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Hemodynamic Changes During Endotracheal Intubation in Patients with Anticipated Difficult Airway: A Comparison Between King Vision Video Laryngoscope and Mccoy Direct Laryngoscope

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ABSTRACT

Laryngoscopy and intubation are known to cause exaggerated haemodynamic response and increased intracranial pressure manifesting as tachycardia, hypertension, dysrhythmias, raised catecholamine level in blood and they may have deleterious respiratory, neurological and cardiovascular effects. To compare the ease of intubation in case of King Vision video laryngoscope and McCoy direct laryngoscope and to compare the hemodynamic responses in the patients with aforementioned techniques. The present study was a Comparative Clinical Study. This Study was conducted from march 2020 to August 2021 at Nilratan Sircar Medical College and Hospital, Kolkata. It was found that in Group K, the mean MPG (Mean±SD) of patients was 3.4000±0.4961 and in Group M, the mean MPG (Mean±SD) of patients was 3.3750±0.6279 which was not statistically significant (p = 0.8439). In Group K, 24 (60.0%) patients were MPG3 and 16 (40.0%) patients were MPG4. In Group M, 23 (57.5%) patients were MPG3 and 17 (42.5%) patients were MPG4. Association of MPG with Group was not statistically significant (p = 0.8203). We found that in Group K, 1 (2.5%) patient had Mucosal injury and in Group M, 3 (7.5%) patients had Mucosal injury which was not statistically significant (p = 0.3049). It was found that in Group K, the mean MPG (Mean±SD) of patients was 3.4000±0.4961 and in Group M, the mean MPG (Mean±SD) of patients was 3.3750±0.6279 which was not statistically significant (p = 0.8439). Our study showed that in Group K, the mean Time taken for intubation (Mean±SD) of patients was 21.3000±2.4200 and in Group M, the mean Time taken for intubation (Mean±SD) of patients was 36.4000±3.5648 which was statistically significant (p = <0.0001). We concluded that the time taken for intubation with king vision video laryngoscope was shortened; this probably was the advantage over the Macintosh laryngoscope group in terms of decreased hemodynamic responses specifically, heart rate (HR) at 1, 3 and 5 min post-induction was significantly lower in the King Vision video laryngoscope group. Moreover, systolic blood pressure (SBP) at these time points, as well as diastolic blood pressure (DBP) and mean arterial pressure (MAP), were also significantly reduced in the King Vision video laryngoscope group compared to the McCoy direct laryngoscope group.

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Key Words
MPG, laryngoscopy, hypertension and dysrhythmias

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INTRODUCTION

Laryngoscopy and intubation are known to cause exaggerated haemodynamic response and increased intracranial pressure manifesting as tachycardia, hypertension, dysrhythmias, raised catecholamine level in blood and they may have deleterious respiratory, neurological and cardiovascular effects. It is usually due to sympathoadrenal response arising from the stimulation of the supraglottic region by the laryngoscope blade along with the tracheal tube placement and cuff inflation[1].

Laryngoscopy and tracheal intubation are known to evoke the stress responses, in the form of tachycardia, systemic hypertension, arrhythmias and increased intracranial pressure exposing the patient to unwanted risk. These responses are more marked in treated and untreated hypertensive patients[2].

It has been observed that amount of forces exerted during laryngoscopy is the key determinant for mechanical stimulation of supraglottic region and stretch receptors present in the respiratory tract, while endotracheal intubation and cuff inflation contributing little additional stimulation. Thus, use of different types of laryngoscope blades can help decreasing these responses.

The Macintosh laryngoscope (MCL) has been the "gold standard" device for direct laryngoscopy and tracheal intubation since its invention by Foregger and Foregger in 1940s[3]. The McCoy's or Corazelli, London, McCoy laryngoscope is also used for direct laryngoscopy and tracheal intubation.

The C-MAC is an indirect laryngoscope having advantage of abandoning the need to align the optical axis in the pharynx and mouth to visualize the entrance of the larynx and improves laryngeal view[4].

The KVVL consists of 2.4 inch reusable display and a disposable rigid blade. Two types of blade are present: one is a channeled one which allows ET tube to be advanced through the glottis and the other blade is a non-channeled one that just permits glottis visualization and ET intubation is helped by a metal stylet[5].

Aims and objective

- **General objective:**
  - To compare the ease of intubation in case of KingVision video laryngoscope and McCoy direct laryngoscope
  - To compare the hemodynamic responses in the patients with aforementioned techniques
- **Specific objectives:**
  - To compare the hemodynamic responses such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure(DBP) and mean arterial pressure (MAP) in between the two groups before, during and after endotracheal intubation
  - Time required for intubation (from beginning of Laryngoscopy to confirmation of the position of tube by ETCO2)

MATERIALS AND METHODS

Study design: Comparative clinical study.

Study setting and timelines: The study was performed in the patients posted for operations under general anesthesia requiring endotracheal tube insertion. The study is expected to span approximately over one and a half year (2020-2021). The study was begin after obtaining permission from ethics committee of this institute and also approval of The West Bengal University of Health Sciences.

Place of study: Nilratan Sircar Medical College and Hospital, Kolkata.

Period of study: Approximately one and a half year march 2020 to august 2021

Study population: Patients of either sex aged between 20-60 years of age with anticipated difficult airway (Mallampati grade 3 And Mallampatigrade 4) posted for elective surgery under general anesthesia

Sample design: ASA (American Society of Anesthesiology) physical status 1 and 2 , age 20 years to 60 years ,either gender with anticipated difficult airway (Mallampati grade 3 And Mallampati grade 4).

Study population: Patients of either sex aged between 20-60 years of age with anticipated difficult airway (Mallampati grade 3 And Mallampati grade 4) posted for elective surgery under general anesthesia.

RESULTS AND DISCUSSION

This comparative Clinical study was performed in the patients posted for operations under general anesthesia requiring endotracheal tube insertion. The study is expected to span approximately over one and a half year (2020-2021). The study was begin after obtaining permission from ethics committee of this institute and also approval of The West Bengal University of Health Sciences.

We found that in Group K, 12 (30.0%) patients were 21-30 years of age, 14 (35.0%) patients were 31-40 years of age, 10 (25.0%) patient were 41-50 years of age and 4 (10.0%) patients were 51-60 years of age. In Group M, 10 (25.0%) patients were 21-30 years of age, 18 (45.0%) patients were 31-40 years of age, 9 (22.5%) patient were 41-50 years of age and 3 (7.5%) patients were 51-60 years of age. It was not statistically significant (p = 0.8309).

Table 1: Association between MPG: Group

	Groups		
MPG	Group K	Group M	Total
3	24	23	47
Row (%)	51.1	48.9	100.0
Col (%)	60.0	57.5	58.8
4	16	17	33
Row (%)	48.5	51.5	100.0
Col (%)	40.0	42.5	41.3
Total	40	40	80
Row (%)	50.0	50.0	100.0
Col (%)	100.0	100.0	100.0

Chi-square value: 1.0526; p-value:0.3049 and Odds ratio: 3.1622 (0.3147, 31.7768)

Table 2: Association between mucosal injury: Group

	Groups		
Mucosal injury	Group K	Group M	Total
No	39	37	76
Row (%)	51.3	48.7	100.0
Col (%)	97.5	92.5	95.0
Yes	1	3	4
Row (%)	25.0	75.0	100.0
Col (%)	2.5	7.5	5.0
Total	40	40	80
Row (%)	50.0	50.0	100.0
Col (%)	100.0	100.0	100.0

Chi-square value: 0.0516; p-value: 0.8203, Odds ratio: 1.1087 (0.4550, 2.7014)

In our study, in Group K, 14 (35.0%) patients were Female and 26 (65.0%) patients were Male. In Group M, 13 (32.5%) patients were Female and 27 (67.5%) patients were Male which was not statistically significant (p = 0.8130).

It was found that in Group K, 14 (35.0%) patients had ASA1 and 26 (65.0%) patients had ASA 2 and in Group M, 9 (22.5%) patients had ASA1 and 31 (77.5%) patients had ASA 2 which was not statistically significant (p = 0.2167).

In Group K, 24 (60.0%) patients were MPG3 and 16 (40.0%) patients were MPG4. In Group M, 23 (57.5%) patients were MPG3 and 17 (42.5%) patients were MPG4. Association of MPG with Group was not statistically significant (p = 0.8203) (Table 1).

We found that in Group K, 1 (2.5%) patient had Mucosal injury and in Group M, 3 (7.5%) patients had Mucosal injury which was not statistically significant (p = 0.3049) (Table 2).

In our study, in Group K, the mean age (Mean±SD) of patients was 35.8750±9.0587 and in Group M, the mean Age (Mean±SD) of patients was 37.1500± 8.2635 which was not statistically significant (p = 0.5127).

We found that in Group K, the mean height (Mean±SD) of patients was 164.8000±7.7168 (cm) and in Group M, the mean height (Mean±SD) of patients was 162.5000±9.0667 (cm) which was not statistically significant (p = 0.2255). In Group K, the mean Weight (Mean±SD) of patients was 73.3000±10.8325 (Kg) and in Group M, the mean Weight (Mean±SD) of patients was 72.4250±13.7130 (kg) which was not statistically significant (p = 0.7523).

In our study, in Group K, the mean BMI (Mean±SD) of patients was 26.8581±2.3896 kg m^{-2}) and in Group M, the mean BMI (Mean±SD) of patients was 27.1880±3.1930 kg m^{-2} which was not statistically significant (p = 0.6024).

It was found that in Group K, the mean MPG (mean± s.d.) of patients was 3.4000±0.4961 and in Group M, the mean MPG (Mean±SD) of patients was 3.3750±0.6279 which was not statistically significant (p = 0.8439).

Xue *et al*.[6] found that a total of 71 patients, ASA physical status I, aged 18-50 years, scheduled for elective plastic surgery under general anesthesia, were randomly allocated to the oral intubation group (OI group) and the nasal intubation group (NI group). The intubation time was significantly longer in the NI group than in the OI group. The total incidence of difficulties encountered during laryngoscopy and intubation were higher in the OI group than in the NI group (29% vs. 6%, p<0.05).

Our study showed that in Group K, the mean Time taken for intubation (Mean±SD) of patients was 21.3000±2.4200 and in Group M, the mean time taken for intubation (Mean±SD) of patients was 36.4000±3.5648 which was statistically significant (p = <0.0001).

Zhang *et al*.[7] found that Totally 57 ASA physical status I-II adult patients undergoing elective plastic surgery and requiring orotracheal intubation were randomly allocated to either GSVL group (n = 29) or FOB group (n = 28). After intubation, BP and HR exhibited significant increases compared to the post-induction values in both groups but the maximum values of BP did not exceed the pre-induction values while the maximum value of HR was higher than the pre-induction value. During the observation, BP and HR at all time points as well as the maximum values of BP and HR had no significant differences between the two groups (p>0.05). The orotracheal intubations using FOB and GSVL result in similar hemodynamic responses.

We examined that in Group K, the mean HR Baseline (Mean±SD) of patients was 76.6750±11.0671 and in Group M, the mean HR Baseline (Mean±SD) of patients was 78.0750±10.2841 which was not statistically significant (p = 0.5595). In Group K, the mean HR After induction 1 min (Mean±SD) of patients was 74.4500±10.8367 and in Group M, the mean HR After induction 1 min (Mean±SD) of patients was 82.5000±15.1742 which was statistically significant (p = 0.0078). In Group K, the mean HR After induction 3 min (Mean±SD) of patients was 74.9000±10.5825 and in Group M, the mean HR After induction 3 min (Mean±SD) of patients was 86.8000±10.9409 which was statistically significant (p = <0.0001). In Group K, the mean HR After induction 5 min (Mean±SD) of

Table 3: Distribution of mean SBP Baseline at different time interval: Group

	Groups	No.	Mean	SD	Minimum	Maximum	Median	p-value
SBP baseline	Group K	40	127.2500	8.8310	96.0000	140.0000	129.5000	0.1829
	Group M	40	124.4500	9.7821	102.0000	143.0000	125.0000	
SBP after induction 1 min	Group K	40	118.9500	11.5224	97.0000	149.0000	119.5000	0.0220
	Group M	40	126.4750	16.7974	99.0000	181.0000	124.0000	
SBP after induction 3 min	Group K	40	118.4750	9.4190	99.0000	134.0000	118.5000	0.0029
	Group M	40	126.5250	13.6024	97.0000	150.0000	130.0000	
SBP after induction 5 min	Group K	40	125.3750	9.1278	107.0000	139.0000	128.0000	0.0409
	Group M	40	130.3500	12.0672	105.0000	143.0000	132.5000	

Table 4: Distribution of mean DBP Baseline at different time interval: Group

	Groups	No.	Mean	SD	Minimum	Maximum	Median	p-value
DBP baseline	Group K	40	79.1500	11.4770	60.0000	122.0000	77.5000	0.5091
	Group M	40	77.6250	8.9290	60.0000	99.0000	78.0000	
DBP after induction 1 min	Group K	40	73.4000	8.7641	62.0000	94.0000	73.0000	0.0231
	Group M	40	80.2000	16.3538	58.0000	120.0000	75.0000	
DBP after induction 3 min	Group K	40	79.1250	9.9000	62.0000	96.0000	79.0000	0.0135
	Group M	40	85.1000	11.2062	66.0000	110.0000	84.0000	
DBP after induction 5 min	Group K	40	74.6500	8.5141	52.0000	90.0000	74.0000	<0.0001
	Group M	40	84.7750	10.3960	64.0000	107.0000	83.5000	

patients was 75.5250±10.1526. In Group M, the mean HR After induction 5 min (Mean±SD) of patients was 86.0000±12.4653. It was statistically significant (p = <0.0001).

Our study showed that in Group K, the mean SBP Baseline (Mean±SD) of patients was 127.2500±8.8310 and in Group M, the mean SBP Baseline (Mean±SD) of patients was 124.4500±9.7821 which was not statistically significant (p = 0.1829). In Group K, the mean SBP After induction 1 min (Mean±SD) of patients was 118.9500±11.5224 and in Group M, the mean SBP After induction 1 min (Mean±SD) of patients was 126.4750±16.7974. This was statistically significant (p = 0.0220). In Group K, the mean SBP After induction 3 min with (Mean±SD) of patients was 118.4750±9.4190 and in Group M, the mean SBP After induction 3 min (Mean±SD) of patients was 126.5250±13.6024 which was statistically significant (p = 0.0029). In Group K, the mean SBP After induction 5 min (mean± s.d.) of patients was 125.3750±9.1278 and in Group M, the mean SBP After induction 5 min (mean± s.d.) of patients was 130.3500±12.0672. It was statistically significant (p = 0.0409) (Table 3).

We found that in Group K, the mean DBP Baseline (Mean±SD) of patients was 79.1500±11.4770 and in Group M, the mean DBP Baseline (Mean±SD) of patients was 77.6250±8.9290 which was not statistically significant (Mean±SD). In Group K, the mean DBP After induction 1 min (Mean±SD) of patients was 73.4000±8.7641 and in Group M, the mean DBP After induction 1 min (Mean±SD) of patients was 80.2000±16.3538 and this was statistically significant (p = 0.0231). In Group K, the mean DBP After induction 3 min (Mean±SD) of patients was 79.1250±9.9000 and in Group M, the mean DBP After induction 3 min (Mean±SD) of patients was 85.1000±11.2062 which was statistically significant (p = 0.0135). In Group K, the mean DBP After induction 5 min (Mean±SD) of patients was 74.6500±8.5141 and in Group M, the mean DBP After induction 5 min (Mean±SD) of patients was 84.7750±10.3960. It was statistically significant (p = <0.0001) (Table 4).

Sixty patients who had uncontrolled hypertension and scheduled for elective surgery requiring tracheal intubation, were randomly assigned to receive intubated with either a GVL (n = 30) or a MDL (n = 30). MAP, pulse rate and RPP were lower in the GVL than the MDL group after endotracheal intubation (p<0.05). MAP, heart rate and RPP returned to pre-intubation values at 3 and 4 min after intubation in the GVL and MDL groups, respectively (p<0.05). Hemodynamic fluctuations in patients with uncontrolled hypertension after endotracheal intubation were lower with the GVL than the MDL technique [8].

We also found that in Group K, the mean MAP Baseline (Mean±SD) of patients was 95.1583±7.4539 and In Group M, the mean MAP Baseline (Mean±SD) of patients was 93.2333±8.5362 which was not statistically significant (p = 0.2860). In Group K, the mean MAP After induction 1 min (Mean±SD) of patients was 88.5750±7.9191 and in Group M, the mean MAP After induction 1 min (Mean±SD) of patients was 96.6000±15.7444 which was statistically significant (p = 0.0051). In Group K, the mean MAP After induction 3 min (Mean±SD) of patients was 92.2500±8.5478 and in Group M, the mean MAP After induction 3 min (Mean±SD) of patients was 98.8833± 10.5764 and this was statistically significant (p = 0.0028). In Group K, the mean MAP After induction 5 min (Mean±SD) of patients was 91.5250±7.4901 and in Group M, the mean MAP After induction 5 min (Mean±SD) of patients was 99.4417±8.7496 which was statistically significant (p = <0.0001) (Table 5).

Table 5: Distribution of mean MAP Baseline at different time interval: Group

	Groups	No.	Mean	SD	Minimum	Maximum	Median	p-value
MAP baseline	Group K	40	95.1583	7.4539	83.0000	113.3333	94.5000	0.2860
	Group M	40	93.2333	8.5362	76.6667	113.6667	93.5000	
MAP after induction 1 min	Group K	40	88.5750	7.9191	76.0000	112.0000	88.0000	0.0051
	Group M	40	96.6000	15.7444	76.0000	140.0000	92.0000	
MAP after induction 3 min	Group K	40	92.2500	8.5478	78.0000	108.0000	92.5000	0.0028
	Group M	40	98.8833	10.5764	77.0000	123.0000	98.5000	
MAP after induction 5 min	Group K	40	91.5250	7.4901	72.0000	106.0000	91.5000	<0.0001
	Group M	40	99.4417	8.7496	80.0000	119.0000	99.0000	

CONCLUSION

It was found that age was not statistically significant in king vision video laryngoscope and McCoy direct laryngoscope. Sex was not Significantly different in two groups. So age and sex were matched in this study. We had compared Hemodynamic responses to endotracheal intubation using king vision video laryngoscope and McCoy direct laryngoscope. In our study, MPG was not statistically significant in king vision video laryngoscope and McCoy direct laryngoscope. Mucosal injury was more in McCoy direct laryngoscope compared to king vision video laryngoscope though it was not statistically significant. No Arrythmia was found in king vision video laryngoscope and McCoy direct laryngoscope. We found that time taken for intubation (seconds) was more in McCoy direct laryngoscope compared to king vision video laryngoscope which was statistically significant. HR After induction 1, 3 and 5 min were less in king vision video laryngoscope compared to McCoy direct laryngoscope which were statistically significant. In this study, SBP After induction 1, 3 and 5 min were less in in king vision video laryngoscope compared to McCoy direct laryngoscope which were statistically significant. DBP and MAP After induction 1, 3 and 5 min were less in king vision video laryngoscope compared to McCoy direct laryngoscope which were statistically significant. Therefore we concluded that the time taken for intubation with king vision video laryngoscope was shortened, this probably was the advantage over the Macintosh laryngoscope group in terms of decreased hemodynamic responses.

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