Research Article

Comparison of duration of layngoscopy, laryngeal view and ease of intubation with different laryngoscopy blades

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Abstract

Introduction: Laryngoscopy is the most important step of general anaesthesia requiring endotracheal intubation. The shape of a laryngoscope blade affects the exposition of the larynx. Even though there are studies comparing Miller, McCoy, Macintosh blades, studies comparing them with MacDoshi blade are sparse. Hence, we decided to evaluate the laryngoscopic view and cardiovascular response obtained with Macintosh, McCoy, MacDoshi and Miller blades in adults. **Materials and Methods:** Two hundred patients in the age group of 18-60 years, ASA class I and II, belonging to malampatti class I and II, undergoing elective surgeries under general anaesthesia were included in the study. Laryngoscopic view, duration of laryngoscopy and ease of intubation were assessed. Data was analysed using SPSS software version 15.0. Data were examined using analysis of variance, Chi square test. $P < 0.05$ was considered statistically significant. **Results:** Laryngoscopic view was better with Miller blades, but the duration of laryngoscopy was lesser and it was easier to intubate with the McCoy blade. The pressor response was lesser with the McCoy blade in comparison to the other blades. **Conclusion:** It is concluded that although the straight blade like Miller improve the visualization of the larynx, the curved blade with flexible tip like McCoy provides better intubating conditions and trigger minimal cardiovascular stress response. The MacDoshi blade provides better laryngoscopic view and produces lesser pressor response than the Macintosh blade.

Keywords: Laryngoscopy, Intubation, General Anaesthesia.

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INTRODUCTION

Laryngoscopy is the most important step of general anaesthesia requiring endotracheal intubation. Laryngoscopes are used to view the larynx and adjacent structures, most commonly for the purpose of intubation through vocal cords. The shape of a laryngoscope blade affects the exposition of the larynx. Intubating conditions apart from varying anatomical structuresare highly dependent on the shape and length of the laryngoscope blade. The laryngoscopic view of vocal cords can be influenced by various factors. The three most important factors are the forward displacement of larynx, forward or prominent upper teeth and backward displacement of tongue. It is in this situation the force applied during laryngoscopy increases as the degree of difficulty increases necessitating the use of different types of laryngoscopic blades. The laryngoscopy is known to have profound cardiovascular effects. This includes pressor response and tachycardia along with an increase in catecholamine concentration, mainly norepinephrine. The major cause of the sympathoadrenal response is believed to arise from stimulation of supraglottic region by laryngoscopic blade with tracheal tube placement and cuff inflation contributing little additional stimulation.[1,2] Complications of pressor response following laryngoscopy include myocardial ischemia, cardiac failure, intracranial haemorrhage and increase in intracranial pressure.[3,4] Various kinds of blades have been designed to facilitate intubation. The commonly used blades are Macintosh blades. Miller blades are straight

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blades, McCoy blade is a curved blade with a flexible tip and the MacDoshi blade is a modification of the Macintosh blade, where the height of the web has been increased by 7mm and the width of the flange decreased by 3 mm making it useful in edentulous patients. Even though there are studies comparing Miller, McCoy, Macintosh blades, studies comparing them with MacDoshi blade are sparse. Hence, we decided to evaluate the laryngoscopic view and cardiovascular response obtained with Macintosh, McCoy, Mac Doshi's and Miller blades in adults.

METHODOLOGY

After Institutional Ethical Committee approval and written informed consent, patients posted for various elective surgeries requiring general anaesthesia were selected. All patients were explained regarding the study and objectives. Sample size was calculated using the data from the previous study conducted by Arino *et al*. Comparing the proportions for laryngoscopic view between Macintosh and Miller blades the minimum sample size was found to be 47 in each group. 50 Patients in each group were included for better validation of the results. Two hundred (200) patients in the age group of 18-60 years, ASA class I and II, belonging to malampatti class I and II, undergoing elective surgeries under general anaesthesia between September 2005 to April 2007 were included in the study. Two hundred (200) patients scheduled for different elective surgeries under general anaesthesia were randomly allocated to one of following four groups of 50 patients in each group using computer generated random numbers.

Group I: Laryngoscopic view and cardiovascular response with Macintosh blade (n-50)

Group II: Laryngoscopic view and cardiovascular response with McCoy blade (n-50)

Group III: Laryngoscopic view and cardiovascular response with MacDoshi blade (n-50)

Group IV: Laryngoscopic view and cardiovascular response with Miller blade (n-50)

Patients with Cardiovascular, cerebrovascular, renal respiratory, neuromuscular, endocrinal or psychiatric disorders or those with suspected difficult airway were excluded from the study. Intravenous line was started and psychological assurance given to the patient. and non-invasive blood pressure, pulse oximeter, ECG were connected. Preinduction parameters: Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and any changes on the ECG are noted. Inj. Pentazocine 0.5 $mgkg^{-1}$ IV was given as premedication 10 minutes before induction for all patients. Pre-oxygenated with 100% oxygen for 3 minutes using Bain's system. Anaesthesia is induced with Inj. thiopentone sodium (2.5%) 5 $mgkg^{-1}$ and relaxation using Inj. Suxamethorium 1.5 mg kg^{-1}. The heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, ECG changes and oxygen saturation (SPO_2) are recorded during induction. Mask ventilated for 1 minute after injection of suxamethonium with Bain's system. Patients were put into "sniffing position". Direct laryngoscopy was carried out under full muscle relaxation. Patients requiring more than one attempt of laryngoscopy were excluded from the study. The laryngeal view obtained was compared according to Cormack and Lehane[6] grading as follows.

Grade I: Full view of glottis.

Grade II: Only posterior commisure visible.

Grade III: Only Epiglottis visible.

Grade IV: No glottic structures visible

All patients were intubated using appropriate size of oral endotracheal tube for that age and sex of the patient. The degree of difficulty with intubation was rated as follows.

Grade I: Intubation easy.

Grade II: Intubation requiring an increased anterior lifting force and assistance to pull the right corner of the mouth upwards to increase space.

Grade III: Intubation requiring multiple attempts and a curved stylet.

Grade IV: Failure to intubate with the assigned laryngoscope.

The endotracheal tube was connected to Bain's system and controlled ventilation is instituted. Anaesthesia is maintained using O_2 in N_2O (33%:67%) at 14 breaths per minute. For maintenance Inj. vecuronium bromide 0.05 $mgkg^{-1}$ was used. The following parameters heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and ECG changes are noted preoperatively and at pre-induction as mentioned already and after induction, during laryngoscopy with Macintosh, McCoy, MacDoshi and Miller blades, 1 minute after laryngoscopy, 2 mins after laryngoscopy, 3 minutes after laryngoscopy, 5 minutes after laryngoscopy, 10 minutes after laryngoscopy. No surgical stimulus was applied during study period, i.e. upto ten minutes after laryngoscopy. Neuromuscular blockade is reversed with Inj. neostigmine 0.05 $mgkg^{-1}$ and Inj. atropine 0.02 $mgkg^{-1}$ both IV after ensuring adequate recovery from neuromuscular blockade. Cuff of endotracheal is deflated after thorough suctioning of the oral cavity and throat, before extubation. All patients were monitored in the postoperative care unit for 2 hours postoperatively. Data was analysed using SPSS software version 15.0. Data were examined using analysis of variance, Chi square test. $P < 0.05$ was considered statistically significant.

RESULTS

Two hundred (200) patients in ASA I and II of either sex, aged between. 18 years to 60 years with Mallampati Class I and II posted for elective surgery under general anaesthesia were selected for the study. The study was undertaken to evaluate the laryngoscopic view and cardiovascular response with Macintosh No. 3, McCoy No. 3, MacDoshi No. 3 and Miller No. 3 blade in adults. The demographic parameters age, sex, weight, mallampati class and temporo mandibular distance was comparable between all the four groups (Table 1). Visualisation of the larynx was better in Group IV, 44 patients had grade of I in comparison to 41 patients in group II, 33 patients in group III and 32 patients in group I (Table 2). The duration of laryngoscopy was highest in group IV (15.06 ± 3.59 secs) as compared to 12.06 ± 1.85 secs in group I, 11.10 ± 1.92 secs in group II and 12.02 ± 1.93 secs in group III (Table 3). The ease of intubation was grade I in 44 patients in group II, 40 patients in group III, 36 patients in group I and 25 patients in group IV (Table 4). The increase in mean heart rate during laryngoscopy was least with group II (McCoy blade) compared to group I (Macintosh blade), group III (MacDoshi blade) and highest with group IV (Miller blade) (Figure 1). The increase in mean systolic blood pressure, mean diastolic blood pressure and mean of mean arterial pressure during laryngoscopy was least with group II (McCoy blade) compared to group III (MacDoshi blade) and group I (Macintosh blade) and highest with group IV (Miller blade) (Figure 2). All the patients in the four groups were intubated in the first attempt. There were no episodes of desaturation, bradycardia or hypoxia during layngoscopy and intubation in all the four groups.

Table 1: Demography

Parameter		Group I	Group II	Group III	Group IV
Age (yrs)		35.84 ± 11.14	37.6 ± 11.12	35.96 ± 11.10	36.18 ± 10.84
Sex	M	23	22	23	22
	F	27	28	27	28
Weight (kgs)		58.72 ± 6.46	59.74 ± 6.41	60.68 ± 7.22	57.92 ± 6.91
Height (cms)		163.04 ± 7.62	162.60 ± 7.28	163.16 ± 6.63	161.82 ± 6.68
MP class	I	35	34	37	36
	II	15	16	13	14
TM distance	6-6.5	13	15	13	15
	>6.5	37	35	37	35

Table 2: Cormack and Lehane grading by groups

Cormack and Lehane grading	Group I	Group II	Group III	Group IV
I	32 (64%)	41 (82%)	33 (66%)	44 (88%)
II	17 (34%)	9 (18%)	17 (34%)	6 (12%)
III	1 (2%)	0	0	0
P value	0.035			

Table 3: Duration of laryngoscopy by groups

Duration of laryngoscopy (sec)	Group I	Group II	Group III	Group IV
≤ 10	29 (58%)	32 (64%)	30 (60%)	3 (6%)
11 to 20	21 (42%)	18 (36%)	20 (40%)	44 (88%)
21 to 30	0	0	0	3 (6%)
Mean duration ± SD	12.06 ± 1.85	11.10 ± 1.92	12.02 ± 1.93	15.06 ± 3.59
P value	p < 0.001			

Table 4: Ease of intubation by groups

Grading	Group I	Group II	Group III	Group IV
Grade 1	36 (72%)	44 (88%)	40 (80%)	25 (50%)
Grade 2	14 (28%)	6 (12%)	10 (20%)	22 (44%)
Grade 3	0	0	0	3 (6%)
P value	p < 0.001			

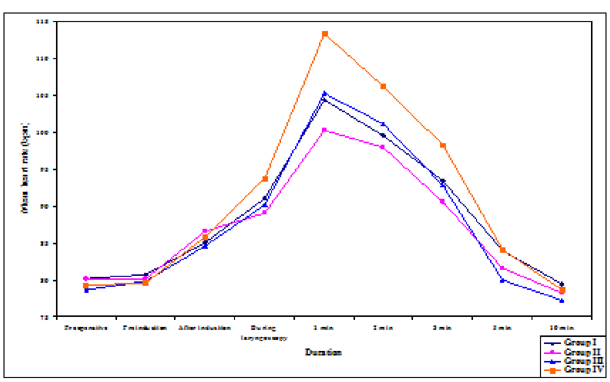

Figure 1

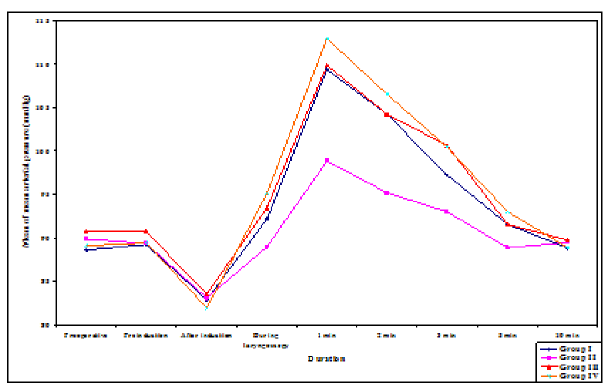

Figure 2

Legend

Figure 1: Mean heart rate (bpm) at various time intervals

Figure 3: Mean of mean arterial pressure (mmHg) at various time intervals

DISCUSSION

Laryngoscopy is the most important step of general anaesthesia requiring endotracheal intubation. Laryngoscopes are used to view the larynx and adjacent structures, for the purpose of intubation through vocal cords. To aid and ease the process of intubation, laryngoscopic blades of different shapes have been designed and studied. The shape of a laryngoscope blade affects the exposition of the larynx. Intubating conditions apart from varying anatomical structures are highly dependent on the shape and length of the laryngoscope blade. The laryngoscopy is known to have profound cardiovascular effects. This include pressor response and tachycardia along with an increase in catecholamine concentration mainly noradrenaline. Both may be hazardous to those with hypertension, myocardial insufficiency and cerebrovascular disease. Thus the blades used for laryngoscopy should facilitate good laryngoscopic view of vocal cords to ease the process of intubation and should trigger minimal stress response. In our study we found that the visualization of the larynx was better with the Miller blade in comparison to the other three blades. With the McCoy blade the incidence of Cormack Lehane grade I was 82%. The visualisation of the larynx was least in the Macintosh blade. This is because the curvature of the macintosh and other curved blades act as an obstruction to the view. This is called as "crest of the hill effect". With the miller blade the volume of tissue that needs to be displaced is less. With the McCoy blade the lever aids in lifting the epiglottis improving vision. Arino *et al*[7] and Cheung *et al*[8] found similar findings in their studies comparing different blades. But Bito *et al* found better laryngoscopic views with McCoy blade in comparison to Miller straight blade. Duration of laryngoscopy was shorter and it was easier to intubate with the McCoy blade in our study. This is because the curved blades provide more room to maneuver the endotracheal tube into the larynx.[7] The MacDoshi blade which is a modification of the Macintosh blade had a better laryngeal visualization of the larynx, duration of laryngoscopy was shorter and intubation was easier than the Macintosh blade. Most of the studies done have confirmed our finding that it is easier to intubate with curved blades than straight blades and blades with flexible tips provide better visualization and provide better conditions to intubate compared to other curved blades.[7-12] Like the study done by various authors, our study showed that haemodynamic responses to intubation were least with the McCoy blade.[13-16] The MacDoshi blade showed lesser stress response in comparison to the Macintosh and Miller blades.

CONCLUSION

It is concluded that although the straight blade like Miller improve the visualization of the larynx, the curved blade with flexible tip like McCoy provides better intubating conditions and trigger minimal cardiovascular stress response. Stress response to laryngoscopy is less marked with the use of the McCoy blade and is due to reduction in the force necessary to obtain a clear view of the larynx. The MacDoshi blade which is a modification of the Macintosh blade provides better laryngoscopic view and produces lesser pressor response than the Macintosh blade.

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