Section: Anaesthesia

Original Research Article

COMPARISON OF HUGEMED VIDEO LARYNGOSCOPE AND MCCOY LARYNGOSCOPE FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH SIMULATED CERVICAL SPINE IMMOBILISATION

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Abstract

Background: Cervical spine injuries can occur due to trauma or disease, affecting 2-5% of patients with trauma. Various devices, including fibre-optic bronchoscopy and the McCoy laryngoscope, are recommended for intubation in patients with cervical spine injuries. This study aimed to compare the efficacy of the Hugemed video laryngoscope and the McCoy laryngoscope in simulating cervical spine injury by comparing the duration of intubation, total duration of intubation, ease of intubation, and haemodynamic responses. **Materials and Methods:** The study was performed at the Department of Anesthesiology, Stanley Medical College, from August 2019 to January 2020 on 60 patients scheduled for elective neurosurgery under general anaesthesia requiring endotracheal intubation. Informed and written consent was obtained from all patients. Sixty patients were randomly selected and divided into groups A and B for tracheal intubation using the McCoy laryngoscope and HugeMed Video Laryngoscope, respectively. **Result:** There were no statistically significant differences between age groups, sex, weight, or MPC grades among the study groups. The groups showed statistically significant differences in BMI, ASA, and IID (p =0.022, p =0.019, and p =0.019, respectively). The differences in mean heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure among the study groups were statistically significant (p<0.0001) [Figures 1-4]. The difference in mean SPO2 values among the study groups was not statistically significant (p=0.4035). **Conclusion:** Hugemed video laryngoscopy offers better visualisation of the glottis, lower IDS scores, and fewer haemodynamic responses than the McCoy group in patients with cervical spine injury.

INTRODUCTION

Cervical spine injuries can occur because of trauma or disease. Approximately 2-5% of trauma patients may have cervical spine injury. The consequence of a spinal injury is injury to the spinal cord. The risk of Spinal injury increases in the presence of head injury, when the level of consciousness is decreased, and with focal neurological deficits. Patients with c-spine injury may need quick management of the airway for airway protection to avoid hypoxia and hypoventilation.[1] The gold standard position for laryngoscopy introduction is the sniffing position. This position maintains and aligns the oral, pharyngeal, and laryngeal axes, giving better glottic visualisation.[2] This position flexes the lower cervical spine, extends the upper cervical spine and extends the atlanto – occipital joint.[3] Management of the airway in patients with anticipated cervical spine injury may result in higher neurological injury.[4] To minimise the risk of cord injury, anaesthetists must know the anatomical and functional relationship between the airway, cervical column and spinal cord.[2]

Trauma life support (TLS) guidelines recommend the usage of Manual In-Line Stabilization (MILS) or a hard collar to stabilise the spine in anticipated cervical spine injury patients.[5] MILS avoids the extension of the head and flexion of the neck, which is important for the optimal alignment of three airway axis.[6] The hard collar may worsen the laryngoscopic view, making intubation difficult with a conventional laryngoscope.[4] To overcome the difficulty, various devices like direct laryngoscope with the help of gum elastic bougie, fibre-optic bronchoscopy, airway scope, McCoy laryngoscope, intubating laryngeal mask airway, C-Trach and Bullard laryngoscope was recommended by many authors.[6]

Fibre-optic bronchoscopy is the gold standard for intubation in patients with c-spine injury. Its use is restricted because of insufficient expertise, availability, and time requirements.[4] The McCoy laryngoscope is a modified version of the standard Macintosh blade.[6] Its tip is hinged, and the angle of the hinged tip is altered by a lever attached to the handle, and pressing the lever towards the handle lifts the tip.[7,8] The hinged tip helps improve the Cormac and Lehane laryngoscopic view by 1 grade compared with the Macintosh blade in patients with c-spine injury. The blade is available in different sizes, 3 and 4.4 The newer generation video laryngoscope has many distinct improvements, like an external light source and a small digital camera at the tip of the blade, which is connected to a video display monitor. It gives an optimum view of the glottis by direct and indirect view.[8,9]

Aim

This study aimed to compare the efficacy of the Hugemed video laryngoscope and the McCoy laryngoscope in simulating cervical spine injury by comparing the duration of intubation, total duration of intubation, ease of intubation, and haemodynamic responses.

MATERIALS AND METHODS

The study was performed at Department of Anesthesiology, Stanley Medical College, from August 2019 to January 2020 on 60 patients scheduled for elective neurosurgery under general anaesthesia requiring endotracheal intubation. Informed and written consent was obtained from all patients.

Inclusion Criteria

Sixty patients who were assessed under the American Society of Anesthesiologists (ASA) classification I and II, between 18 and 60 years of age, and scheduled for various elective neuro surgeries under general anaesthesia requiring endotracheal intubation were included in this study.

Exclusion Criteria

Patients with Modified Mallampati class 3 and 4 scores, thyromental distance of 6, inter-incisor distance of 3, body mass index of 30, risk of gastric aspiration (emergency surgeries), relevant drug allergy, and anticipated difficult airway were excluded from the study.

Sixty patients were randomly selected and divided into groups A and B for tracheal intubation using the McCoy laryngoscope and the Huge Med Video Laryngoscope, respectively. Preoperative and airway assessments were performed. All patients were kept nil per oral (NPO) for 8 hours before surgery. The patients' general conditions, such as ECG, pulse oximetry, non-invasive blood pressure, and end-tidal carbon dioxide monitors, were attached, and the values were recorded.

Patients were pre-oxygenated with 100% oxygen for 3 min. Premedicated with intravenous glycopyrrolate 5 mcg/kg, Midazolam 0.05 mg/kg and induction of anaesthesia was done with fentanyl 2mcg/kg intravenously and thiopentone 3-4 mg/kg intravenously. After induction, manual in-line stabilisation (MILS) was performed on the cervical spine. After assessing the ability to intubate, atracurium 0.2 mg/kg was infused intravenously, and intubation was performed after manual ventilation with 02 for 3 minutes. Intubation was performed with McCoy for Group A and Huge Med laryngoscope for Group B by the same anaesthesiologist who had experience using both laryngoscopes.

The percentage of glottic opening (POGO) score (0 to 100%,100= full visualisation of the glottis from anterior commissure to inter-arytenoids notch,0= no visualisation even inter-arytenoid notch is not seen). A cuffed endotracheal tube 7–8.5 mm was used according to the appropriate size under direct vision and was introduced into the trachea, and the respiratory circuit was connected. Air entry was confirmed by capnography and chest auscultation. If the attempt at the first intubation failed, the next intubation was performed after only 1 minute of mask ventilation. Intubation failure was considered if it could not be performed in 3 attempts. Intubation was performed by an experienced anaesthesiologist who had experience of more than 20 intubations in each device.

The number of optimisation manoeuvres required (laryngeal manipulations, use of a stylet) to facilitate intubation, number of intubation attempts, duration of successful intubation, and success rates were recorded. Intubation difficulty score (IDS) IDS 0=easy intubation, score 1-5= slightly difficult, score 5= difficult, was calculated for the outcome. Following intubation, the patients were mechanically ventilated until the end of the surgical procedure, and anaesthesia was maintained with desflurane or sevoflurane in a mixture of oxygen and nitrous oxide. Immediately following tracheal intubation for 5 min, no other interventions were performed, and no other drugs were administered.

RESULTS

Demographic profiles and airway parameters (Table 1) were comparable between the groups. All patients were successfully intubated. Most patients were aged 21-30 years in study groups, and most of the patients were male 21 (70%) in group A and 18 (60%) in group B). The mean weight of cases in group A was 60.7±7.2 kgs, and in group B was 61.3±7.7 kgs. There were no statistically significant differences between age groups, sex, and weight among the study groups.

Most patients had a BMI of 18.5-24.9 and an ASA grade of 1. There were no ASA grade 3 or 4 cases in either of the study groups. In group A, 60% belong to IID <4.5 cm and 40% >4.5 cm. In group B, 86.67% belong to IID <4.5 cm and 13.33% >4.5 cm. The groups showed statistically significant differences in BMI, ASA, and IID (p =0.022, p =0.019, and p =0.019, respectively). Most patients had MPC grades 1 and 2. The difference between the MPC grades among the study groups was not statistically significant (p=0.737) [Table 1].

The number of operators (N2) among the study groups was comparable and not statistically significant (p=0.08). Number of attempts (N1): In group A, 73.33% of the patients were intubated on 1st attempt, and in group B, 93.33% were intubated on 1st attempt, which was statistically significant among the study groups (p=0.03). No alternative technique (N3) was used in this study.

Among group A patients, 63.33%, 23.34%, and 13.33% had CL grades 1, 2a, and 13.33% had 2b CL respectively. Among the patients in group B, 93.34% had grade 1, 3.33% had grade 2a, and 3.33% had grade 2b CL. The difference between CL grades (N4) among the study groups was statistically significant (p=0.018). Forty per cent of the patients in Group A required an extra lifting force (N5) of 13.33% in Group B, which was statistically significant (p=0.019). In group A, 36.67% of patients required laryngeal pressure (N6) compared to 13.33% in group B, which was statistically significant among the study groups (0.03). Abduction of the vocal cords (N7) was observed in both groups [Table 2].

In group A, the mean POGO score was 71.53±26.97; in group B, the mean POGO score was 87.13±15.71. The difference between the mean POGO scores of the study groups was statistically significant (p =0.008). Among the study groups, the mean duration of intubation in group A was 27.33 seconds, and in group B, it was 21.5 seconds. The difference in the mean duration of intubation among the study groups was statistically significant (p<0.001).

The differences in mean heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure among the study groups were statistically significant (p<0.0001) [Figures 1-4]. The difference in the mean SPO2 values among the study groups was not statistically significant (p=0.4035) [Figure 5].

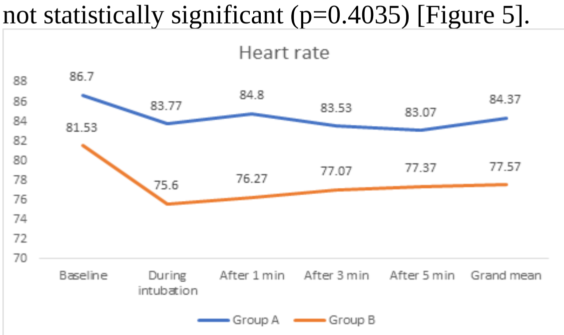

Figure 1: Comparison of mean heart rate among the study groups

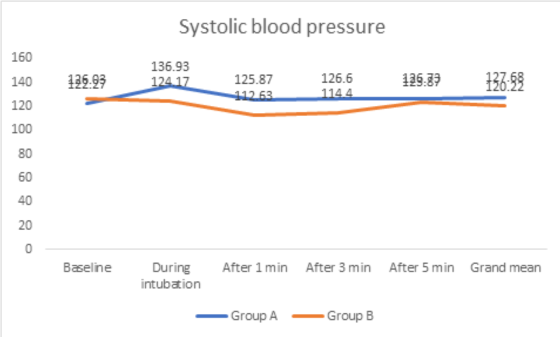

Figure 2: Comparison of mean systolic blood pressure between study groups.

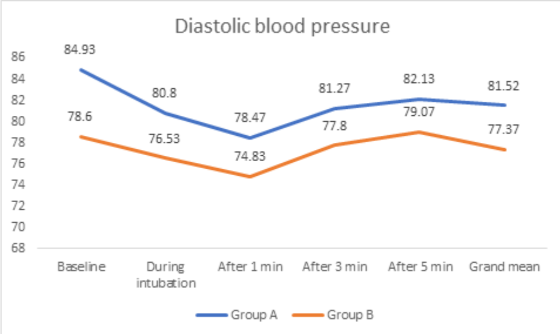

Figure 3: Comparison of the mean diastolic blood pressure between the study groups.

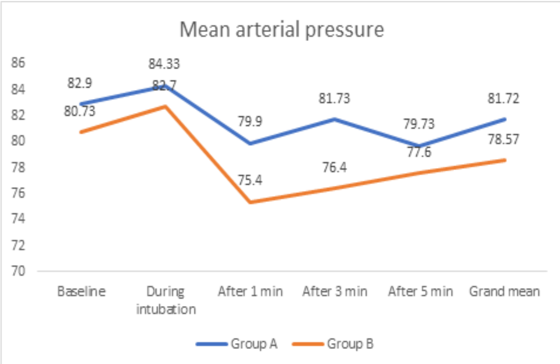

Figure 4: Comparison of mean arterial pressure between the study groups.

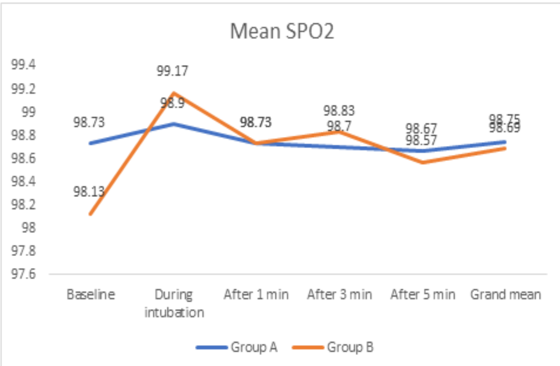

Figure 5: Comparison of the mean SPO2 between the study groups

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Table 1: Comparison of demographic data between groups

		Group A	Group B	P value
Age	<20	1 (3.33%)	1 (3.33%)	0.971
	21-30	10 (33.33%)	11 (36.67%)	
	31-40	7 (23.33%)	5 (16.67%)	
	41-50	5 (16.67%)	6 (20%)	
	51-65	8 (26.67%)	7 (23.33%)	
Gender	Male	21 (70%)	18 (60%)	0.416
	Female	9 (30%)	12 (40%)	
Weight (kgs)		60.7 ± 7.2	61.3 ± 7.7	0.756
BMI	<18.5	2 (6.67%)	3 (10%)	0.022
	18.5-24.9	12 (40%)	22 (73.33%)	
	25-29.9	13 (43.33%)	3 (10%)	
	>30	3 (10%)	2 (6.67%)	
ASA	1	18 (60%)	26 (86.67%)	0.019
	2	12 (40%)	4 (13.33%)	
	3	0 (00%)	0 (00%)	
	4	0 (00%)	0 (00%)	
Thyromental distance	>6.5cm	25 (83.33%)	21 (70%)	0.222
	<6.5cm	5 (16.67%)	9 (30%)	
Inter-incisor distance	<4.5	18 (60%)	26 (86.67%)	0.019
	>4.5	12 (40%)	4 (13.33%)	
MPC grade	1	16 (53.33%)	13 (43.33%)	0.737
	2	8 (26.67%)	10 (33.33%)	
	3	6 (20%)	7 (23.34%)	
	4	0 (00%)	0 (00%)	

Table 2: Comparison of Intubation difficulty scale score among the study group

IDS score		Group A	Group B	P value
N1 (attempts)	1st – Score 0	22 (73.33%)	28 (93.33%)	0.037
	2nd – Score 1	8 (26.67%)	2 (6.67%)	
N2 (operators)	1st – Score 0	25 (83.33%)	29 (96.67%)	0.085
	2nd – Score 1	5 (16.67%)	1 (3.33%)	
N3 (alternative techniques)	Not used – Score 0	30 (100%)	30 (100%)	-
N4 (CL grade)	1st – Score 0	19 (63.33%)	28 (93.34%)	0.018
	2a – Score 1	7 (23.34%)	1 (3.33%)	
	2b – Score 2	4 (13.33%)	1 (3.33%)	
N5 (lifting force)	Normal – Score 0	18 (60%)	26 (86.67%)	0.019
	Increased – Score 1	12 (40%)	4 (13.33%)	
N6 (laryngeal pressure)	Not applied – Score 0	19 (63.33%)	26 (86.67%)	0.036
	Applied – Score 1	11 (36.67%)	4 (13.33%)	
N7 (vocal cord position)	Abducted – Score 0	30 (100%)	30 (100%)	-

DISCUSSION

Cervical spine injuries affect 2-5% of trauma patients, necessitating airway management to prevent hypoxia and hypoventilation. Trauma life support guidelines recommend manual in-line stabilisation or rigid collars to stabilise the spine. However, these devices can hinder the laryngoscopic view and intubation. Alternatives include direct laryngoscopes, fiberoptic bronchoscopes, airway scopes, McCoy laryngoscopes, intubating laryngeal mask airways, and Bullard laryngoscopes. The McCoy levering laryngoscope improves the laryngoscopic view in patients with cervical spine injuries. Video laryngoscopes, with external light sources and digital cameras, provide optimum glottis visualisation.[1,4,6,8,9]

In this study, we compared the efficacy of the Hugemed laryngoscope and the McCoy blade laryngoscope in simulated cervical spine injury. We recorded the duration of laryngoscopy, time taken for intubation, difficulty in intubation (IDS score), and haemodynamic response. The demographic variables compared were age, sex, and BMI between both groups. The primary aim of our study was to compare and record the duration of laryngoscopy, intubation time, intubation attempts, and IDS scores. The mean duration of intubation was compared between the two groups, and it was inferred that it was significantly shorter in the Hugemed group (21.5 s) than in the McCoy group (27.33 s).

The time required for intubation was shorter in the Hugemed group, and the mean total duration of intubation was significantly different between the groups. Our results for the duration of intubation differed from the study of Jain et al., comparing McCoy and video laryngoscope in simulated cervical spine injury.[4]

The IDS score was used to evaluate intubation difficulty. In our study, 28 patients in the Hugemed Group B and 22 in the McCoy Group A were intubated on the first attempt and were comparable. The results were the same as those of the study by Jain et al.; twenty-five patients in Group A and 29 in Group B required a single person for intubation.[4] The same technique in our study was intubated for all patients.

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In the C-MAC group, 28 patients had CL grade 1 and 2 patients had CL grade 2a and 2b, respectively. In the McCoy group, 19 patients had CL grade 1, seven had CL grade 2a, and four had CL grade 2b. Therefore, glottic exposure was better in the Hugemed group than in the McCoy group. It is statistically significant, which was similar to studies by Jain et al and Sabry et al,[4,8] Jain et al. compared the McCoy laryngoscope and C-MAC video laryngoscope in simulated cervical spine injury and observed that out of 30 patients, 29 patients in the C-MAC group and 16 patients in the McCoy group had CL grade 1 and was statistically significant.[4] Sabry et al. compared C-MAC D blade and McCoy laryngoscopes during cervical immobilisation and observed that out of 30 patients, 16 patients in the C-MAC group and four patients in the McCoy group had CL grade 1, which was statistically significant.8
The McCoy group (12 patients) required more lifting force for the glottic view than the Hugemed group (4 patients), which was statistically significant. Four patients in group B required external laryngeal pressure at intubation compared to 11 patients in group A, which was statistically significant. The IDS score was statistically significant between the groups. Hugemed's use resulted in easier intubation compared with McCoy's. This result is similar to the study by Jain et al.[4]
In our study, the heart rate, mean systolic BP, mean diastolic BP, mean BP, and MAP were recorded at all times, were comparable between the Hugemed and McCoy groups, and were statistically significant. At the same time, the spO2 was insignificant between the groups. This result differed from the study by Jain et al.[4]

CONCLUSION

Our study found that Hugemed video laryngoscopy required less intubation time and provided optimal visualisation of the glottis. The IDS score was lower and had fewer haemodynamic responses than Group A patients with simulated cervical spine injury. Hence, the Hugemed group had better visualisation of the glottis and needed an optimal lifting force and clinically significant external laryngeal pressure with lower IDS scores than the McCoy group.

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