-value below 0.05 was considered statistically significant.

4. Observations and Results

The two groups were comparable with respect to demographic characteristics. The mean age was 36.60±11.4 years in Group K and 39.53±10.9 years in Group M, and mean weight was 54.03±7.3 kg and 56.03±6.3 kg respectively, with no statistically significant difference ($p>0.05$). Group K comprised 15 males and 15 females, whereas Group M comprised 13 males and 17 females.

Table 1: Demographic profile of the two groups

Variable	Group K (n=30)	Group M (n=30)	p-value
Mean age (years)	36.60 ± 11.4	39.53 ± 10.9	>0.05
Mean weight (kg)	54.03 ± 7.3	56.03 ± 6.3	>0.05
Sex (M / F)	15 / 15	13 / 17	>0.05

First-attempt success was achieved in all 30 patients (100%) in Group M, whereas in Group K 26 patients (86.66%) were intubated at the first attempt and 4 (13.33%) required a second attempt. None of the patients in either group needed more than two attempts. The difference in first-attempt success was statistically significant ($p<0.05$).

Table 2: Number of attempts for successful intubation

Attempt	Group K (n=30)	Group M (n=30)	p-value
First attempt	26 (86.66%)	30 (100%)	<0.05
Second attempt	4 (13.33%)	0 (0%)	—

Mean intubation time was substantially shorter with the McGrath MAC (13.93±3.50 s) than with the King Vision (30.07±9.70 s); this difference was statistically significant ($p<0.05$). No optimisation manoeuvre was required in either group.

Table 3: Mean intubation time and optimisation manoeuvres

Parameter	Group K (n=30)	Group M (n=30)	p-value
Mean intubation time (s)	30.07 ± 9.70	13.93 ± 3.50	<0.05
Optimisation manoeuvre required	0 (0%)	0 (0%)	—

Glottic visualisation, graded by the Cormack–Lehane system, was adequate in both groups. A grade I view was obtained in 80% of Group K and 93.33% of Group M, while a grade IIa view occurred in 20% and 6.66% respectively. Grades III and IV were not encountered with either device.

Table 4: Glottic visualisation (Cormack–Lehane grade)

Grade	Group K (n=30)	Group M (n=30)
I	24 (80%)	28 (93.33%)
IIa	6 (20%)	2 (6.66%)
IIb / III / IV	0 (0%)	0 (0%)

The Intubation Difficulty Scale confirmed easier intubation with the McGrath MAC. An IDS score of 0 (easy intubation) was recorded in 93.33% of Group M compared with 76.66% of Group K. No patient in either group had an IDS score of 5 or above, indicating that no instance of moderate or major difficulty occurred.

Table 5: Intubation Difficulty Scale (IDS) score distribution

IDS score	Group K (n=30)	Group M (n=30)
0 (easy)	23 (76.66%)	28 (93.33%)
1	4 (13.33%)	2 (6.66%)
2	3 (10%)	0 (0%)
3-4	0 (0%)	0 (0%)

Haemodynamic responses differed markedly between the two devices. In Group K, heart rate, SBP, DBP and MAP rose sharply during laryngoscopy and remained significantly elevated above baseline up to 10 minutes after intubation. In Group M the rise was smaller, returned towards baseline sooner, and was clinically insignificant at all time points. On inter-group comparison, all four parameters were significantly higher in Group K than in Group M during and after intubation ($p<0.05$). Oxygen saturation stayed at or above 98% in both groups throughout, with no significant difference. Representative heart-rate values are summarised below.

Table 6: Mean heart rate (beats/min) at selected time intervals

Time point	Group K	Group M	Inter-group p
Baseline	82.20 ± 10.50	86.00 ± 11.20	>0.05
0 min (intubation)	113.30 ± 11.40	92.40 ± 9.30	<0.001
1 min	110.60 ± 9.80	89.70 ± 7.50	<0.001
3 min	104.27 ± 9.20	85.50 ± 6.90	<0.001
5 min	98.30 ± 8.90	82.30 ± 6.90	<0.001
10 min	93.30 ± 8.60	78.90 ± 6.40	<0.001

Table 7: Mean systolic blood pressure (mmHg) at selected time intervals

Time point	Group K	Group M	Inter-group p
Baseline	116.00 ± 8.50	119.50 ± 9.40	>0.05
0 min (intubation)	150.30 ± 10.70	123.90 ± 11.80	<0.001
1 min	146.50 ± 10.60	122.00 ± 8.60	<0.001
3 min	135.00 ± 8.60	117.40 ± 7.90	<0.001
5 min	122.30 ± 7.20	114.00 ± 8.30	<0.001
10 min	113.40 ± 6.80	111.60 ± 7.40	>0.05

Complications were more frequent in Group K. A transient rise in heart rate (≥20% above baseline) occurred in 28 patients and a transient rise in SBP in all 30 patients of Group K, none of which required treatment. Minor airway trauma—lip injury in 2 patients, mucosal trauma in 1, and oral bleeding in 1- was confined to Group K and resolved without intervention. In Group M only 2 patients showed transient hypertension and no other complication was recorded.

Table 8: Intra-operative complications

Complication	Group K (n=30)	Group M (n=30)
Hypertension (transient)	30	2
Tachycardia (transient)	28	0
Lip injury	2	0
Mucosal trauma	1	0
Bleeding from oral cavity	1	0
Hypoxia / dental injury / oesophageal intubation / laryngospasm	0	0

5. Discussion

The central finding of this study is that, in adult patients with a normal airway, the non-channelled McGrath MAC videolaryngoscope provided easier and faster intubation with greater haemodynamic stability than the channelled King Vision videolaryngoscope. Several inter-related observations support this conclusion.

First, the McGrath MAC achieved a 100% first-attempt success rate, whereas a small but significant proportion of King Vision intubations required a second attempt. The Macintosh-like geometry of the McGrath blade likely contributes here, because it preserves the familiar handling of conventional laryngoscopy while still offering an indirect screen view. With the channelled King Vision, tube delivery depends on correct alignment of the integrated channel with the glottic opening, which can occasionally demand repositioning and a further attempt.

Second, the mean intubation time with the King Vision was more than twice that of the McGrath MAC. Although a channelled design is intended to simplify tube advancement, navigating the tube through the fixed channel towards the cords can be more time-consuming than the free, directly visualised tube manipulation possible with a non-channelled blade. The shorter intubation time with the McGrath MAC is clinically meaningful because a briefer apnoeic period reduces the risk of desaturation and limits the duration of the noxious laryngoscopic stimulus.

Third, although both devices produced adequate glottic exposure with no grade III or IV views, the McGrath MAC yielded a higher proportion of grade I views and correspondingly lower IDS scores. Because the IDS integrates attempts, operators, alternative techniques, glottic grade, lifting force and laryngeal manipulation into a single index, the lower scores in Group M reflect an overall easier intubating experience rather than any single advantage.

Fourth, the haemodynamic data consistently favoured the McGrath MAC. Heart rate and arterial pressures rose significantly and persistently in the King Vision group, while the McGrath group showed only a blunted, short-lived response. The longer laryngoscopy time and the greater number of patients requiring a second attempt in the King Vision group plausibly intensified the sympathetic pressor response. This stability is particularly relevant for patients in whom exaggerated cardiovascular responses are undesirable.

Finally, the complication profile reinforced these differences, with minor airway trauma and transient cardiovascular disturbances clustering in the King Vision group, whereas the

McGrath MAC was associated with minimal complications. Taken together, these findings are consistent with reports describing high success rates for Macintosh-style videolaryngoscopes in routine practice.

6. Strengths and Limitations

The strengths of this study include the performance of all intubations by a single experienced anaesthesiologist, which minimised skill-related variability, and the recording of all readings by a single observer, which reduced inter-observer bias. A uniform induction technique in normotensive adults limited confounding of the haemodynamic results.

The study also has limitations. The sample size was small, so the findings cannot be widely generalised, and the observational design without blinding leaves the possibility of selection bias. Because only patients with a normal airway were enrolled, the conclusions cannot be extrapolated to obese, paediatric, geriatric or anticipated-difficult-airway populations. Larger randomised trials are warranted to confirm these observations.

7. Conclusion

In adult patients with a normal airway undergoing elective surgery, the McGrath MAC (non-channelled) videolaryngoscope proved superior to the King Vision (channelled) videolaryngoscope. Compared with the King Vision, the McGrath MAC offered a higher first-attempt success rate, a shorter intubation time, a better laryngoscopic view, lower IDS scores, no requirement for optimisation manoeuvres, greater haemodynamic stability and fewer complications. The McGrath MAC videolaryngoscope can therefore be regarded as the preferable choice for routine endotracheal intubation in adults with a normal airway.

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