*Journal of Applied Pharmaceutical Research*
*Volume 11 Issue 3, Year of Publication 2023, Page 11 – 17*
*DOI: 10.18231/j.joapr.2023.11.3.11.17*

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**Research Article**

**JOURNAL OF APPLIED PHARMACEUTICAL RESEARCH | JOAPR**
*www.japtronline.com* *ISSN: 2348 – 0335*

# COMPARISON OF KING VISION VIDEO LARYNGOSCOPE VERSUS MCCOY LARYNGOSCOPE FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH IMMOBILIZED CERVICAL SPINE

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***Article Information***
Received: 21st July 2022
Revised: 19th May 2023
Accepted: 6th June 2023
Published: 31st August 2023

**Keywords**
*Cervical Immobilization, King Vision Video laryngoscope, McCoy Laryngoscope*

***ABSTRACT***
**Background:** Objective of this study was to compare King vision video laryngoscope versus McCoy laryngoscope for endotracheal intubation in patients with simulated immobilized cervical spine in terms of mean intubation time and number of attempts and successful intubation. **Methodology:** This was a prospective randomized study of 70 patients of ASA Grade I or II and aged 18- 60yrs, who underwent elective surgery under general anaesthesia. Intubation was done with either King Vision video laryngoscope (channelled blade) [Group A] or McCoy laryngoscope [Group B] after immobilizing the cervical spine using a cervical collar. We compared the mean intubation time, success rate and intubation difficulty using the Intubation Difficulty Score (IDS), glottic visualization using POGO score, hemodynamic parameters and complication if any. **Results:** Both the groups were comparable regarding the demographic variables such as age, sex, weight and ASA class. The mean intubation time of patients in Group A was significantly less (16.57±4.11 seconds) than Group B (20.14±5.72 seconds) (P= 0.004). IDS and POGO scoring were found significantly better in group A as compared to group B. But intubation success rate was 100% in both groups. Hemodynamic parameters and complications were also comparable. **Conclusion:** King Vision video laryngoscope is found superior to the McCoy laryngoscope if cervical immobilization is anticipated in terms of ease of intubation and glottic visualization.

## *INTRODUCTION*

Injury to the cervical spine typically results from trauma or disease. Between 2 to 5% of people who have blunt trauma develop cervical spine injuries. A spinal cord damage is a terrible result of a cervical spine injury [1]. To reduce the risk of spinal cord injury, an anesthesiologist must comprehend the anatomical and functional relationships between the airway, cervical column, and spinal cord [2]. Increased neurologic

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impairment may result from airway treatment in patients with suspected cervical spine injuries [3]. During intubation for limiting cervical spine movement, various devices and maneuvers are introduced. The Advanced Trauma Life Support (ATLS) guidelines advise using a manual inline stabilizer (MILS) or a stiff cervical collar during laryngoscopy and intubation [1]. These maneuvers can lead to a poor laryngeal view during conventional laryngoscopy, which makes intubation difficult because we are unable to extend the neck sufficiently to align the oropharynx axis with the laryngeal axis [4]. Hence patients with cervical spine injuries fall under the category of anticipated difficult intubation. Even the most skilled anesthesiologist may find it difficult to intubate a patient whose cervical spine movement is restricted or unwanted [1].

Numerous devices, including fiber optic bronchoscopy, airway-scope, McCoy laryngoscope, direct laryngoscope with rubber elastic boogie, intubating laryngeal mask airway, C-Trach, and Bullard laryngoscope, have been advised to overcome the problem of constrictive neck movements [5]. Fiber optic bronchoscopy is the gold standard device in cases of cervical spine damage. Its application is nevertheless constrained by a lack of knowledge, accessibility, and time constraints hence other easily available devices need to be studied [3].

The McCoy laryngoscope has a movable tip that elevates the epiglottis and needs less neck movement during laryngoscopy [6]. The regular Macintosh blade has been modified for the McCoy levering laryngoscope [5]. It features a hinged tip, and a lever linked to the handle allows you to adjust the angle of the hinged portion [7,8]. The tip is raised by pulling the lever toward the handle [8]. In comparison to the Macintosh blade, the hinged tip aids in improving the Cormack and Lehane laryngoscopic vision by one grade in patient with cervical spine damage [3].

The King Vision video laryngoscope is the most recent gadget to offer the "ideal picture" for intubation using video and digital technology. There are two different types of blades on it, one has a channel and the other has no channel. The organic light emitting diode display has a remarkably high level of clarity and resolution [9]. The primary outcome measure was mean intubation time taken by the King Vision versus McCoy. The secondary outcome recorded were successful intubation attempts, POGO score, IDS score, change in mean hemodynamic parameters and complications if any noted.

Although both the devices in the study have been independently evaluated and compared with the gold standard McIntosh laryngoscope in simulated difficult airway, there is paucity of literature comparing king vision video laryngoscope and McCoy laryngoscope. Therefore, we planned to conduct a prospective, randomized study with a purpose to compare the effectiveness of King Vision video laryngoscope with the McCoy laryngoscope for endotracheal intubation in patients with immobilized cervical spine.

## *METHODOLOGY*

After the Institutional Ethics Committee approval permission from institutional ethical committee obtained no. 1111/MC/EC/2021 dated-1/12/2021 and CTRI registration number CTRI/2022/06/043054, written informed consent was obtained. This study was a randomized interventional study in which randomization was done in computer generated random number table.

**Inclusion criteria**: Total 70 patients of ASA 1 & 2 class, between age 18-60 years undergoing elective surgeries under general anaesthesia requiring endotracheal intubation were included in the study and randomly divided into two groups (35 in each group).

**Exclusion criteria**: Patients with morbid obesity, anticipated difficult intubation patients with cardiovascular disease and uncontrolled hypertension were excluded from the study.

A detailed Pre-anaesthetic airway examination was carried out, electrocardiogram, pulse oximeter, non-invasive blood pressure, and baseline hemodynamic parameters were all monitored and recorded after the patient was brought into the operating room. After preoxygenation patient was premedicated with Inj. metoclopromide 0.2 mg/kg iv, midazolam 0.02 mg/kg, glycopyrrolate 0.005 mg/kg, fentanyl 2mcg/kg. Around the neck of patient, cervical collar was placed to immobilize the cervical spine and before induction hemodynamic parameters was recorded. Induction of anaesthesia was achieved with Inj. Propofol 2mg/kg, and Inj.rocuronium 0.9 mg/kg iv given as muscle relaxant. Adequate mask ventilation was assured and laryngoscopy was done by using either King vision video laryngoscope (channelled blade) or McCoy laryngoscope according to assigned group. Cormack and Lehan grading [10], POGO score [11] was noted, Modified Cormack Lehan grade IV was excluded. Time to be taken for intubation, Numbers of attempts, Intubation Difficulty Scale [12], was recorded. End tidal $CO_2$, a sufficient chest rise, and auscultation were used to

confirm bilateral ventilation. Hemodynamic parameters (HR, SBP, DBP, MBP, $SPO_2$) was recorded at definite time intervals i.e. 1, 3, 5, 10, 20 minutes. Maintenance of anaesthesia was done with Sevoflurane (1.5 – 2.0 %) and $O_2$: $N_2O$ (50:50) and Injection Atracurium. When the procedure is over, all the anaesthetic agent was discontinued and after reversal with injection Neostigmine (0.06mg/kg) and injection Glycopyrrolate (0.005 mg /kg). Extubation done and patient shifted to recovery room. Patient was observed and asked about any side effects (mucosal trauma, bleeding, sore throat, difficulty in vocalization) in post-operative period.

Quantitative data was expressed as mean±SD and tested with independent student t-test while qualitative data was expressed as frequency and percentage and tested with chi square test. Software **Epi-Info version 7.2.1.0** was used for statistical analysis. The sample size estimation was based on the calculation that 70 cases are required at 95% confidence interval and 80% power to verify the expected difference of 2.4±3.5 seconds in mean intubation according to previous study [13].

## *RESULTS*

Age, sex, and other demographic factors like ASA were comparable between the two groups (table 1)

**Table-1**: Comparison of Demographic parameters between the study groups

| Parameter | GroupA | GroupB | *p*-value |
|---|---|---|---|
| Age (years) | 43.3± 11.8 | 34.9± 13.9 | 0.052 |
| Gender (male/female) | 21/14 | 24/11 | 0.618 |
| Weight (kg) | 63.2± 7.3 | 60.7± 8.1 | 0.183 |
| ASA(STATUS) 1/2 | 25/10 | 22/13 | 0.611 |

Patients in Group B had an average intubation time of 20.14±5.72 seconds, compared to 16.57 ± 4.11 seconds for Group A patients which shows patients in Group A had a statistically significant shorter mean intubation time (p-value=0.004), figure 1.

In both Group A and Group B, the rate of successful intubation was 100%. Successful intubation on the first attempt was 97.1% in Group A and 94.3% in Group B while successful intubation in second attempt was 2.9% in group A and 5.7% in group B. In Group A, (34/35) patients succeed on their first attempt, (1/35) succeed on their second attempt, and in group B (33/35) patients succeed on their first attempt, (2/35) succeed on their second attempt. No statistically significant difference found between the patients in either group in terms of the number of successful attempts (Table 2). In Group A, 16 patients have 100% POGO scores, 14 have 50-100%, and 5 have scores below 50%, while in Group B, 9 patients have 100% POGO scores, 9 have 50-100% and 17 have scores below 50%. Thus, patients in Group A demonstrate significantly better glottic visualization in terms of POGO scores with "p-value=0.008" (figure 2)

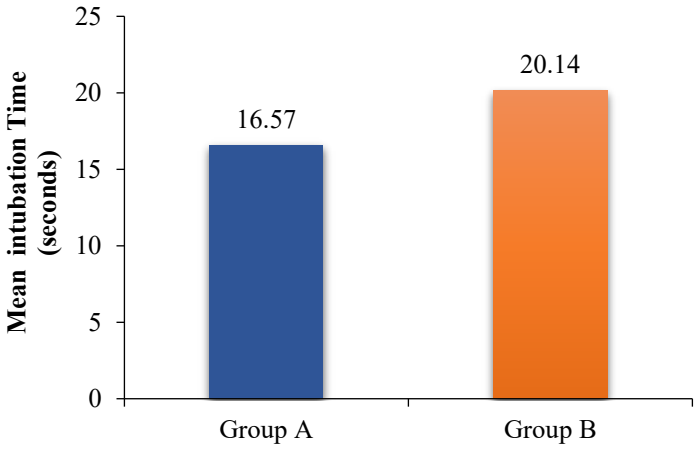


**Figure1. Comparison of mean intubation time (seconds) between the study groups**

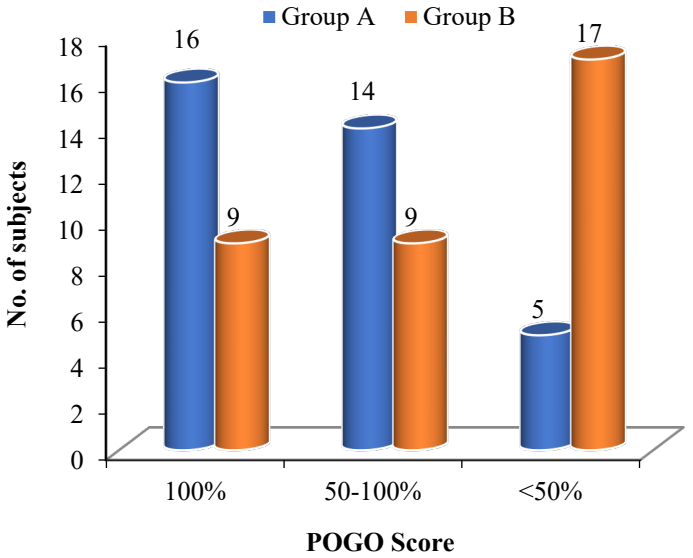


**Figure 2: Comparison of POGO score between study groups**

In group A 17 patients with 0 IDS, 12 patients with 1-5 IDS scores, and 6 patients with > 5 IDS, whereas Group B has 10 patients with 0 IDS, 9 patients with 1-5 IDS, and 16 patients with > 5 IDS. Thus, we encountered significantly more difficulty in intubation in group B "p-value=0.034", figure 3

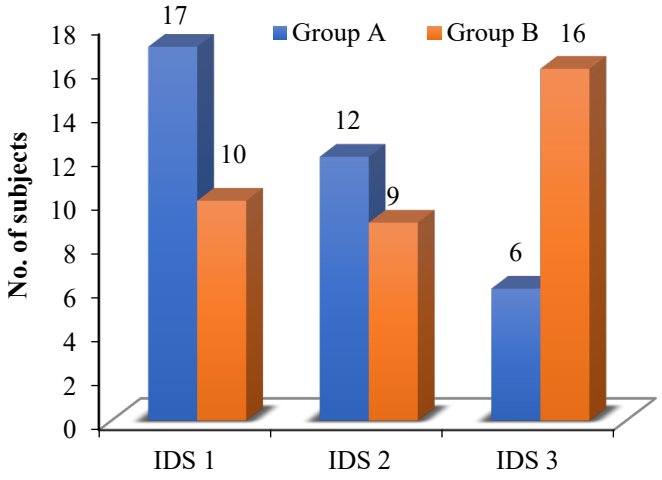


**Figure 3: Comparison of IDS (intubation difficulty scale) between the study groups**

**Table 2:** Comparison of various Intubation characteristics between the study groups

| **Parameter assessed** | **Group A** | **Group B** | ***p*-value** |
|---|---|---|---|
| **Overall Successful intubation** | **35 (100%)** | **35 (100%)** | **1.000** |
| Successful intubation in 1st attempt | 97.1% | 94.3% | |
| Successful intubation in 2nd attempt | 2.9% | 5.7% | |
| No. of attempts (1/2) | 34/1 | 33/2 | |
| **Mean Intubation time (seconds)** | **16.5 ± 4.1** | **20.1± 5.7** | **0.004*** |
| **POGO Score** | | | |
| 100% | 16 | 9 | 0.008* |
| 50-100% | 14 | 9 | |
| <50% | 5 | 17 | |
| **IDS** | | | |
| 0 | 17 | 10 | 0.034* |
| <5 | 12 | 9 | |
| >5 | 6 | 16 | |
| **Complications** | | | |
| Mucosal trauma | 1 | 0 | 1.000 |
| Bleeding | 0 | 0 | |
| Post-operative sore throat | 0 | 0 | |

Both the groups were comparable regarding hemodynamic parameter (figure 4 and 5) and complications (table 2)

## *DISCUSSION*

Suboptimal glottic visualization due to cervical collar in situ (simulating cervical spine injury) is a cause of significant concern to the anesthetist as it may not only lead to delay in intubation but may also require multiple attempts which can cause airway trauma and hemodynamic instability. Failed intubation with disastrous consequence is also nightmare for anesthetist, hence need for advanced airway devices are a matter of continuous research. Our study aims to find out the better option between Kings Vision video laryngoscope and McCoy blade laryngoscope in patients with immobilized cervical spine.

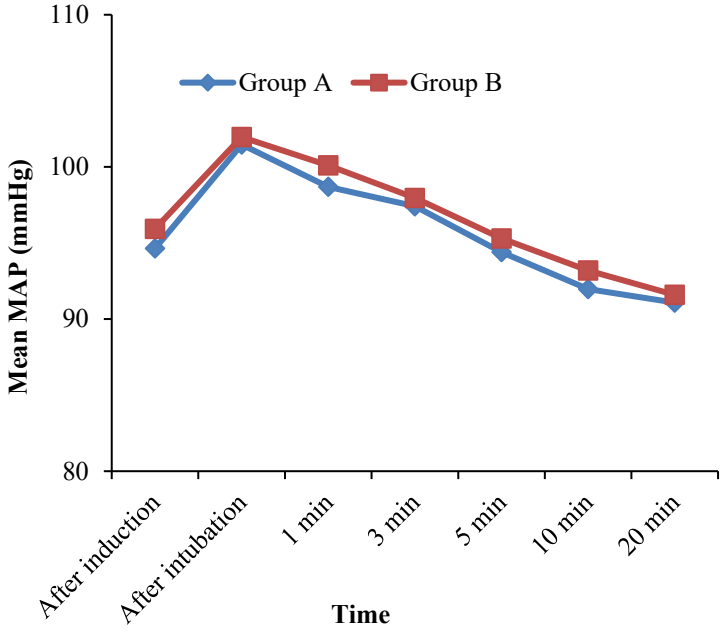


**Figure 4: Comparison of mean MBP (mmHg) between study groups at various time intervals**

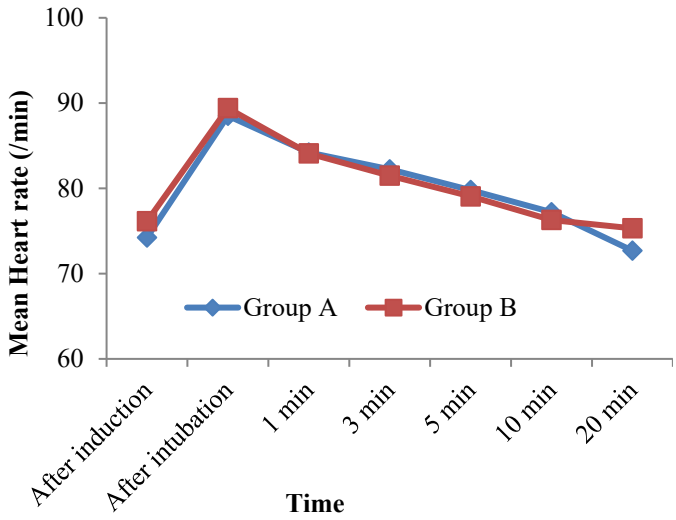


**Figure 5: Comparison of heart rate at various time interval between the study groups**

We did this by evaluating the time required for intubation, the intubation difficulty score, the number of attempts and success rate of intubation, the haemodynamic response, and any complications.

In our study in both the groups, the demographic variables like age, weight, gender and ASA status were comparable. The result of our study suggested that, patients in group A required significantly less time for intubation ((16.57 ± 4.11 sec) than patients in group B (20.14 ± 5.72 sec) "p-value=0.004". Our result is supported by Chandra et al [13], Biswal et al [14], Singhal et al [15] who found that intubation with channeled king vision video laryngoscope requires less time as compare to McCoy blade. Channeled blade with already loaded endotracheal tubes guides both the tube and blade tip towards the glottis making intubation quicker. Moreover, it obviates the need of a stylet. But Ali et al [1] &Ahmed et al [16] observed comparable time to intubation with either King Vision or McCoy Blade. Ali et al [1] explained it because of fogging on the distal lens while Ahmed et al [16] found that field of vision was narrower and smaller with King Vision video laryngoscope. Our experience was better with King Vision video laryngoscope as angulations of channeled blade was better and easy hand to eye coordination. Results from study done by Murphy et al [17] and Rendeki et al [18] were consistent with our study too.

The successful intubation was 100.0% in both the groups and no statistically significant difference existed between the patients in either group in terms of the number of successful attempts. Our result is in concordance with previous studies done by Biswal et al [14], Singhal et al [15], Ali et al [1], Chandra et al [13], Shravanalakshmi et al [19], Ahmed et al [16] and Murphy et al [17] showing efficacy of both King Vision Video Laryngoscope and McCoy blade in intubation where cervical immobilization is anticipated. Vortuba et al [20], Gabbott et al [21] and Murphy et al [17] supported our results which prove the user-friendly design of video laryngoscope as well as McCoy levering laryngoscope.

Regarding POGO scoring, Group A exhibited significantly better scoring as compared to Group B suggesting better glottic visualization when laryngoscopy was performed with King vision video laryngoscope. King vision video laryngoscope has in built camera placed 34 mm from the distal tip and a strong endoscopic light source which provides wide clear field of vision of the glottic aperture. The bulky blade also provides superior upward lifting force hence providing better visualization of glottis. Moreover, it has an inbuilt anti fogging system. Our result are in concordance with previous studies done by Biswal et al [14], Ali et al [22], Chandra et al [13], Ahmed et al[16] and Shravanalakshmi et al [19] hence proving superior role of King Vision Video Laryngoscopy in glottic visualization.

There was statistically significant difference in IDS of patients in between Group A and Group B. Patients in Group A encountered less difficulty in intubation. These findings are consistent with Ali et al [1], Rendeki et al [18] and Singhal et al [15] concluding channeled King Vision Video Laryngoscope has the potential to provide ease of intubation. Its unique anatomical blade curvature and the airway channel not only improve the glottic view but also facilitated the tube placement with minimum manipulation in our study too.

In this study, there was no statistically difference in terms of mean pulse rate, mean systolic blood pressure, mean diastolic blood pressure and mean arterial pressure in the intraoperative and postoperative period at different time intervals. Similar results were found by Gulabani et al [23]
Comparable hemodynamic parameters reflect the fact that both McCoy and King vision both provides a glottis view without a need to align the oral, pharyngeal and laryngeal axes and therefore require less force to be applied during laryngoscopy. Although the time taken to glottis visualization and intubation was not noted separately in our study which could have provided us more information. The similar results were also seen in studies by Chandra et al [13], Biswal et al [14], Singhal et al [15] and Ahmed et al [16].

In our study in group A one patient (3.0%) and in group B zero patient had mucosal trauma. No other complications (bleeding, sore throat, difficulty in vocalization) were seen in either group. Intubation with King's vision Video laryngoscope is safe in terms of oropharyngeal injury or major airways related complications as supported by Chandra et al [13], Kumar et al [24] and Singhal et al [15] Sub optimal glottis visualization may require multiple attempts and use of stylet/boogie and other airway adjuncts can cause trauma to airway. By improving glottis visualization and easy negotiation of endotracheal tube, channelled blade helps in avoiding the airway trauma and resulting morbidity.

## *LIMITATION*

1. Present study deals with a small subset of patients from a single center.
2. The anaesthetist was not blinded to the randomization of laryngoscope, which could have resulted in observer's bias if anaesthetist already had a personal preference for a particular device.
3. All intubation were carried out by experienced anaesthesiologists hence the results may not apply to less experienced person.
4. The time taken to intubation and glottic visualization was not noted in our study which could have provided us more information.

## *CONCLUSION*

Our study concluded that the King Vision Video Laryngoscope is superior than the McCoy laryngoscope in terms of shorter intubation time and better glottic visualization with comparable hemodynamic parameters for endotracheal intubation if cervical spine immobilization is anticipated.

## *FINANCIAL ASSISTANCE*

Nil

## *CONFLICT OF INTEREST*

The authors declare no conflict of interest

## *AUTHOR CONTRIBUTION*

Neelu Sharma conceptualized the whole research. Jitendra Kumar Yadav did the research work and did the statistical analysis with Raj Kumar Harshwal. Savita Meena and Neelu Sharma supervised the intubation and guided as per need. Sukirti Sharma helped in collecting information. Rajkumar Harshwal and Jain Prashant Abhay drafted manuscript and collected references. Manuscript writing was done by Jitendra yadav and Neelu Sharma.

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